



**VEHICLE SERVICING AND
REPAIRING
NTQF Level II**

Learning Guide- #31

**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 LO2-LG-31

TTLM Code: EIS VSR2 TTLM 0919v1

LO1: Prepare to remove wheel & hub assembly

Instruction Sheet 1

Prepare to remove wheel & hub assembly

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

- Workplace instructions.
- Workplace Health and Safety (WHS) requirements.
- Source and interpret procedures and information.
- Select and analyse removal options.
- Select and prepare appropriate tools and equipment.

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 –

- ✓ Workplace instructions are used to determine job requirements relating to removing vehicle wheel & hub assemblies
- ✓ Workplace Health and Safety (WHS) requirements are observed and applied throughout the work Procedures and information are sourced and interpreted
- ✓ Removal options are analysed and those most appropriate to the circumstances are selected
- ✓ Appropriate tools and equipment are selected and prepared

Learning Instructions:

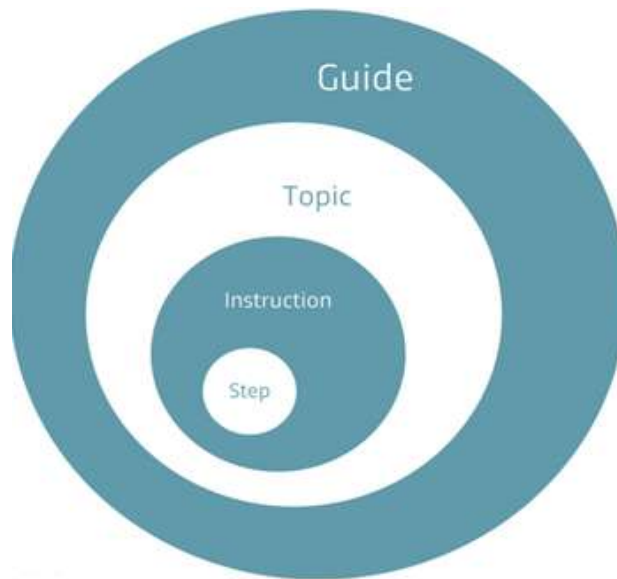
1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 2 to 33.
3. Read the information written in the “Information Sheets 1”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the “Self-check 1” in page 6.
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

Workplace instructions

Structure and clarity in instructions

Structure is the key to saving time in basically everything and the domain of work instructions is no exception. In order to write a work instruction, from the company's perspective, and understand work instructions, from the end-user's perspective, there has to be a clear and to-the-point structure. Based on academic research on instructional design and learnability, we have structured our platform into the following parts:



Every Swipe Guide work instruction follows this same, basic format. Having a consistent approach to structure allows our customers to reproduce quality work instructions with minimal effort. This model is a handy visual representation of the key components of our instructional approach:

- i. Guide
- ii. Topic
- iii. Instruction
- iv. Step

Let's have a look at these components in greater detail:

i. Guide

The basic element of every instruction is the "guide." You can see the guide as the entire paper booklet of a product, from first to the last page. It contains every topic, instruction, and step of how to use a specific product.

ii. Instruction

A guide consists of several different instructions. The Multi packer acme work instruction consists of a number of separate instructions, demonstrated above, including:

- Prepare the Machine
- Prepare divider
- Safety first

These instructions each contain a certain number of steps.

iii. Step

“Steps” are the detailed descriptions of instructions. They show the user the step-by-step process of performing a given task. There is a clear goal in every instruction, and the description of the goal should therefore always be task-oriented and to the point.

Prepare for operation

Read and understand all operating instructions and precautions in this manual before operating or servicing.

Make sure you know and understand the positions and operations of all controls. Make certain all controls are in neutral and the park brake is applied before starting the machine.

Make certain all people are well away from your area of work before starting and operating the machine.

Check and learn all controls in an area clear of people and obstacles before starting your work. Be aware of the vehicle size and have enough space available to allow for operation. Never operate the vehicle at high speeds in crowded places.

Emphasize the importance of using correct procedures when working around and operating the machine.

Do not let children or unqualified persons operate the machine. Keep others, especially children, away from your area of work. Do not permit others to ride on the machine.

Make sure the vehicle is in the proper operating condition as stated in the Operator Manual. Make sure the vehicle has the correct equipment required by local regulations.

