Ethiopian TVET-System

Electro Mechanical Equipment And Machinery Maintenance

NTQF Level –II

Based on March, 2017G.C. Occupational Standard

Module Title: Carrying out Machines and Equipment Programming Safety and Maintenance

TTLM Code: EIS EME2 TTLM 0920v1

This module includes the following Learning Guides

LG54:- Prepare **for scheduled maintenance**

LG Code: - EIS EME2 M11 LO1-LG-54

LG 55: Carry out maintenance

LG Code: - EIS EME2 M11 LO1-LG-55

LG56: Complete maintenance work

LG Code: - EIS EME2 M11 LO1-LG-56

Instruction Sheet-1	Learning Guide 54: **Prepare for scheduled maintenance**

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

- Identifying, selecting and providing tools and supplies required to carry out programmed maintenance tasks
- Carrying out and making adjustments of pre-operational checks of machinery and equipment
- Identifying and segregating faulty or unsafe machinery and equipment
- Identifying and reporting OHS hazards in the workplace

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 –

- Identify, select and provide ***Tools and supplies*** required to carry out programmer maintenance.
- Checks Pre-operational of machinery and equipment
- Identify and segregate Faulty or unsafe machinery and equipment for repair or replacement according to enterprise requirements.
- identify and reported OHS hazards in the workplace.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below
3. Read the information written in the “Information Sheets 1- 4”. Try to understand what are being discussed.
4. Accomplish the “Self-checks 1,2,3,4 ,” in each information sheets on pages 10,13,17,&21 .
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-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets 1, 2 and 3 on pages 28,29 and 30.and do the LAP Test on page 31”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity.

After You accomplish Operation sheets and LAP Tests, ensure you have a formative assessment and get a satisfactory result; then proceed to the next LG.

Information Sheet-1	Identifying, selecting and providing tools and supplies required to carry out programmed maintenance tasks

1. Introduction

Maintenance: Workplace activities such as constructing, installing, setting up, testing, adjusting, inspecting, modifying, and maintaining machinery on a preventive, periodic and predictive basis. These activities include lubrication, cleaning or unjamming of machinery and making adjustments or tool changes where a worker may be exposed to the unexpected energization or startup of the machinery or release of hazardous stored energy.

The key to minimizing tools problems is scheduled routine inspection and maintenance. All types of tools and machinery require regular inspections so to maintain their integrity and availability. The maintenance becomes simple and effective with the use of minor and major inspections categorized into levels representing the life expectance to be used.

Keep your tools in good condition. Protect them from rust, nicks, burrs, and breakage.

. **Use each tool only for the job it was designed to do.** Each particular type of tool has a specific purpose. Remember, improper use of tools results in improper maintenance. Improper maintenance results in damage to equipment and possible injury or death to you or others.

Safe maintenance practices. Always avoid placing tools on or above machinery or an electrical apparatus. Never leave tools unattended where machinery or aircraft engines are running.

2. Types of maintenance

2.1. **Breakdown maintenance:** Breakdown maintenance is basically the “run it till it breaks” type of maintenance mode. No actions or efforts are taken

to maintain the equipment till its design life is reached. Advantages are, Low cost, less staff. Disadvantages are Increased cost due to unplanned downtime of equipment.

2.2. **Preventive maintenance** is the maintenance schedules which has to be carried out to the equipment, in a preplanned way before serious breakdown takes place. there are different types of maintenance schedule.

1. **Daily maintenance schedules**: example checking overheating ,terminal connection ,examine control element, add oil if necessary etc
2. **Weekly maintenance schedules**: example Check belt tension, Blow out dirt from machine or tools, Check the intensity of vibrations during operation of machine and Clean filters where provided.
3. **Monthly maintenance schedules**: example Overhaul controllers, Inspect and clean oil circuit breakers, etc
4. **Annual Maintenance schedules example over hauling the machine**

2.3. **Corrective maintenance**: It improves equipment and its components so that preventive maintenance can be carried out reliably. Equipment with design weakness must be redesigned to improve reliability or improving maintainability

3. Measuring tools

Tools are designed to make a job easier and enable you to work more efficiently. If they are not properly used and cared for, their advantages are lost to you. Regardless of the type of work to be done, you must have, choose, and use the correct tools in order to do your work quickly, accurately, and safely. Without the proper tools and the knowledge of how to use them, you waste time, reduce your efficiency, and may even injure yourself

3.1 Measuring Tape

It consists of a ribbon of cloth, plastic, or metal strip with linear measurement markings. It is a common measuring tool. Its flexibility allows for a measure of great length to be easily carried in pocket or toolkit and permits one to measure around curves or corners

Figure 1. measuring tapes

3.2 **A Vernier caliper is precision measuring tool.** 3. Vernier Caliper We can measure inside, outside and depth. It has locknut which is very useful to keep the measurement permanently.

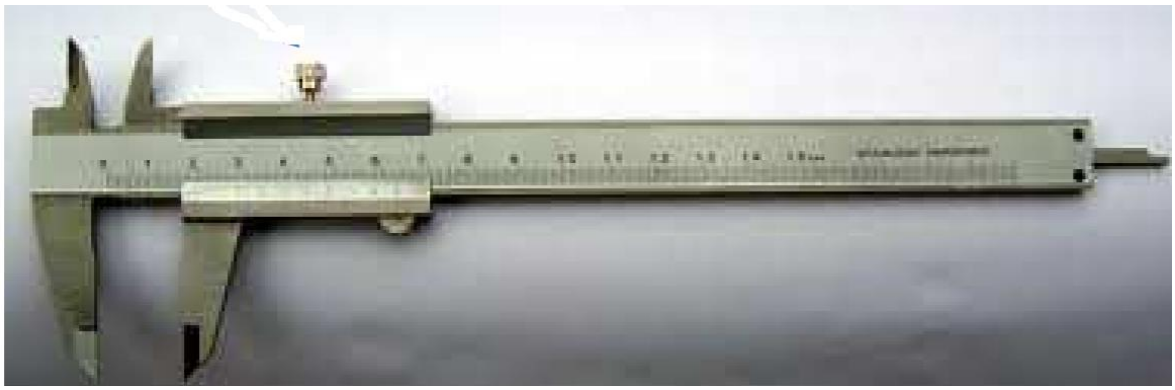


Figure.2. Analog Vernier caliper

Figure 3. Digital Vernier caliper

3.3 Micrometer

- A micrometer is also called micrometer screw gauge.
- It is used for precise measurement.
- The least count of Micrometer is 0.001 mm

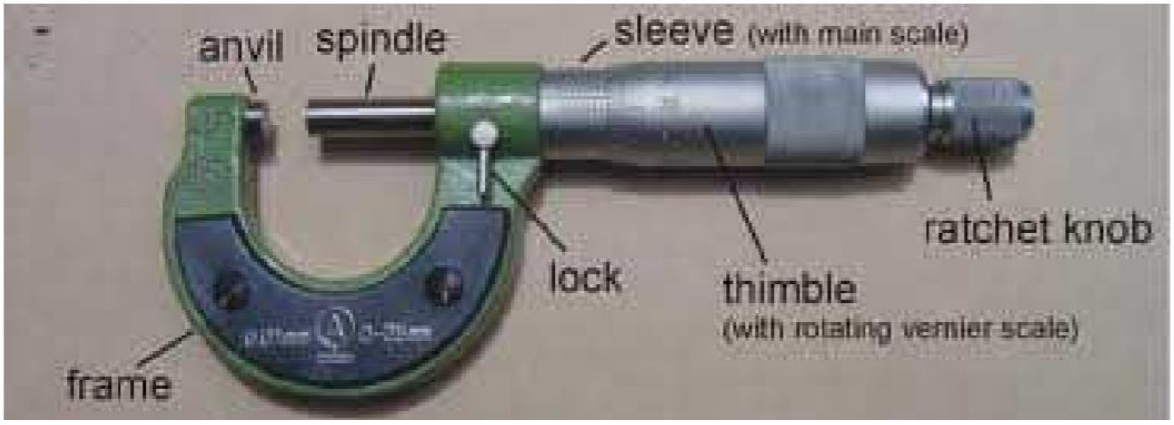


Figure 4. Micro meter and its parts

3.4 Feeler Gauges

A feeler gauge is a simple tool used to measure gap widths. Feeler gauges are mostly used in engineering to measure the clearance between two parts.

- They consist of a number of small lengths of steel of different thicknesses with measurements marked on each Measuring Tools piece.

- They are flexible enough that, even if they are all on the same hinge, several can be stacked together to gauge intermediate values.

Figure 5. feeler gauges

3.5 Thread gauges

A thread pitch gauge, also known as a screw pitch gauge or pitch gauge, is used to measure the pitch or lead of a screw thread.

