
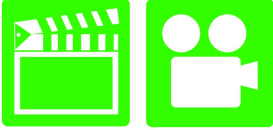





Automotive Maintenance and Light Repair, 1ST Edition

Chapter 57 WHEEL BEARINGS

Opening Your Class

KEY ELEMENT	EXAMPLES
Introduce Content	This course or class covers Automotive Maintenance and Light Repair . 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">— Prepare for Suspension and Steering (A4) ASE certification test content area “C” (Related Suspension and Steering Service).— Discuss the various types, designs, and parts of automotive antifriction wheel bearings.— Describe the symptoms of defective wheel bearings.— Explain wheel bearing inspection procedures and causes of spalling and brinelling.— List the installation and adjustment procedures for front wheel bearings.— Explain how to inspect, service, and replace rear wheel bearings and seals.
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.

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  	<p>1. SLIDE 1 CH57 WHEEL BEARINGS</p> <p>2. SLIDES 2-3 EXPLAIN OBJECTIVES</p> <p>Check for ADDITIONAL VIDEOS & ANIMATIONS @ http://www.jameshalderman.com/ WEB SITE REGULARLY UPDATED</p> <p>4. SLIDE 4 EXPLAIN Figure 57-1 Rolling contact bearings include (left to right) ball, roller, needle, and tapered roller.</p> <p>5. SLIDE 5 EXPLAIN Figure 57-2 Ball bearing point contact</p> <p>6. SLIDES 6-7 EXPLAIN Antifriction Bearings</p> <p>8. SLIDE 8 EXPLAIN FIGURE 57-3 Radial load is the vehicle weight pressing on wheels. The thrust load occurs as chassis components exert a side force during cornering.</p> <p>9. SLIDE 9 EXPLAIN Figure 57-4 Roller bearing line contact.</p> <p>10. SLIDE 10 EXPLAIN Figure 57-5 A tapered roller bearing will support a radial load and an axial load in only one direction.</p> <p>11. SLIDE 11 EXPLAIN Figure 57-6 Many tapered roller bearings use a plastic cage to retain the rollers.</p> <p>12. SLIDES 12-13 EXPLAIN Antifriction Bearings</p> <p>14. SLIDE 14 EXPLAIN Figure 57-7 Non-drive-wheel hub with inner and outer tapered roller bearings. By angling the inner and outer in opposite directions, axial (thrust) loads are supported in both directions.</p>
	<p><u>DEMONSTRATION:</u> SHOW EXAMPLES OF BALL BEARINGS. WHAT IS THEIR ADVANTAGE OVER ROLLER BEARINGS, & WHERE ARE BALL BEARINGS MOST OFTEN USED ON VEHICLES? SHOW EXAMPLES OF ROLLER BEARINGS. WHAT IS THEIR ADVANTAGE OVER BALL BEARINGS?</p>
	<p><u>DISCUSSION:</u> DISCUSS ROLE OF ANTIFRICTION BEARINGS IN REDUCING FRICTION—ALLOWING WHEELS TO ROTATE WHILE SUPPORTING VEHICLE'S WEIGHT. HAVE STUDENTS NAME 4 TYPES OF ANTIFRICTION BEARINGS.</p>

ICONS

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DEMO



QUESTION



QUESTION



QUESTION

DEMONSTRATION: SHOW EXAMPLES OF NEEDLE BEARINGS. WHERE MIGHT NEEDLE BEARINGS BE USED INSTEAD OF ROLLER BEARINGS? SHOW STUDENTS EXAMPLES OF TAPERED ROLLER BEARINGS. WHAT ABOUT THE DESIGN OF THESE BEARINGS MAKES THEM THE MOST USED AUTOMOTIVE WHEEL BEARING? SHOW STUDENTS THE PLACEMENT OF INNER AND OUTER WHEEL BEARINGS. WHY ARE THE INNER WHEEL BEARINGS ALWAYS LARGER?

DISCUSSION: DISCUSS DIFFERENCE BETWEEN AXIAL, OR THRUST, AND RADIAL LOADS AND HOW TAPERED ROLLER BEARINGS ACCOMMODATE BOTH.

