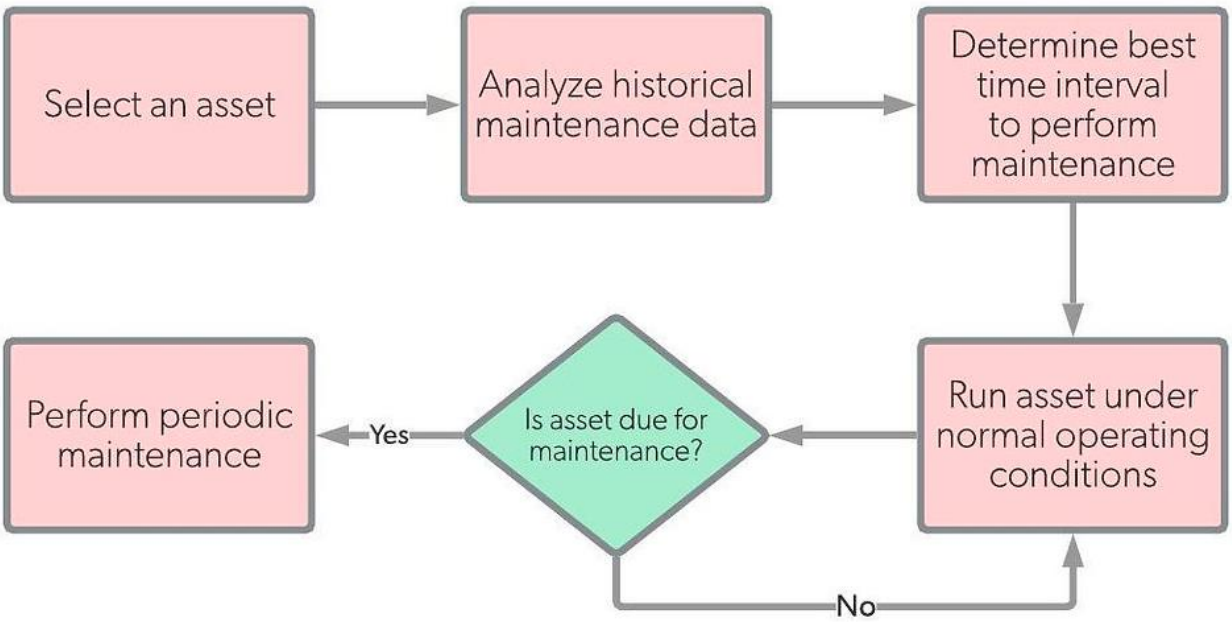
# Automotive mechanics Level-I

## Based on March 2022, Curriculum Version 1




## Module Title: - Perform Periodic Service

## Module code: EIS AUM1 M08 0322

## Nominal duration: 60Hours

**Prepared by: Ministry of Labor and Skill**

**September, 2022**

**Addis Ababa, Ethiopia**

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# Acknowledgment

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# Acronym

- SOS = Scope of Services
- LAP = Learning  Activity Performance
- SSA = Service Scope Activity
- PM =.preventive maintenance
- WO= work order
- WHS = world health safety
- MIP = Malfunction indicator lamp
- RO = Is input on the computer's keyboard.
- EP = Extreme Pressure
- DOT = Department of Transportation
- SAE = Society of Automotive Engineers
- EPA = Environmental Protection Agency

## Introduction to the Module

Periodic maintenance is the activity performed on your vehicle based on a set time interval. The purpose of periodic maintenance, or time-based maintenance, is to maintain smooth operation of your vehicle.

This module is designed to meet the industry requirement under the automotive mechanics occupational standard, particularly for the unit of competency: **perform periodic service.**

**This module covers the units**:

- Preparing for work
- Selecting lubricants/ coolants
- Applying lubricants/ coolant
- service and Maintenance activities
- housekeeping activities

**Learning Objective of the Module**

- Prepare for work
- Select lubricants/ coolants
- Apply lubricants/ coolant
- Carry-out service and Maintenance activities
- Perform housekeeping activities

**Module Instruction**

For effective use this modules trainees are expected to follow the following module instruction:

1. Read the information written in each unit
2. Accomplish the Self-checks at the end of each unit
3. Perform Operation Sheets which were provided at the end of units
4. Do the “test” giver at the end of each unit and
5. Read the identified reference book for Examples and exercise

# 1. Unit one: Prepare for work

This unit is developed to provide you the necessary information regarding the following content coverage and topics:

- Introduction to service and maintenance work plan
- Performing inspection
- Selecting source of information

This unit will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Overview service and maintenance work plan
- Perform inspection
- Select source of information

## 1.1. Overview service and maintenance work plan

### Work plan

A Scope of Services (SOS), sometimes referred to as a Scope of Work (SOW), describes the tasks or services to be provided and specific deliverables required to achieve the desired result for which the SSA/ service scope activity/ is intended. An SOS is the first section of the SSA that must be communicated. The SOS may be provided in writing by the party seeking the services; or, you may be required to determine on your own the intended services to capture the requirements in writing. The result of this step is critical to the success of the rest of the steps. This initial fact-gathering process is intended to reveal any information that you should know in subsequent steps and later in performance of the services in the SSA.

**Manufacturers‟ documentation Service concepts and extent of service provision**

Periodic services are those services performed not to correct problems but rather to prevent them. These and other basic services All of these services may be performed by technicians in many different types of service facilities—dealerships, independents, and specialty shops. Regardless of what type of shop,

- Equipment and documents to be returned with the vehicle;
- Original and, if previously delivered, spare keys.
- All original documentation such as
    1. vehicle's registration,
    2. traffic insurance,
    3. warranty booklet,
    4. instruction manual etc.,

Stamped service history documents proving that all required periodic maintenance works have been performed at service workshops

PM items for servicing of the periodic maintenance and the service interval of the Vehicle are stated in the maintenance schedule chart of the Owner's Manual,

**Owner's Manual**

Supplement or Warranty Booklet etc the maintenance schedule is stipulated by these Factors: model, age, country in which is used, or how to use (state) of the vehicle.

T, R, I, A, L stand for symbols of maintenance operation.

T - Tighten to specified torque

R - Replace or change

I - Inspect and correct or replace as necessary

A - Adjust as necessary and/or Check

L - Lubricate

A typical PM schedule recommends particular service at mileage or time intervals, Whichever comes first? Driving habits and conditions should also be used to determine the Frequency of PM services intervals. There are many types or styles of driving, which can Generally be organized into categories.

The first thing a tech needs to worry about is**Company resources, and Repair guides and service plans**.

**Repair guides and service plans**

- ✓ A **repair** guides is written for every vehicle brought into the shop for service repair guide may also be called service or work orders (WO). WOs contain information about the customer, the vehicle, the customer's concern or request, an estimate of the cost for the services, and the time the services should be completed WOs are legal documents that are used for many other purposes, such as payroll and general record keeping. Legally, an WO protects the shop and the customer. Although every shop may enter different information onto the original WO, most WOs contain the following information:
- ✓ Complete customer information
- ✓ Complete vehicle identification
- ✓ The service history of the vehicle
- ✓ The customer's complaint
- ✓ The preliminary diagnosis of the problem
- ✓ An estimate of the costs of the parts involved in the service
- ✓ The time the services should be completed
- ✓ The actual services performed with their cost
- ✓ The parts replaced during the services
- ✓ Recommendations for future services
  - ➢ Standard/special tools
  - ➢ Technical information, Procedures and devices for measuring and testing
- ✓ A replacement vehicle should be returned under full and complete conditions same as it was delivered to you.
- ✓ Replacement vehicle should be returned with a fuel level same as when it was delivered to you.
- ✓ Vehicle should be returned on the specified date.

- ✓ Drivers are held responsible for transition and any traffic fines imposed to the vehicle.
  - ➢ Technical systems and subsystems for Maintenance
  - ➢ auxiliary materials, Spare part and material requisitioning lists
  - ➢ Health and safety at work and prevention of accidents

**Workplace Health and Safety**

Workplace health and safety covers the concept of the *health*, *safety* and *welfare* of all persons who may be impacted by work activities in the workplace.

WHS is the term used to describe the laws and processes that help to protect employees from death and injury while at work.

**Importance of WHS**

Workplace health and safety protects works by setting standards for the workplace. It provides guidelines for lifting, for working with hazardous chemicals, protective equipment's like eye protection and ear protection and limits the number of hours a person can work at a particular job (preventing injury due to fatigue/stress).

**SAFETY PRECAUTIONS IN SERVICE OPERATIONS**

- ➢ Do not operate the engine for an extended period of time without proper exhaust ventilation



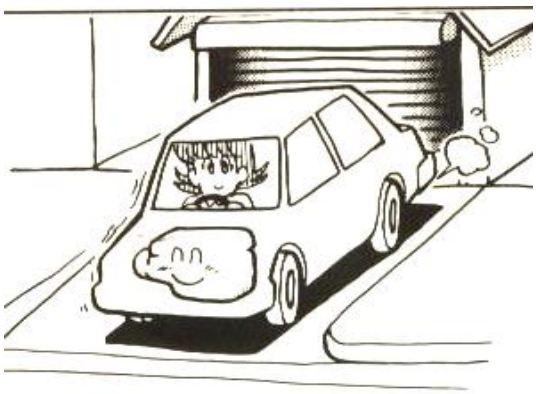



figure 1.1exhaust gas

Warming-up the Engine With-Out Proper Exhaust Ventilation Will Produce Carbon Monoxide

- ➢ Before jacking up the vehicle, apply wheel chocks or other tire blocks to the wheels to prevent the vehicle from moving. After jacking up the vehicle, support the vehicle weight with safety stands at the points designated for proper lifting and towing before working on the vehicle.

- When removing a heavy component such as the engine or transaxle / transmission, take care not to lose your balance and drop it. Also, do not allow it to hit against adjacent parts, especially brake tube and break cylinder.

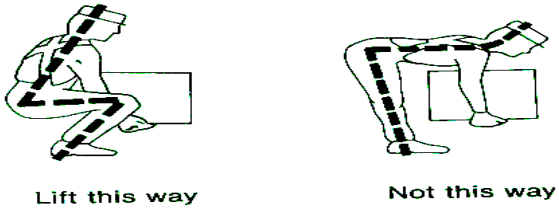



figure 1.2Correct Body Position in Lifting an Object

- Before starting repair, which does not require battery power, always turn off the ignition switch, then disconnect the ground cable from the battery to prevent accidental short circuit.