Work Area Safety Instructions

The floor of your work area and bench tops should be kept clean, dry, and orderly. Any oil, coolant, or grease on the floor can make it slippery. Slips can result in serious injuries. To clean up oil, use commercial oil absorbent. Also, keep all water off the floor. Water is slippery on smooth floors, and electricity flows well through water. Aisles and walkways should be kept clean and wide enough to easily move through. Make sure the work areas around machines are large enough to safely operate the machine.

Make sure all drain covers are snugly in place. Open drains or covers that are not flush to the floor can cause toe, ankle, and leg injuries. Keep an up-to-date list of emergency

telephone numbers clearly posted next to the telephone. These numbers should include a doctor, hospital, and fire and police departments. Also, the work area should have a first-aid kit for treating minor injuries and eye-flushing kits readily available. You should know where these items are kept.

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 instructional structure
2. What are key component of instructional approach
3. Define the following terms
 - i. Step
 - ii. Instruction
4. Write at list three point about prepare work for operation
5. Write the work are safety instructions

Note: Satisfactory rating – 60%

Unsatisfactory - below 60%

Answer Sheet

Score = _____
Rating: _____

Name _____ ID NO _____

Information Sheet-2

Workplace Health and Safety (WHS) requirements

2. Workplace Health and Safety requirements

Health and Safety If the proper safety procedures are not adhered when working on Wheels and Tires this could lead to serious injury \health problems to personnel. Instruction is given in the proper safety precautions applicable to working on Wheels and Tires which include the following:

- ✚ Compressed air
- ✚ Correct tire pressure
- ✚ Danger as tire bead locates itself on the wheel rim
- ✚ Damage to the tire bead during refitting & removal
- ✚ Steel wire ends protruding from the crown
- ✚ Balance weights insecurely attached
- ✚ Vehicle insecurely supported
- ✚ Wheel bearings incorrectly tightened \ torque
- ✚ Road wheels not torque
- ✚ Use of Personal Protective Equipment (PPE) e.g. Eye protection, foot wear etc.

2.1, Protective clothing and equipment

Wear all personal protective equipment (PPE) and protective clothing issued to you or called for by job conditions and country/local regulations. PPE includes, but is not limited to, equipment to protect eyes, lungs, ears, head, hands and feet when operating, servicing, or repairing equipment.

Always keep hands, feet, hair, and clothing away from moving parts. Do not wear loose clothing, jewelry, watches, or other items that could entangle in moving parts. Tie up long hair that can also entangle in moving parts. See figure 1-1



Figure1- 1 Protective clothing and equipment

2.2. Use of tools and equipment

Wrenches

The word wrench means twist. A wrench is a tool for twisting and/or holding bolt heads or nuts. Nearly all bolt heads and nuts have six sides; the jaw of a wrench fits around these sides to turn the bolt or nut. All technicians should have a complete collection of wrenches. This includes both metric and SAE wrenches in a variety of sizes and styles (Figure 1–2). The width of the jaw opening determines its size. For example, a 1/2-inch wrench has a jaw opening (from face to face) of 1/2 inch. The size is actually slightly larger than its nominal size so the wrench fits around a nut or bolt head of equal size. The following are some types of wrenches used by automotive technicians.

- ❖ Open-End Wrench
- ❖ Box-End Wrench
- ❖ Combination Wrench
- ❖ Flare Nut (Line) Wrenches
- ❖ Allen Wrench
- ❖ Adjustable-End Wrench
- ❖ Sockets and Ratchets



Figure1- 2 A technician needs many different sets of wrenches.

Lug Nut Torque

Obviously, to rotate the tires you must remove the tire/wheel assemblies and then reinstall them. Before reinstalling a tire/wheel assembly on a vehicle, make sure the wheel studs are clean and not damaged, then clean the axle/rotor flange and wheel bore with a wire brush or steel wool. Coat the axle pilot flange with disc brake caliper slide grease or an equivalent. Place the wheel on the hub. Install the lug nuts, and tighten them alternately to draw the wheel evenly against the hub. They should be tightened to a specified torque (Figure 1-3) and sequence to avoid distortion. Many tire technicians snug up the lug nuts, then when the car is lowered to the floor, they use a torque wrench for the final tightening.

Some technicians use a torque absorbing adapter, also called a torque stick (Figure 1-4), to tighten the lug nuts. Make sure you use the correct stick for the recommended torque. Then check the actual torque of the lug nuts with a torque wrench.



Figure1- 3 Wheel lugs should be tightened to the specified torque.



