BASIC INFRASTRUCTURE OPERATIONS
NTQF LEVEL I

Learning Guide-20

Unit of Competence: Use Hand and Power Tools
Module Title: Using Hand and Power Tools
LG Code: CON BIO1 M06 LO1-LG20
TTLM Code: CON BIO1 M06 TTLM 0919 V1

LO1.Plan and prepare

Instruction Sheet	Learning Guide #20

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

- Understand work instructions and relevant document
- Applying work instructions
- Safety and OHS application
- Application of environmental protection

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**:

- Access, interpret and apply compliance documentation relevant to the use of hand and power tools
- Obtain, confirm and apply work instructions for the allotted task
- Obtain, confirm and apply safety requirements from the site safety plan and organizational policies and procedures relevant to the allotted task
- Identify, confirm and apply environmental protection requirements for the allotted task from the project environmental management plan

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below 3 to 6.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14** respectively.
5. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -15.**
6. Do the “LAP test” **in page – 16** (if you are ready).

Information Sheet-1	Understanding relevant compliance documentation

Introduction

Tools

- Tools can be divided into two main groups: hand tools and power tools. Hand tools are operated by the physical strength of the user. Power tools require an external source of power such as electricity or compressed air to operate. Each of these groups can also be divided into sub groups. Do not use tools that you do not know how to operate.

Types of Relevant compliance documentation

1.1 legislative, organization and site requirements and procedures

Legislation refers to the preparation and enactment of laws by a legislative body through its lawmaking process. The legislative process includes evaluating, amending, and voting on proposed laws and is concerned with the words used in the bill to communicate the values, judgments, and purposes of the proposal.

1.2 Manufacturer's guidelines and specifications

A manufacturing specification contains all the information that is needed to make the product. It describes the stages of manufacture and the materials needed, using flowcharts, diagrams, notes and samples. A manufacturing specification is done once the final product has been developed.

1.3 Ethiopian standards and code of practice

This Code provides guidance on how to manage the risks associated with construction work in the workplace.

1.4 employment and workplace relations legislation

There is a range of employment legislation that affects workplaces across. Apart from industrial relations legislation governing employment terms and conditions, it is important for HR practitioners to have a sound understanding of other legislation relating to employees such as workplace health and safety and anti-discrimination laws.

1.5 **The document required in hand and power tools are:**

- amount of hand tools required

- amount of power tools required
- what kind of power required to operate power tools

Self-Check -1	Written Test

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

1. _____ provides guidance on how to manage the risks associated with construction work in the workplace.3 points)

1. Legislation
C. standards
2. code
D. Services

2. A manufacturing _____ contains all the information that is needed to make the product 5 points)

A. **Specification** C. Services
B. Regulation D. **standards**

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____

2. _____

.

Information Sheet- 2	Applying work instructions

2.1 Applying work instructions of hand tools and power tools

Follows **instruction hand and power tools:-**

- It indicates as how to accomplish something or job without accidents and corrects way to do it.

  - ✓ Never use power tools without allowance of your instructor
  - ✓ Always get permission to use the machine
  - ✓ Hammerheads should firmly secure to the handle.
  - ✓ Trowel, saws, chisels, and other tools should not be left lying on scaffolds, when not used.
  - ✓ All ropes and chains for lifting should be inspected before use they should not be loaded beyond the limit recommended by the manufacturer/engineer.
  - ✓ Nails or bolts used in construction scaffold should be of adequate size of sufficient number at each connection to develop the designed strength of structure.
  - ✓ Inspect wood before planning, cutting, etc and remove any nails, dirt, or other things that will injure the cutting blade.
  - ✓ Keep loose clothing, such as ties and sleeves, tucked in or rolled up.
  - ✓ Never allow your fingers to pass over the revolving blades.
  - ✓ Keep the safety guard in place and properly adjusted.
  - ✓ Never depend up on your muscles in lifting something heavy. Get someone to help you.
  - ✓ Test the sharpness of tools on wood, not on your hand.
  - ✓ Be careful when using your thumb as a guide during cutting the wood.
  - ✓ Make sure your hands are not in front of sharp edged tools that are in use.
  - ✓ Keep cutting tools sharp.
  - ✓ Store cutting tools in appropriate place
  - ✓ Dress properly for work. It may often be desirable to wear an apron or coveralls over your clothing.
  - ✓ Never use defective tools. Hammers with loose heads are particularly dangerous.