*Ianition Switch in*



*Disconnected Ground*

figure 1.3 checking starting system

- To prevent serious burns, avoid contact with hot metal parts such as the radiator exhaust manifold, tail pipe and muffler. "*Do not remove the radiator cap when the engine is hot*".

**Pre-inspection Work**

Before the inspection put floor mats, covers, etc. In the customer's vehicle to

Protect from dirt or scratches, and prepare to start the inspection.

Driver's seat: • Place seat covers

• Place floor mats • Place steering wheel cover

• Open engine hood (by pulling on the engine hood release lever) Vehicle front:

• Open engine hood • Place fender covers

• Place front cover • Place wheel chocks against the wheels.

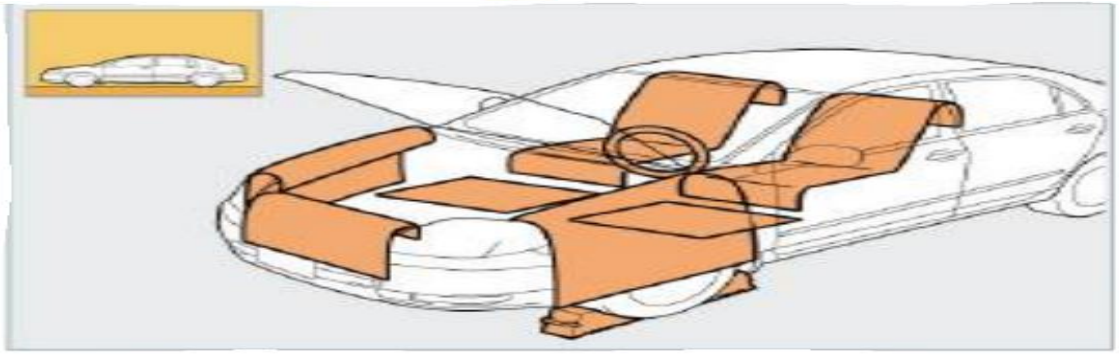


figure 1.4pre inspection works

- Clean all dis-assembled parts in the designated liquid or solvent prior to inspection or assembly.



figure 1.5 Spraying the Disassembled Engine Parts

- Use approved bonding agent, sealants or their equivalents when required.




figure 1.6Example of Approved Bonding Agent

- Replace oil seals, gaskets, packing, O-rings, locking washers, cotter pins, self-locking nuts, etc. as instructed and discard used ones.



figure 1.7 Example of an Old/Damaged Lock Rings

- Use only the lubricants specified in the applicable section or those indicated under "***Recommend fuel and lubricants***".




*Viscosity Rating*







**figure 1.8Recommended Oil for Gasoline & Diesel Engines**




*Service Rating*

*Do not touch the terminals of electrical components which utilize microcomputers such as electronic control units. "**Static electrical charges stored in your body may damage internal electronic components**".*

- After disconnecting vacuum hose or air hose, attach tag, which indicates the proper connection to prevent in correct connection.
- The use of the proper tools and recommended essential tools should be used where specified for proper, safe and efficient service repair.
- When effecting repairs on the fuel, oil, water, vacuum or exhaust systems, make certain to check all affected lines for leaks.
- Dispose drained oil or used solvent for cleaning parts in an appropriate manner.

## 1.2. Performing inspection

Checks of various systems and areas of a vehicle

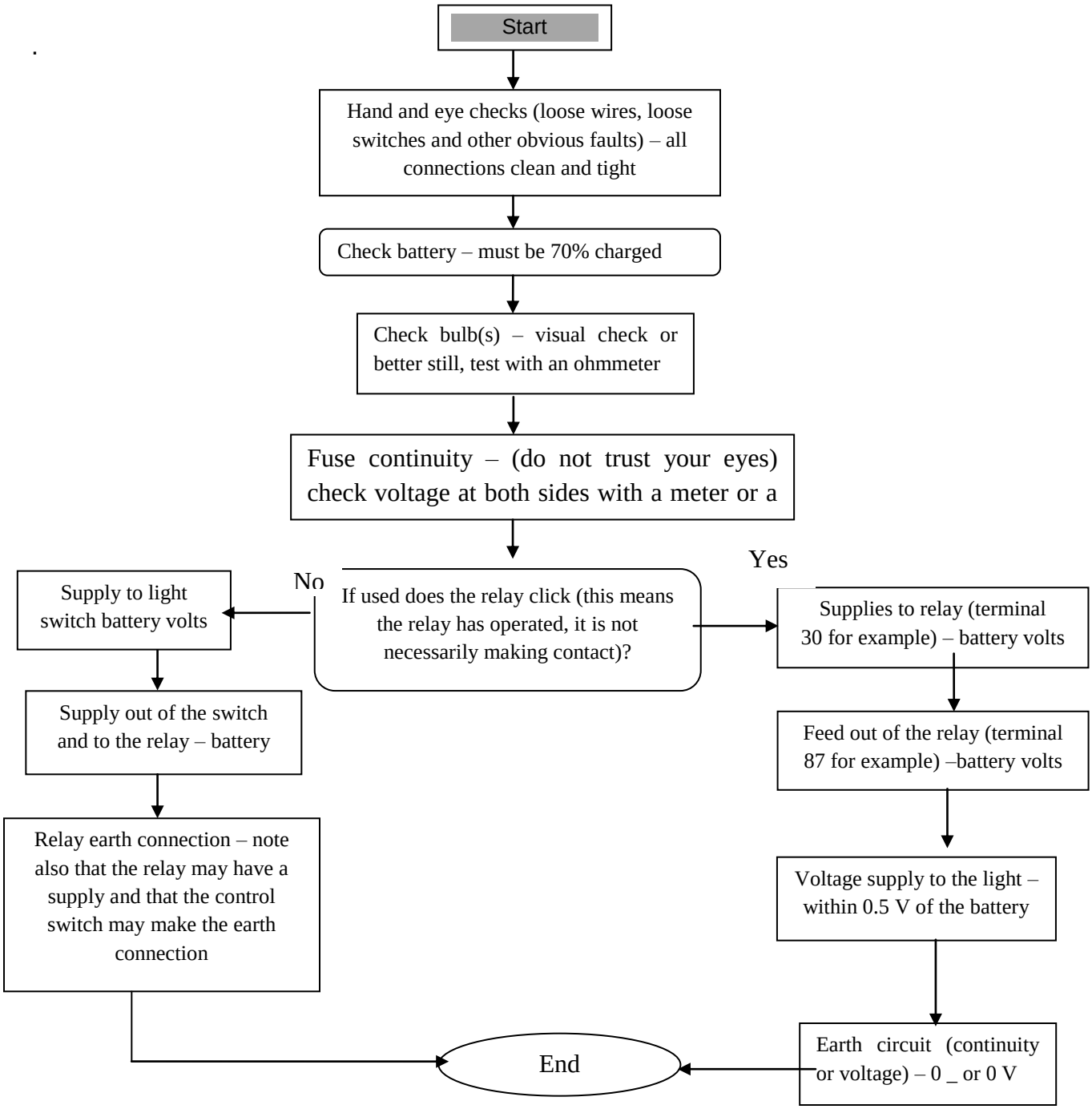
The exact systems and subsystems that are inspected vary. The inspections are part of the vehicle registration process. Often automobile dealers are required to complete a safety inspection on all used vehicles before they are sold and report the results to the customer.

### Diagnosis chart

| SYMPTOM | POSSIBLE CAUSE | ACTION NEEDED |
|---|---|---|
| Engine will not crank | • Dead battery<br>• Melted fusible link<br>• Loose connections<br>• Faulty ignition switch<br>• Faulty magnetic switch, relay, neutral start switch or clutch switch<br>• Mechanical problem in engine<br>• Problem in theft deterrent system | • Check battery state-of-charge<br>• Replace fusible link<br>• Clean and tighten connections<br>• Check switch operation; replace as needed<br>• Check and replace as needed<br>• Check engine<br>• Check service manual for system tests |
| Engine cranks too slowly to start | • Weak battery<br>• Loose or corroded connections<br>• Faulty starter motor<br>• Mechanical problems with engine or starter | • Check battery and charge as needed<br>• Clean and tighten connections<br>• Test starter<br>• Check engine and starter; replace worn out parts |
| Starter keeps running | • Damaged pinion or ring gear<br>• Faulty plunger in magnetic switch<br>• Faulty ignition switch or control circuit<br>• Binding ignition key | • Check gears for wear or damage<br>• Test starter pull-in and hold-in coils<br>• Check switch and circuit components<br>• Check key for damage |
| Starter spins, but engine will not crank | • Faulty over-running clutch<br>• Damaged or worn pinion gear or ring gear | • Check over-running clutch for proper operation<br>• Check gears for damage and wear; replace as needed |
| Starter does not engage/disengage properly | • Faulty magnetic switch<br>• Damaged or worn pinion gear or ring gear | • Bench test starter<br>• Check gears for damage and wear; replace as needed |

Source: Toyota

## Flow chartsTree lighting system Diagnosis Chart




**Outside the Vehicle**

- ✓ Check to see if the car leans or tilts in any direction from side to side or from front to back.
- ✓ Suspension

1. Shock absorber damping force Determine the amount of the damping force on the shock absorbers by rocking the vehicle up and down and checking how long it takes for the vehicle to stop locking.

2. Vehicle slant visually inspect whether the vehicle is slanted or not.

HINT: If the vehicle is slanted, verify the following items:

• Tire air pressure Differences in tire size or wheel size from left to right Unequal vehicle load distribution Check your tires for low air pressure, nails, or other evidence of defects and spare tire for air pressure.

- ✓ Cracks or damage Inspect the tread and the sidewalls of the tire for cracks, cuts, or other damage.
- ✓ Wedged metal particles or other foreign objects Inspect the tread and the sidewalls of the tire for any metal particles, stones, or other foreign objects that may be wedged.

HINT: If there are stones on the tread area of the tire, remove it so it will not create more damage on the tire.

- ✓ If nails or other metal is present on the tire, remove the tire and check for possible air leaks.