- Is used as a precision measuring instrument.
- Allows the user to determine the profile of the given thread.
- Allows to categorize the thread by shape and pitch

Figure 6 feeler gauges

Table-1 Measuring Tools maintenance schedules

NO	Measuring Tools/Device	To Be Inspected	Recommended Interval
1	Multimeter	Battery and terminals	weekly
2	Micrometer	Knob and others	Monthly
3	Vernier caliper	Scales	Monthly/as per measurement
4	Feeler gauge	flatness	Monthly / as per measurement
5	Thread gauge	Threads	Monthly / as per measurement

4. Maintenance schedule of generator and pump

4.1. **Generator**: -is an electromechanical machine that converts mechanical energy in to electrical energies through the medium of magnetic field.

Table-2 Generator and pump Schedule maintenance

No	Equipment	Recommended Intervals
	Generator	
1	Generator Air Coolers	Annual
2	Oil Check	Daily
3	Fuel Check	Daily
4	Mechanical Vibrations	Daily
5	Out Put Terminal Check	Daily
6	Cooling System	Weekly ,Annual
7	Air In Take And Filter	Weekly, Monthly
8	Battery Terminal Connection	Daily
9	Coupling	Annual
10	Overhaul Engine	Per Manufactures
	Pump	
1	Pump Impeller	Annual,
2	Shaft And Coupling	Weekly, Annual
3	Mechanical Seals	Weekly
4	Bearings	Weekly
5	Pressure Relief Valves	Annual

4.2. Pumping Machinery Maintenances

Pumping machinery and pumping station are very important components in water Supply system. Pumping machinery is subjected to wear, tear, erosion and corrosion due to their nature of functioning .Generally,more number of failures or interruptions in water supply is attributed to pumping machinery than any other component. Sudden failures can be avoided by timely inspection, follow up actions on observations of inspection and planned periodical maintenance. Downtime can be reduced by maintaining inventory of fast-moving spare parts. Efficiency of pumping machinery reduces due to normal wear and tear

Pumping Machinery Maintenances

(a) Daily maintenance

- Clean the pump, motor and other accessories.
- Check coupling bushes/rubber spider.
- Check stuffing box, g etc.

(i) Routine observations of irregularities

The pump operator should be watchful and should take appropriate action on anyirregularity noticed in the operation of the pumps. Particular attention should be paid tofollowing irregularities.

- Changes in sound of running pump and motor
- Abrupt changes in bearing temperature.
- Oil leakage from bearings
- Leakage from stuffing box or mechanical seal
- Changes in voltage
- Changes in current
- Changes in vacuum gauge and pressure gauge readings
- Sparks or leakage current in motor, starter, switch-gears, cable etc
- Overheating of motor, starter, switch gear, cable etc.

(II) Record of operations and observations

A log book should be maintained to record the observations, which should cover the followingitems

- Timings when the pumps are started operated and stopped during 24 hours.
- Voltage in all three phases.
- Current drawn by each pump-motor set and total current drawn at the installation.

(b) Monthly Maintenance

- Check free movement of the gland of the stuffing box
- Check condition ofbearing oil and replace or top up if necessary.

(c) Quarterly Maintenance

- Check alignment of the pump and the drive.
- Clean oil lubricated bearings and replenish with fresh oil.
- Tighten the foundation bolts and holding down bolts of pump.
- Check vibration level.
- Clean flow indicator,

(d)Annual Inspections and Maintenance

A very thorough, critical inspection and maintenance should be performed by trained operator/Engineer once in a year.

Following items should be specifically attended.

- Clean and flush bearings with kerosene
- Clean bearing housing and examine for flaws
- Check clearances in wearing ring.
- Check impeller hubs and vane tips for any pitting or erosion.
- Check interior of volute, casing and diffuser for pitting, erosion, and rough surface.
- All vital instruments i.e. pressure gauge, vacuum gauge, ammeter, voltmeter, Check performance test of the pump for discharge, head efficiency.

Self-Check -1	Written Test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: each contains 1.5pts

I. Choose the correct answer

1. One of the following is not measuring tools

   A/ Multimeter B./Micrometer C/ Hammer D/ Caliper

2. The main propose of schedule maintenance is

   A/ to increase serviceability B/ to decrease efficiency C/ to avoid problems to be created D/ all except B

3. The type of schedule maintenance which has to be carried out in a preplanned way before serious breakdown takes place is as known

   A/ corrective maintenance B/ breakdown maintenance C/preventive maintenance D/ all of the above

4. The type of measuring tools used to measure the pitch of the thread is

   A/ Thread gauges B/ feeler gauges C/ Micrometer D/ none

Answer Sheet-1

Name: _____ Date: _____

Short Answer Questions

1._____**2.**_____

3._____

4._____

Score = _____

Rating: _____

Note: **Satisfactory rating – 3 points Unsatisfactory – 3 below 3points**

Information Sheet-2	Carrying out and making adjustments of pre-operational checks of machinery and equipment

It is important to carry out a series of checks before using a piece of machinery. This is particularly important in situations in which a number of people use the same machine. Larger companies and organizations usually have a system of checks, and a maintenance department that will deal with reported defects. Individuals working alone or in small teams will be responsible for checking and maintaining their own machines.

Pre-operational: -A visual "circle check" or pre-operational inspection of machinery and equipment prior to every use will reduce the chance of machine and equipment being operated in an unsafe condition. This makes it easier to spot and deal with maintenance issues early before they turn into a problem causing downtime, equipment damage or expensive repairs. Unsafe machinery can also cause injury to the operator or other workers and damage to facilities or product. The Operator's Manual and maintenance records for each piece of equipment is readily available to check on the need for oil and **filter changes, greasing, seal replacement** and so on. To be ensure maintenance records are checked regularly and performed as scheduled or needed. Manuals and maintenance records for our equipment are kept:

Before operating any piece of equipment, begin with a visual check of the work area. Check the following

- Is it level and clear of obstructions and overhead wires?
- Is there any evidence of fluid leaks?
- Are there other people in the area?
- Walk around the vehicle noting any wear or damage to tires, hoses, forks, attachments, chains, reels, hold-downs, guards and so forth.
- Are there any loose or missing parts?

Machine and equipment calibration: Make sure that all inspection, measuring and test equipment are working. Calibrating or adjusting instruments for accuracy is important. One way to test an instrument's accuracy is to compare its results to those of an accurate reference instrument. This can be done by shipping the testing or measuring equipment to the manufacturer. It could also be done by hiring someone from outside the company to check the instrument.

You can also test the instrument against controlled conditions. **The best example of this is the use of pH standards for pH meter calibrations**. In this test, solutions of known pH values are compared to results from the meter. Whatever method is used, make sure that the calibration standards are traceable. Also make sure that they meet national or international standards. If no such standards are available or practical, use a single reproducible standard or an in-house standard. The frequency of calibration may depend on the manufacturers' limits or recommendations. It might also depend on **the instrument's accuracy in the past**. Consider the risk to the product if the instrument is not working correctly. High-risk activities, need more frequent instrument calibration or accuracy checks.

Documentation Calibration documentation should include:

A list of all equipment requiring calibration

Calibration procedures and frequencies. These procedures must include

- The frequency of calibration activities
- Who will perform the calibration?
- specific directions and limits for accuracy and precision;
- Description of standards used,
- Procedures necessary for maintaining certification of calibration standards or devices.

When calibration limits aren't met, take corrective actions to restore the equipment to its required accuracy. Also check whether there have been any long-term effects on the instrument's quality and operation. Document all related activities.

Self-Check -2	Multiple choice and written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: each contains 1.5pts

II. Choose the correct answer

1. The main propose of pre start checking of equipment and machinery are A/ To avoid risk B/ to increase quality of production C/ to make accuracy D/ all of the above
2. Documentation calibration includes

A/ standard use B./frequency of calibration C/ accuracy and precision D/ all

3. What are going to be checked before going to operate equipment and machinery ;list them
4. What is precision?

Answer Sheet-2

Name: _____ Date: _____

Short Answer Questions

1._____**2.**_____

3._____

4._____

Score = _____

Rating: _____

Note: **Satisfactory rating – 3points** **Unsatisfactory - below 3points**

Information Sheet-3	Identifying and segregating faulty or unsafe machinery and equipment

Introduction

Machine operators may find themselves having to deal with minor problems with machinery or equipment. The operator manual will be their first point of reference if working alone. As they get to know their machinery, they will become familiar with **common faults and problems and know how to deal with them**, but will still need to refer to the manual for less routine problems. You must identify any problems with the equipment and machinery and take correct action. Generally, 'fault finding' is presented in tables that give a range of possible solutions for each problem.

Make sure there is at least one problem that could have several possible causes (e.g. problem: **example to operate generatorstarter turns slowly; causes: low battery power, low battery output or loose connection**.**Remedies**: **service battery, new battery, check connections).**You identify the fault through a process of elimination; you can then correct it.

1. Fault finding methods

Most machines go wrong at some time. Operator manuals have a section on finding faults. This is usually a table that gives a list of common problems and some suggestions about what might be the cause of the problems. It may also give advice about how to put them right.