Figure1- 4 Torque sticks are color coded to indicate their torque setting.

Screwdrivers

A screwdriver drives a variety of threaded fasteners used in the automotive industry. Each fastener requires a specific kind of screwdriver, and a well-equipped technician has several sizes of each.

Screwdrivers are defined by their sizes, their tips (Figure 1-5), and the types of fasteners they should be used with. Your tool set should include both blade and Phillips drivers in a variety of lengths from 2-inch “stubbies” to 12-inch screwdrivers.

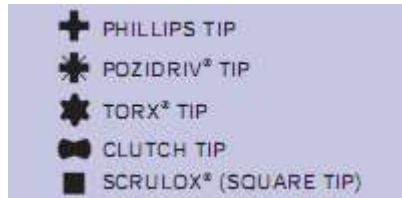


Figure1- 5 the various screwdriver tips that are available.

Pliers

Pliers (Figure 1-6) are gripping tools used for work-ing with wires, clips, and pins. At a minimum, an auto technician should own several types: standard pliers for common parts and wires, needle nose for small parts, and large, adjustable pliers for large items and heavy-duty work.

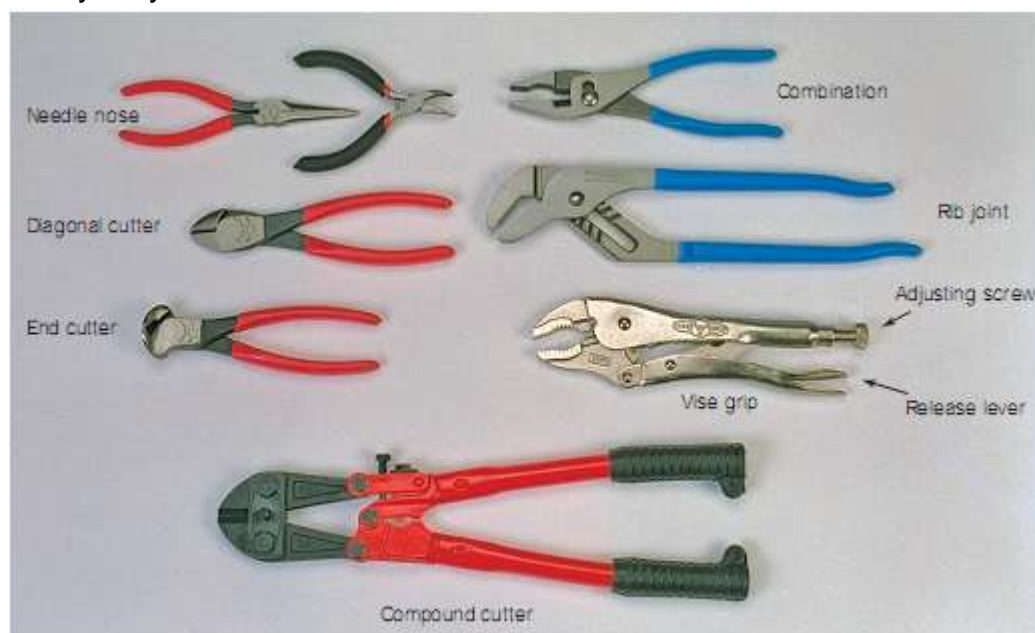


Figure1- 6various types of pliers.

Hammers

Hammers are identified by the material and weight of the head. There are two groups of hammer heads: steel and soft faced (Figures 1-7and 1-8).



Figure1- 7 Various steel-faced hammers



Figure1- 8 Soft-faced hammers.

JACKS AND LIFTS

Jacks are used to raise a vehicle off the ground and are available in two basic designs and in a variety of sizes. The most common jack is a hydraulic floor jack, which is classified by the weights it can lift: 1½, 2, and 2½ tons, and so on. These jacks are controlled by moving the handle up and down. The other design of portable floor jack uses compressed air. Pneumatic jacks are operated by controlling air pressure at the jack.

The hydraulic floor lift is the safest lifting tool and is able to raise the vehicle high enough to allow you to walk and work under it. Various safety features prevent a hydraulic lift from dropping if a seal does leak or if air pressure is lost. Before lifting a vehicle, make sure the lift is correctly positioned.