**Inside the Vehicle**

- ✓ Check the Lights for Operation (Driver's seat) – Ignition Switch to "ON" position
- ✓ Clearance Lights  License Plate Lights  Taillights
- ✓ Head Lights - Dimmer / High with indicator lights and Low  Head Light Flasher and indicator light
- ✓ Turn or Signal Lights and Hazard warning lights and indicator lights  Instrument Panel Lights and Warning Lights
- ✓ Stoplights with taillights ON or illuminated  Handbrake / Parking Brake Indicator Light
- ✓ Backup Lights  Dome Lights  Check the Warning Lights for System Operation (Driver's seat) – Ignition Switch "ON" position after engine has started.
- ✓ Charging System Warning Light  Oil Pressure Warning Light  Engine Warm-up Warning Light
- ✓ Engine System Warning Light / Malfunction indicator lamp (MIP)
- ✓ Note: Inspect that the warning lights go out after the engine is started. In case the warning lights does not go out / turn-off; therefore, refer to the owner's manual.

**Changing brake parts**



figure 1.9 brake accessory

**PURPOSE OF BRAKING SYSTEM**

- ✓ Stop the vehicle by converting the kinetic energy of the vehicle to heat energy.
- ✓ Heat energy is created in the brakes by friction.
- ✓ Friction is created between a moving and a non-moving surface at each wheel to generate the heat.
- ✓ Disc and drum brakes are the most common type of braking systems used.

**Factors Effecting Braking**

- ✓ Number of wheels braking.
- ✓ Weight of vehicle.
- ✓ Type of friction material.
- ✓ Surface area of friction material.
- ✓ Size or discs or drums
- ✓ Tire traction.
- ✓ Road surface.
- ✓ Load transfer.
- ✓ Incline or decline of road. (gravity)
- ✓ Engine braking.
- ✓ Pressure applied

**Types of Braking Systems**

- ✓ ***Service brakes***. It's the primary braking system using a pedal connected to a hydraulic system causing it to operate.
- ✓ ***Parking brakes***. It's mechanically applied by a lever or pedal

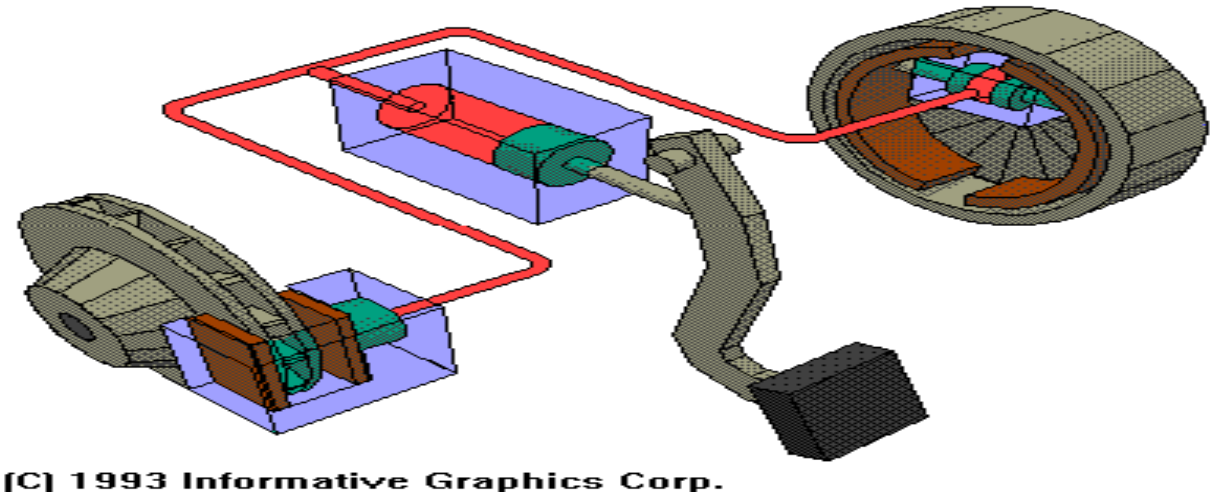



figure 1.10 brake linkage

**Set back maintenance indicator, changing drive belt, Oil and Filter changes, Battery maintenance, wheels Tyres, windshield wipers**

General maintenance includes those items which should be checked during the normal day-to-day operation of the vehicle. They are essential if the vehicle is to continue operating properly. The owners can perform the checks and inspections themselves or they can have their NISSAN dealers do them for a nominal charge.

**Outside The Vehicle**

the maintenance items listed here should be performed from time to time, unless otherwise specified.

**Inside The Vehicle**

The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, cleaning the vehicle, etc

| Items | Description |
|---|---|
| **Lamps** | Make sure that the headlamps, stop lamps, tail lamps, turn signal lamps, and other lamps are all operating properly and installed securely. Also check headlamp aim. |
| **Warning lamps and chimes** | Make sure that all warning lamps and chimes are operating properly. |
| **Steering wheel** | Check for change in the steering conditions, such as excessive free play, hard steering or strange noises.<br>**Free play: Less than 35 mm (1.38 in)** |
| **Seat belts** | Check that all parts of the seat belt system (e.g. buckles, anchors, adjusters and retractors) operate properly and smoothly, and are installed securely. Check the belt webbing for cuts, fraying, wear or damage. |

## UNDER THE HOOD AND VEHICLE

the maintenance items listed here should be checked periodically e.g. each time you check the engine oil or refuel.

| Items | Description |
|---|---|
| **Windshield washer** | **Fluid** Check that there is adequate fluid in the tank. |
| **Engine coolant level** | Check the coolant level when the engine is cold. |
| **Engine oil level** | Check the level after parking the vehicle on a level spot and turning off the engine |
| **Brake and clutch fluid levels** | Make sure that the brake and clutch fluid levels are between the "MAX" and "MIN" lines on the reservoir |
| **Battery** | Check the fluid level in each cell. It should be between the "MAX" and "MIN" lines. |

## SET BACK MAINTANANCE INDICATORE

### Oil Pressure Indicator

All vehicles have an oil pressure gauge and/or a low-pressure indicator light. Oil gauges are either mechanically or electrically operated and display the actual oil pressure of the engine. The indicator light only warns the driver of low oil pressure.

| Item | Description |
|---|---|
| **Tires** | Check the pressure with a gauge periodically when at a service station, including the spare, and adjust to the specified pressure if necessary. Check carefully for damage, cuts or excessive wear. |
| **Windshield wiper** | **Blades** Check for cracks or wear if they do not wipe properly. |
| **Doors and engine hood** | Check that all doors, the engine hood, the trunk lid and back door operate properly. Also ensure that all latches lock securely. Lubricate if necessary. Make sure that the secondary latch keeps the hood from opening when the primary latch is released. When driving in areas using road salt or other corrosive materials, check for lubrication frequently |
| **Tire rotation** | Tires should be rotated every 10,000 km (6,000 miles) |

**GAUGES**

Instruments are arranged on the instrument panel in front of the driver's seat to enable the driver to grasp the vehicle status easily.

The instrument panel uses meter (gauge) display and light display.

The meter (gauge) display for detailed indication of the status at each moment generally consists of the following meters and gauges:

- **Speedometer** Consists of the speedometer indicating the vehicle speed, the odometer indicating the distance travelled, and the trip meter, which can be reset 0 as desired.
- **Tachometer** Indicates the engine speed ion rpm (revolutions per minute)
- **Voltmeter** Indicates the battery voltage or alternator out-put voltage
- **Oil pressure gauge** Indicates the engine oil pressure
- **Fuel gauge** Indicates the fuel level in the fuel tank
- **Water (Engine coolant temperature gauge** Indicates the engine coolant temperature

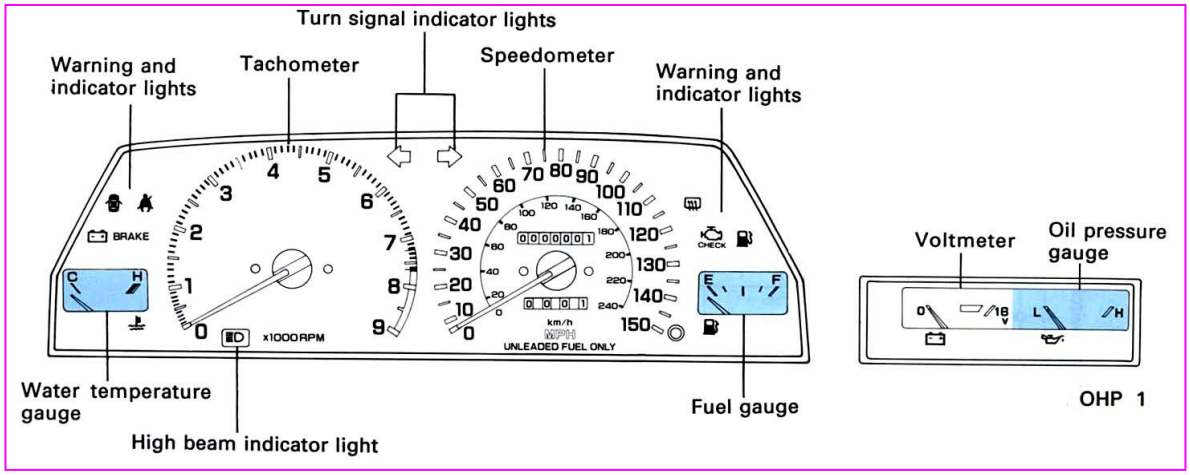



figure 1.11 gauges

## 1.3. Selecting source of information

**Service fluids, tires, waste disposal**

- **Checking Brake Fluid Level and Leaks** if fluid level is extremely low, check brake system for leaks.
- **Checking Brake Lines and Cables** Check brake fluid lines and parking brake cables for improper attachment, leaks, chafing, abrasions, deterioration, etc.
  - **Changing Brake Fluid**

    1. Drain brake fluid from each air bleeder valve.

2. Refill until new brake fluid comes out from each air bleeder valve. Use same procedure as in bleeding hydraulic system to refill brake fluid.

Refill with recommended brake fluid. See "RECOMMENDED FLUIDS AND LUBRICANTS".

- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.

**Tires**

the vehicle's tires should be checked for damage and wear. Tires should have at least 1⁄16 of tread remaining. Any less and the tire should be replaced. Tires have "tread wear indicators" molded into them. When the wear bar shows across the width of the tread, the tire is worn beyond its limits. Most shops use a tire wear gauge, which gives an accurate measurement of the tread depth. Also, check the tires for bulges, nails, tears, and other damage. All of these indicate the tire should be replaced.

**Periodic Maintenance manual**

Follow the Maintenance Schedule Suggested in Your Vehicle's Owner's Manual your vehicle also requires maintenance tasks that are performed less frequently, but are vital to allowing your automobile to live a long and fruitful life. These tasks include oil changes, tire rotations, replacing transmission fluid, and the like.

