



VEHICLE SERVICING AND REPAIRING

NTQF Level II

Learning Guide- #33

**Unit of Competence: Remove, Inspect, and Refit
Vehicle Wheel & Hub Assemblies**

**Module Title Removing, Inspecting, and Refitting
Vehicle Wheel & Hub Assemblies**

LG Code: EIS VSR2 M09 LO3-LG-33

TTLM Code: EIS VSR2 TTLM 0919v1

LO3: Service wheel & hub assembly

Instruction Sheet	Service wheel & hub assembly
--------------------------	---

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics –

- Analyse and Select servicing options
- Select and prepare appropriate tools and equipment
- Service wheel & hub assembly
- Check Wheel & hub operation

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, you will be able to –

- ✓ Servicing options are analysed and those most appropriate to the circumstances are selected
- ✓ Appropriate tools and equipment are selected and prepared
- ✓ Wheel & hub assembly is serviced according to workplace procedures and manufacturer and component supplier specifications and without causing damage to components or systems
- ✓ Wheel & hub operation is checked for correct service according to workplace procedures and manufacturer and component supplier specifications

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 2 to 24.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1” in page 7.
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to “Information Sheet 2”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1

Analyse and Select servicing options

Wheel-Bearing Service

Wheel bearings are normally filled with grease. If this grease dries out, the bearing will fail. Some wheel bearings can be disassembled and packed (filled) with grease, while others are sealed units that require replacement when worn. When performing tire-related service, check the wheel bearings for play and wear.

NOTE: - For procedures on checking, removing, and replacing wheel bearings, refer to the manufacturer's service manual.

Tire Repair

Leaks from a tubeless tire are located by filling the tire with air and then placing the tire in a drum full of water. Bubbles will show the location of any leaks. If a drum of water is not available, coat the tire with soapy water. Soap bubbles will show the location of the leak.

It has been common practice to attempt the repair of some punctures without dismounting the tire through the use of a rubber plug. However, this practice is no longer recommended, because of serious safety concerns.

WARNING Using a plug to attempt tire repair without dismounting is effective only 80 percent of the time. The remaining 20 percent of such repairs will result in tire failure, which may take the form of a dangerous sudden deflation (blowout).

The safe and correct procedure for tire repair is to always remove the tire from the wheel and make the repairs from the inside of the tire. After the tire has been dismounted, it should be thoroughly inspected. During this inspection, check the inside surface carefully, to locate the puncture and determine the nature and extent of the damage.

The Rubber Manufacturers of America lists two requirements for correctly repairing a puncture: the repair **MUST** fill the injury to the tire and the repair **MUST** soundly patch the inner liner. Various products are available for repairing the puncture to the tire, including plugs and liquid sealants.

Before replacing a tubeless tire, examine the rim carefully for dents, roughness, and rust; any defects may impair or break the air seal. Straighten out any dent with a hammer, and use steel wool or a wire brush to clean out any rust or grit in the bead seat area. After cleaning, paint any bare metal spots where the tire bead seats so that the tire is easier to remove later. If the rim is badly damaged, replace it with a new one.

The procedure for repairing a tubeless tire (Figure 3-1) is as follows:

1. Inspect the inside of the tire and remove nails or other damaging items. Then scrape the damaged area with a sharp-edged tool and buff. Be careful not to damage the liner or expose any cords.

WARNING Serious injury can result using your bare hand to feel for obstructions; use a rag to feel inside the tire.

2. . Lubricate the hole by pushing bonding compound into it from both sides of the tire. Also, pour bonding compound on the insertion tool and push it through the hole with a twisting motion until it can be inserted and withdrawn easily.
3. Place a plug slightly larger than the hole in the tire in the eye of the insertion tool hole. Wet the plug with bonding compound. Always pour it directly from the can so the compound in the can does not become contaminated.
4. While stretching and holding the plug with your hand, insert the plug into the hole from the inside of the tire. Stretch and hold the plug until it is forced into the hole and one end extends through it.
5. After the plug extends through the tire, remove the insertion tool and cut off the plug approximately 1/16 inch above the surface.
6. When using a cold patch, carefully remove the backing from the patch and center the base of the patch on the damaged area. Stitch the patch down firmly with the stitching tool, working from the center out.
7. When using a vulcanizing hot patch, cover the area with a light coat of glue and allow it to dry. This glue normally comes with the hot patch kit. Remove the backing from the patch and center it on the damaged area. Clamp it finger tight.