15. SLIDES 15-18 EXPLAIN Antifriction Bearings

19. SLIDE 19 EXPLAIN Figure 57-8 Sealed bearing and hub assemblies are used on the front and rear wheels of many vehicles.

20. SLIDE 20 EXPLAIN Figure 57-9 Sealed bearing and hub assemblies are serviced as a complete unit as shown. This assembly includes the wheel speed sensor.

ON NON-DRIVE TAPERED WHEEL BEARINGS INNER RACE MUST SLIDE SMOOTHLY OVER THE SPINDLE.

21. SLIDES 21-23 EXPLAIN Bearing Greases

24. SLIDE 24 EXPLAIN CHART 57-1

DISCUSSION: DISCUSS NATIONAL LUBRICATING GREASE INSTITUTE (NLGI) GREASE PENETRATION TEST. WHAT IS SIGNIFIED BY LOW AND HIGH NUMBERS? WHAT DO THE QUALITY RATINGS INDICATE? WHAT TYPES OF GREASE WOULD BE USED FOR THE WHEEL BEARINGS OF CARS STUDENTS ARE WORKING ON? GREASE IS USED ON WHEEL BEARINGS TO REDUCE FRICTION FURTHER. ASK STUDENTS TO DISCUSS TYPES OF GREASE AND THE PURPOSE OF ADDITIVES IN THEM.

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25. SLIDES 25-26 EXPLAIN Seals

27. SLIDE 27 EXPLAIN Figure 57-10 Typical lip seal with a garter spring & EXPLAIN Figure 57-11 garter spring helps hold sharp lip edge of the seal tight against shaft.

DEMONSTRATION: SHOW STUDENTS EXAMPLES OF A DYNAMIC SEAL AND THE GARTER SPRING USED TO HOLD THE LIP OF THE SEAL IN PLACE

DISCUSSION: ASK STUDENTS TO TALK ABOUT THE PURPOSE AND FUNCTION OF SEALS, AND DISCUSS THE DIFFERENCE BETWEEN STATIC AND DYNAMIC SEALS.

28. SLIDES 28-30 EXPLAIN Bearing Diagnosis

DISCUSSION: ASK STUDENTS TO DISCUSS SYMPTOMS OF DEFECTIVE BEARINGS AND HOW TO DIAGNOSE THE EXACT PROBLEM. ASK STUDENTS TO DESCRIBE THE SOUND OF DEFECTIVE WHEEL BEARINGS AND DISCUSS ITS CAUSE.

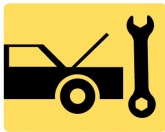
TO DETERMINE LOCATION OF A BEARING NOISE DRIVE VEHICLE ALONG A HIGH SOLID WALL ABOUT SIX FEET AWAY WITH WINDOW OPEN. THEN DRIVE BY AGAIN GOING OTHER WAY. THE NOISE WILL ECHO OFF WALL AND HELP YOU TO HEAR IT.

DISCUSSION: ASK STUDENTS TO IDENTIFY SYMPTOMS OF A DEFECTIVE WHEEL BEARING

ON-VEHICLE NATEF TASK DIAGNOSE WHEEL BEARING NOISES, WHEEL SHIMMY, AND VIBRATION CONCERNS; DETERMINE NECESSARY ACTION.

31. SLIDE 31 EXPLAIN Figure 57-12 Removing the grease cap with grease cap pliers & EXPLAIN Figure 57-13 Using a seal puller to remove the grease seal.

DEMONSTRATION: SHOW HOW TO REMOVE INNER WHEEL BEARING & GREASE SEAL. SHOW HOW TO USE WHEEL BEARING RACE PULLER. SHOW HOW TO INSTALL BEARING RACE

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DEMONSTRATION: SHOW STUDENTS HOW TO REMOVE A WHEEL GREASE CAP TO ACCESS THE OUTER WHEEL BEARING. SHOW STUDENTS HOW TO DO THE WHEEL BEARING LOOSENESS TEST. ASK THEM TO DESCRIBE SOME OF PROBLEMS THAT LOOSE WHEEL BEARINGS CAN CAUSE.

32. SLIDE 32 EXPLAIN Figure 57-14 Cleaning a wheel bearing with a parts brush and solvent & EXPLAIN Figure 57-15 A wheel bearing race puller.