Floor Jack

A floor jack is a portable unit mounted on wheels. The lifting pad on the jack is placed under the chassis of the vehicle, and the jack handle is operated with a pumping action. This forces fluid into a hydraulic cylinder in the jack and the cylinder extends to force the jack lift pad upward and to lift the vehicle. Always be sure that the lift pad is positioned securely under one of the car manufacturer's recommended lifting points. To release the hydraulic pressure and lower the vehicle, the handle or release lever must be turned slowly.

The maximum lifting capacity of the floor jack is usually written on the jack decal. Never lift a vehicle that exceeds the jack lifting capacity. This action may cause the jack to break or collapse, resulting in vehicle damage or personal injury.

When a vehicle is raised by a floor jack, it should be supported by safety stands (Figure 1-9). Never work under a car with only a jack supporting it; always use safety stands. Hydraulic seals in the jack can let go and allow the vehicle to drop.



Figure1- 9 whenever you have raised a vehicle with a floor jack, the vehicle should be supported with jack stands.

Front Bearing Hub Tool

Front bearing hub tools are designed to remove and install front wheel bearings on FWD cars. These bearing hub tools are usually designed for a specific make of vehicle and the correct tools must be used for each application. Failure to do so may result in damage to the steering knuckle or hub. Also, the use of the wrong tool will waste quite a bit of your time.

Jack Stands

Jack Stands, These are used to keep the vehicle elevated after it has been raised with the jack. They have a wide square base and come to an apex where the car rests on them. See figure.



Figure1- 10 two jack stands; the lever shown on these stands is not used to raise the vehicle but to adjust the height of the stands to keep the vehicle raised.

2.3. Handling of material

Handling damage to tyres can lead to tyre failure at any time. As a minimum, the tyre manufacturers' instructions should form the basis of correct handling technique. General guidance includes:

- ✚ use only fit-for-purpose tyre handling equipment
- ✚ using flat slings or straps for lifting never use steel wire rope slings, chains or rope
- ✚ where possible leave the bead protector in place until the tyre is ready to be fitted
- ✚ Consider keeping the bead protectors in case the tyre is removed in the future for repair or re-tread.

Large heavy equipment tyres and tyre assemblies can weigh a significant amount.

Some vehicles use water ballast in the tires which may weigh some 20-30% more than similar sized air-filled tyres. At this size there is no other option but to use mobile machinery to handle the items. If tyre assemblies move unexpectedly during transport, handling or fitting there is potential for crush injuries to tyre fitters or vehicle operators.

The following should be considered, when working with, or handling heavy objects during tyre, wheel and rim repairs:

- ✚ Use jacking pads, jacking equipment and stands that are designed.
- ✚ the weight of wheel assemblies should be clearly marked in a prominent location
- ✚ Never work near or under a suspended load this includes vehicles that are on jacks. A vehicle on a jack is considered a suspended load until it is supported on appropriate work stands
- ✚ apply sound communication and traffic management procedures when tyre fitters or spotters are interacting with heavy mobile equipment

Aside from purpose-built tyre handling machines, various tyre-handling equipment and attachments are commercially available for use with forklifts, telehandlers, loaders and hydraulic vehicle loading cranes.

2.4. Use of fire-fighting equipment

Fire Extinguishers

You should know the location of all fire extinguishers (Figure 1-11) and fire alarms in the shop and you should also know how to use them before you need one. You should also be aware of the different types of fires and fire extinguishers (Table 1–1). All extinguishers are marked with a symbol or letter signifying the class of fire for which they are intended. Using the wrong type of extinguisher may cause the fire to grow instead of being put out.

If a fire extinguisher is not handy, a blanket or fender cover may be used to smother the flames. Be careful when doing this because the heat of the fire may burn you and the blanket. If the fire is too great to smother, move everyone away from the fire and call the local fire department. A simple under-the-hood fire can cause the total destruction of the car and the building and can take some lives. You must be able to respond quickly and precisely to avoid a disaster.

Using a Fire Extinguisher

Remember, never open doors or windows during a fire unless it is absolutely necessary; the extra draft will only make the fire worse.

Make sure the fire department is contacted before or during your attempt to extinguish a fire. To extinguish a fire, stand 6 to 10 feet from the fire. Before releasing the agent from the extinguisher, hold the extinguisher firmly in an upright position. Aim the nozzle at the base and use a side-to-side motion, sweeping the entire width of the fire (Figure 1-12). Stay low to avoid inhaling the smoke. If it gets too hot or too smoky, get out. Remember;

never go back into a burning building for anything. To help remember how to use an extinguisher, remember the word **“PASSES”**

Pull the pin from the handle of the extinguisher.