NOTE: Each patch or plug kit should contain specific instructions.

A few basic safety rules for repairing a tubeless tire are as follows:

- ✓ Do NOT attempt to repair a puncture by plugging the tire from the outside.
- ✓ ALWAYS dismount the tire and patch the inner liner.
- ✓ Do NOT attempt to repair sidewalls or tires with punctures larger than a 1/2 inch.
- ✓ Reduce the air pressure to at least 15-psi when removing an object from the tire.
- ✓ Broken strands in a steel belted tire can indicate more serious damage than initially suspected. Replace the tire.
- ✓ Follow the procedures given in the tire repair kit.

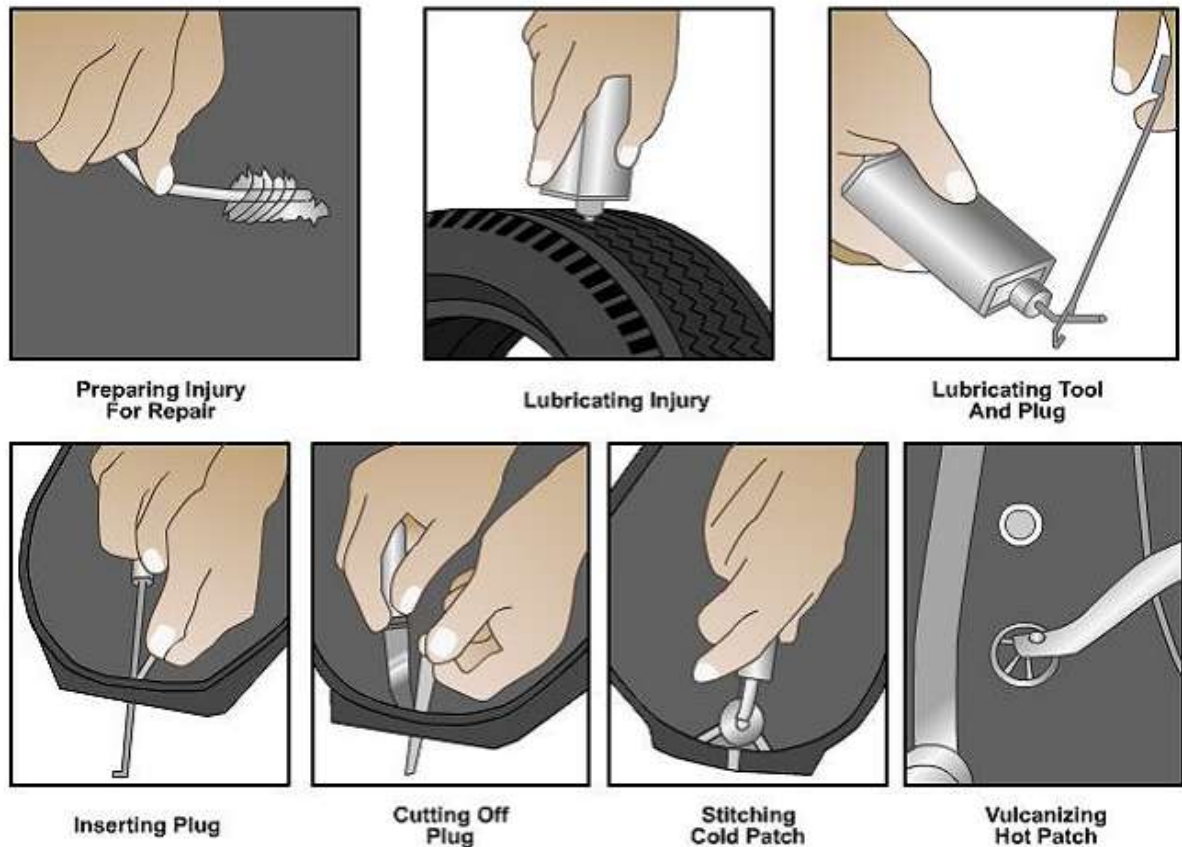


Figure 3- 1 — repairing a tire puncture

Preventive Maintenance

Preventive maintenance of tires and wheels involves periodic inspections, checking inflation pressure, wheel balancing, and rotation. Wheel bearings are periodically lubricated and checked for wear.