- ✓ Strongly tighten the tool and the formwork members with a nails or screw or bolts.
- ✓ Properly select the material for the appropriate work.
- ✓ Check the accuracy of the formwork that properly constructed

Self-Check -2	Written Test

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

1. Which one of the following is not correct instruction for hand tools?(3 points)

A. Always get permission to use the machine
B. Hammerheads should not firmly secure to the handle
C. Keep cutting tools sharp
D. Properly select the material for the appropriate work.
E. all

2. Check the accuracy of the formwork that properly construct is cannot be instruction(3points)

A. TRUE B. FALSE

3. List five (5)hand tools instruction.(5 points)

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
2. _____
3. _____
   3.1_____
   3.2_____
   3.3_____
   3.4_____
   3.5_____

.

Information Sheet- 3	applying Safety and OHS of hand and power tool

3.1 Hand and Power Tool Safety

The word safety refers to your freedom from danger, injury and damage, and to your personal security.

- **What Safety Means:-**

a. Safety means a complete understanding of your work and knowledge of every step that must be taken and the realization that mistakes could be costly to yourself and to the company.
b. Safety means good judgment. Never rely on luck; always be prepared to cope with unexpected situations and being alert when following your routine.
c. Safety means remembering the safety rules set up by your company and applying them every minute when you are on the job.

- Hand and Power tools are such a common part of our lives that workers can become complacent with the hazards they pose. Steps are needed to identify and prevent tool-related hazards before a severe incident occurs. Employees who use hand and power tools are exposed but not limited to the following hazards: falling, flying objects, abrasions, splashing objects, harmful dusts or fumes, mists, vapors and gases. Workers shall be provided with appropriate personal protective equipment (PPE) to eliminate exposures. Regular inspections of tools can reduce exposes.

3.2 Five basic safety rules to prevent hand and power tool hazards:

1. Keep all tools in good condition with regular maintenance.
2. Use the right tool for the job.
3. Examine each tool for damage before use and do not use damaged tools.
4. Operate tools according to the manufacturers' instructions.
5. Provide and properly use the right personal protective equipment (PPE).

3.3 applying Safety requirements

a. protective clothing and equipment

   Over all cloths **-** Protects the normal clothes from dust, grease and other spilling materials

b. use of tools and equipment
c. Employees who use hand and power tools are exposed to the following hazards:
   - falling,

- flying objects,
- abrasions,
- splashing objects,
- Harmful dusts or fumes, mists, vapors and gases.

d. workplace environment and safety
e. handling of materials
f. use of firefighting equipment and first aid equipment
g. hazard control and hazardous materials and substances
h. personal protective equipment
i. Workers shall be provided with appropriate personal protective equipment (PPE) to eliminate exposures by using.
   - head protection **-** Hard hat Protects worker from any falling objects dropping from high level during construction
   - Eye protection – safety glasses or goggles, worn at all times for eye protection.
   - Cut Protection – Cut resistant gloves made of Kevlar, Spectra, or stainless steel can help protect against the instance of a misdirected blade.
   - Foot Protection –Foot protection is offered by a reinforced toe in boot or shoe form.
j. emergency procedures related to equipment operation which include
   - emergency shutdown and stopping;
   - Extinguishing equipment fires;
   - Organizational first aid requirements and evacuation

3.4 OSHA Hand Tool Standards

OSHA sets standards for hand tools that generally apply to all industries, as well as specific standards for several industries, including shipyards, marine terminals and construction. OSHA's general standard makes all employers responsible for the condition of hand tools used by employees, even if the tool is supplied by the employee. As a matter of company policy, hand tools should be inspected before use by your employees for signs of defects or misuse. For example, tools with wooden handles, such as hammers and axes, should not be used if the handle is splintered or cracked. OSHA's hand-tool standards for shipyards require that impact tools, such as chisels, be inspected for mushroomed heads that can shatter on impact.

