

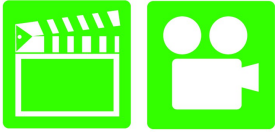
# Automotive Maintenance and Light Repair, 1<sup>ST</sup> Edition

## Chapter 59 DISC BRAKES

### Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers <b>Automotive Maintenance and Light Repair</b> . 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 the chapter learning objectives to the students. <ul style="list-style-type: none"><li>— Prepare for the Brakes (A5) ASE certification test content area “C” (Disc Brake Diagnosis and Repair).</li><li>— List the items that should be checked during a visual inspection.</li><li>— Describe the caliper disassembly procedure.</li><li>— Describe the caliper assembly procedure.</li><li>— List the steps necessary to reduce brake noise.</li></ul>
Establish the Mood or Climate	Provide a <i>WELCOME</i> , 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.

## ICONS



## Ch59 DISC BRAKES

1. SLIDE 1 CH59 DISC BRAKES
2. SLIDES 2-3 EXPLAIN OBJECTIVES

Check for **ADDITIONAL VIDEOS & ANIMATIONS**  
@ <http://www.jameshalderman.com/>  
**WEB SITE REGULARLY UPDATED**

### **VIDEO: DISC BRAKE DIAGNOSIS** **WWW.MYAUTOMOTIVELAB.COM**

[HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET\\_MYLABS/AKAMAI/TEMPLATE/VIDEO640X480.PHP?TITLE=VIDEO%20OF%20CALIPERS%20102.3&CLIP=PANDC/CHET/2012/AUTOMOTIVE/A5-C6.MOV&CAPTION=CHET/CHET\\_MYLABS/AKAMAI/2012/AUTOMOTIVE/XML/A5-C6.ADB.XML](http://media.pearsoncmg.com/ph/chet/chet_myLABS/akamai/template/VIDEO640X480.PHP?TITLE=VIDEO%20OF%20CALIPERS%20102.3&CLIP=PANDC/CHET/2012/AUTOMOTIVE/A5-C6.MOV&CAPTION=CHET/CHET_MYLABS/AKAMAI/2012/AUTOMOTIVE/XML/A5-C6.ADB.XML)

### **DISCUSSION: ASK STUDENTS TO DISCUSS** **PROCEDURE FOR DIAGNOSING DISC BRAKE** **PROBLEMS.**

**TO VERIFY CUSTOMER CONCERN, ASK CUSTOMER**  
**TO DRIVE VEHICLE WHILE YOU RIDE ALONG TO**  
**MAKE SURE VEHICLE IS OPERATED IN SAME**  
**MANNER IN WHICH PROBLEM OCCURS**

4. SLIDE 4 EXPLAIN **Figure 59-1** Minimum thickness for various types of disc brake pads. Pad wear sensors often make a “chirping” sound when the vehicle is moving if the pads are worn. Do not confuse that noise for a defective wheel bearing or other fault.
5. SLIDE 5 EXPLAIN **Figure 59-2** This cracked disc brake pad must be replaced even though it is thicker than minimum allowed by vehicle manufacturer and the wear sensor was not close to the rotor.

### **ELECTRONIC SENSOR IN A BRAKE PAD THAT** **OPERATES WEAR INDICATOR IS EASILY BROKEN** **WHEN REMOVING PADS.**








6. SLIDE 6 EXPLAIN **Figure 59-3** Be careful to observe the direction in which replacement linings are facing. Some vehicle manufacturers offset the friction material on the steel backing to help prevent or minimize tapered pad wear. Check service information for details as to which direction the pads should be installed.
7. SLIDE 7 EXPLAIN **Figure 59-4** Most disc brake calipers have a brake inspection opening. For a thorough inspection, however, the caliper should be removed and the entire braking system thoroughly inspected.

**ICONS****Ch59 DISC BRAKES****DEMO**

**DEMONSTRATION: SHOW STUDENTS HOW TO DO THE BLEED AND SQUIRT TEST TO DETERMINE IF A BRAKE IS BEING COMPLETELY RELEASED.**

**DISCUSSION: ASK STUDENTS TO DISCUSS THE PROCESS OF VISUALLY INSPECTING DISC BRAKES. WHAT SHOULD THEY DO BEYOND CHECKING THE THICKNESS OF THE LINING?**