5.8.1 Rotating Tires

Rotating the tires will preserve balanced handling and traction of the tires and even out tire wear. Manufacturers recommend that tires be rotated every 6 months or 6,000 miles (whichever comes first), even if they do not show signs of wear. Tire rotation when done at the recommended times helps even out tire wear by allowing each tire to serve in as many of the wheel positions of the vehicle as possible.

NOTE: - Remember that tire rotation CANNOT correct problems due to worn mechanical parts or incorrect inflation pressures.

While every vehicle is equipped with four tires, usually tires on the front need to accomplish very different tasks than the rear tires. Each wheel position can cause different wear rates and different types of tire wear. It is to your advantage that all four tires wear together because wear reduces tread depth of a tire, and uniform wear allows tires to respond to the operator's input more quickly, maintains the handling, and helps

increase the cornering traction of a tire. Figure 3- 2 shows common tire rotation diagrams. A description of each is as follows:

- On vehicles that have non-directional tread patterns, rotate the tires in a forward cross pattern; you can include the spare tire as well.
- If the vehicle has directional tires, rotate these tires from front to back only and vice versa.
- If the vehicle has non-directional tires that are a different size from front to rear, rotate these tires from side to side only.

When your tires wear out together, you can get a new set of tires without being forced to change tires in pairs. You will also be able to maintain the original handling balance of the vehicle.

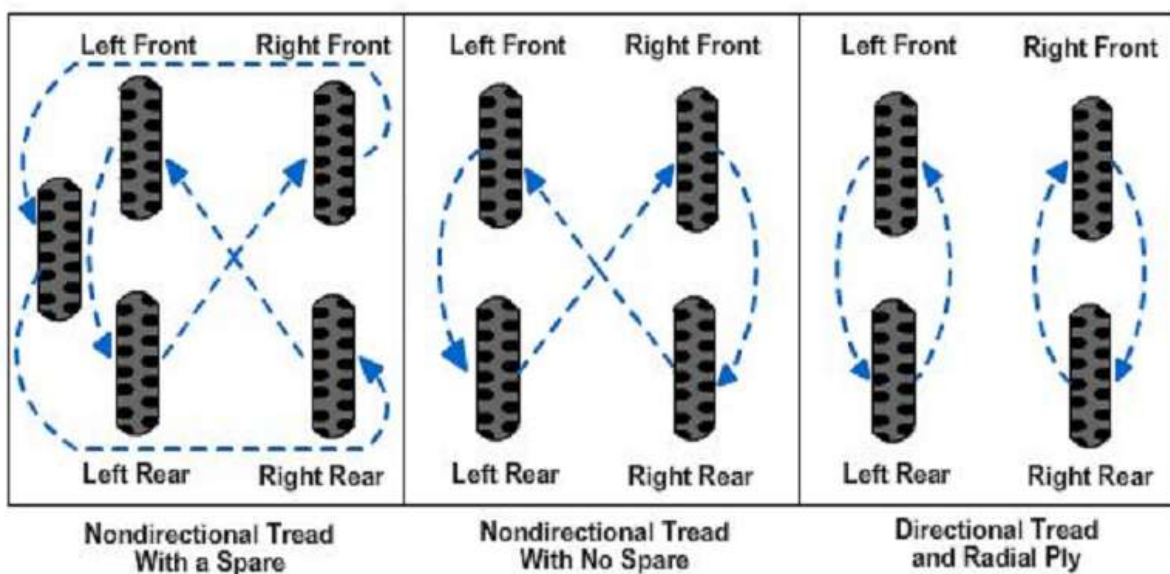


Figure 3- 2 — Tire rotations.