3.5 Powered Hand Tools

OSHA safety standards for powered hand tools are determined by the type of power source used by the tool, such as pneumatic, electrical or powder-actuated. For example, powder-actuated tools must be inspected for proper guarding to protect against flying particles and fragments. The tool should also be inspected to determine that all moving parts move freely and the barrel is not obstructed. For

pneumatic tools, the hoses used for conducting compressed air must be inspected to ensure that they are rated to handle the pressures needed to properly use the tool.

Self-Check -3	Written Test

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

1. _____ refers to your freedom from danger, injury and damage, and to your personal security.(1 points)

A. Accident
C. safety
B. OSH
D. PPE

2. Hard hat Protects worker from any falling objects dropping from high level during construction is known as.(1 points)

A. Eye Protection C. head protection
B. Cut Protection D. Foot Protection

3. Which hazards are exposed Employees who use hand and power tools.(1point)

A. Falling C. Abrasions
B. Flying objects D. Splashing objects E. ALL

4. List the Five basic safety rules to prevent hand and power tool hazards.(2point)

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

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

Information Sheet- 4	Appling environmental protection

4.1 concepts of Appling environmental protection

- **Environmental Health and Safety:** EHS is responsible for reviewing hazards associated with hand and portable power tools during annual shop inspections. The tools will be reviewed to make sure they are in good working order, suitable for the jobs they are used for, and do not pose a hazard to the operator. EHS is responsible for reviewing and updating the Hand & Portable Power Tools Guidelines. EHS and supervisors can also work jointly in the development of Job Safety Analysis for hand tools that present a unique hazard to the employee.

4.2 Method of applying environmental protection

- It should be applies by Using of:

  - ✓ organizational/project environmental management plan
    An Environmental Management Plan (EMP) can be defined as "an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced".
  - ✓ waste management
  - ✓ water quality protection
  - ✓ noise, vibration; dust and clean-up management

Self-Check -4	Written Test

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

1. list Method of applying environmental protection (3 points)
2. _____ is responsible for reviewing and updating the Hand & Portable Power Tools guidelines(2point)

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
2. _____

List of Reference Materials

1. Machine and Portable Tools: Portable Tool Requirements (SLAC-I-730-0A21S-027). Describes requirements for procuring, safeguarding, using, and maintaining portable tools

2. Hand & Power Toolshttps://www.dli.pa.gov/Businesses/Compensation/WC/safety/paths/resources/Documents/Safety%20PowerPoints/New/Hand%20and%20Power%20Tools.pptx

BASIC INFRASTRUCTURE OPERATIONS
NTQF LEVEL I

Learning Guide-2

Unit of Competence: **Use Hand and Power Tools**
Module Title: **Using Hand and Power Tools**
LG Code: **CON BIO1 M06 LO2-LG-21**
TTLM Code: **CON BIO1 M06 TTLM 0919 V1**

LO2. Select and use hand tools

Instruction Sheet	Learning Guide #21

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

- Types and uses of hand tools.
- Checking serviceability and safety of tools
- clamp or Fix materials in position
- Effective utilization of hand tools
- locating hand tools not in immediate use

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**:

- Select hand tools consistent with needs of the job
- Check tools for serviceability and safety, and report faults
- Clamp or fix materials in position
- Use hand tools safely and effectively according to their intended use
- Safely locate hand tools when not in immediate use

Learning Instructions:

a. Read the specific objectives of this Learning Guide.
b. Follow the instructions described below 3 to 6.
c. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
d. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14** respectively.
e. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -15.**
f. Do the “LAP test” **in page – 16** (if you are ready).