HANDS-ON TASK: HAVE STUDENTS FOLLOW STEPS 1-21 ON PAGE 140 TO PERFORM A NON-DRIVE WHEEL BEARING INSPECTION AND REPLACE AND GREASE ANY DEFECTIVE BEARINGS THEY FIND. SELECT A STUDENT TO SUMMARIZE THE PROCESS AND RESULTS FOR THE CLASS

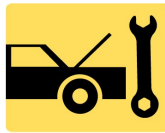
33. SLIDE 33 EXPLAIN Figure 57-16 Installing a bearing race with a driver & EXPLAIN Figure 57-17 Notice the new blue grease has been forced through the bearing.
34. SLIDE 34 EXPLAIN Figure 57-18 commonly used hand-operated bearing packer & EXPLAIN Figure 57-19 The wheel bearing is placed between two nylon cones and then a grease gun is used to inject grease into the center of the bearing.
35. SLIDE 35 EXPLAIN CHART 57-2
36. SLIDE 36 EXPLAIN Figure 57-20 wheel bearing adjustment procedure as specified for rear-wheel-drive vehicles. Always check service information for exact specified procedure for vehicle being serviced & EXPLAIN Figure 57-21 properly secured wheel bearing adjustment nut.

HANDS-ON TASK: HAVE STUDENTS PERFORM WHEEL BEARING ADJUSTMENT PROCEDURE FOR REAR-WHEEL DRIVE VEHICLE BY USING A TORQUE WRENCH. HAVE STUDENTS REPACK A BEARING WITH BEARING PACKER AND WITH THEIR HANDS

NATEF MLR TASK A5F1 REMOVE, CLEAN, INSPECT, REPACK, AND INSTALL WHEEL BEARINGS; REPLACE SEALS; INSTALL HUB AND ADJUST BEARINGS.

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NATEF MLR TASK A5F5 REPLACE WHEEL BEARING AND RACE.

- 37. **SLIDES 37-38 EXPLAIN** Sealed Bearing Replacement
- 39. **SLIDE 39 EXPLAIN Figure 57-22** A rear wheel sealed bearing hub assembly.
- 40. **SLIDE 40 EXPLAIN Figure 57-23** Removing the drive axle shaft hub nut. This nut is usually very tight and the drift (tapered) punch wedged into the cooling fins of the brake rotor keeps the hub from revolving when the nut is loosened. Never use an impact to remove or install a drive axle shaft hub nut because the hammering action can damage the bearing.
- 41. **SLIDE 41 EXPLAIN Figure 57-24** A special puller makes the job of removing the hub bearing from the knuckle easy without damaging any component.
- 42. **SLIDE 42 EXPLAIN Figure 57-25** A typical full-floating rear axle assembly.
- 43. **SLIDE 43 EXPLAIN Figure 57-26** semi-floating rear axle housing is the most commonly used in light rear-wheel-drive vehicles & **EXPLAIN Figure 57-27** A retainer plate-type rear axle bearing. Access to the fasteners is through a hole in the axle flange.

VIDEO: 1 MINUTE: REAR AXLE SEALS WWW.MYAUTOMOTIVELAB.COM

[HTTP://MEDIA.PEARSONCMG.COM/PH/CHET/CHET_MYMLABS/AKAMAI/TEMPLATE/VIDEO640X480.PHP?TITLE=REAR%20AXLE%20SEALS&CLIP=PANDC/CHET/2012/AUTOMOTIVE/A5-B2.MOV](http://media.pearsoncmg.com/ph/chet/chet_mymlabs/akamai/template/video640x480.php?title=rear%20axle%20seals&clip=pandc/chet/2012/automotive/a5-b2.mov)&CAPTION=CHET/CHET_MYMLABS/AKAMAI/2012/AUTOMOTIVE/XML/A5-B2.ADB.XML