Self-Check -1	Written Test
----------------------	---------------------

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

Sort answer

1. Write the importance of filling grease in Wheel bearings
2. Explain The procedure for repairing a tubeless tire
3. Describe Rotating tires and to show as figure changing of position

Note: Satisfactory rating - 60 %

Unsatisfactory - below 60%

Answer Sheet

Score = _____

Rating: _____

Name _____ **ID NO** _____

Operation Sheet 1

Service of a Wheel Bearing

1 Prepare the vehicle

Prepare the vehicle by having it in a raised condition and at a comfortable working height.



The road wheel removed and the brake unit stripped to enable the hub to be dismantled.



2 Remove the bearing hub assembly

Pry off the dust cap and remove the locking device. This is usually a cotter pin through the nut and spindle.



Remove the retaining nut and washer.



Clean them and place them in a safe place ready for reassembly.



When removing the hub, be careful not to get any of the grease on the brake shoes if they are still in position.



3 Remove the hub seal

Using a long dowel or drift and using a hammer, gently drive on the front of the inner hub bearing from inside the hub unit.



This will push the bearing out and also remove the oil seal. It is good practice to renew the oil seal when you service the bearings.



4 Clean and check the old bearings

Use a paper towel to wipe all of the old bearing grease from the spindle and the hub dust cap.



Clean the bearing with solvent and air dry on a paper towel or blow it dry with compressed air.



Clean out any grease in the hub and dispose of the grease in an environmentally friendly manner. It is not recommended to use shop rags for this, especially if they are laundered for re-use.

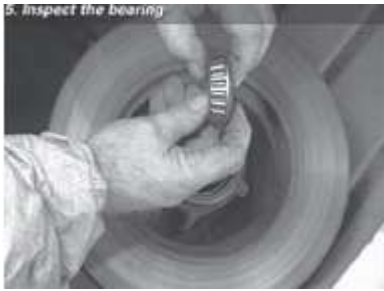


If you use an air blower as part of the cleaning process, be careful not to blow the old, dirty grease into the bearing or let the bearing spin.



5 Inspect the bearing

Inspect the bearing and it's housing, which is called the "bearing race," for damage.



If you see any pitting or obvious damage, replace the bearing and the bearing race. These must be replaced as a set.



6 Re-pack grease into bearing

Check your shop manual to see which grease is recommended for the vehicle and its application. The most common method is to pack the bearings by hand.



Put a small amount of grease in the palm of your hand.



Work the grease into the large open end of the bearing until it oozes out the opposite side then spread a fresh layer of grease all around the bearing and on the bearing races.



You can also grease the bearing with a pressure-bearing packer unit, if the correct grease is used for the application.



Place the freshly greased bearing on a paper towel.



7 Grease inside of the hub and dust cap

Put a small amount of grease in the cavity of the hub.



Also, pack some grease into the dust cap. Fill it about one-third, not all the way up.



8 Re-install the bearings and seal

Re-install the bearing in the same bearing race. Leave a ring of grease below the bearing race to help keep the fresh grease inside the bearing area after it heats up.



Before installing the new seal, ensure it is the right size to go over the spindle, by checking its diameter with the old oil seal that was removed from the hub.



Install the new seal with its sealing lip facing towards the bearing, with a recommended seal-installing tool.



Carefully tap on the installer tool ensuring that the seal goes in straight.



Lightly lubricate the seal lip.

9 Inspect the sealing area of the spindle

Inspect the sealing area for any signs of wear or damage. If the seal area is worn or grooved,



If the seal area is worn or grooved, it will affect the sealing function and could damage the renewed seal.



10 Re-install bearing hub assembly

Slide the hub assembly onto the spindle and ensure it sits on the sealing area.



Put the outer bearing in place.



Add the washer and retaining nut and screw it up by hand until it just touches the back of the outer bearing.



Now tighten, or pre-load the bearing, in accordance with the specifications in the vehicle's shop manual.



Re-install the brake assembly and get your instructor to check that the job is secure and within specifications prior to replacing the road wheel.



LAP Test 1	Practical Demonstration
-------------------	--------------------------------

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 2:00 hour.