Information Sheet-1	Types and uses of hand tools

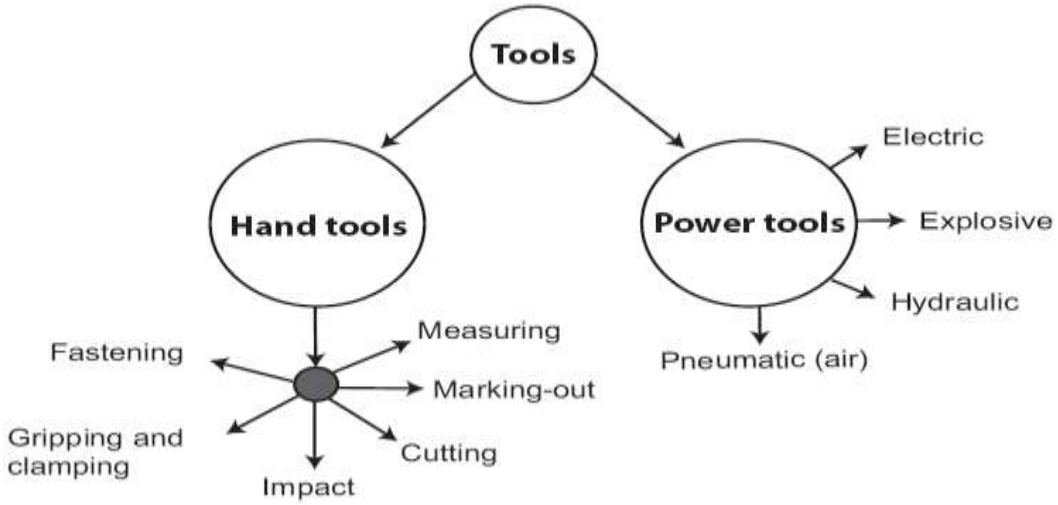
INTRODUCTION

Definitions

Hand tool means a tool that is nonpowered or operates only through physical exertion by hand and includes anything from axes to wrenches and paper-cutting boards in offices.

Hand tools are fairly simple tools which you use with your hands, and which are usually not powered.

2.1 Types of tools and equipments



Hand tools and equipment are to include but not be limited to cramps, vices, adjustable spanners, crow bars, pinch bars, bolt cutters, brooms, chisels, hacksaws, and handsaws, hammers, measuring tapes, axes, rakes, hand augers, picks, mattocks, pliers, shovels, spades, sledge hammers, spanners, wrenches, spirit levels and wire cutters.

Employee instruction/training programs shall provide detailed training in the proper use of hand tools for the specific area of operations in which they will be working in. Attention will be given to tool selection, tool use, and proper personal protective equipment that are required to be used when operating the specific tool as outlined in the following sections