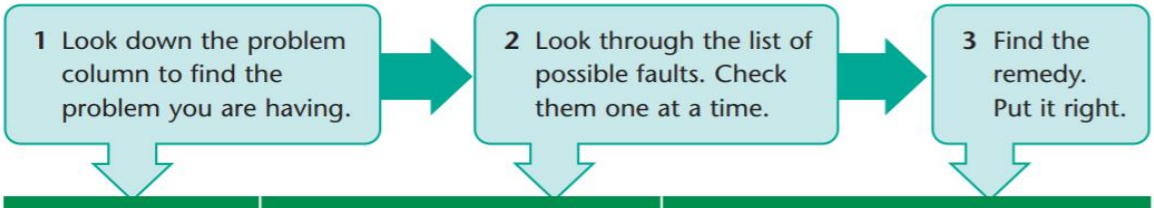
There are different methods fault-finding methods

a. **Inspection fault finding method: -**The purpose of an inspection is to identify whether the equipment can be operated, adjusted and maintained safely and that any deterioration (for example, damage, defect, wear) can be detected and remedied before it results in unacceptable risk'

b. **Diagnosis with test equipment :** Tracing the faults with test equipment according to manufactures instruction manual example if starter motor not

start check the battery voltage and acidic solution with digital or analog multimeter and hydrometer respectively if battery is ok continue to check the starter coil with multimeter and continue until you get the faults.

Example fault finding inspection and remedies for petrol powered



Problem	Possible fault	Remedy
Engine will not start	Fuel starvation – no fuel, faulty fuel hose Incorrect/contaminated fuel Spark plug lead disconnected Faulty spark plug Throttle setting incorrect Engine brake not released	Fill fuel tank Drain fuel tank and fill with correct fuel Connect spark plug lead Clean and adjust gap or replace Set throttle to 'fast' position Operate engine stop lever
Engine runs rough	Faulty spark plug connection Faulty spark plug Air cleaner element blocked Incorrect/contaminated fuel	Check spark plug connection lead Clean and adjust gap or replace Clean or replace air cleaner element Drain fuel tank and fill with correct fuel

Example 2 Motor troubleshooting

Defect	Cause	Solution
Motor does not start	Blown fuses	Replace the fuses with correct one with rated value
	Incorrect line connections	Check the connections
	Motor overloaded	Decrease the load
	Mechanical damage	Check whether the motor and drive rotate freely
	One of the phases may be open	Check the phases on the line
Motor runs and die down	Power failure	Check for a loose connection in the power supply line, fuses and control

Motor service and any troubleshooting must be handled by qualified persons who have proper tools and equipment. Before rectifying any faults, please read the information in the section titled Safety information

Faults during operation

Deviations from conditions during normal operation, such as an increase in power consumption, temperatures or vibrations, unusual noises or odors, tripping of monitoring devices, etc., indicate that the motor is not functioning properly. This can cause faults which can result in eventual or immediate death, severe injury, or material damage.

Self-Check -3	Multiple choice and true false

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: each contains 2 pts

i. Choose the correct answer

1. The materials used to identify the problem of battery source in generator is known as

   A/ Multimeter B/Hydrometer C/ Hammer D/ Calliper
2. What are the probable faults if pump does not startdischarging water?

   A/ Power failure B/ Blown fuse C/ Mechanical damage D/ all
3. What are the possible solutions if the engine of generator will not start?

   A/ may connect battery terminal properly B/ mayfill fueltank C/preventive maintenance D/ A and B
4. Usual Inspection is not important before machine and equipment operated (True/False)
5. Tracing the faults with test equipment according to manufactures instruction manual is known as troubleshooting method of fault finding (True/False)

Answer Sheet-3

Name: _____ Date: _____

Short Answer Questions

1._____**2.**_____ **3**_____

4. _____ **5.** _____

Score = _____

Rating: _____

Note: **Satisfactory rating – 6points** **Unsatisfactory - below 6points**

Information Sheet-4	Identifying and reporting OHS hazards in the workplace

The objective of this information sheet

To protect workers from the hazards of machinery and to prevent accidents, incidents and ill health resulting from the use of machinery and equipment at work by providing guidelines for:

I. Ensuring that all machinery for use at work is designed and manufactured to eliminate or minimize the hazards associated with its use;

II. Ensuring that employers are provided with a mechanism for obtaining from their suppliers necessary and sufficient safety information about machinery and equipment to enable them to implement effective protective measures for workers; and

III. Ensuring that proper workplace safety and health measures are implemented to identify, eliminate, prevent and control risks arising from the use of machinery and equipment

1. Identifying hazards in work place

Introduction

In ensuring OHS (occupational health and safety) in the use of equipment and machinery by reducing the associated hazard, hazard assessments (identifying hazard) should be conducted at various levels. hazard assessment should be completed by employers to ensure that the machinery and equipment's are safe and to provide a safe system of work, and workers should be consulted to reflect their views and experiences, and should actively participate in the hazard/risk assessment procedures

Hazard identifying/assessment: - is the process of evaluating the hazards/risks to safety and health arising from hazards at work.

1.1. Hazard identifying procedure

Safety and health risks can be identified /assessed /in five steps as follows

1. Collecting the appropriate information and determining the limits of the machinery, such as use, speed, time, environmental and interface limits;
2. Identifying and documenting the hazards associated with the tasks to be performed for the use and maintenance of machinery in the workplace;
3. Assessing risks arising from hazards by estimating the **likelihood and severity** of consequences and deciding whether the risks are adequately controlled
4. Planning actions to eliminate or reduce risk; and
5. Documenting risk assessment results.

Typical categories of hazards and hazardous situations include (1) mechanical; (2) electrical; (3) thermal; (4) noise; (5) vibration; (6) radiation; (7) materials and substances; (8) ergonomic; (9) unexpected start-up, overrun and overspeed; (10) inadequate stopping; (11) rotating parts; (12) power supply failure; (13) control circuit failure; (14) errors of fitting; (15) break-up during operation; (16) falling or ejected objects or fluids; (17) loss of stability and overturning of machinery; (18) slipping, tripping and falling; and (19) combinations of the above.

1.2. Reporting OHS hazards in the workplace

To report OHS hazard in work place the following protocol must be followed.

1) All employees must immediately report any occupational injury, accident or near miss to the safety officer or their supervisor.

2) Supervisors must immediately tend to injuries and then report them to the safety officer.

3) Branch managers must immediately discuss the incident with the safety officer and injured persons.

If an injury/hazard occurs a record must be kept and include the following:

a) Name of worker

b) Name and qualifications of person giving first aid

c) A description of illness or injury

d) The first aid given to the worker

e) The date and time the illness or injury

f) The date and time the illness or injury was reported

g) Where at the work side the incident occurred?

h) The work-related cause of the incident, if any

The purpose of this procedure is to comply with Occupational Health & Safety act, workers compensation board and to determine the cause of the accident and make recommendations to prevent further re-occurrence. All reports of injury must be filed

Self-Check -4	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: each contains 2 pts

1. Write the importance of identifying and reporting hazards in work place?
2. Mention at least three typical categories of hazards and hazardous situations
3. Write typical procedures of OHS hazard reporting in Answer Sheet-3

Name: _____ Date: _____

Score = _____

Rating: _____

Short Answer Questions

1.----------

2.----------

3.----------

Note: **Satisfactory rating – 4points** **Unsatisfactory - below 4 points**

Operation Sheet 1	Techniques of fault finding for engine generator will not run

Step 1- wear PPE.

Step 2- Select the necessary measuring tools and materials required for generator engine maintenance

Step3- list down the probable faults

Step 4- list down the possible solution

Step5- troubleshoot all the probable faults

Step6- Confirm the faults and solution

Step 7- Test the generator

Operation Sheet 2	Techniques of fault finding for pump does not discharge enough water

Step 1- wear PPE.

Step 2- Select the necessary measuring tools and materials required for pump maintenance

Step3- list down the probable faults

Step 4- list down the possible solution

Step5- Troubleshoot all the probable faults

Step6-Confirm the faults and solution

Step 6- Test the pump

LAP Test 1	Practical Demonstration

Name: _____ **Date:** _____

Time started: _____ **Time finished:** _____

Instructions: given the necessary measuringdevice and hand tools required for enginegenerator will not run perform the following tasks within 5 hours

TASK.1. Test battery voltage using multimeter.

TASK 2. Conductspecific gravity of battery using hydrometer

TASK 3. Check starter solenoid

TASK 4. Check fuel line

TASK5.Run the generator.

LAP Test 2	Practical Demonstration

Name: _____ **Date:** _____

Time started:_____**Time finished:** _____

Instructions: given the necessary measuring device and hand tools required for pump does not discharge enough water perform the following tasks within 4 hours

TASK.1. Identify the problem

TASK 2. Maintain the pump

TASK 3.Test the pump

.