**Repair Manuals**

- ✓ Not as detailed as factory manuals
- ✓ One set may include data an all American cars produced for several years
- ✓ More economical to purchase than factory manuals

**Example Battery maintenance**

**Basic visual checking's:**

1. Check for *cracks in the battery case and for broken terminals*. Either may allow Electrolyte leakage. The battery must be *replaced*.
2. Check for *cracked or broken cables or connections*. *Replace*, as needed.
3. Check for *corrosion on terminals and dirt or acid on the case top*. *Clean* the terminals and case top with a mixture of water and baking soda or ammonia. A wire brush is needed for heavy corrosion on the terminals.
4. Check for a *loose battery hold-down* and *loose cable connections*. *Tighten*, as needed.

5. Check the level of electrolyte. The level can be viewed through the translucent plastic case or by removing the vent caps and looking directly into each cell. The proper level is 1/2"

above the separators. If necessary, add distilled water to each low cell. **Avoid overfilling**. When water is added, always charge the battery to make sure the water and acid mix.

6. Check for cloudy or discolored electrolyte caused by overcharging or vibration. This could cause **high self-discharge**. The problem should be corrected and the battery replaced.

7. Check the condition of plates and separators. Plates should alternate dark (+) and light (-). If all are **light**, severe **undercharging** is indicated. Cracked separators may allow shorts. The battery should be replaced. An undercharging problem should be corrected.

8. Check the tension and condition of the alternator drive belt. A loose belt must be tightened. It will prevent proper charging. A belt too tight will reduce alternator life. It should be loosened to specs. A **frayed** or **glazed** belt will fail during operation. Replace it.

**Service Manual**

**Service (Shop) Manuals**

Books with detailed information on how to repair a vehicle

**Types of service manuals include:**

- ✓ manufacturer's manuals
- ✓ specialized manuals
- ✓ general repair manuals

Technical information system /workshop information system

**Workshop information**

- ✓ Inspect equipment and tools before and after work.
- ✓ Refer to service manual or ask for advice from instructors or superiors before performing an operation which are un familiar or lack confidence
- ✓ Do not perform any operations if proper safety cannot be ensured

**Practice sifting, sorting, sweeping, cleaning, spic and span, and self- discipline.**

- ✓ Keep your workplace clean and orderly.
- ✓ Instead of trying to clean your workplace make an effort not to put dirt on it

**Basic shop safety sign**




figure 1.12work area sign

**Communications and documentation systems**

*Communication with the customer during the maintenance service*

*Definition about the communication with the customer during the maintenance service:*

Contact to the customer during the maintenance service might be necessary because of the following reasons: something unexpected in the car comes up, there are no required parts for the repairing, the foreman or the mechanic needs additional information about the car. In this section there are the sentence beginnings and answers related to communication with the customer during the maintenance service.

The main message of the answers is that customers want that they are contacted:

- ✓ If the time reserved for the maintenance service exceeds.
- ✓ If there are something unpredicted faults found.
- ✓ If the costs are higher than expected

**Risk factor**

**Electrical safety sign**

If incorrectly handled, there is a possible danger of short-circuit in electrical equipment and machinery that may cause fire.

To prevent this to happen, the following points must be carefully observe.

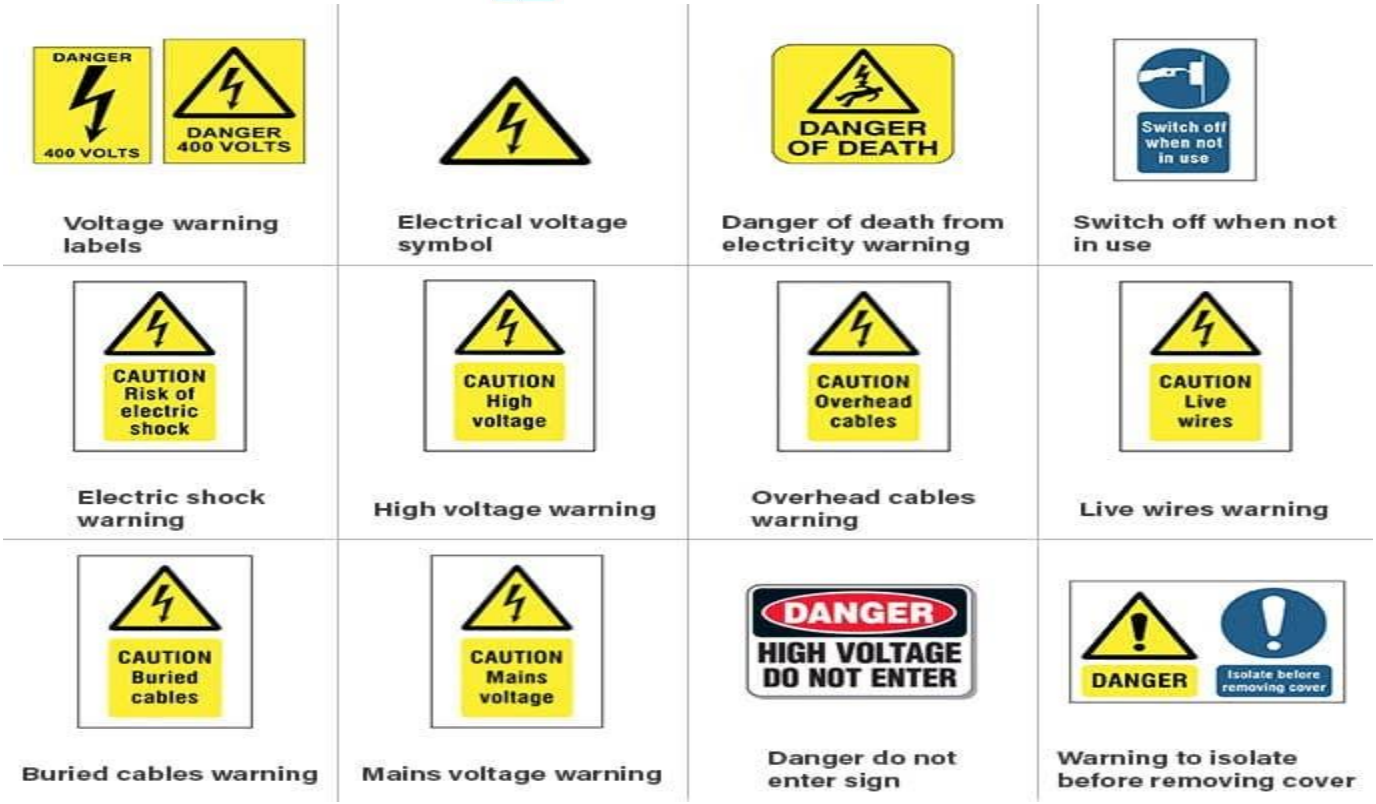



figure 1.13 electrical sign

**Electrical safety precaution**

- ✓ Do not go near broken or dangling Electrical wires as in illustration A and B.
- ✓ To prevent electrical shocks, never touch any electrical equipment with wet hands as shown in illustration C.
- ✓ When disconnecting a plug, do not pull on the cord, pull on the plug itself as in illustration F.
- ✓ Do not route an electrical cord through wet or oil soaked areas, through heated surfaces, or around sharp corners as in illustration D and E.

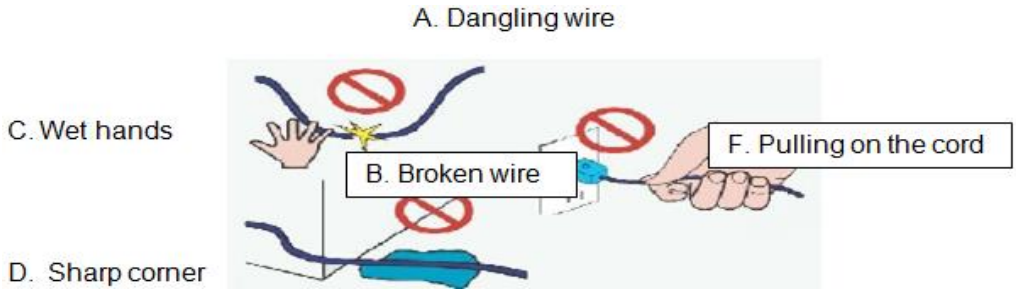
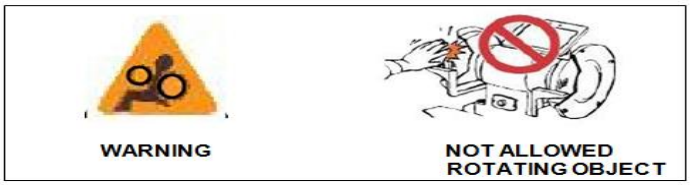



figure 1.14 risk area

**NOTE:** If encountered any of the situations shown below, the following actions must be taken:

- Report the matter to the instructor after switching off the switch.
- Report any blown fuse to the instructor, do not attempt to repair or replace it.

**Equipment safety sign**



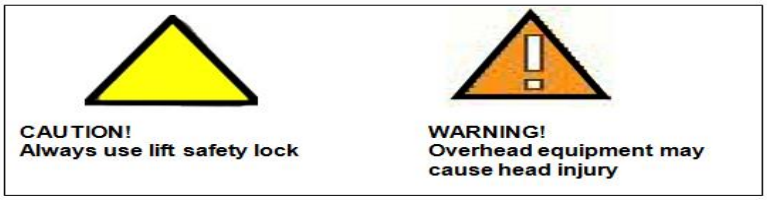




figure 1.15 equipment safety sign

## Computerized Shop Management Systems

Today, most service facilities use computerized shop management software. The information for the completion of an RO is input on the computer's keyboard. The software package also helps in the estimation of repair costs. The software also takes information from the RO and saves it in various files. These files are used for many purposes, such as schedule reminders, bookkeeping, vehicle/owner history, and tracking employee productivity. Notes can also be added to the RO (these do not appear on the RO). These personal notes can be used to remind the shop of commitments made to the customer, any special information about the customer and/or the vehicle, and any abnormal events that took place during the customer's last visit to the shop. When the customer arrives at the shop, the computer can quickly recall all pertinent information about the vehicle. Typically, all the service writer needs to do is key in the vehicle's license number, the vehicle's identification number, or the owner's name. If the customer has been to the shop before, all information will be available to the service writer.