2.2 Types and uses of hand tools

Types of hand tools depend on method of operation

1.2.1 Measuring tools

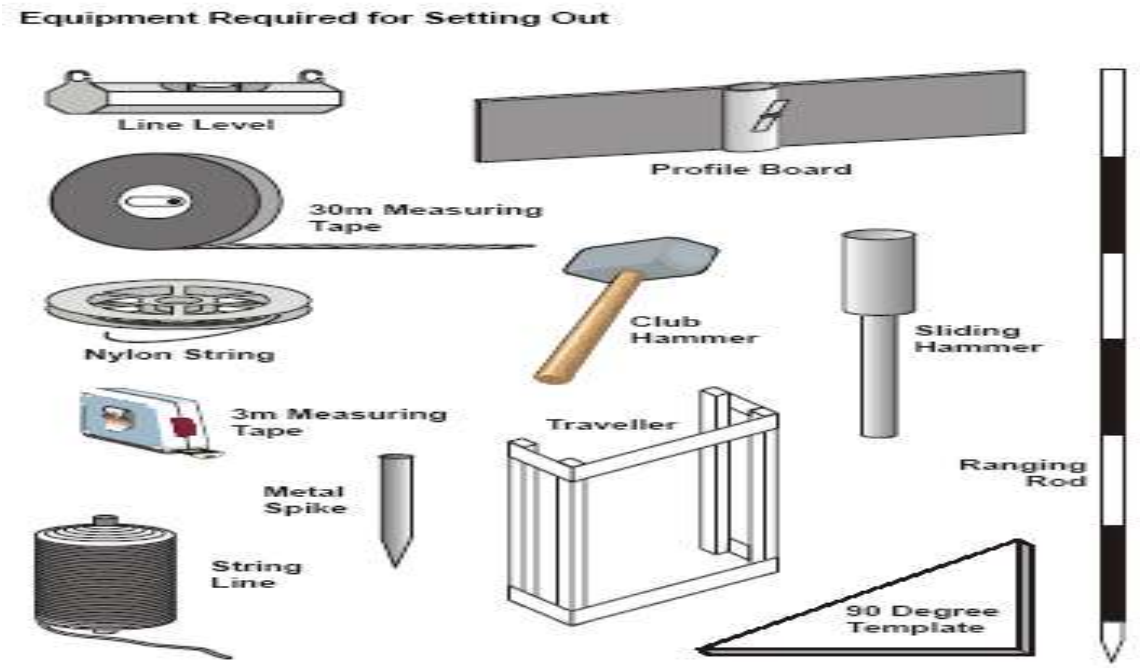
1.2.2 Leveling tools

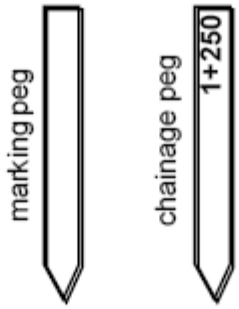
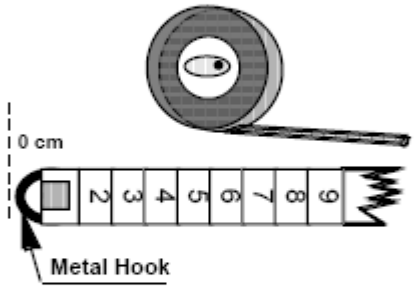
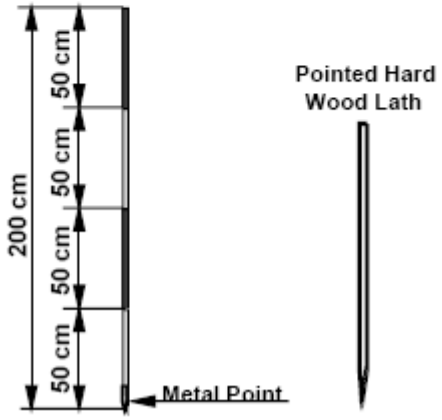
1.2.3 Cutting tools

1.2.4 Marking tools

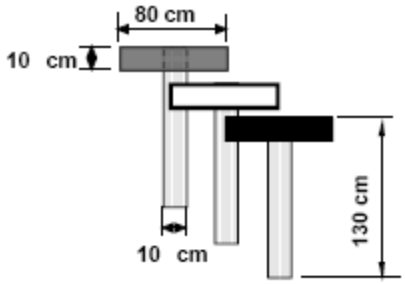
1.2.5 Mason tool

2.3 selecting tools for setting out



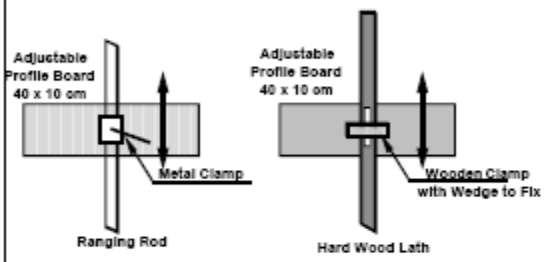
Pegs: Pegs are used for survey purposes and for setting out all the activities. On labour-based sites usually wooden sticks are used of approximately 50 cm length and strings. On one end they are pointed so that they can easily be hammered into the ground. Survey pegs, for example chainage pegs, are cut at the edge so that a clear marking can be made.	
Tape Measure: A great variety of tape measures exist. The most common length of tape measure used for setting out is 30 metres. The tapes are made of steel or linen. Although the former is stronger, the numbers/ marking on the tape become unreadable after a period of use. Note: The location of the 'zero point' may differ from tape measure to tape measure	
Ranging Rods: Ranging rods are round sticks usually 2 m long with a diameter of approximately 2.5 cm. They are made of various materials (metal, hard plastic, wood) and are usually provided with a pointed metal end. They are painted red and white with black marking at the 1 meter point. The lengths of the red/white sections are 50 cm. As a cheaper alternative a hard wood lath (must be straight), which is pointed at one, end can also be used as a ranging rod. At the same time it can be used as vertical part of the profile board (see below).	