Instruction Sheet-2	Learning Guide 55: Carry out maintenance

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

- maintaining suitable personal protective equipment
- servicing of machinery and equipment according to operator's manual/manufacturers
- Removal procedures /instruction of consumable components
- Replacing fluids and lubricants
- Conducting work according to OHS requirements

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 –

- Maintain suitable personal protective equipment
- Service machinery and equipment
- Remove consumable components
- Replace fluids and lubricants
- Conduct work according to OHS requirements

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below
3. Read the information written in the "Information Sheets 1- 5". Try to understand what are being discussed.
4. Accomplish the "Self-checks 1,2,3,4 5," in each information sheets on pages 27,31,37,39 & 42.
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-checks).
6. If you earned a satisfactory evaluation proceed to "Operation sheets 1, 2 and 3 on pages 28,29 and 30.and do the LAP Test on page 31". However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity.
7. After You accomplish Operation sheets and LAP Tests, ensure you have a formative assessment and get a satisfactory result; then proceed to the next LG

Information Sheet-1	Maintaining suitable personal protective equipment

1 What is personal protective equipment?

Personal protective equipment, or PPE, is designed to protect employees from serious workplace injuries or illnesses resulting from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. Besides face shields, safety glasses, hard hats, and safety shoes, PPE includes a variety of devices and garments such as goggles, coveralls, gloves, vests, earplugs, and respirators.

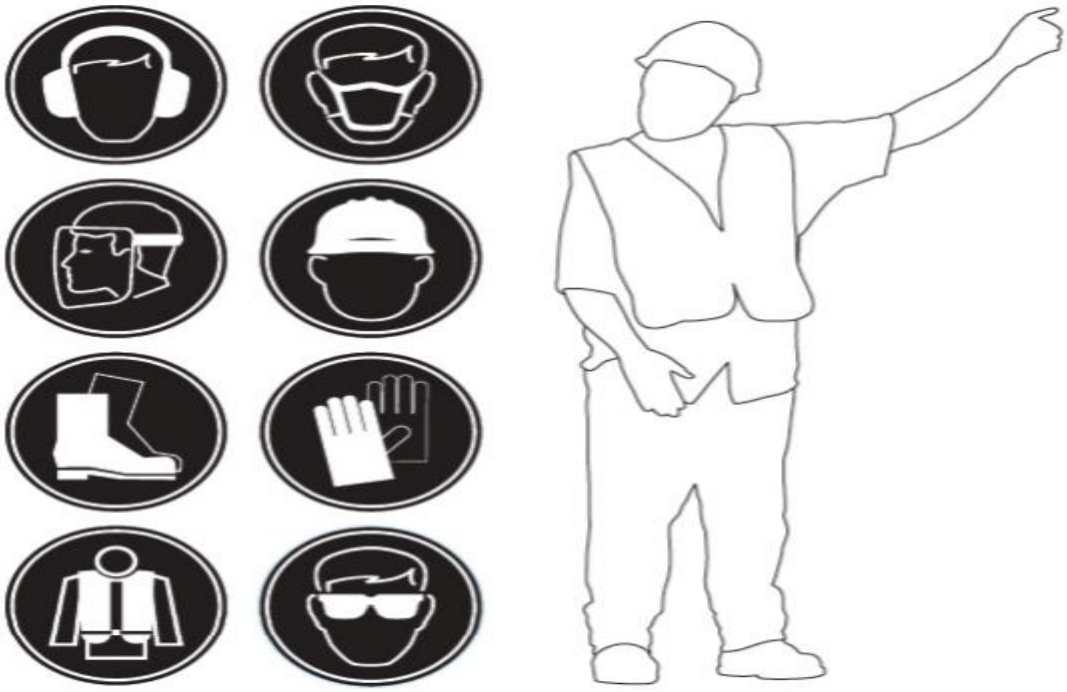


Figure 43.1 Typical PPE to be worn by an Operator/workers

• Appropriate PPE should always be worn whilst working in and around the machine and equipment in industries or at workplace set. Wear a hard hat, protective glasses, gloves and other protective equipment, as required by machinery or equipment set location.

, wear protective devices around an engine for ears in order to help prevent damage to hearing.

• Do not wear loose clothing or jewelry that can snag on controls or on other parts of the engine.

Ensure that all protective guards and all covers are secured in place on the engine.

• Never put maintenance fluids into glass containers. Glass containers can break.

• Use all cleaning solutions with care.

• Report all necessary repairs

Personal protective equipment

- Safety glasses must be worn at all times in work areas.
- Safety footwear must be worn at all times in work areas.
- Appropriate gloves must be worn
- Close fitting protective clothing must be worn (no loose clothing).
- Hearing protection is required.
- Long and loose hair must be contained.

2. Maintaining PPE

An effective system of maintenance of PPE is essential to make sure the equipment continues to provide the degree of protection for which it is designed. Therefore, the manufacturer's maintenance schedule (including recommended replacement periods and shelf lives) must always be followed. Inspect PPE before each use. With most PPE, it only takes a few minutes to inspect the equipment for any breaks, tears and visible signs of stress or damage. Maintenance may include: cleaning, examination, replacement, repair and testing. You may be able carry out simple maintenance (e.g. cleaning), but more intricate repairs must only be carried out by competent personnel. Immediately remove any damaged equipment from service until a competent person or a manufacturer's representative can certify the equipment for use. If not authorized by a manufacturer to repair PPE, do not attempt to fix it.

Self-Check -1	Multiple choice and written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: each contains 2 pts

I. Choose the correct answer

1. One is not used for PPE

   A/ Shoes B/Hamlet C/ goggle D/ Slipper

2. Should workers wear PPE to help prevent hand injuries?

   A/ eye google B/ hand glove C/ shoe D/ all

3. Maintenance conducted in PPE may include

A/ cleaning B/inspecting C/preventive maintenance D/ A and B

4. The importance of PPE in work place are

A/ safeguarding us form hazard B/ prevent accident hazard C/ nothing help us D/ A and B

Part II written test

5. Can PPE protect workers from head injuries?
6. What can PPE do to protect workers from hearing loss?

Answer Sheet-3

Name: _____ Date: _____

Short Answer Questions

Score = _____

Rating: _____

1._____**2.**_____ **3**_____

4. _____

5. ----------

6.----------

Note: **Satisfactory rating – 6points** **Unsatisfactory - below 6points**

Information Sheet-2	Servicing of machinery and equipment according to operator's manual/manufacturers

Introduction

people are responsible for the day-to-day upkeep of their machinery and are ultimately responsible for the safe working of the equipment. Workers should be familiar with operator manuals and know how to use them effectively and efficiently. Understanding how format is used for different purposes is a valuable skill that will help them to use the manuals successfully.

Manufacturer manuals provide essential guidance on recommended frequency for inspections and maintenance for generators. Ensure at least one set of operation and maintenance manuals are supplied by the manufacturer of the machinery and equipment at the time of acquisition.

Maintenance manuals This is a very important document and should be readily available. The information it contains will tell you Which parts of the equipment to clean daily/weekly/monthly. The frequency of inspections and which parts of the machine to inspect What to look for in these inspections. What type of lubricants to use? Where and with what frequency Spare part numbers (this will help when re-ordering) Recommended spare parts that should be kept on-site Recommendations on how often certain pieces may need to be replaced (motors, valves, switches, thermostats).

1.1. Operator manual includes the following

1. The name and model number(s) the manual covers.
2. A set of numbered instructions that must be followed in a particular order.
3. A checklist where everything should be done but the order is not important.
4. A diagram that shows you all the different components in one part of the machine.
5. A page number (use the contents page) for:
   - Safety information
   - Machine specifications
   - Service or maintenance information.
6. A page to help you identify faults or problems.
7. Information that is in a table. What is the table about?
8. Warning signs for the following messages. Write down the page number for each one.
   - Stay clear of rotating parts'
   - Keep people away from machine while operating
   - Stand clear of discharge area
   - Do not touch parts that are hot from operation.
9. A diagram that helps you with a maintenance or repair job.
10. The section for pre-start checks.

1.2. Servicing machine or equipment

When operator or technicians provide service for machine or equipment they should remained the following

1. what is the last thing to re-connect?
2. You are trying to sort out a problem. Which page will you go to?
3. You need to replace a spare part. Which page do you need?
4. What maintenance checks are needed every allocated hour?
5. You need to replace the spare part. What is the part number?
6. In the diagram, how many screws are needed to fix the area on?

Self-Check -2	written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: each contains 2 pts

1. Write the main propose of operator /manufacturer manual for machinery and equipment
2. What it includes the operator manual write at least three of them
3. Write the steps to service battery

Answer Sheet-2

Name: _____ Date: _____

Short Answer Questions

Score = _____

Rating:

1----------

2----------

3.----------

Note: **Satisfactory rating – 3points** **Unsatisfactory - below 3 points**

Information Sheet-3	Removal/replacement procedures /instruction of consumable components

Removal/ replacement procedure is the guide line for maintenance service of machine and equipment for replacing. different consumable components.