Aim the extinguisher’s nozzle at the base of the fire.

Squeeze the handle.

Sweep the entire width of the fire with the contents of the extinguisher.

Table 1–1 Guide to Extinguisher Selection



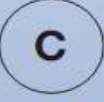

	Class of Fire	Typical Fuel Involved	Type of Extinguisher
Class  Fires (green)	For Ordinary Combustibles Put out a class A fire by lowering its temperature or by coating the burning combustibles.	Wood Paper Cloth Rubber Plastics Rubbish Upholstery	Water* ¹ Foam* Multipurpose dry chemical ⁴
Class  Fires (red)	For Flammable Liquids Put out a class B fire by smothering it. Use an extinguisher that gives a blanketing, flame-interrupting effect; cover whole flaming liquid surface.	Gasoline Oil Grease Paint Lighter fluid	Foam* Carbon dioxide ⁵ Halogenated agent ⁶ Standard dry chemical ² Purple K dry chemical ³ Multipurpose dry chemical ⁴
Class  Fires (blue)	For Electrical Equipment Put out a class C fire by shutting off power as quickly as possible and by always using a nonconducting extinguishing agent to prevent electric shock.	Motors Appliances Wiring Fuse boxes Switchboards	Carbon dioxide ⁵ Halogenated agent ⁶ Standard dry chemical ² Purple K dry chemical ³ Multipurpose dry chemical ⁴
Class  Fires (yellow)	For Combustible Metals Put out a class D fire of metal chips, turnings, or shavings by smothering or coating with a specially designed extinguishing agent.	Aluminum Magnesium Potassium Sodium Titanium Zirconium	Dry powder extinguishers and agents only



Figure1- 11 Know the location and types of fire extinguishers that is available in the shop.



Figure1- 12 Aim the nozzle at the base of the fire and sweep the entire width of the fire.

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 PPE requirement for wheel ,hub and tire servicing
2. Write at list five kinds of wrench to use automotive technicians.
3. Which tools used to loose and tight of vehicle wheel nut
4. Write at list three tools to during replace (changing) of tire
5. Describe the way use of fire extinguisher

Note: Satisfactory rating – 60%

Unsatisfactory - below 60%

Answer Sheet

Score = _____

Rating: _____

Name _____ **ID NO** _____

Operation Sheet 1

How can Using a Fire Extinguisher

Tools and Materials:

1. Extinguisher
2. Wearing PPE

Description: Most fire extinguishers operate using the following P.A.S.S. technique:

Steps and Procedures:

1. **PULL...** Pull the pin. This will also break the tamper seal.
2. **AIM...** Aim low, pointing the extinguisher nozzle (or its horn or hose) at the base of the fire.

Note: Do not touch the plastic discharge horn on CO₂ extinguishers, it gets very cold and may damage skin.

3. **SQUEEZE...** Squeeze the handle to release the extinguishing agent.
4. **SWEEP...** Sweep from side to side at the base of the fire until it appears to be out. Watch the area. If the fire re-ignites, repeat steps 2 - 4. Show below figure



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 0:20 hour.

Task 1. To show How can Using a Fire Extinguisher (0:20 minute)

Information Sheet-3

Source and interpret procedures and information

General maintenance information

- ✓ Before doing any unplugging, lubricating, servicing, cleaning, or adjusting:
 - Park the vehicle on a solid level surface.
 - Make sure all controls are in the neutral position and apply the park brake.
 - Make sure all implements and attachments have been lowered to the ground.
 - Stop the engine and take the key with you.
 - Look and Listen! Make sure all moving parts have stopped.
 - Put blocks in front of and behind the wheels of the vehicle before working on or under the machine.
- ✓ Do not leave the vehicle or implement unattended with the engine running.
- ✓ Do not pull crop or any other object from the vehicle while the vehicle engine is running. Moving parts can pull you in faster than you can move away.
- ✓ Check all nuts and bolts periodically for tightness, especially wheel mounting hardware.
- ✓ Do not attempt to service or adjust the vehicle until all moving parts have stopped.
- ✓ Check all nuts and bolts periodically for tightness, especially wheel mounting hardware.
- ✓ Be aware of the size of parts when doing service work. Never stand under or near a part being moved with lifting equipment.
- ✓ After unplugging, lubricating, servicing, cleaning, or adjusting the vehicle make sure all tools and equipment have been removed.
- ✓ Make sure electrical connectors are clean and free of dirt or grease before connecting.
- ✓ Check for loose, broken, missing, or damaged parts. Make sure the vehicle is in good repair. Make sure all guards and shields are in position.
- ✓ Always raise implement, shut off vehicle engine, apply the parking brake, shift to park position (or neutral) remove the key and install the cylinder stops channels before working around the engine.
- ✓ Avoid working under the engine. However, if it becomes unavoidable to do so, make sure the vehicle securely blocked and the cylinder lockup channels are in position.
- ✓ Never service, check or adjust drive chains or belts while the engine is running.