Boning Rods (also called Travellers):
Boning rods are T-shaped and of a uniform height. They can easily be manufactured by nailing a wooden plank of 80 cm length and 10 cm height on another plank of 130 cm length and 10 cm width so that the end result looks like a ¨T¨. The horizontal plank should be painted in clearly visible colours. Boning rods have to be used in a set of three.



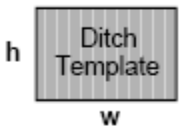
Profile Board:
A profile board is designed in such a way that it can be attached to a ranging rod. It has a screw mechanism that enables the profile board to slide up and down on the ranging rod and be fixed at any desired point simply by tightening the screw. A long lasting profile board is the one made from thin steel plate (40 cm x 10 cm) welded to a short length of metal tubing that can slide up and down and can be clamped to the metal rod.

Alternatively wooden profile boards can be attached to a hard wood rod and fixed with a wedge pushed into the wooden clamp.



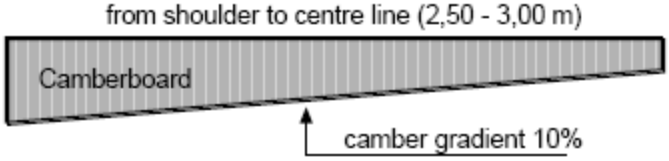
Templates: are used to control certain shapes of the road. For example, to control the correct shape for the slope and ditch, a template of the standard slope-ditch size can be used by the labourers to continuously check whether the correct shape is being dug. Templates are very useful control aids as any labourer can see the exact size and shape of the work she/he is required to carry out. They are usually made of wood and tailor-made for each particular project in accordance with the standard measurements (see specifications).

h = height of ditch
w = width of ditch
s = slope



h = height of ditch
w = width of ditch

Note:
Always use templates together with spirit level



Copyright Info/Author: Federal TVET agency

Spirit Level:
Spirit levels are available in all different sizes. For construction work robust and long spirit levels are ideal. The longer the spirit level the more exact the measurement will be. Always ensure that the spirit level is properly adjusted before you buy it.

Straight-Edge with Spirit Level:
If the spirit level is not long enough, then a straightedge of 2.50 m to 3.50 m, usually out of wood, can be used. Always ensure that your straightedges on site are actually straight on both sides.

Line Level:
A line level is a small spirit level of about 80 - 120 mm length. It has a hook on each end of the level which is used for hooking the level onto a smooth line. The level is used together with a line, ranging rods (or profile boards) and a tape measure. The line level requires two people to operate.

The line level can be used to:

- transfer levels
- check existing gradients
- set out gradients

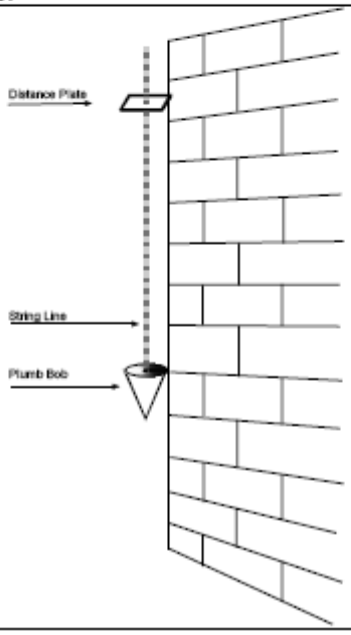
Always check:

- that the line is smooth or of nylon
- keep the line tight,
- level is in the middle between the two ranging rods,
- check the accuracy of the level regularly.