## Self-Check -1.1

**Test 1**

**Direction:** Multiple choice questions

**1.** Before starting the engine the driver or owner of the vehicle must inspect the

(a) tire pressure (b) radiator coolant

(c) engine oil (d) All of the above

2. If the battery electrolyte level is low it can be topped-up using

(a) pure water (b) distilled water

(c) sea water (d) None of the above

**Test 2**

**Directions:** write if the statement is correct and write false when the statement is incorrect

1. Periodic services are those services performed not to correct problems.
2. Work order contain information about the customer, the vehicle, the customer's concern or request, an estimate of the cost for the services, and the time the services should be completed.
3. WO protects the shop and the customer.
4. All required periodic maintenance works have not performed at service workshops.
5. WOs are legal documents that are used for many other purposes

**Test 3**

**Directions:** Answer all the questions listed below.

1. Write types of gauge.
2. _____ is Indicates the engine speed revolution rpm
3. _____ is Instruments are arranged on the instrument panel in front of the driver's
4. Write the common type of braking systems used.
5. _____ is It's mechanically applied by a lever or pedal
6. List the Factors Effecting Braking.

## Operation sheet 1.1

**Operation title:** inspecting drive belt

**Purpose:** to identify the belt is working properly or not

**Instruction:** The belt checking processes is don when the engine is turned off

**Tools and requirement:** belt gauge, wrench,

**Steps in checking drive belt:-**

- ✓ **Check for cracking**. The belt needs to be inspected for cracking.
- ✓ **Check the edge wear**. If the belt is showing signs of wearing on its outer edge, then it will need to be replaced
- ✓ **Check for splitting**. As the belt wears over time, it not only will become brittle but it will start to become thinner
- ✓ **Check for missing ribs**. If the belt begins to lose large pieces of the rubber, then it needs to be replaced.
- ✓ **Check for a contaminated belt**. If the belt appears to have any sort of contamination on it, then it needs to be replaced
- ✓ **Check for a loose belt**. If the belt is loose then it may need to be tightened, or it may be failing
- ✓ **Use a belt gauge**. This test can only be done on a serpentine belt

**Quality criteria:-** it should be checked with hand and gauge.

## LAP Test

Name: _____ Date: _____

Time started: _____ Time finished: _____

**Instruction I:** Given necessary templates, tools and materials you are required to perform the following tasks

**Task 1:** check drive belt

**Task 2:** check battery condition

**Task 3:** check cooling system

**Task 4:** check brake system

# 2. Unit Two: Select lubricants/ coolants

This unit to provide you the necessary information regarding the following content coverage and topics:

- Types/Classification of Lubricants
- Cause and Effects of Gear Oil Dilution
- Maintenance schedule
- Identifying lubricants/coolants

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify types/Classification of Lubricants
- Identify cause and Effects of Gear Oil Dilution
- Prepare maintenance schedule
- Identify lubricants/coolants

## 2.1. Types/Classification of Lubricants

Lubrication is crucial for the control of friction and wear by adding a friction-reducing film between the moving surfaces.

The lubricant which is used can either be a fluid or solid substance. Substances which are generally used to lubricate a surface are lube oil and grease which are the most common forms of lubricants available.

The type of lubricant used is determined by the application. There are different types of lube oils for different applications such as automobile, industrial, marine and others.

**Role of a Lubricant**:

Some of the key roles that lubricant plays in the automobile applications are as follows:

- ✓ Reduce friction
- ✓ Transfer heat
- ✓ Prevent corrosion
- ✓ Protect against wear
- ✓ Carry away contaminants
- ✓ Transmit power
- ✓ Act as a seal

**Types of lubricants used in automobiles.**

**Engine Oil**

This is the most common form of automotive lubricant that you would see being used in automobiles.

It consists of base oils enhanced with various additives, particularly anti wear additives, detergents, dispersants, and for multi-grade oils, viscosity index improvers. Motor oil is used for lubrication of internal combustion engines.

The main function of motor oil is to reduce friction and wear on moving parts and to clean the engine from sludge and varnish.

It also neutralizes acids that originate from fuel and from oxidation of the lubricant, improves sealing of piston rings, and cools the engine by carrying heat away from moving parts.

**Gear Oil** This oil is generally used for transmissions, transfer cases, and differentials in automobiles, trucks, and other machinery.

Gear oil usually has a high viscosity and contains extreme pressure (EP) additives that consist of phosphorus sulfur compounds, to cope with the sliding action of hypoid bevel gears and combat wear.

**Greases** Is used in the suspension and steering joints to prevent any premature wear and tear. It is made from oil and thickeners. The lubricating oil can be petroleum or synthetic and can vary in viscosity.

additionally, anti-wear and extreme pressure additives can be added to formulate greases for specific applications, such as, high speed bearings, very cold or very hot conditions, open gears, extreme loads or high moisture conditions, to name a few.

Thickeners can be combined or formulated with additional chemicals to produce more complex thickeners for specific applications that require high tolerance for extremely high temperatures like disc brakes in some vehicles which uses this type of grease for its wheel bearings.

**Brake Fluids** are used in all automobile applications to maintain and improve the performance of brake systems.

Brake system plays a crucial role in the safety of cars and trucks so it is extremely important to keep brakes in great condition to maintain its high performance.

Brake fluids are not oils it is made from ethylene glycols and anticorrosion additives. Ethylene glycols can withstand the high operating temperatures of automobile brake systems and that will keep the brakes in good operating conditions.

There are basically four types of brake fluids:

DOT 3, DOT 4, DOT 5, and DOT 5.1. The specifications for all automotive brake fluids are defined by Society of Automotive Engineers (SAE) Standard

**Power-Steering Fluid**

now locates the power-steering pump. The level of power-steering fluid is checked with the engine off. The filler cap on the power-steering pump normally has a dipstick. Unscrew the cap and check the level. The level of the fluid is normally checked when the engine is warm. If the fluid is cold it will read lower than normal. Add fluid as necessary. Sometimes the fluid used in these systems is ATF; check the service manual for the proper fluid type before adding fluid.

**Clutch Fluid**

On some vehicles with a manual transmission, there is another but smaller master cylinder close to the brake master cylinder. This is the clutch master cylinder. Its fluid level needs to be checked, which is done in the same way as brake fluid. In most cases, the clutch master cylinder uses the same type of fluid as the brake master cylinder. However, check this out before adding any fluid

**Hydraulic Oil**

A hydraulic system is any system that requires force activation from one point to another. Some examples of hydraulic systems in a vehicle is the power-steering system.

Hydraulic oils usually made from base oils and additive package to combat wear and corrosion.

**Automatic transmission fluids (ATFs)**

- ✓ An ATF has to satisfy several requirements. It must:
- ✓ Lubricate the gears in the gearbox;
- ✓ Fill the torque converter (or 'automatic clutch') and thus convey power from the engine to the gearbox;
- ✓ Act as hydraulic medium by conveying signals from the valves in the control unit to the internal clutches/brakes that engage the gears;
- ✓ Ensure smooth but rapid take-up of power between the friction faces of the oil-immersed clutches/brakes;
- ✓ Remove frictional heat and cool the whole transmission unit.

## 2.2. Couse and effect of oil dilution

Oil dilution is the term used to describe the increase in the oil level in the engine. This happens by the entry of fuel into the engine oil. The causes of oil dilution can be various and also depend on the fuel required (diesel or petrol).

**Petrol in oil - motor oil smells like petrol**

If your oil level is too high and you also notice a smell of petrol in the engine oil, there is a good chance that your gasoline engine has an oil dilution. Petrol settles on the cylinder walls during cold starts and is introduced into the oil via the piston ring. This results in a mixing of oil and fuel. Since the oil in the engine does not heat up strongly enough, the fuel is not completely burned. Parts of the fuel remain in the lubricant and continue to dilute it. The oil level can therefore rise slowly.

**Diesel in oil**

Oil dilution also occurs in diesel vehicles. The reason for this is the post-injection of diesel to clean the diesel particle filters. During post-injection, additional diesel is injected into the cylinder chamber. This fuel is supposed to reach the diesel particulate filter with the exhaust gases and to clean the filter there. However, not all parts of the post-injection are always actually emitted. Smallest amounts of diesel stick to the cylinder walls and enter the engine compartment through the piston movement. As a result, diesel enters the engine oil and increases the oil level.

**Is my vehicle affected by the problem oil dilution?**

The first indication of oil dilution is to measure the oil level. Here you can find instructions on how to do this. If the measurement level of the engine oil is too high, there may be a dilution of the oil. In this case, it is recommended to take an oil sample from the vehicle in order to determine in the laboratory whether there is an increased amount of fuel in the oil.

**Is oil dilution dangerous?**

At what point the oil dilution becomes dangerous for the engine can only be precisely determined by the engine manufacturer. Only there the appropriate tests are made. Unfortunately, this information is rarely published. Some laboratories classify the limit value of fuel in the oil at 2-4%, others around 5% as critical. This value also differs between petrol and diesel vehicles.

| Fuel entry in oil | Normal | Increased | Critical |
|---|---|---|---|
| Petrol | < 1% | 1 - 2,5% | > 2,5% |
| Diesel | < 3% | 3 – 5% | > 5% |

It is certain that any amount of fuel in the oil changes the viscosity. Too much fuel in the oil leads to a lack of lubrication. The optimum oil pressure can no longer be built up. From a purely technical point of view, the engine oil would have to be changed at the latest when it is no longer within the SAE class limit.

As examples we have added limit values of the common SAE classes 30 and 40.

| SAE | 30 | 40 |
|---|---|---|
| Viscosity at 100 °C | 9.3 - 12.5 $mm^2/s$ | 12.5 - 16.3 $mm^2/s$ |
| Recommended change | ≤ 9 $mm^2/s$ | ≤ 12 $mm^2/s$ |

In addition, oil dilution not only reduces the viscosity of the engine oil, but also its quality. With all the impurities, an increased ageing behavior of the oil comes into play. The processes acting here can, among other things, form acids and trigger corrosion. This can cause long-term engine damage.

As fuel enters the oil, the falling flash point is a factor, too. If an engine oil in its fresh state has a flash point of approx. 240 °C, this may be less than 100 °C when highly diluted. This increases the risk of fire in the engine compartment.

A high proportion of biofuel in the oil can lead to an increase in the viscosity of the engine oil over a longer period of time until its complete polymerization.

**How can oil dilution be avoided?**

The effect of oil dilution is intensified by driving short distances, especially in cold outside temperatures. The engine is often started cold and rarely reaches the optimum operating temperature. This causes a lot of fuel to accumulate in the oil. If you have to drive many short distances, it is always advisable to move the vehicle over longer distances and drive at higher speeds.

Another reason for oil dilution can be a defective thermostat in the radiator. If the radiator cools the engine down too much, too much fuel is deposited on the cylinder walls. Have the functionality of the thermostat checked in case of doubt.