1. For example set of instructions about servicing **the aircleaner of** generatorwhere whole components need replacing

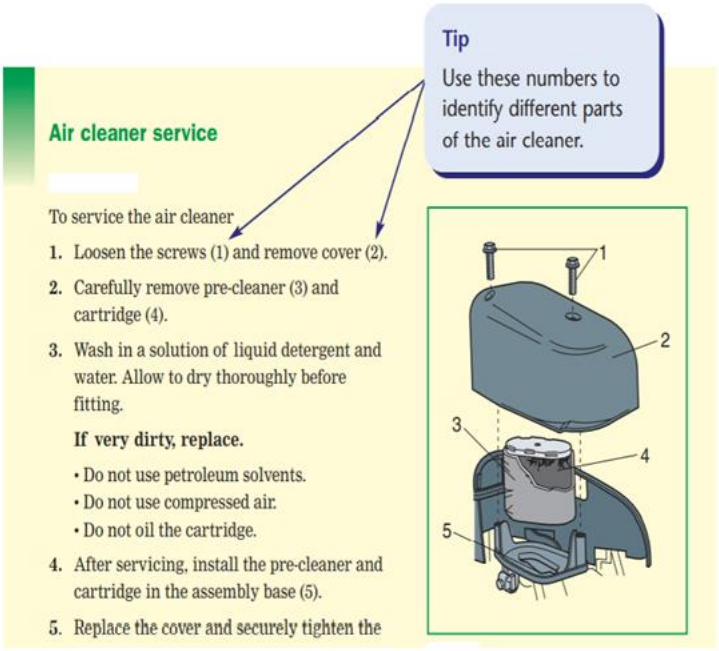


Figure 3.1. components of air cleaner

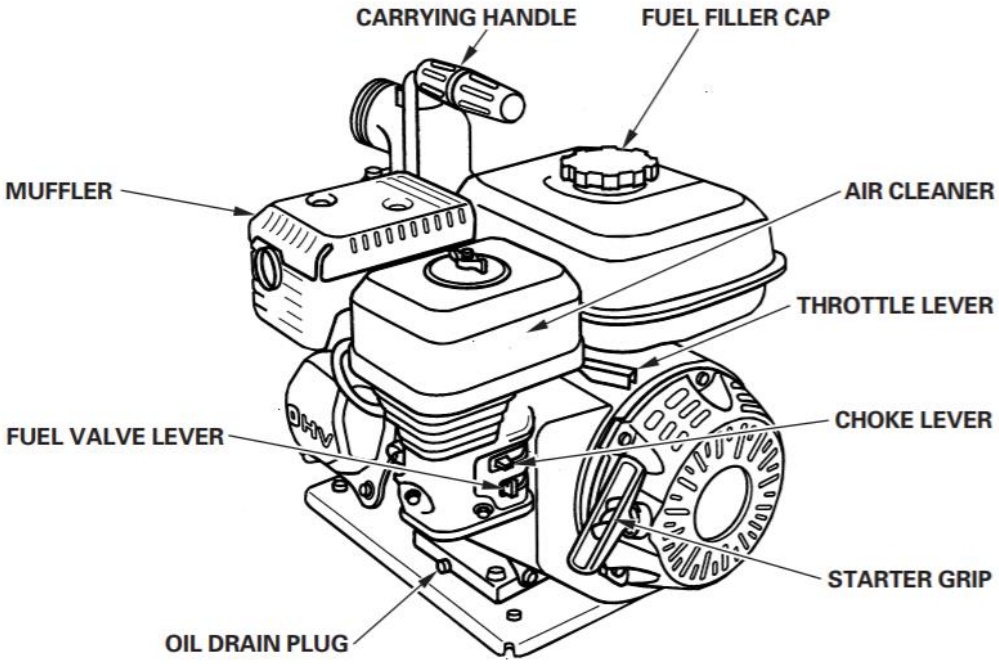
General procedure for removal / replacement of components of machine and equipment

1. Carrying out the instructions in thecorrect order. How could it go wrong? What arethe implications for getting it wrong? What canhelp get it right?
2. Discuss different appearanceof these instructions. What features are similar?Which are different?
3. Read through the set of instructions and highlight any words that are

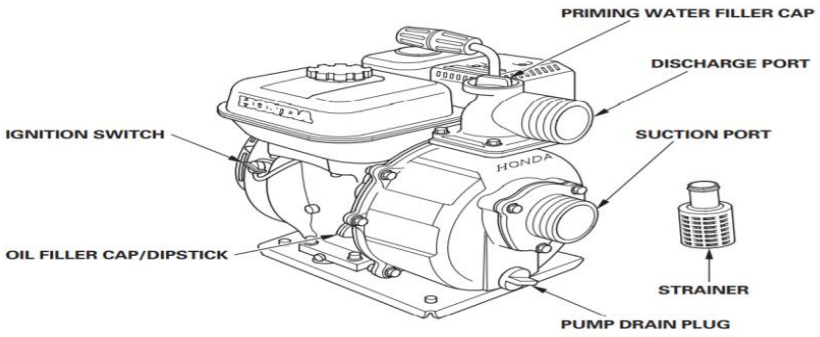
unfamiliar or that they are not sure about.

4. Interpret the language first.
5. Put the instructions into context.

Example-



(a)



(b)

Figure. 3.2. a and b show the pare parts of dewatering pump.

2. Removal of engine oil

Check the engine oil level with the engine stopped and, in a level, position.

1. Remove the oil filler cap/dipstick and wipe it clean.
2. Insert and remove the dipstick without screwing it into the filler neck.
3. Check the oil level shown on the dipstick.
4. If the oil level is low, fill to the edge of the oil filler hole with the recommended oil
5. Screw in the oil filler cap/dipstick securely

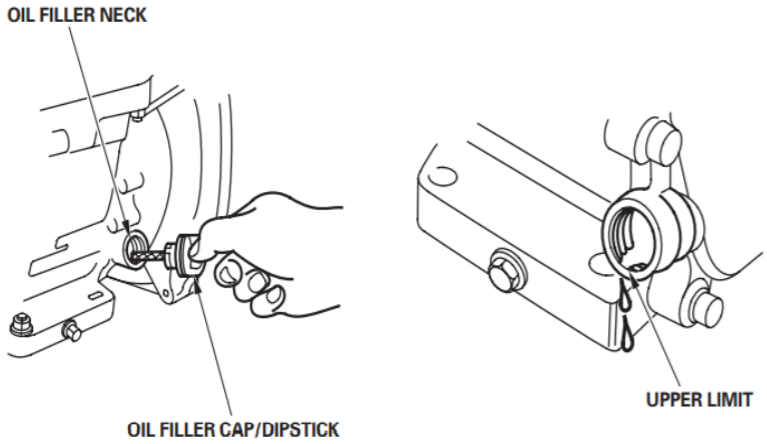


Figure 3.3. Engine oil drain area

3. ENGINE OIL CHANGE

Drain the used oil while the engine is warm. Warm oil drains quickly and completely.

1. Place a suitable container below the engine to catch the used oil, then remove the oil filler cap/dipstick and the drain plug.
2. Allow the used oil to drain completely, then reinstall the drain plug, and tighten it securely.

   Please dispose of used motor oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash, pour it on the ground, or down a drain.
3. With the engine in a level position, fill to the edge of the oil filler hole with the recommended oil
4. Screw in the oil filler cap/dipstick securely.

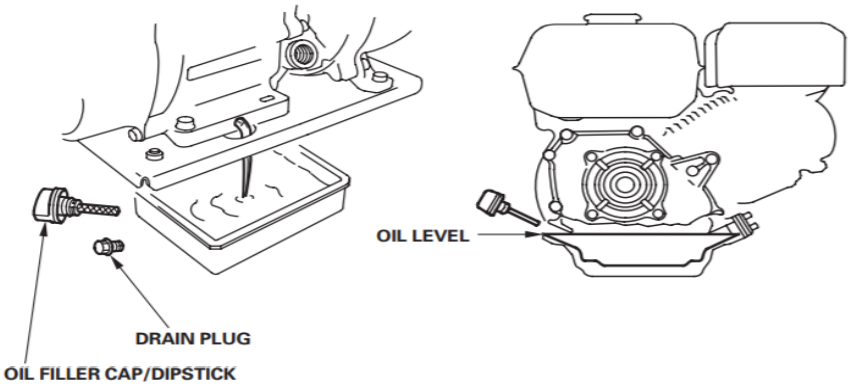


Figure 3.4 drain oil from tank

Fuel System Components. Check for fuel oil components such as fuel hose, fuel pipes, fuel filters, injector pumps, etc. If damages to these components are encountered, replace following the instructions provided by the manufacturer.

5. Lubricants

The primary purpose of a lubricant is to reduce friction and wear between two moving surfaces, but a lubricant also acts as a coolant, prevents corrosion, and seals out dirt and other contaminants. In order for a lubricant to perform as intended, careful attention must be given to its selection and application as well as its condition while in use.

lubrication Maintain systems to comply with applicable standards and specifications Lubrication of Powerplant Equipment, provides more information on lubricants and their use. The equipment manufacturer should provide specific information on the lubricant type and on the periodic recommended maintenance for a particular application.

Oil Lubrication used to lubricate oil between moving surface. For successful lubrication, it is critical that the proper oil be chosen, properly applied, and kept clean and uncontaminated. For example, emulsifiers are added to motor oil to allow the oil to hold water in an emulsion until the engine's heat can boil it away. In bearing lubrication, where there is not sufficient heat to evaporate the water, the oil must be capable of readily separating from water.