Check accuracy of line level:

- Place two ranging rods 20 m apart,
- Fix a line on the 1m-mark on one rod and transfer the level to the other rod = mark this level. The line should be kept tight and the bubble on the line level should be in the middle,
- Keep line in place, unhook the line level and turn it around
- Adjust the line again and make sure the bubble on the line level is in the middle. Mark the new level on the rod and measure the difference between the two levels.

Plumb Bob:
The plumb bob is usually used by masons to check the vertical alignment of walls. On road sites this is the case for structure work. The distance plate is slightly wider than the plumb bob itself and can be freely moved along the string line. In this way the plate can be held against the top of the wall while the plumb bob hangs on the lower end. If the plumb bob nearly touches the wall, then the top and bottom point of the wall are in a vertical line. The alignment of the wall can then be checked by sighting the string line with the wall line. If they are parallel to each other then the wall is straight (vertical).



- **Mason line**
  Mason line sometimes called, Fish line, is a rope used to transfer horizontal & vertical alignments or lines, i.e., use to mark base line on the floor or vertical point alignments of wall. In other wards, it is used to align the walling blocks, (stone, bricks, concrete blocks, hydra form etc). It is available in different thickness & sizes in the market.
- **Graphite Pencil**
  This is used for marking in wall construction. It is specially produced for this purpose in such a way that it will not wear out fast.
- **Hose level**
  It is a transparent PVC hose. It is used to transfer or mark vertical levels on surface of wall when it is filled with water, but without any air bubbles. The water level in each end of the hose is equal. It is an instrument to mark equal levels on site. It is very accurate but not eases to handle.
- **Straight edge**
  This is a perfectly straight metal/aluminum/ with all long and short edges parallel to its centerline. It is employed to check straight alignments of walls. Its length ranges from 2m up to 4m. Together with the sprit level, it can be used to bridge over the point to be checked. A straight edge/Level/ can also be made from a wooden plank with perfectly parallel edges.

- **Angle / Tray square**
  It is used to measure a right angle (90º) of a corner. Used in laying masonry units or blocks at corners of masonry wall.

- **Block laying trowel**
  This is a tool, which every mason needs. Used for picking up mortar out of the barrel, spreading mortar on the wall, bed joints and cutting off excess mortar. In addition to the picture shown, a Triangular and rectangular trowel are also used by the mason.
- **Walling Hammer/Mason hammer/**
  Walling Hammers are used especially to knock of parts of walling unit blocks, /brick, concrete blocks etc/. The hammer weighs about half a kilogram and is made of steel. It has a wooden handle, which should always fit, firmly to the hole in the head. The flat part of the hammer at one of its end is called cutting edge/use to cut bricks or concrete blocks/ and the square head of the hammer on the other end is called striking face which is used to strike laid stones. The hammer must be formed in a kind that the cutting edge and central line of the hammerhead lay in a circular arc.
- **Club hammer and bolster**s used to strike marrow – headed chisels and brick set or for driving stakes.
- **Chisel** Used to cut concrete blocks, bricks, plaster surface and to remove mortar projections etc. Cold chisels are available in different sizes and shapes. The operation is done together with a club hammer.
- **Mortar barrel/ drum**

This is used by mason, plasterer, tiller, etc, and serves to prepare small amount of mortar right at the working place. It is also used as temporary mortar storage, supplied from mixing station, and to control water ratio of the mix when it gets dry. Always, keep it workable and clean.

- **Mortar spade** :-Mortar spade is used to strip the mortar paste, prepared in the barrel or drum and keeps the mix to right and uniform consistency.
- **Bucket** :-Bucket is used to serve small amount of water or material and to take the tools after work.
- **Brush:-** Is used for wetting the building stones, cleaning fresh mortar joints of masonry wall, to clean hand tools before and after use and to clean dust on surfaces.