Self-Check -3	Written Test
----------------------	---------------------

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

Sort answer

1. Write the General maintenance information before doing any unplugging, lubricating, servicing, cleaning, or adjusting.

True or false

1. Technician During maintenance must Check all nuts and bolts periodically for tightness, especially wheel mounting hardware.
2. Service on vehicle the power transmission position must be apply the parking brake or shift to park position (or neutral)
3. During engine is running possible to check or adjust drive chains or belts .

Note: Satisfactory rating – 60%

Unsatisfactory - below 60%

Answer Sheet

Score = _____

Rating: _____

Name _____ ID NO _____

Information Sheet-4

Select and analyse removal options

Optional Select Tires and Rims

Many vehicle owners like to replace the vehicle's original tires and rims with alternatives of different width, diameter and profile.

The following sub-sections outline the legal requirements for replacement tires and rims fitted to a passenger car or derivative, or to an off-road passenger car, which will ensure your vehicle continues to comply with Queensland legislation, while allowing for your individual preferences.

For a passenger car, passenger car derivative or 'soft roader', the overall diameter of any alternate tire fitted may be up to 15mm larger or 26mm smaller than that of any tire designated by the vehicle manufacturer for that model.

The overall diameter of any alternate tire fitted to any of the following types of vehicles may be up to 50mm larger or 26mm smaller than that of any tire designated by the vehicle manufacturer for that vehicle:

- a passenger vehicle specifically designed for off-road use;
- a light goods vehicle with 4WD or 2WD configuration.
- a medium weight goods vehicle with up to 4500 kg and with 4WD or 2WD configuration;

Note: Speedometer accuracy must be maintained for the selected tire and rim combination. Replacement tires must also conform to the following requirements:

- The tires must be rated by the tire manufacturer as being suitable for road use.
- When fitting passenger car tires to light goods vehicles originally fitted with light truck tires, the load rating of the replacement tires must be based on the highest individual wheel load multiplied by a service factor of 1.10.
- The tires on a given axle must be of the same construction (e.g. radial) and of the same size.
- Where retreaded tires are used, they must have been retreaded and marked.

Low profile tires, which replace standard profile tires, are normally fitted in combination with rims of larger than standard diameter to maintain the correct overall diameter of the wheel. A diagram of this concept appears to the right.

General Conditions for Alternative Rims and Tires

The rims and tires must not protrude beyond the bodywork of the vehicle, including flares, when viewed from above with the wheels facing straight ahead. If the vehicle was originally constructed with a portion of the wheel protruding, the alternative wheels must not protrude further than the original ones.

The tire to rim fitting and the tire to rim combination must be in accordance with the Tire and Rim Standards Manual. Reputable tire retailers should have this information and be able to advice on the correct combinations.

All rims fitted to an axle must be of the same diameter, width and offset. They must not have a circumferential weld other than that which attaches the outer rim to the center. All rims must have stud hole pitch circle diameters suitable to the hub.

Wheel nut tapers must be appropriate to the wheel and must engage the thread of the wheel studs for at least the same length as the nuts provided by the vehicle manufacturer.

Slotted and elongated stud holes are not permitted.

The fitting of spacers or adaptors between wheels and hubs, other than those provided by the vehicle manufacturer, is not permitted.

The tire and rim must not foul wheel arches or suspension components under any conditions. Steering limit stops must not be adjusted to reduce the turning circle in order to allow the fitting of the alternative rims and tires.

The tires must have a tread depth of at least 1.5mm on every part of the tire that touches the road and not have any apparent defect that is likely to make the vehicle to which they are fitted unsafe.

Fitting tires that have been treated by re-cutting or re-grooving is not permitted unless the tire has been marked by the original manufacturer as 'suitable for re-cutting or re-grooving'. Re-grooving that exposes chord or steel is not permitted.