Task1. Service of a Wheel Bearing

Operation Sheet 2

Checking a Hub Bearing Assembly

Tools and Materials:

- Hydraulic jack
- Block
- Stand
- Lugnut (cross wrench)
- Torque Wrench
- Dial Indicator with Magnetic Base

Steps and Procedures:

This information will help you to recognize common causes of wheel noise and find signs of a damaged or worn hub bearing assembly.

1. Verify the source of any unfamiliar noise: Road surface conditions, tire tread design, wear patterns, and improper maintenance conditions including poor alignment and worn suspension parts. (Fig. 1)



Figure2- 1 -

2. Make sure you have the proper tools.
3. Perform a full hand rotation check on the wheel. Grasp the wheel at the 3 and 9 o'clock positions. Push and pull while oscillating the wheel. Perform a second check, grasping the wheel at the 12 and 6 o'clock positions. Listen and feel for roughness. (Fig. 2)



Fig. 2

- Remove the lug nuts and the wheel. Remove the caliper from the caliper-mounting bracket. Support the caliper with an “S” hook or a piece of wire. (Fig. 3)



Fig. 3

- Remove the caliper-mounting bracket and the brake rotor. (Fig. 4)



Fig. 4

- Rotate the hub bearing assembly by hand. A loose hub bearing assembly may indicate bearing damage, the axle nut may have backed off, or improper axle nut clamping. Roughness, looseness or noise from the bearing is an indication of bearing damage and requires replacement. (Fig. 5)



Fig. 5

- Check the hub bearing assembly's internal clearance using a dial indicator with a magnetic base. For an accurate reading, thoroughly clean and smooth the surfaces where you will place the dial indicator base and tip. Use a fine file, wire brush, emery cloth or honing stone as appropriate to remove any debris, nicks or burrs. (Fig. 6)



Fig. 6

- Place the dial indicator base on the knuckle or a secure portion of the suspension. When setting the dial indicator tip, the indicator itself should have ample travel for the variation around the face. Position the indicator tip perpendicular on the wheel pilot as close to the center of the hub bearing assembly as possible to provide the most accurate results. (Fig. 7)



Fig. 7

- Grasp the wheel flange at the 3 and 9 o'clock positions, and push while oscillating the hub bearing assembly approximately 90° side-to-side at least five times. Set the dial indicator to zero. Next, pull while oscillating the hub bearing assembly approximately 90 degrees side-to-side at least five times. Proper loading and oscillation is necessary to fully seat the bearings. (Fig. 8)



Fig. 8

- Observe the total indicator movement. If it exceeds 0.004", replace the hub bearing assembly. (Fig. 9)



LAP Test 1	Practical Demonstration
-------------------	--------------------------------

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 2:00 hour.

Task1. Service of a Wheel Bearing

List of Reference Materials

- 1- Crawford's Guide to Beginners Auto Maintenance & Repair
(www.CrawfordsAutoService.com)
- 2- Using a Fire Extinguisher From OSHA Webpage:
(http://www.osha.gov/SLTC/etools/evacuation/portable_use.html#Using)
- 3- ↑ <https://www.safework.nsw.gov.au/safety-alerts/safety-alerts/uncontrolled-movement-of-vehicles>
- 4- ↑ <https://checkers-safety.com/chocking-procedures/>
- 5- ↑ <https://www.2carpros.com/articles/wheel-removal-and-re-installation>
- 6- ↑ <https://www.2carpros.com/articles/wheel-removal-and-re-installation>
- 7- ↑ <http://cf.linnbenton.edu/eit/app/mackd/web.cfm?pgID=7739>
- 8- ↑ <http://www.safebraking.com/top-ten-brake-job-mistakes-pads-rotors-calipers/>
- 9- ↑ <http://www.boatus.com/magazine/trailering/2013/october/repacking-or-replacing-your-trailer-tire-bearings.asp>
- 10- ↑ <https://www.2carpros.com/articles/how-to-replace-front-wheel-bearings-and-seals>
- 11- ↑ <http://knowhow.napaonline.com/dirty-jobs-pack-wheel-bearing/>