Grease Lubrication: Grease is a lubricant consisting of a lubricating oil combined with a thickening agent.

Self-Check -3	Multiple choice and true /false

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: each contains 2 pts

Part I multiple choice : Choose the correct from the given alternative choices

1. The primary purpose of lubricant is

   A/ to increase friction B/ to reduce friction C/ used as cooling agent D/A&C

2. One of the following is not consumable components

   A/ spar parts of machine B/ lubricants C/ oil D/none

3. What it requires to remove for the servicing of engine generator

   A/ operator manual B/ tools and materials C/ service manual D/ all

   Part II True /False

4. Grease is a lubricant consisting of a lubricating oil combined with a thickening agent

5. Fuel hose,& fuel pipes are the component of cooling system

Answer Sheet-3

Name: _____ Date: _____

Short Answer Questions

1___,2_____,3____ 4_____,5_____

Score = _____

Rating: _____

Note: **Satisfactory rating – 5points Unsatisfactory - below 5 points**

Information Sheet-4	Replacing fluids and lubricants up to prescribed schedule

Care must be taken to ensure that fluids are contained during inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Checklist for Diesel Engines replacing fluids and lubricants

Item	Action
Fuel oil system.	Clean fuel oil strainers as required by operating conditions.
	Check the system components for clean condition
	Refer to manufacturer's recommendations to replace
Lubricating oil filters.	Check lubricating oil filters.
	Clean and replace filter elements as necessary
Fuel Oil Tanks and Lines.	Drain service tanks and lines.
	Remove water and sediment.
	Check heating coil for proper operation.
Lubricating Oil Cooler	Clean and inspect lubricating oil cooler for leaks and good condition.
	Clean outer surfaces more often under dusty operating conditions for more efficient cooling.
	Refer to manufacturer's instructions and replace the lubricants
Lubricating Oil Pump.	inspect the pump after 2,000 hours of use for proper operation
	Refer to manufacturer's specifications for the pump replace the lubricants

When you replace the fluids /lubricants Dispose of all fluids according to local regulations and mandates.

Disposal of Waste Improper disposal of waste can threaten the environment. Potentially harmful fluids should be disposed of according to local regulations. Always use leakproof containers when you drain fluids. Do not pour waste onto the ground, down a drain, or into any source of water

Self-Check -4	Multiple choice and true /false

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: each contains 2 pts

1. Why we replace fluids and lubricants in machinery and equipment?
2. What causes if you dispose fluids/lubricants to environments?
3. What is the difference between fluids and lubricants?

Answer Sheet-4

Name: _____ Date: _____

Short Answer Questions

Score = _____

Rating: _____

1._____

_____

2._____

_____

3.

_____

_____

Note: **Satisfactory rating – 3points** **Unsatisfactory - below 3 points**

Information Sheet-5	Conducting work according to OHS requirements

Introduction

Electromechanical equipment and machinery, including generator sets, transfer switches, switchgear, and accessories, can cause bodily harm and pose life-threatening danger when improperly installed, operated, or maintained. To prevent accidents be aware of potential dangers and act safely.

One of your most important responsibilities is to protect your Health and Safety as well as that of your co-workers. This booklet will discuss some of your duties under the occupational Health and Safety legislation and help you to make your workplace safer and healthier.

1. OHS includes the following

It requires law

Workplaces under the jurisdiction are governed by your provincial legislation.

The legislation places duties on owners, employers, workers, suppliers, the self-employed and contractors, to establish and maintain safe and healthy working conditions. The legislation is administered by your country/regional legislation.

Employers' responsibilities

Because occupational hazards arise at the workplace, it is the responsibility of employers to ensure that the working environment is safe and healthy. This means that they must prevent, and protect workers from, occupational risks. But employers' responsibility goes further, entailing knowledge of occupational hazards and a commitment to ensure that management processes promote safety and health at work. For example, an awareness of safety and health implications should guide decisions on the choice of technology and on how work is organized.

Your Responsibilities

You must also comply with the legislation. You have responsibilities to:

- protect your own Health and Safety and that of your co-workers;
- not initiate or participate in the harassment of another worker; and
- co-operate with your supervisor and anyone else with duties under the legislation.

Your Rights

The legislation gives your three rights:

- The right to know the hazards at work and how to control them;
- The right to participate in Occupational Health and Safety
- The right to refuse work which you believe to be unusually dangerous.

Your Right To Know

The Act requires your employer to provide you with all the information youneed to control the hazards you face at work. For example, chemicals at theworkplace must be listed. You are entitled to review this list. Your employermust train you to safely handle the chemicals you will work with. If you areinexperienced, you must receive an orientation which includes;

- What to do in a fire or other emergency;
- First aid facilities;
- Prohibited or restricted areas;
- Workplace hazards; and
- Any other information you should know.

You must also be supervised closely by a competent supervisor.

Self-Check -5	Multiple choice and true /false

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: each contains 2 pts

1. What is OHS?
2. Write your rights in work place area regarding to OHS legislation?
3. List down employers' responsibilities of OHS
4. What are your responsibilities in OHS at work place?

Answer Sheet-4

Name: _____ Date: _____

Short Answer Questions

Score = _____

Rating: _____

1._____

_____

2._____

_____

3.

_____

_____

4.-

_____

_____

Note: **Satisfactory rating – 4points** **Unsatisfactory - below 4 points**

Instruction Sheet-3	Learning Guide56:Complete maintenance work

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

- Cleaning, returning and storing tools to operating orders
- Following environmental procedures and collecting, treating and disposing waste
- Cleaning and maintaining work area
- Reporting malfunctions, faults, wear or damage to tools

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 –

- Clean, return and store tools
- Follow environmental procedures and collect, treat and dispose waste
- Clean and maintain work area
- Report malfunctions, faults, wear or damage to tools

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below
3. Read the information written in the “Information Sheets 1- 4”. Try to understand what are being discussed.
4. Accomplish the “Self-checks 1,2,3,4 ,” in each information sheets on pages 48,52 55 and 57,
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-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets 1, 2 and 3 on pages 28,29 and 30.and do the LAP Test on page 31”. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity.

After You accomplish Operation sheets and LAP Tests, ensure you have a formative assessment and get a satisfactory result; then proceed to the next LG.

Information Sheet-1	Cleaning, returning and storing tools to operating orders

Introduction

Electromechanical equipment should be kept clean for maximum efficiency and service longevity. Keeping electrical equipment clean is an important part of any **electrical preventive maintenance program**, but using the wrong cleaning methods *could be costly.* Workplace floors shall be kept as clean and dry as possible to prevent accidental slips with or around dangerous hand tools.

Tools are designed to make a job easier and enable you to work more efficiently. If they are not properly used and cared for, their advantages are lost to you.

A hand tool is a device for doing a particular job that does not use a motor, but is powered solely by the person using it.

Tools are expensive; tools are vital equipment. When the need for their use arises, common sense plus a little preventive maintenance prolongs their usefulness.

1. Cleaning

Cleaning is the removal of all visible trash in an approved way with the use of mechanical and chemical action or both, so that all areas are cleaned and sanitized to a high standard. Cleaning is an investment in the assets of a tools and equipment

The following precautions for the care of tools should be observed:

- Clean tools after each use. Oily, dirty, and greasy tools are slippery and dangerous to use.
- Never hammer with a wrench.
- Never leave tools scattered about. When they are not in use, stow them neatly on racks or in toolboxes.
- Apply a light film of oil after cleaning to prevent rust on tools.
- Inventory tools after use to prevent loss

1.1. Why do we clean?

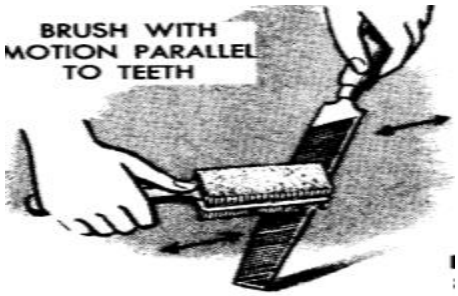
There are many reasons why we clean but the most important ones are -

- **Health Regulations:** Health is first in our daily activities and keep clean tools in our work place area.
- Prolonging the life of tools and equipment's
- Attractive handling If a tool is poorly cleaned and maintained, it will affect the number of users who choose to return
- Provide Safe and Clean Environment

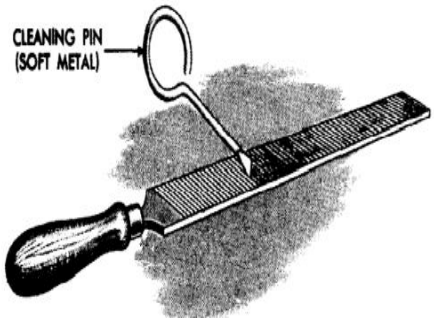
1.2. Identify tools to be cleaned and maintained

Example -Cleaning Files

1. The cutting action of a file produces small particles or chips called filings. These particles Frequently wedge between the teeth of file and impair the free cutting action. Frequent cleaning is necessary to obtain maximum efficiency of file.
2. Brush filings from between teeth of file with wire brush. Push brush in a direction parallel with teeth.