The maximum tire width for a car or car derivative must not be more than 1.3 times the vehicle manufacturer's widest optional tire.

However, for an off-road passenger vehicle fitted with front and rear beam axles, the maximum tire width must not be more than 1.5 times the vehicle manufacturer's widest optional tire.

The nominal width of the narrowest tire fitted to a vehicle must not be less than 70 per cent of the nominal width of the wider tire fitted and never less than the vehicle manufacturer's narrowest optional tire as indicated on the manufacturer's tire placard.

Wheel Selection

Wheels are a very important and critical component of your running gear system. When specifying or replacing your trailer wheels it is important that the wheels, tires, and axle are properly matched. The following characteristics are extremely important and should be thoroughly checked when replacement wheels are considered.

1. Bolt Circle. Many bolt circle dimensions are available. Some vary by so little that it might be possible to attach an improper wheel that does not match the axle hub. Be sure to match your wheel to the axle hub.

2. Capacity. Make sure that the wheels have enough load carrying capacity and pressure rating to match the maximum load of the tire and trailer.

3. Offset. This refers to the relationship of the center line of the tire to the hub face of the axle. Care should be taken to match any replacement wheel with the same offset wheel as originally equipped. Failure to match offset can result in reducing the load carrying capacity of your axle.

4. Rim Contour.

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

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

Sort answer

1. What is considering vehicle owners replace the vehicle's original tires and rims checking profile
2. Write important and critical component during replacement of wheels

Note: Satisfactory rating – 60%

Unsatisfactory - below 60%

Answer Sheet

Score = _____

Rating: _____

Name _____ ID NO _____

Information Sheet-5

Select and prepare appropriate tools and equipment

Prepare Rules & Select to Tools and equipment

Automobiles are big and heavy with lots of mechanical moving parts. In the right environment a vehicle can be maintained and repaired safely and effectively. However, in the wrong environment repairing a vehicle can be dangerous. Follow the tips in this chapter to stay safe.

Basic Shop Rules:

- ✚ Never work alone
- ✚ Wear eye protection
- ✚ Avoid loose clothing or hair
- ✚ Stay clear of moving parts of a running vehicle
- ✚ Be aware of hazardous chemicals and keep a flushing station nearby for eyes and skin (at home this could be a bathroom sink or shower).
- ✚ Keep proper clean up materials in case of an accidental spill (see below)
- ✚ Dont mix your work space with other cluttering materials such as home storage, garden tools and other items.
- ✚ Never go under a vehicle that is elevated improperly (the jack to change the tire is NOT sufficient, see more details below)
- ✚ Know where the fire extinguisher is and have a planned exit route. The fire extinguisher should be kept in working order and in a place with easy access.
- ✚ Keep an emergency response number handy and posted clearly where others can see it.
- ✚ Keep an emergency kit in your vehicle for roadside emergencies or repairs.
- ✚ Consult your vehicle owners manual for specific safety rules regarding your vehicle

Jack and Jack Stand Safety

A vehicle can be raised off the ground by a hydraulic jack (Figure1-13). A handle on the jack is moved up and down to raise part of a vehicle and a valve is turned to release the hydraulic pressure in the jack to lower the part. At the end of the jack is a lifting pad.

The pad must be positioned under an area of the vehicle's frame or at one of the manufacturer's recommended lift points. Never place the pad under the floor pan or under steering and suspension components, because they can easily be damaged by the weight of the vehicle. Always position the jack so that the wheels of the vehicle can roll as the vehicle is being raised.

Safety stands, also called jack stands (Figure 1-14), are supports of various heights that sit on the floor. They are placed under a sturdy chassis member, such as the frame or axle housing, to support the vehicle.

Once the safety stands are in position, the hydraulic pressure in the jack should be slowly released until the weight of the vehicle is on the stands. Like jacks, jack stands also have a capacity rating. Always use a jack stand of the correct rating.

Never move under a vehicle when it is supported by only a hydraulic jack. Rest the vehicle on the safety stands before moving under the vehicle.

The jack should be removed after the jack stands are set in place. This eliminates a hazard, such as a jack handle sticking out into a walkway. A jack handle that is bumped or kicked can cause a tripping accident or cause the vehicle to fall.



Figure1- 13 Typical hydraulic jack. Courtesy of Lincoln Automotive Company



Figure1- 14 Jack stands should be used to support the vehicle after it has been raised by a jack.

Proper Lifting Points:

A motor vehicle is a 4,000+ pound piece of machinery that could fall on top of you.