If none of the measures should lead to success, the last step is a more frequent oil change to replace the contaminated oil. Especially for engines with long life fillings, shortening the change interval to, for example, one year (instead of two years) can be helpful.

## 2.3. Maintenance schedules

Daily Maintenance (Car Owner's/ Driver's Responsibility)

In the process of using the car every day, making some simple maintenance checks

Can help in early diagnosis of problems that can cause breakdowns

- ✓ Engine compartment:
- ✓ Check oils and fluids.
- ✓ Coolant
- ✓ Confirm that there is coolant in the radiator reservoir tank.
- ✓ Engine oil Use the dipstick to check the engine oil level.
- ✓ Brake fluid Check that there is brake fluid in the reservoir tank of the brake master
- ✓ cylinder
- ✓ Washer fluid
- ✓ Using the level gauge, check the washer fluid level.

*Note: The purpose of this oil and fluid inspection is to determine if there is a minimum amount of oils and fluids available for starting the engine or operating the wipers during the periodic inspection.*

**I**-Inspection **A**-Adjustment **R**-Replace **C**-Clean **L**-Lubrication

**Table 2-1maintenance schedule**

| No | Item | Daily | First month | Every month | Every3 months | Every6 months | Every1 year | Note |
|---|---|---|---|---|---|---|---|---|
| 1. | Motor | | | | | **I** | | |
| 2. | Motor controller | | | | | **I** | | |
| 3. | Battery | | **I** | **I** | | | | |
| 4. | Charger | | **I** | **I** | | | | |
| 5. | Dc to dc converter | | **I** | **I** | | | | |
| 6. | Tire | **I** | **I** | **I** | | | | |
| 7. | Tire pressure | **I** | **I** | **I** | | | | |
| 8. | Brake clearance | | **I** | **I** | **A** | | | |
| 9. | Light\electrical system\meter | | **I** | **I** | | | | |
| 10. | Electric throttle operation | | | | **I** | | | |
| 11. | Steering handle bar | | | | | **I** | | |
| 12. | Bolt\screw\nut tightness | | **I** | **I** | | | | |
| 13. | Main stand spring | | | | | **I** | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 14. | Suspension oil | | | | **I** | | | |
| 15. | Chassis lubrication | | | | | **L** | | |
| 16. | Transmission belt | | | | | | **I** | |
| 17. | Transmission oil | | **R** | Replace every 4 month or 2000km | | | | |

**Notes this maintenance schedule is depend on only for one model.**

**Shortening the path of work around the vehicle**

a. Try as much as possible to concentrate work involving the same area, and do it all at one time.

b. The path of movement around the vehicle should start (location) from the engine

Compartment around outside the vehicle and end inside the vehicle

c. Tools, instruments, and replacement parts should be prepared in advance and placed within easy reach.

## 2.4. Identifying lubricants/coolants

The substances used for lubrication are called lubricants.

| **Lubricant Coolant** | **Coolant** |
|---|---|
| (1) Thin layer of this fluid between two machine parts helps in keeping them cool. | (1) It helps to cool down the job and cutting tool while cutting operations carried out. |
| It gives long life to m/c parts. | (2)It gives long life to cutting tools |
| (3) It saves m/c from rust. | (3) It saves job from rust. |
| (4) It helps in the smooth running of m/c and its parts | (4) Cutting is done easily with its use. |
| (5) It protects the m/c and tools from becoming jam. | (5) It protects the job and tools from becoming jam. |
| (6) It helps in keeping the m/c fit and in good working condition | (6) It helps in giving fine finishing on the jobs. |

## Self-check-2.1

**Test-I**

**Direction** writes if the statement is correct and writes false when the statement is incorrect

1. Protect against wear role of a lubricant:
2. oil dilution reduces the viscosity

**Test-I**

**Directions:** write short answer for the following questions

1. List the purpose of lubricant
2. Write types of lubricant

.

# 3. Unit Three: Apply lubricants/ coolant

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

- Safe procedure and using PPE
- Using correct tools and equipment
- Draining and re-filling
- Dispose used lubricants

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Use correct tools and equipment
- Drain and re-fill coolant and lubricant
- Dispose used lubricants

## 3.1. Safe procedure and using PPE

**The advanced and risk-free production process**

**The use of high-quality PPE or Personal Protective Equipment**

When it comes to ensuring the safety of your workers, you cannot ignore the importance of both these factors. A worker with all the superior quality PPE can get hurt because of working with outdated and damaged machines. On the other hand, if your workers do not wear proper PPE, accidents can happen at any point.

**Potential Dangers in Automobile Industry**

The automobile is one of those industries where the chances of having accidents are very high. Workers here need to handle many dangerous components like chemicals, batteries, engines, and other electric items. The slightest negligence can cause major accidents and injuries.

Despite advancements in the modern procedure of automobile productions, risks are there. Workers can have a burn, cut, or other types of serious injuries in their bodies because of these components and their negligence.

**Use of PPE for Ultimate Protection**

The use of PPE in the automobile industry is common. Those gloves, face-protective covers, boots, and other protective equipment will keep those workers safe in hostile conditions.

1. **Face Guard**

They use polycarbonate face protection which is anti-fog, chemical-resistant, and scratch-resistant. One can clearly see things while wearing these face protection gear. This cover protects their eyes, inhalation system, and face skin from all kinds of hazards.

2. **Protective Suits**

These suits are designed to protect the body from getting into direct contact with any chemical or toxic substances during the production time. These suits are lightweight and never restrict your movements. They are very well fitted and breathable too.

3. **Gloves**

Keeping the hands of workers safe from heat and chemical objects should be a priority for all automobile manufacturers. Workers who design and manufacture car engines or electric vehicles

should always wear protective gloves to keep their hands safe against short circuit electric arcs as well as thermal discharge.

If you own an automobile manufacturing company or managing a team of workers in an automobile product unit, you should consider buying the best quality PPE for your workers. Their protection will ensure the uninterrupted production of good quality automobile products.

Ghosh Exports provide a wide range of PPE for all types of industries, including automobiles. We deliver the best quality products at the best price. All our products are long-lasting and suitable for all types of hostile conditions.

## 3.2. Using correct tools and equipment

**Hand tools w**hile power tools are important, many maintenance professionals use a variety of hand tools in their daily work. These tools have the advantage of not requiring power sources and are often more portable. These are some of the most common hand tools for maintenance professionals:

**Screwdrivers:** Screwdrivers are common tools that allow maintenance employees to tighten and remove screws during repair, construction and assembly.

**Hammers:** Many maintenance professionals use hammers to drive and remove nails.

**Crescent wrenches:** Crescent wrenches are common hand tools that allow professionals to tighten and remove nuts and bolts with hexagonal heads.

**Hand saws:** Many maintenance professionals use hand saws and hacksaws to cut materials such as wood, metal and plastic.

**Electrical tools w**hile electricians normally complete most electrical maintenance and repair, some maintenance professionals complete minor electrical repairs. This can include installing lighting fixtures, outlets and switches and replacing light bulbs. These are some electrical tools that maintenance employees might use:

**Wire and cable strippers:** These tools allow electricians and maintenance professionals to remove the rubber coating from the outside of electrical wires.

**Multimeters:** are tools that can test the functionality of electrical circuits by measuring voltage, resistance and current.

**Crimpers:** Crimpers are tools that allow maintenance professionals to join wires, connectors and other electrical components.

**Strap Wrench** is used for turning pipe or cylinders where you do not want to mar the surface of the work. To use this wrench, the webbed strap is placed around the pipe and passed through the

slot in the metal body of the wrench. The strap is then pulled up tight; and as the mechanic turns the wrench in the desired direction, the webbed strap tightens further around the pipe. This gripping action causes the pipe to turn.

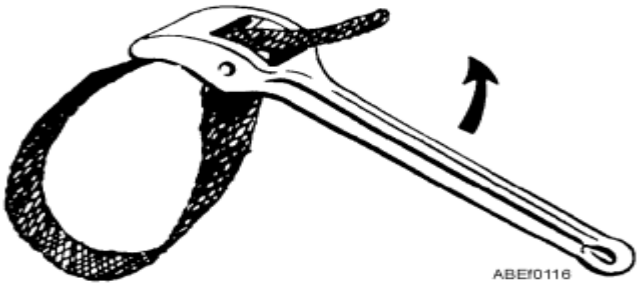



**Figure 3.1strap wrench (filter wrench)**

**Grease gun g**reasing Wipe clean the grease fitting and the tip of the nozzle, connect the nozzle, then reciprocate the lever. If grease is charged normally, old grease is pushed out from the groove or clearance near the fitting. For the amount of grease to charge, refer to the instruction manual for the target machine, or charge the machine with new grease until old grease is completely pushed out. Note, however, that old grease does not come out depending on the greasing point.



**figure 3.2 grease gun**

## 3.3. Draining and re-filling

**Oil Change** Description This Activity Plan will demonstrate to students how to successfully perform an engine oil and filter change on a vehicle. Students will be given the opportunity to perform this activity on a vehicle of their own choosing to demonstrate the learned skills.

**Tools**

- ✓ Oil drain pan
- ✓ Oil filter wrench
- ✓ Wrenches to remove the oil pan drain plug
- ✓ A socket set with a selection of sockets (most vehicles manufactured in the past 20 years
- ✓ use metric drain plugs)

- ✓ Torque wrench
- ✓ Recycling containers for used oil and filter

**Materials**

- ✓ Work order
- ✓ Oil change checklist
- ✓ Access to vehicle information for torque values
- ✓ Engine oil
- ✓ Oil filter
- ✓ Paper towel or wipes

**Resources**

- ✓ Vehicle information system (All Data or Mitchell, vehicle service manual or Internet access)
- ✓ Work order
- ✓ Oil change checklist
- ✓ Clipboards and pencils

## 3.4. Dispose used lubricants

**Waste Oil**

Before beginning a discussion on waste oil, it is important to first understand exactly what it is. A common term that is used interchangeably with waste oil is used oil.

According to the U.S. Environmental Protection Agency (EPA), the definition of used oil is any oil that has been refined from crude oil or any synthetic oil that has been used and as a result of such use is contaminated by physical or chemical impurities. This is the technical description for the oil that is drained out of your equipment.