3. Remove remaining particles from teeth by using a narrow strip of soft metal such as brass or copper. A soft metal will not damage teeth.



Storage:-Be sure files and rasps are clean and dry. Do not use lubricants or rust preventive compounds. Wrap them individually in waterproof barrier wrapping paper.

Place in racks or box in a manner which will make it impossible for faces or edges of files to contact each other.

Cleaning Wrench

1. Remove screw which acts as worm axle from wrench. Lift worm and worm spring from wrench.
2. Stretch worm spring. Insert spring into cupped end of worm and reassemble wrench. Tighten worm axle screw securely.
3. Prick punch wrench adjacent to screw to lock screw in position

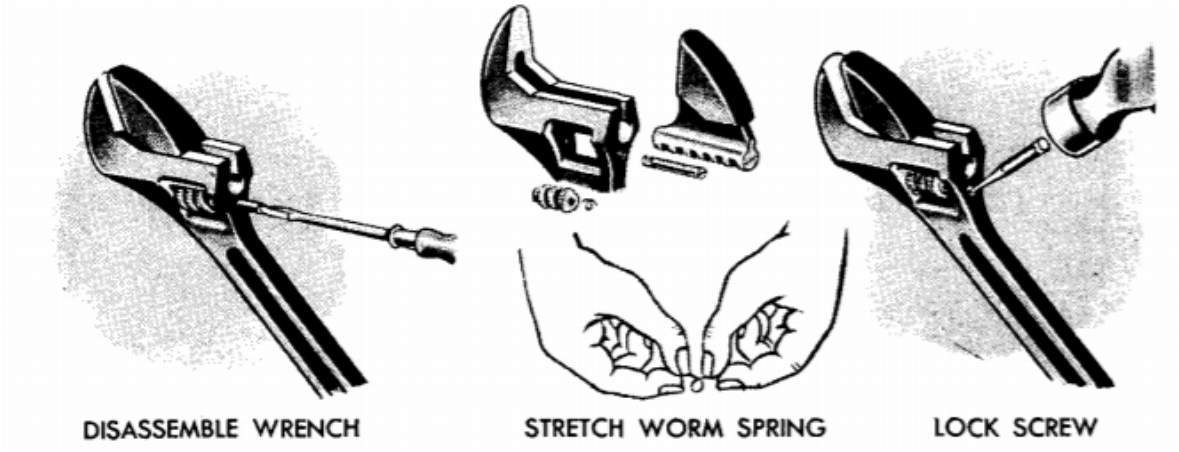


Figure 44.1 cleaning adjustable wrench

Storage

Coat wrenches with rust preventive compound (thin film) and store in a dry place. Upon removal from storage, wash with dry cleaning solvent to remove rust preventive compound.

Cleaning plier

Wash pliers in dry cleaning solvent and wipe dry with a clean cloth. Clean dirt from serrated jaw faces with a wire brush. When completely dry, lubricate pivot pin with one or two drops of preservative lubricating oil (special) or engine oil

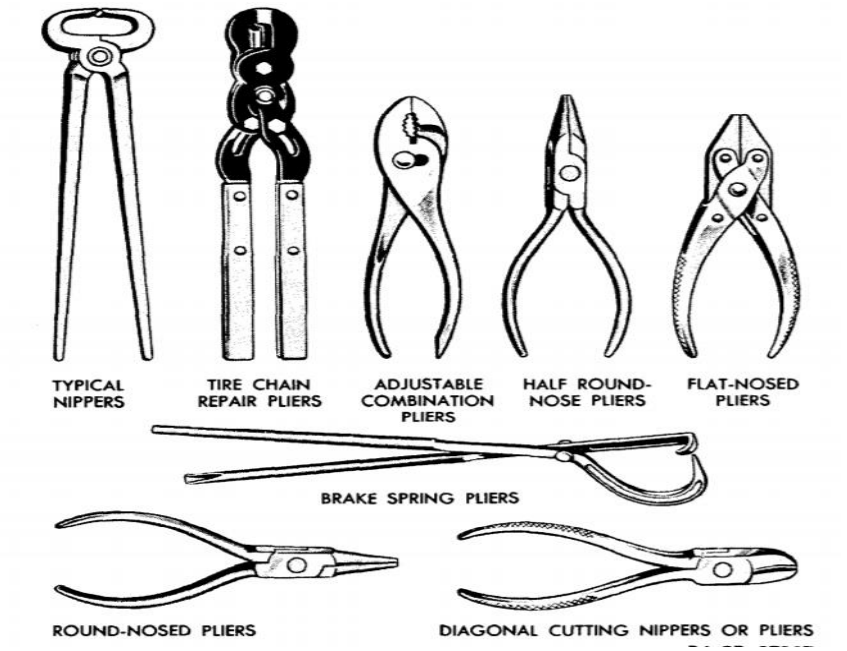


Figure 44.2 Different type of pliers

Storage Avoid from moisture and put in dry place for long life span and for easily moves the jaws to twist or cut properly

Self-Check -3	Multiple choice and true /false

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: each contains 2 pts

Part I. multiple choice

1. The processes of avoiding trash from tools is known as ?
   A/ maintaining B/ cleaning C/ disposing D/ all
2. Why you clean tools and equipment
   A/ to reduce its precision B/to increases its precision C/ A &B D/ none
3. The importance of storage tools standardizes form in work place is
   A/ any users can pick easily B/ easily for managing tools C/ easy for inventory D/ all

Part II say true/False

4. Cleaning can't bring significant impact on tools and equipment
5. Storing tools in the right place createssafe environment for workers

Answer Sheet-1

Name: _____ Date: _____

Short Answer Questions

Score = _____

Rating: _____

1_____, 2_____, 3._____,

4._____

5._____

Note: **Satisfactory rating – 5points Unsatisfactory - below 5points**

Information Sheet-2	Following environmental procedures and collecting, treating and disposing waste

1. Collecting waste

Collecting means gathering it from where it is produced (such as a workshop, business or market) and transporting it, either to an intermediate collection site or to a final place of recycling or disposal. Collecting waste keeps neighborhoods clean and reduces health risks, particularly for workers and visitors

Waste materials: All – but think about how different waste types will require different types of collection. For instance, dry waste and recycled waste , may need to be transported in a larger container

Important points in collecting wastes

- Collect the waste in suitable containers and often enough so it does not become apain or a danger to people.
- Use containers with lids and handles, and make sure they do not leak.
- Take care: sharp objects can puncture waste sacks. Lift heavy objects carefully.
- Waste collectors must wear protective clothing – gloves, covered feet, arms and legs, and highly visible colors to avoid traffic injuries

2. Waste cleaning equipment

After collecting waste from work place site site, it is good practice to clean the area of any residue. The type of equipment depends on the area to be cleaned, the nature of the waste, and personal preference

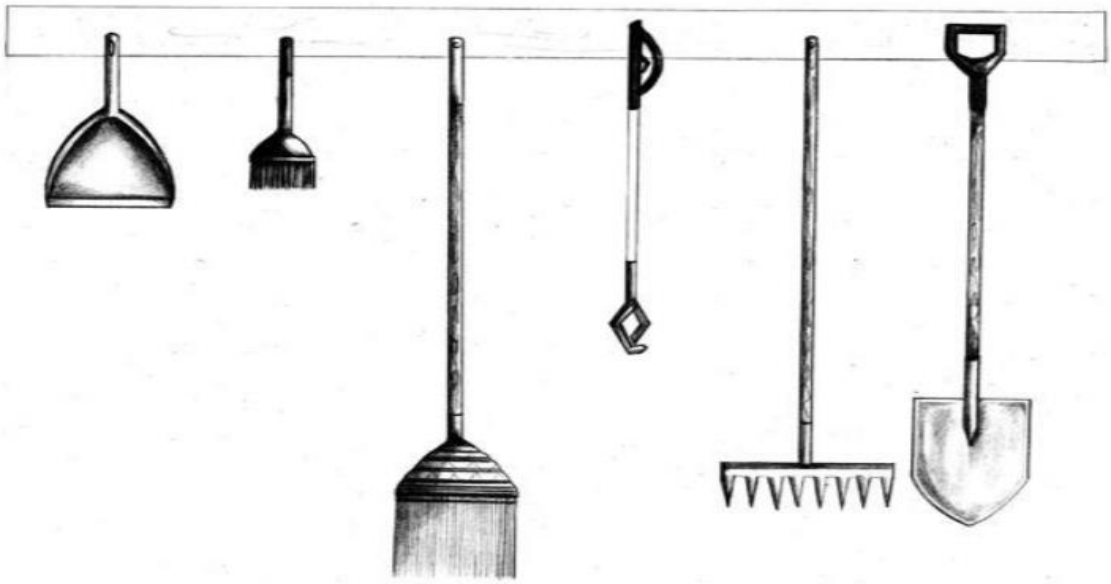


Figure 44.3. Useful waste cleaning equipment

3. Disposal of waste

Disposal of waste should be done regularly throughout the day in order to remove the possibility of creating hazard, bad smells and to eliminate the possibility of attracting pests and flies.