8. **SLIDE 8 EXPLAIN Figure 59-5 (a)** Both rear- and forward-mounted calipers have the bleeder valve at the top. Some calipers will fit on the wrong side of the vehicle, yet not be able to be bled correctly because the bleeder valve would point down, allowing trapped air to remain inside the caliper bore. If both calipers are being removed at the same time, mark them “left” and “right.”
9. **SLIDE 9 EXPLAIN Figure 59-6** Many manufacturers recommend removing  $\frac{1}{2}$  of brake fluid from master cylinder before servicing disc brakes. Use a squeeze bulb and dispose of used brake fluid properly.
10. **SLIDE 10 EXPLAIN Figure 59-7** Most manufacturers recommend that bleeder valve be opened and brake fluid forced into a container rather than back into the master cylinder reservoir. This helps prevent contaminated brake fluid from being forced into the master cylinder where the dirt and contamination could cause problems.
11. **SLIDE 11 EXPLAIN Figure 59-8** Many calipers use a hollow “banjo bolt” to retain flexible brake line to caliper housing. Fitting is usually round like a banjo. The copper washers should always be replaced and not reused.
12. **SLIDE 12 EXPLAIN Figure 59-9** Caliper retaining bolts are often called guide pins. These guide pins are used to retain caliper to the steering knuckle. These pins also slide through metal bushings and rubber O-rings.
13. **SLIDE 13 EXPLAIN Figure 59-10** If caliper is not being removed, it must be supported properly so that weight of caliper is not pulling on flexible brake line.
14. **SLIDE 14 EXPLAIN Figure 59-11** A wooden block or a folded shop cloth helps prevent damage when caliper pistons are removed. Use extreme care when removing a caliper piston using compressed air. The pressure applied can force the piston out of the caliper with tremendous force. Always follow service information instructions.

ICONS	Ch59 DISC BRAKES
	<p><b>HANDS-ON TASK: HAVE STUDENTS CARRY OUT THE STEPS TO REMOVE DISC BRAKE CALIPERS. HAVE STUDENTS INSPECT THE CALIPERS THEY HAVE REMOVED, AND SELECT STUDENTS TO REPORT THEIR OBSERVATIONS TO THE CLASS.</b></p>
	<p>15. SLIDE 15 EXPLAIN Figure 59-12 A loaded caliper includes all hardware and shims with the correct pads all in one convenient package, ready to install on the vehicle</p>
	<p>16. SLIDE 16 EXPLAIN Figure 59-13 Floating calipers must be able to slide during normal operation. Therefore, there must be clearance between the caliper and the caliper mounting pads (abutments). Too little clearance will prevent the caliper from sliding and too much clearance will cause the caliper to make a clunking noise when the brakes are applied.</p>
	<p>17. SLIDE 17 EXPLAIN Figure 59-14 Using an air-powered sanding disc to clean the caliper mount pads.</p> <p>18. SLIDE 18 EXPLAIN Figure 59-15 Determine which face of the special tool best fits the holes or slots in the piston. Sometimes needle-nose pliers can be used to rotate the piston back into the caliper bore.</p>
	<p><b>DEMONSTRATION: SHOW PROPER WAY TO REMOVE A BRAKE PAD THAT HAS AN ELECTRONIC WEAR SENSOR. SHOW STUDENTS HOW TO CHECK AN ELECTRONIC SENSOR FOR PROPER INSTALLATION WITH A CONTINUITY TESTER</b></p>
	<p><b>DEMONSTRATION: SHOW CALIPER ABUTMENTS ON A DISC BRAKE, AND DISCUSS THE ISSUES CAUSED BY TOO MUCH CLEARANCE BETWEEN THE ABUTMENT AND THE CALIPER. WHAT CAUSES THIS AND WHAT ARE THE SYMPTOMS? ASK STUDENT TO IDENTIFY POSSIBLE REPAIRS</b></p>
	<p><b>IT MAY TAKE SEVERAL TRIES TO GET RETAINING TABS TIGHT ON OUT BOARD PAD. THEY MUST BE TIGHT TO POINT WHERE YOU HAVE TO FORCE THEM ON BY HAND.</b></p>
	<p>19. SLIDE 19 EXPLAIN Figure 59-16 Note the twisted flexible brake line. This was caught by an automotive instructor before the brake work on the vehicle was completed. The twisted brake line can cause brake hose failure if not corrected.</p>

## ICONS

## Ch59 DISC BRAKES



20. **SLIDE 20 EXPLAIN Figure 59-17** For best braking performance, purchase replacement disc brake pads that include all clips and shims specified by the vehicle manufacturer. Some pads even come with a package of the specified grease to use on the shims to reduce the possibility of brake noise.

21. **SLIDE 21 EXPLAIN CHART 59-1**

22. **SLIDES 22-23 EXPLAIN Servicing Disc Brake Calipers: Caliper Assembly**

24. **SLIDE 24 EXPLAIN Figure 59-18** Notice beveled pads. The shape of the pad helps reduce brake noise

25. **SLIDE 25 EXPLAIN FIGURE 59-19** The screwdriver blade is used to keep the piston applied to allow self-adjustment to occur when the brake pedal is released.