Although most used oil alone is considered non-hazardous, if it has been contaminated by a hazardous substance, then it must be handled as hazardous waste. This encompasses an entirely different set of protocols. Just because most mineral and synthetic fluids by themselves are considered non-hazardous does not mean that all risks associated with handling them have been eliminated

**Removal**

The best practice for the removal of waste oil from a machine is to keep oil from ever being introduced to the environment. The rise in popularity of portable filter carts has made this process even easier.

With a waste oil drum nearby and a filter cart hooked to the system's drain, oil is pulled out of the reservoir and introduced into the waste oil container. For this procedure, it is recommended to bypass

the filters on the cart. After all, there is no need to filter the waste oil, which not only would slow down the pump but also cost more money for the purchase of new filters.

If filter carts are not available in your facility, having an appropriate waste oil container is a necessity. The container should be labeled for waste oil only and have adequate volume to hold all of the oil in the system from which it is being drained.

Although 5-gallon buckets are often used to capture waste oil and then emptied into used oil drums or totes, this practice offers many opportunities for spills by the constant transfer of oil from one vessel to another.

If waste oil is to be stored in large volumes or for extended periods in a single location, it is best to have spill-containment protocol in place. By using spill-containing pallets or building underground spill-containment reservoirs, you can ensure that leaks or spills are captured and greatly reduce the risk of environmental impact.

## Self-check

### Test 1

**Direction:** give short answer for the following questions

1. Why is it important to employ the right tool for the right job?
2. List the safety rules to be followed during servicing of a vehicle

## Operation sheet 3.1

**Operation title:** Draining and refilling engine oil

**Purpose:** of this operation can trainee, trainers about changing engine oil

**Instruction:** The spilling of hot engine oil is unavoidable during this procedure, care must be taken to prevent scalding.

**Tools and requirement:** oil filter, oil, wrench, rag and container

**Steps in changing oil:-**

- ✓ Start the engine and allow to run for 10 minutes, stop the engine.
- ✓ Loosen the bolt and filter to allow engine oil to drain.
- ✓ Make sure that the O-ring seal is exposed.
- ✓ Allow 10 minutes for the engine oil to drain from the oil filter housing.
- ✓ Install new O-ring seals.
- ✓ Tighten the component finger tight first.
- ✓ Torque to: 25 Nm
- ✓ Fill the engine with oil
- ✓ Clean any residual engine oil from the oil filler cap area.
- ✓ Start the engine and allow to run for 10 minutes, stop the engine. Check for leaks.
- ✓ Finally dispose the old engine oil

**Quality criteria:-** Correct installation of the oil filler cap can be obtained by tightening the cap until hard stop.

**Precaution:-** Make sure the engine is warm.

## LAP Test

Name: _____ Date: _____

Time started: _____ Time finished: _____

**Instruction I:** Given necessary templates, tools and materials you are required to perform the following tasks

**Task 1:** change engine oil

**Task 2:** change brake fluid

# 4. Unit four: Carry-out service and Maintenance activities

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

- Identifying Systems/subsystems
- Following service rules standards and regulations
- Performing Inspection and replace components

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Identify Systems/subsystems
- Follow service rules standards and regulations
- Perform Inspection and replace components

## 4.1. Identifying Systems/subsystems

**Battery**

The battery is the main source of electrical energy for the vehicle. It is very important that it is inspected and checked on a regular basis.

**Charging System**

A charging system output test measures the maximum current the alternator can produce at a specified voltage or maximum load. A charging system output test should be done when generator voltage low and current is suspected. A load tester, VAT tester, or ammeter may be used to measure the current.

Procedures differ with non-inductive testers. Always check the operating directions of the tester before connecting to charging components. When using an ammeter to perform an output test, calculate the charging system output by adding the two ammeter readings together and compare these figures with the manufacturer's specifications to determine needed tests and repairs. For instance, if the system tests low, a regulator voltage and regulator bypass test is usually required to determine if the alternator, regulator, or circuit wiring is at faults. Some guidelines to prevent damage to the charging and other electrical systems

**Drive Belts**

Drive belts have been used for many years. **V-belts** and **V-ribbed** (serpentine) **belts** are used to drive water pumps, power steering pumps, air-conditioning compressors, generators, and emission control pumps. Heat has adverse effects on drive belts and they tend to over cure due to excessive heat. This causes the rubber to harden and crack. Excessive heat normally comes from slippage. Slippage can be caused by improper belt tension or oily conditions.

Drive belts can be used to drive a single part or a combination of parts. An engine can have three or more V-belts. In some cases, two matched belts are used on the same pulley set. This increases the strength of the belt and pulley connection and provides redundancy in case a belt breaks.

**Engine Oil**

Engine oil is a clean or refined form of **crude oil**. Crude oil, when taken out of the ground, is dirty and does not work well as a lubricant for engines. Crude oil must be refined to meet industry standards. Engine oil (often called motor oil) is just one of the many products that come from crude oil. Engine oil is specially formulated so that it:

- ✓ Can flow easily through the engine
- ✓ Provides lubrication without foaming
- ✓ Reduces friction and wear

- ✓ Prevents the formation of rust and corrosion
- ✓ Cools the engine parts it flows over
- ✓ Keeps internal engine parts clean

**Chassis Lubrication**

A PM procedure that is becoming less common because of changing technology is chassis lubrication. However, all technicians should know how to do this. During the lubrication procedure, grease is forced between two surfaces that move or rub against each other. The grease reduces the friction produced by the movement of the parts. During a chassis lube, grease is forced into a pivot point or joint through a grease fitting. Grease fittings are found on steering and suspension parts, which need lubrication to prevent wear and noise caused by their action during vehicle operation.

**Cooling System**

Whenever you change an engine's oil, you should also do a visual inspection of the different systems under the hood, including the cooling system. Inspect all cooling system hoses for signs of leakage and/or damage. Replace all hoses that are swollen, cracked, or show signs of leakage.

**Windshield Wipers**

check the condition of the windshield wipers. Wiper blades can become dull, torn, or brittle. If they are, they should be replaced. Also, check the condition of the wiper arms. Look for signs of distortion or damage. Also, check the spring on the arm. This spring is designed to keep the wiper blade fairly tight against the windshield. If the spring is weak or damaged, the blade will not do a respectable job cleaning the glass

**Windshield Washer Fluid** The last fluid level to check is the windshield washer fluid. Visually check the level and add as necessary. Always use windshield washer fluid and never add water to the washer fluid reservoir, especially in cold weather. The water can freeze and crack the tank or clog the washer hoses and nozzles.

**Tires**

The vehicle's tires should be checked for damage and wear. Tires should have at least 1⁄16 of tread remaining. Any less and the tire should be replaced. Tires have "tread wear indicators" molded into them. When the wear bar shows across the width of the tread, the tire is worn beyond its limits. Most shops use a tire wear gauge, which gives an accurate measurement of the tread depth Also, check the tires for bulges, nails, tears, and other damage. All of these indicate the tire should be replaced.

**Inflation** Check the inflation of the tires. To do this, use a tire pressure gauge. Press the gauge firmly onto the tire's valve stem. The air pressure in the tire will push the scale out of the tool. The highest number shown on the scale is the air pressure of the tire. Compare this reading with the specifications for the tire.

The correct tire pressure is listed in the vehicle's owner's manual or on a decal (placard) stuck on the driver's doorjamb. The air pressure rating on the tire is not the amount of pressure the tire should have. Rather this rating is the maximum pressure the tire should ever have when it is cold.

ADDITIONAL PS CHECKS

the following PS checks are in addition to those items specified by the manufacturer. These should be performed at these suggested time intervals to help ensure safe and dependable vehicle operation.

**Time: While operating the vehicle**

- ✓ Pay attention to and note any changes in the sound of the exhaust or any smell of exhaust fumes in the vehicle.
- ✓ Check for vibrations in the steering wheel. Notice any increased steering effort or looseness in the steering wheel.
- ✓ Notice if the vehicle constantly turns slightly or to one side of the road.
- ✓ when stopping, listen and check for strange sounds, pulling to one side, increased brake pedal travel, or hard-to-push brake pedal.
- ✓ if any slipping or changes in the operation of the transmission occur, check the transmission fluid level.
- ✓ Check the automatic transmission's park function.
- ✓ Check the parking brake.

***Time: At least monthly***

- ✓ Check the operation of all exterior lights, including the brake lights, turn signals, and hazard warning flashers.

***Time: At least twice a year***

- ✓ Check the pressure in the spare tire.
- ✓ Check headlight alignment
- ✓ Check the muffler, exhaust pipes, and clamps.
- ✓ Inspect the lap/shoulder belts for wear.
- ✓ Check the radiator, heater, and air-conditioning hoses for leaks or damage.

***Time: At least once a year***

- ✓ Lubricate all hinges and all outside key locks.

- ✓ Lubricate the rubber weather strips for the doors.
- ✓ Clean the body's water drain holes.
- ✓ Lubricate the transmission controls and linkage.

## 4.2. Following service rules standards and regulations

**Maintenance Standards**

Maintenance standards are established criteria for performing various maintenance tasks such as cleaning, repairs, parts replacement, lubrication, and maintenance data collection. Stakeholders in the maintenance industry establish standards for various reasons, including reduced safety risks, increased asset reliability, and enhanced efficiency.

**Overview**

Companies of all sizes establish their own internal standard operating procedures (SOPs) to ensure smooth maintenance and operations. Additionally, industry institutions, such as the International Organization for Standardization (ISO), publish official maintenance standards as recommended best practices. Maintenance departments use these standards as guidelines when developing, implementing, and correcting maintenance team strategies.

**The implementation of maintenance standards takes into account:**

- ✓ Organizational operating plans and budgets
- ✓ Environmental laws, OSHA mandates, and other regulatory requirements
- ✓ Terms and conditions of facility and asset insurance policies
- ✓ Terms and conditions of operations and maintenance agreements

While organizations have no obligation to implement SOPs, most high-volume companies consider them crucial to their long-term success. The more complex pieces of equipment a company utilizes, the easier it becomes to overlook the many small tasks involved in maintaining equipment reliability and cost-efficiency.

**The Benefits of Maintenance Standards**

Maintenance standards serve the following primary purposes:

- ✓ **Clarify Contractual Obligations:** Ensure organizations and maintenance professionals understand responsibilities, liabilities, and important details.

- ✓ **Simplify Daily Operations:** Harmonize maintenance best practices among organizational key stakeholders so everyone knows exactly what, when, and how to execute preventive and corrective maintenance tasks without question.
- ✓ **Keep Everyone Safe:** Define criteria for reducing the risk of injury, minimizing environmental impact of processes, and upholding quality control.