Never go under a vehicle that is not elevated properly. If the vehicle is elevated properly then there should not be any problem.

Vehicles should only be lifted at their proper lifting points. The proper lifting points on a vehicle are the locations on the vehicle where you place the jack to lift the vehicle and where the jack stands are placed to keep the vehicle elevated. Lifting points are different on every vehicle. The owner's manual will specify where the lifting points are for your specific vehicle. Often vehicles have lift points marked on the running board or rocker panel. There are a couple of disastrous events that can happen during an attempt to raise a vehicle without using the proper lifting points. The weight of the car pressing down and the jack pressing up can damage the body of the vehicle. Or worse, the jack could tip or slide while a person is underneath the vehicle. See figure 1-15

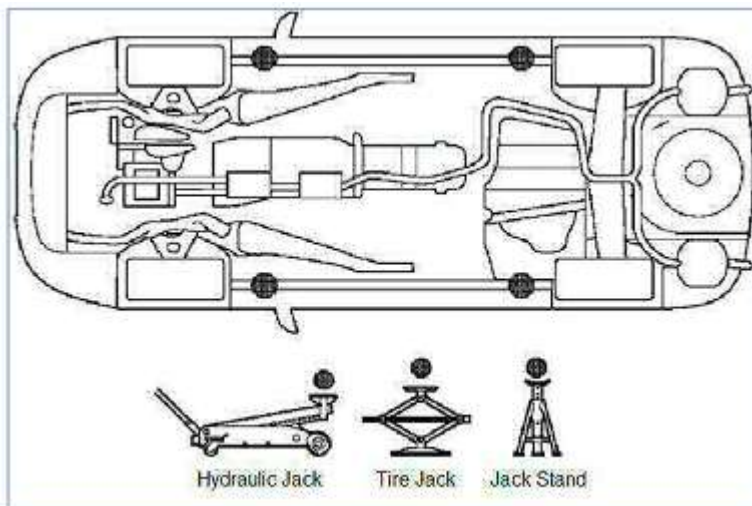


Figure1- 15 An illustration which demonstrates vehicle lift points for a sample vehicle; consult the owner's manual for the lift points of a specific vehicle.

Any vehicle that has a frame can be lifted by the frame. When the front is lifted the jack is usually placed under the suspension cross member. When lifting the rear the jack is placed under the axle if it has a solid axle. If it doesn't have a solid axle then it should be lifted by the factory recommended lift points.

Vehicles should always be on firm, level ground. If the ground is not level then the car may roll and tip the jack. A jack or a jack stand can also slip out or fail to hold the vehicle in an elevated position when the ground is not firm, such as on a dirt road or when there is ice or snow.

There are different types of jacks and jack stands. A jack is used to raise the vehicle either by hydraulic pumping or hand cranking. A jack stand is used to keep the vehicle elevated and has a firm square base. One type of jack that people are most familiar with is the one that is included with the spare tire kit. This is to be used only for changing the tire and it is not sufficient for keeping a vehicle elevated when working under the vehicle. The jack used for changing tires often has a four point rectangular base. This is not as stable as a square base.



Figure1- 16 Hydraulic jack with hand-pump mechanism

When minor repairs are being performed, such as changing a tire, it is permissible to raise just one corner of the vehicle, or the front or the rear. The vehicle is first raised with a jack and then placed on jack stands. (Do not go under the vehicle while it is elevated by a jack). The vehicle should be equally balanced on the jack stands.

A mechanics shop may have industry jacks or hydraulic lifts. These can be used to raise the vehicle and keep it elevated. These lifts can raise the entire vehicle at the same time. When lifting the entire vehicle the center of gravity should be positioned evenly with the lifting hoist arms. This is evident when the vehicle is raised and all tires lift off the ground at the same time. Most vehicles are front-heavy due to the engine block. However, many work trucks are balanced to have the center of gravity in the middle.



Figure1- 17 Hydraulic lift with hoist arms that raise the vehicle on its lifting points. The lift consists of two vertical blue beams and four white hoist arms. Two white hoist arms on the other side of the vehicle are not seen in the pictures.



Figure1- 18; Another hydraulic lift that raises the car on its tires

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 at list five point for basic shop rules
2. vehicle can be raised from ground by _____
3. after raising the vehicle support by _____

Note: Satisfactory rating - 3 points

Unsatisfactory - below 3 points

Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____

Short Answer Questions

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/>