

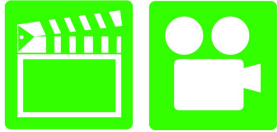
# Manual Drive Train and Axles 1<sup>st</sup> Edition

## Chapter 11 Wheel Bearings and Service

### Opening Your Class

KEY ELEMENT	EXAMPLES
<b>Introduce Content</b>	This course or class covers operation and service of <b>Manual Drive Trains and Axles</b> . 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>	Explain the chapter learning objectives to the students. <ol style="list-style-type: none"><li>1. Explain the diagnosis of defective wheel bearings.</li><li>2. Discuss rear drive axle classifications.</li><li>3. State the reasons for bearing failure.</li></ol>
<b>Establish the Mood or Climate</b>	Provide a <i>WELCOME</i> , 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.

**ICONS** **Ch11 Wheel Bearings and Service**



- 1. SLIDE 1 WHEEL BEARINGS & SERVICE**
- 2. SLIDE 2 EXPLAIN OBJECTIVES**

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

- 3. SLIDES 3-5 EXPLAIN** Bearing Diagnosis: Symptoms of a Defective Bearing
- 6. SLIDES 6-7 EXPLAIN** Rear Drive Axle Classifications
- 8. SLIDE 8 EXPLAIN** Figure 11–25 A typical full-floating rear axle assembly.
- 9. SLIDE 9 EXPLAIN** Figure 11–26 A three-quarter-floating rear axle.
- 10. SLIDE 10 EXPLAIN** Figure 11–27 A semi-floating rear axle housing is the most commonly used in light rear-wheel-drive vehicles.





**WHEEL BEARING ASSEMBLY**

**DEMONSTRATION: 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?**

**DISCUSSION: DISCUSS ROLE OF ANTIFRICTION BEARINGS IN REDUCING FRICTION—ALLOWING WHEELS TO ROTATE WHILE SUPPORTING VEHICLE’S WEIGHT. NAME 4 TYPES OF ANTIFRICTION BEARINGS.**

**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.**

ICONS	Ch11 Wheel Bearings and Service
	<p><b>DISCUSSION: DISCUSS NATIONAL LUBRICATING GREASE INSTITUTE (NLGI) GREASE PENETRATION TEST. WHAT IS SIGNIFIED BY LOW &amp; HIGH NUMBERS? WHAT DO THE QUALITY RATINGS INDICATE? WHAT TYPES OF GREASE WOULD BE USED FOR 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.</b></p>
	<p><b>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.</b></p>
	<p><b>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.</b></p>
	<ol style="list-style-type: none"> <li>11. SLIDE 11 EXPLAIN <b>Bearing Failure Analysis</b></li> <li>12. SLIDE 12 EXPLAIN <b>Figure 11–35</b> normally worn bearing. If it does not have too much play, can be reused.</li> <li>13. SLIDE 13 EXPLAIN <b>Figure 11–36a</b> corrosion etches into surface of roller or race, bearing should be discarded.</li> <li>14. SLIDE 14 EXPLAIN <b>Figure 11–36b</b> If light corrosion stains can be removed with an oil-soaked cloth, the bearing can be reused.</li> <li>15. SLIDE 15 EXPLAIN <b>Figure 11–37a</b> When just the end of a roller is scored, it is because of excessive preload. Discard the bearing.</li> <li>16. SLIDE 16 EXPLAIN <b>Figure 11–37b</b> This is a more advanced case of pitting. Under load, it will rapidly lead to spalling.</li> <li>17. SLIDE 17 EXPLAIN <b>Figure 11–38a</b> Always check for faint grooves in the race. This bearing should not be reused.</li> <li>18. SLIDE 18 EXPLAIN <b>Figure 11–38b</b> Grooves like this are often matched by grooves in the race. Discard the bearing.</li> </ol>

## ICONS

## Ch11 Wheel Bearings and Service



QUESTION



DEMO

DEMO

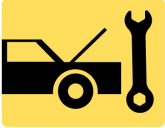






19. **SLIDE 19 EXPLAIN Figure 11–39a** Regular patterns of etching in the race are from corrosion. This bearing should be replaced.
20. **SLIDE 20 EXPLAIN Figure 11–39b** Light pitting comes from contaminants being pressed into the race. Discard the bearing.
21. **SLIDE 21 EXPLAIN Figure 11–40a** This bearing is worn unevenly. Notice the stripes. It should not be reused.
22. **SLIDE 22 EXPLAIN Figure 11–40b** Any damage that causes low spots in the metal renders the bearing useless.
23. **SLIDE 23 EXPLAIN Figure 11–41a** In this more advanced case of pitting, you can see how the race has been damaged.
24. **SLIDE 24 EXPLAIN Figure 11–41b** Discoloration is a result of overheating. Even a lightly burned bearing should be replaced.
25. **SLIDE 25 EXPLAIN Figure 11–42a** Pitting eventually leads to spalling, a condition where the metal falls away in large chunks.
26. **SLIDE 26 EXPLAIN Figure 11–42b** In this spalled roller, the metal has actually begun to flake away from the surface. )
27. **SLIDE 27 EXPLAIN Figure 11–43** These dents resulted from the rollers “hammering” against the race, such as what occurs when the heavily loaded vehicle hits a bump or is shock loaded. Condition is called brinelling.

### **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.**

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

**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**

ICONS	Ch11 Wheel Bearings and Service
	<p><b>THEM TO DESCRIBE SOME OF PROBLEMS THAT LOOSE WHEEL BEARINGS CAN CAUSE.</b></p> <p><b>HANDS-ON TASK:</b> HAVE STUDENTS FOLLOW STEPS 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</p>
	<p><b>HANDS-ON TASK:</b> 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</p>
	<p><b>ON-VEHICLE NATEF TASK REMOVE, CLEAN, INSPECT, REPACK, AND INSTALL WHEEL BEARINGS.</b></p>
	<p><b>ON-VEHICLE NATEF TASK REPLACE WHEEL BEARING AND RACE.</b></p>
	<p><b>ON-VEHICLE NATEF TASK INSPECT AND REPLACE WHEEL STUDS.</b></p>
	<p><b>ON-VEHICLE NATEF TASK REMOVE &amp; INSTALL SEALED WHEEL BEARING ASSEMBLY.</b></p>
	<p><b>28. SLIDES 28-29 EXPLAIN Summary</b></p>