- 44. **SLIDES 44-46 EXPLAIN** Rear Axle Bearing and Seal Replacement
- 47. **SLIDE 47 EXPLAIN Figure 57-28** slide hammer-type axle puller can also be used.
- 48. **SLIDE 48 EXPLAIN FIGURE 57-29** slide hammer-type axle puller can also be used.
- 49. **SLIDE 49 EXPLAIN Figure 57-30** To remove the axle from this vehicle equipped with a retainer-plate rear axle, the brake drum was placed back onto the axle studs backward so that the drum itself can be used as a slide hammer to pull the axle out of the axle housing. A couple of pulls and the rear axle is pulled out of the axle housing
- 50. **SLIDES 50-51 EXPLAIN** Rear Axle Bearing and Seal Replacement



- 52. **SLIDE 52 EXPLAIN Figure 57-31** To remove the C-lock (clip), the lock bolt has to be moved before the pinion shaft.
- 53. **SLIDE 53 EXPLAIN Figure 57-32** The axle must be pushed inward slightly to allow the C-lock to be removed. After the C-lock has been removed, the axle can be easily pulled out of the axle housing.
- 54. **SLIDE 54 EXPLAIN Figure 57-33** Using a hydraulic press to press an axle bearing from the axle. When pressing a new bearing back onto the axle, pressure should only be on the inner bearing race to prevent damaging the bearing.
- 55. **SLIDE 55 EXPLAIN Figure 57-34** Removing an axle seal using the axle shaft as the tool

DISCUSSION: ASK STUDENTS TO TALK ABOUT C-LOCK REAR AXLES. WHAT TYPE OF BEARING IS USED WITH THIS AXLE? HOW DO YOU LUBRICATE AXLE BEARING? HOW DO YOU REMOVE THIS TYPE OF AXLE TO SERVICE BEARINGS?

DEMONSTRATION: SHOW STUDENTS HOW TO DO DRUM SLIDE HAMMER TRICK TO REMOVE AN AXLE FROM A VEHICLE EQUIPPED WITH A RETAINER-PLATE REAR AXLE. SHOW STUDENTS HOW TO SAFELY REMOVE LOCK BOLT FROM CARRIER. CARE MUST BE TAKEN TO NOT BREAK BOLT IN CARRIER.

- 56. **SLIDE 56 EXPLAIN Figure 57-35** This is a normally worn bearing. If it does not have too much play, it can be reused.
- 57. **SLIDE 57 EXPLAIN Figure 57-36 (a)** When corrosion etches into the surface of a roller or race, the bearing should be discarded. **(b)** If light corrosion stains can be removed with an oil-soaked cloth, bearing can be reused.
- 58. **SLIDE 58 EXPLAIN Figure 57-37 (a)** When just the end of a roller is scored, it is because of excessive preload. Discard the bearing. **(b)** This is a more advanced case of pitting. Under load, it will rapidly lead to spalling.
- 59. **SLIDE 59 EXPLAIN Figure 9-38 (a)** Always check for faint grooves in the race. This bearing should not be reused. **(b)** Grooves like these are often matched by grooves in the race (above). Discard the bearing.
- 60. **SLIDE 60 EXPLAIN Figure 9-39 (a)** Regular patterns of etching in the race are from corrosion. This bearing should be replaced. **(b)** Light pitting comes from

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contaminants being pressed into race. Discard bearing

61. SLIDE 61 EXPLAIN Figure 9-40 (a) This bearing is worn unevenly. Notice the stripes. It should not be reused. (b) Any damage that causes low spots in the metal renders the bearing useless.

62. SLIDE 62 EXPLAIN Figure 9-41 (a) In this more advanced case of pitting, you can see how race has been damaged. (b) Discoloration is a result of overheating. Even a lightly burned bearing should be replaced.

63. SLIDE 63 EXPLAIN Figure 9-42 (a) Pitting eventually leads to spalling, a condition where the metal falls away in large chunks. (b) In this spalled roller, the metal has actually begun to flake away from the surface

64. SLIDE 64 EXPLAIN Figure 9-43 These dents resulted from the rollers “hammering” against the race, a condition called brinelling

65. SLIDES 65-73 EXPLAIN REAR AXLE BEARING REPLACEMENT

HOMework: HAVE STUDENTS RESEARCH WORK OF JOHN HARRISON, AN ENGLISH CLOCKMAKER WHO INVENTED THE FIRST PRACTICAL CAGED ROLLER BEARING IN THE MID-1740S.