Types of waste

- Dry waste
- Waste that can be recycled

Dry waste The amount of dry waste produced in the work place has been dramatically reduced due to the increase and availability of recycling. Example of dry wastesarecoil , wire cable piece sheet iron and others which is disposed in to garbage bags..

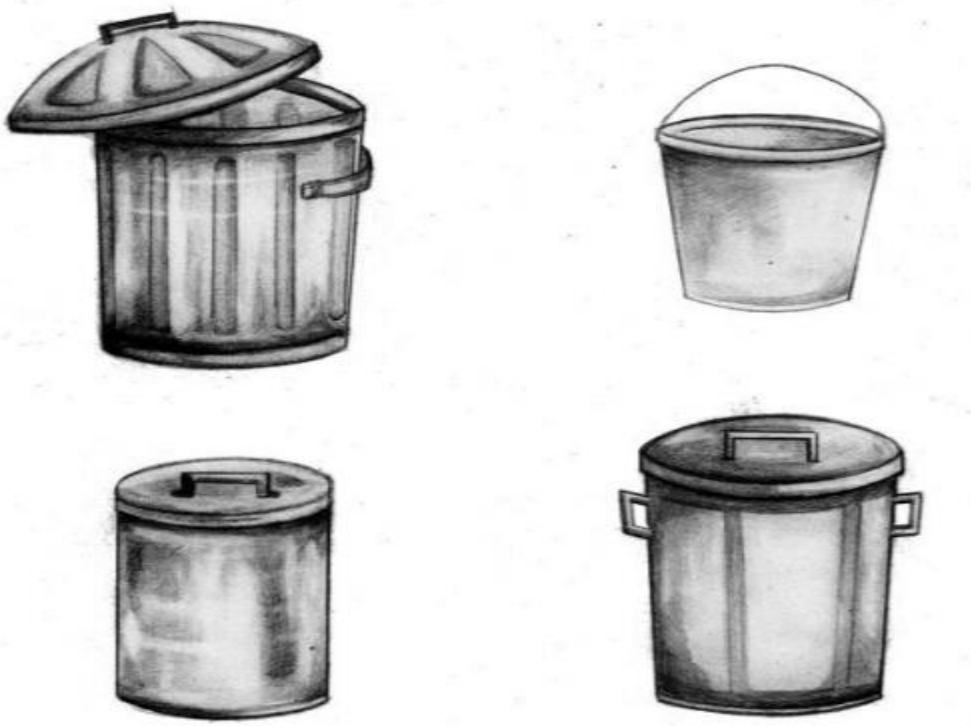


Figure 44.4 Different types of waste container

Waste that can be recycled

Currently much of today's waste may be recycled by companies and local government bodies. Due to the increased information and awareness of environmental issues, most businesses recycle some of their waste. All these are done at company level or governmental level .

Self-Check -2	Multiple choice and written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: each contains 2 pts

Part I. multiple choice

1. Which one of the following is important point in collecting waste
   A/ wear PPE B/ prepare suitable container C/ separate waste type D/ all
2. One of the following equipment is not used for cleaning waste
   A/ shovel B/sweeps C/ hand rack D/ none
3. The unhanding of disposal waste causes
   A/ Environmental hazards B/ creates un safe environment C/ increase products D/ A &B
4. Write important points in collecting wastes

Answer Sheet-2

Name: _____ Date: _____

Short Answer Questions

Score = _____

Rating: _____

1_____, 2_____, 3._____,

4._____, .____,_____,

_____

Note: **Satisfactory rating – 4 points Unsatisfactory - below 4points**

Information Sheet-3	Cleaning and maintaining work area according to OHS

Introduction

What is cleaning and maintaining

Cleaning is the removal of all visible trash from working areas in an approved way with the use of mechanical and chemical action or both, so that all areas are cleaned and sanitized to a high standard. Cleaning work area creates safe atmosphere and environment for workers and users

Cleaning work area involvessweeping floors, dusting furniture, machinery equipment and other surfaces, mopping or washing floors, polishing surfaces, articles and accessories, tools and device, rearranging cleaned areas and putting things in their specific place.

We can say that cleaning is a process of removing dust, dirt or any other undesirable materials like colors, spots, contents of an ashtray, etc.

What happens if cleaning is not done on a regular basis in your working areas ? Yes, work place or your living room will become the breeding ground of insects such as **cockroaches, spiders, ants, flies and mosquitoes.** It will look dirty and will be most uncomfortable. Living in such circumstances can also lead to diseases such as asthma, bronchitis, etc. Thus, cleaning is necessary for a general presentable appearance and also to ensure good hygienic conditions.

What do you understand by dust and dirt in? ‘

Dust:- collectively refers to the loose particles, which are very easily moved by air and settle on any surface. It is easily removed with the help of a dry cloth. ‘

Dirt:- refers to dust which sticks to any surface with the help of moisture or grease. It is more difficult to remove dirt as compared to dust. Dirt has to be removed either with a detergent or any other cleaning agent.

1.1. Method of cleaning work area

When cleaning work areas follow the OHS legislative procedures of wearing all the necessary materials to prevent yourself form causing hazards in respiratory system

a. Sweeping: -When a sweeper or a brush is used to carry the dust laterally along the room, the process is known as sweeping. While sweeping any vertical surface as walls, you should remember to start from the top and sweep downwards. Similarly, for lateral sweeping as for floors, start from one end of the room and move to another, preferably a door, and carry the dust all along or collect in a dust pan. All the movable articles kept on the floor should be lifted, swept under, and kept back in place.
b. Polishing: -When some reagent is rubbed on a surface to bring out the shine, the process is known as polishing and the reagent applied is known as the 'polish'. Similarly, many other articles/ decorative items made of brass, wood, marble etc, may be polished

Figure 44.5 Different types of cleaning equipment

Maintaining is the upkeep of all machineries, furniture, fittings and equipment to an exacting standard within the property so that all areas look consistently new and beautiful

Self-Check -3	Multiple choice and true/False

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: each contains 2 pts

Part I. multiple choice

1. The process of removing dust, dirt or any other undesirable materials in work area is known as

   A/ cleaning B/ maintaining C/washing D/ all

2. One of the following is not method of cleaning work area

   A/ Dusting B/ sweeping C/ polishing D/ all E/ none

3. A loose particle, which are very easily moved by air and settle on any surface is

   A/ Dust B/ Dart C/ A &B D/ none

4. upkeep of all machineries, furniture, fittings and equipment to an exacting standard in work area is called

   A/ maintaining B/ Removing C/ cleaning D/B&C

   Part II True/False

5. particles, which are very easily moved by air and settle on any surface is called dust

6. Removal of all visible trash from working areas is known as maintenance

Answer Sheet-3

Name: _____ Date: _____

Short Answer Questions

Score = _____

Rating: _____

1_____, 2_____, 3._____,4_____

5,_____

6._____

Note: **Satisfactory rating – 6 points Unsatisfactory - below 6points**

Information Sheet-4	Reporting malfunctions, faults, wear or damage tools to supervisor

Introduction

On occasions there may be pieces of work equipment that cannot be repaired or are repeatedly in a state of disrepair through constant use.This may be because of age, spare parts no longer being available or through accidentalor deliberate damage this is called Malfunctions of equipment or tools

Fault is defined as any tools or equipment working inappropriate condition due to different reasons

The distractof tool or machine spare parts due to working long time or overload working is known as wear or damage of tools or equipment

1. Reporting of malfunctions, and faults,

Fault Reporting: - is the technique of reporting suspected tools, equipment and machine defects using fault reporting formats

The reporting format includes the following

1. Name of Care provider_____
2. Address/department _____
3. Name of tools and serial number _____
4. Location of problem_____
5. Nature of problem_____
6. The date and time of reporting_____
7. The name of person reporting fault and their contact number_____
8. The name of the maintenance person attending to the problem_____
9. The time the repair was carried out_____
10. Estimated Dollar /birr amount_____
11. Any special comments (guest complaint or arrival time)_____

Self-Check -4	Written test

Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page: each contains 2 pts

Part I. multiple choice

1. What is faults(2pts)
2. Write the difference between malfunction and faults? (3pts)
3. Write fault reporting formats(5pts)

Answer Sheet-4

Name: _____ Date: _____

Short Answer Questions

Score = _____

Rating: _____

1_____

_____

_____

2_____

_____

_____

_____,

3._____

_____

_____,

Note: **Satisfactory rating – 5points** **Unsatisfactory - below 5points**

Reference

- Mc GRAW-HILL hand books maintenance planning and scheduling handbook second edition(Richard D.palmer)
- 40 CFR Parts 1 through 1000, Title 40 Code of Federal Regulations – Protection of the Environment
- ANSI / IEEE 450-2010, Recommended Practice for Maintenance, Testing, and replacement of Vented Lead-Acid Batteries for Stationary Applications
- IEEE 67, IEEE Guide for Operation and Maintenance of Turbine Generators.
- IEEE 446, Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications. IEEE 492, IEEE Guide for Operation and Maintenance of Hydro-Generators.