Additionally, adhering to maintenance standards is crucial to passing audits, minimize unplanned downtimes, and reduce extraneous spending. Leading with agreed-upon protocols also can help build a positive work culture.

**Who Produces Maintenance Standards?**

While some departments implement unique SOPs according to their unique needs, most departments follow global maintenance industry standards. The two dominant international regulatory organizations are the International Organization for Standardization (ISO) and the International Electro-technical Commission (IEC).

**Maintenance standards developed by ISO include:**

- ✓ Quality Management Standards
- ✓ Environmental Management Standards
- ✓ Health and Safety Standards
- ✓ Energy Management Standards
- ✓ Food Safety Standards
- ✓ IT Security Standards

## 4.3. Performing Inspection and replace components

**Replace windshield**

**Wipers**

Visibility is a must whenever you're on the road. And your window to the outside world is your windshield keeping it in excellent order is partly the job of your windshield wiper. Now, remember that these wipers are not exactly very durable so they tend to wear out a little faster than other components of your car. The good news is that they're a lot easier to replace, too. If your windshield is already getting streaky or that it makes a squeaking, grating noise every time it is switched on, then it's time to replace it. Buy a replacement wiper blade that is recommended for your vehicle. And while you're replacing your wipers, why don't you give your windshield a thorough cleaning both inside and out.

**Replace air filter**

**Example: Replacing cabin air filter**

. This is one of the easiest and most practical ways to keep everyone safe and comfy inside your car's cabin. The current recommendation is to replace your cabin air filter every 12 months or every 12,000 miles, whichever comes first. However, you can always refer to your owner's manual for the recommended schedule of cabin air filter replacement.

**Replace broken indicator bulbs**

These fixtures in your vehicle are very important and as such should never be overlooked in your car maintenance checklist. Indicator or signal lights inform other motorists of the direction you are planning to go to. This way they will also know what to do. For example, if you're signaling left, then they should know not to overtake and to start slowing down to compensate for your own reduction in speed. The thing is that if the indicator light to the direction where you're turning is flashing a lot faster than when you switch on to the other direction, it simply means you have a blown light bulb. The great news is that today's cars come with lighting modules that are can be easily replaced without having to go to the shop. A word of caution though, it is important to use only the kind of bulb that is specific to your vehicle's make. And if you can remember we did mention in the beginning that reading your vehicle owner's manual can help you a great deal in your basic car maintenance chores. Additionally, the manual will also tell you exactly how to access and replace these lights.

## Self-check-4.1

Name: _____ Date: _____

**Directions:** Answer all the questions listed below.

**Write true if the statement is correct write False if not correct**

1. Engine oil is a clean or refined form of crude oil.
2. charging system output test measures the maximum current the alternator can produce at a specified voltage or maximum load.
3. belts are used to drive water pumps, power steering pumps, air-conditioning compressors, generators, and emission control pumps.
4. Engine oil is specially formulated so that it can flow easily through the engine

## Operation sheet 4.1

**Operation title:** changing wiper blades

**Purpose:** to exercise the changing step

**Instruction:** after finishing pay attention next time it rains.

**Tools and requirement:** screw driver and combination plair

**Steps in changing wiper blades:-**

- ✓ Know what part of the blade to change.
- ✓ Measure the size blade you need and buy replacement blades.
- ✓ Installing New Wiper Blades
- ✓ Raise the metal wiper arm away from the windshield.
- ✓ Unhook the old wiper blade.
- ✓ Insert the new wiper.

**Quality criteria:-** replacing the wiper blade without damage.

**Precaution:-** Examine the wipers for cracks.

## LAP Test

Name: _____ Date: _____

Time started: _____ Time finished: _____

**Instruction I:** Given necessary templates, tools and materials you are required to perform the following tasks within 5 hours

**Task 1:** replace the wiper blade

**Task 2:** replace air filter

# 5. Unit Five: Carry-out service and Maintenance activities

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

- Storing Tools, equipment and materials are properly
- Keeping workplace

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:

- Storing Tools, equipment and materials are properly
- Keeping workplace

## 5.1. Storing Tools, equipment and materials are properly

Tools should stay in a dry, clean area to make them last as long as possible. Humidity can cause rust to develop, which can make tools stop working properly. Dirt can also get inside tools and cause them to malfunction prematurely. Avoid areas with extreme temperature swings, which can be hard on your equipment.

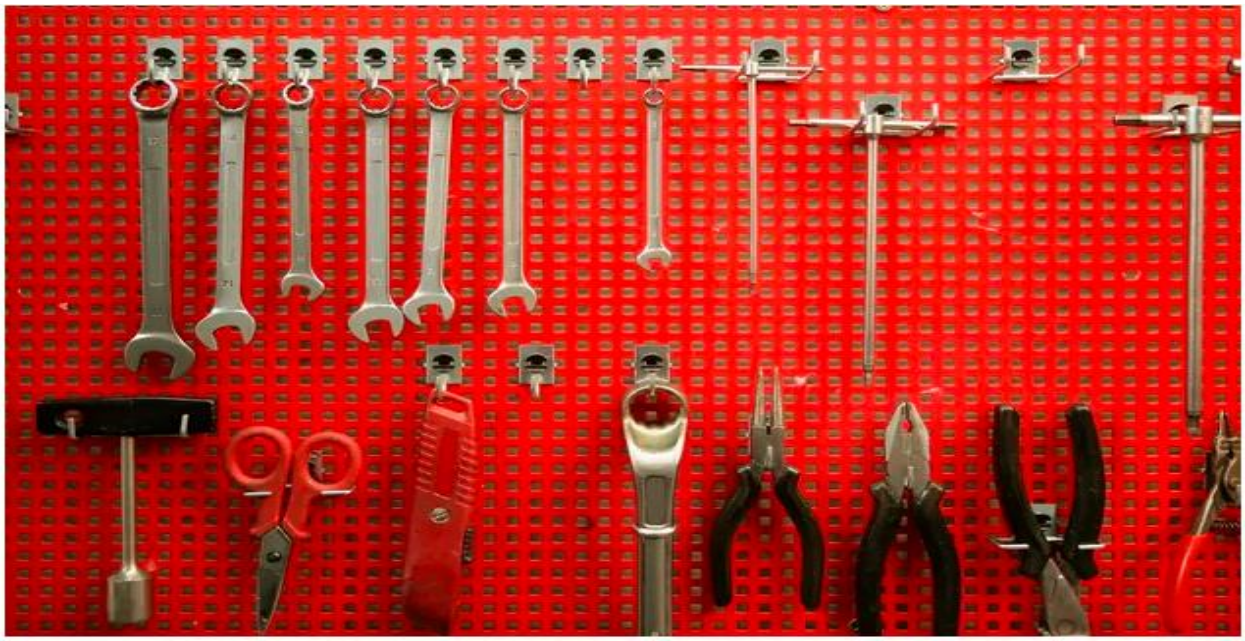


figure 5.1sorting style

**Important of proper storage of tools and equipment**

By storing your tools, you'll **increase their durability**. Storing your tools prevents them from collecting dust, grease, and rust. If you take care of your tools, they'll last longer and perform better for a more extended time.

**3three Benefits to Properly Organizing and Storing Tools in Your Garage**

Keeping all the tools in your garage organized may seem like a minor detail, but it’s crucial for ease of use and accessibility. Here is a look at some of these benefits to organizing the tools in your garage.

**Proper Maintenance b**y storing your tools, you’ll increase their durability. Storing your tools prevents them from collecting dust, grease, and rust. If you take care of your tools, they’ll last longer and perform better for a more extended time. Taking care of your tools also allows you to save money, as you’ll avoid having to replace damaged ones. Figure out which tools must be stored and which you can leave out in the open.

**Improved Accessibility b**y properly storing your tools, you’ll be able to find the tools that you need promptly. You can avoid the inconvenience of having to look all over your garage

for a specific one. The frustration of being unable to find a tool when necessary has caused people to give up on completing their projects.

**Maximize Your Space h**aving vertical space inside of your garage is fundamental. Many people store their primary tools at their arm level because it's convenient. Consider storing seldom-used items higher in your garage using wall cabinets.

## 5.2. Keeping workplace

**the purpose of workplace housekeeping**

Poor housekeeping can be a cause of incidents, such as:

- ✓ tripping over loose objects on floors, stairs and platforms
- ✓ being hit by falling objects
- ✓ slipping on greasy, wet or dirty surfaces
- ✓ striking against projecting, poorly stacked items or misplaced material
- ✓ cutting, puncturing, or tearing the skin of hands or other parts of the body on projecting nails, wire or steel strapping

To avoid these hazards, a workplace must "maintain" order throughout a workday. Although this effort requires a great deal of management and planning, the benefits are many

**Housekeeping at work**

Effective housekeeping can help control or eliminate workplace hazards. Poor housekeeping practices frequently contribute to incidents. If the sight of paper, debris, clutter and spills is accepted as normal, then other more serious hazards may be taken for granted.

Housekeeping is not just cleanliness. It includes keeping work areas neat and orderly, maintaining halls and floors free of slip and trip hazards, and removing of waste materials (e.g., paper, cardboard) and other fire hazards from work areas. It also requires paying attention to important details such as the layout of the whole workplace, aisle marking, the adequacy of storage facilities, and maintenance. Good housekeeping is also a basic part of incident and fire prevention.

Effective housekeeping is an ongoing operation: it is not a one-time or hit-and-miss cleanup done occasionally. Periodic "panic" cleanups are costly and ineffective in reducing incidents

**Benefits of good housekeeping practices**

Effective housekeeping results in:

- ✓ reduced handling to ease the flow of materials
- ✓ fewer tripping and slipping incidents in clutter-free and spill-free work areas
- ✓ decreased fire hazards
- ✓ lower worker exposures to hazardous products (e.g. dusts, vapours)
- ✓ better control of tools and materials, including inventory and supplies
- ✓ more efficient equipment cleanup and maintenance
- ✓ better hygienic conditions leading to improved health
- ✓ more effective use of space

- ✓ reduced property damage by improving preventive maintenance
- ✓ less janitorial work
- ✓ improved morale
- ✓ improved productivity (tools and materials will be easy to find)

## Self-check-3

Name: _____ Date: _____

**Directions:** Answer all the questions listed below.

**Instruction I:** Write true if the statement is correct write False if not correct

1. Storing your tools prevents them from collecting dust, grease, and rust.
2. Proper maintenance benefits to properly organizing and storing tools in your garage.
3. Effective housekeeping can help control or eliminate workplace hazards.

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