26. **SLIDES 26-27 EXPLAIN Disc Brake Squeal**  
**Correction: Correcting Disc Brake Squeal**




**DISCUSSION: ASK STUDENTS TO DISCUSS HOW TO TEST NEWLY INSTALLED BRAKE PADS PRIOR TO A TEST DRIVE AND WHY THIS IS AN IMPORTANT FIRST STEP. ASK STUDENTS TO TALK ABOUT THE CAUSES OF DISC BRAKE SQUEAL. HOW CAN YOU TELL THE DIFFERENCE BETWEEN THE SOUND OF A THIN-LINING WARNING SENSOR AND OTHER PROBLEMS ASSOCIATED WITH OPERATING DISC BRAKES? ASK STUDENTS TO DISCUSS THE PROCESS OF BEDDING-IN, OR BURNISHING, REPLACEMENT BRAKE PADS TO BREAK THEM IN. WHAT IS OEM RECOMMENDATION FOR PADS WITH WHICH THEY ARE WORKING? IS THIS TYPICALLY APPROPRIATE FOR NEW BRAKES TODAY?**



**DEMONSTRATION: SHOW STUDENTS AN EXAMPLE OF ANTI-SQUEAL SHIMS AND DISCUSS HOW THEY WORK. ASK STUDENTS TO DISCUSS WAYS TO PREVENT DISC BRAKE SQUEAL. TALK ABOUT HOW AND WHERE TO APPLY GREASE TO DISC BRAKES TO REDUCE BRAKE NOISE. ASK STUDENTS TO DISCUSS HOW TO MACHINE BRAKE ROTORS TO REDUCE BRAKE NOISE. HOW DOES CHANGING THE BRAKE PAD LINING AND SHAPE HELP DIMINISH BRAKE NOISE?**

ICONS	Ch59 DISC BRAKES
	<p>ALWAYS PURCHASE REPLACEMENT DISC BRAKE PADS THAT INCLUDE ALL THE CLIPS, SHIMS, AND LUBRICANT SPECIFIED BY THE OEM</p>
	<p><b>DISCUSSION:</b> ASK STUDENTS TO DISCUSS POSSIBLE CAUSES OF DRAGGING BRAKES. ASK STUDENTS TO TALK ABOUT WHY FRONT DISC BRAKES MIGHT BE VERY SENSITIVE TO LIGHT APPLICATION OF THE BRAKES. ASK STUDENTS TO DISCUSS WHY REAR DRUM BRAKES MIGHT SKID DURING HARD APPLICATION OF THE BRAKES</p>
	<p><b>DEMONSTRATION:</b> SHOW STUDENTS HOW TO USE A BRAKE PRESSURE TESTER TO DIAGNOSE AN IMBALANCE BETWEEN THE LEFT- AND RIGHT-SIDE BRAKES.</p>
	<p><b>DEMONSTRATION:</b> SHOW STUDENTS PROPER WAY TO TORQUE A WHEEL ON TO A VEHICLE USING A TORQUE STICK AND THEN TO DOUBLE CHECK THEIR WORK WITH A TORQUE WRENCH WHEN THE CAR IS ON THE GROUND.</p>
	<p>28. SLIDES 28-45 EXPLAIN <u>OPTIONAL DISC BRAKE SERVICE</u></p>
	<p><b>NATEF MLR TASK A5D1 REMOVE AND CLEAN CALIPER ASSEMBLY; INSPECT FOR LEAKS AND DAMAGE/WEAR TO CALIPER HOUSING; DETERMINE NECESSARY ACTION.</b></p>
	<p><b>NATEF MLR TASK A5D2. CLEAN AND INSPECT CALIPER MOUNTING AND SLIDES/PINS FOR PROPER OPERATION, WEAR, AND DAMAGE; DETERMINE NECESSARY ACTION.</b></p>
	<p><b>NATEF MLR TASK A5D3 REMOVE, INSPECT, AND REPLACE PADS AND RETAINING HARDWARE; DETERMINE NECESSARY ACTION.</b></p>
	<p><b>NATEF MLR TASK A5D4 LUBRICATE AND REINSTALL CALIPER, PADS, AND RELATED HARDWARE; SEAT PADS AND INSPECT FOR LEAKS.</b></p>

<b>ICONS</b>	<b>Ch59 DISC BRAKES</b>
	<p><b>SEARCH INTERNET: AUTOMOTIVE DISC BRAKE DESIGNS HAVE A LONG HISTORY DATING BACK TO FREDERICK WILLIAM LANCHESTER'S PATENT IN 1902. HAVE STUDENTS COLLABORATE ON A REPORT COVERING EARLY HISTORY OF DISC BRAKE DESIGNS—FROM 1949 CROSLEY HOTSHOT TO 1963 STUDEBAKER AVANTI.</b></p>