Carpenter Tools:

- **Marking tools (Sharp Pencil, Scratch awl and Marking knife)**

- **Sharp pencil:** It is used to indicate the point that you required to show the point or cut point. Start the mark with the point of the pencil in contact with the nark on the rule move the pencil directly away from the rule while making the mark.
- **Scratch awl:** Scratch awl is a handy tool for a carpenter. It can be used to mark wood with a scratch mark.
- **Scriber or marking knife:** It is used to draw lines parallel with the edge of the timber.

- **Cutting Tools (Handsaw, Coping saw, Bow Saw, Carpenter's Axe, brush, backsaw, rip saw, etc)**

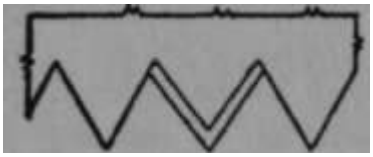
  - **Hand Saw**
  - **Cross cut and**
  - **Rip saws**

Carpenters use two types of saws, one to cut across the grain, the other to cut lengthwise of the grain of wood. They are called, respectively, crosscut and rip saws. Handsaw has a wooden handle. The better grade handsaws are taper ground that is the blade is thinner along the back than along the cutting or to other edge.

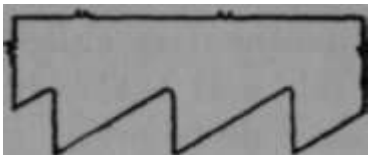
Types of cutting tools

- **Crosscut saw:** It means cutting wood across the grain. The teeth are sharpened like knife and bent right and left. This is called Set. It makes the saw alternately to the cut wider than the blade. The saw cut is called kerfs. Since the kerfs is wider than the blade. The blade will not bind (stick) as the sawing is ion. The teeth of the crosscut saw are filed to a point. These points are arranged to come alternately, first over one side of the blade and then over the other. This is done to cause the teeth to cut the fiber of the wood first at the limits of the kerfs, just as the spur of the auger bit first cuts a circle on

the wood before the lip removes any shavings; and for the same reason, namely, to prevent tearing the grain of the wood After the points of the teeth have severed the fiber of the wood, the backs of the teeth crumble and carry out the wood of the kerfs in the form of sawdust.



- **Rip Saw:** rip saw has teeth filed to a cutting edge. They are formed like chisels and cut in the same way. It is used for sawing with the grain or fiber of the wood. The tooth is chisel shaped are set alternately to the right and left.



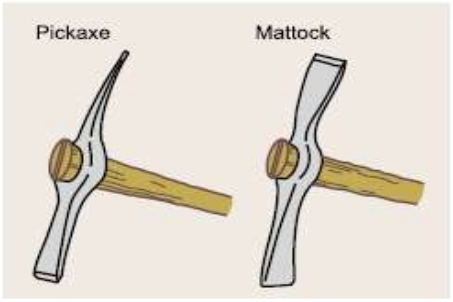
- **Backsaw:** It is a cross cut saw with a thin blade and fine teeth. A heavy piece of steel fitter over the back of the thin blade prevents it from buckling. The blades of backsaw are from 20cm to 45cm long. It is designed for fine accurate work.
- **Hacksaw:** The hack saw form is used with a variety of interchangeable metal cutting blades, which are used for cutting soft metals and hard metals such as nails, angle Iron and reinforced steel.
- **Coping Saw:** Coping saw is used to make small irregular curved cut
- **Bow saw:** Carpenters usually use Bow saw in the construction site in order to cut like eucalyptus wood. The upper section to the tension arm should be provided with an eye for easy opening and should be designed to support the hand; supplied with blade of hardened tooth points.

Fig for bow saw

- **Carpenters axe:** This tool is used mainly to cut tree and chop the wooden plugs. But also has many other uses. It has a hickory handle, steel head forged in one piece, fine grain steel, hardened and tempered edge.

❖ **Tools Excavation**

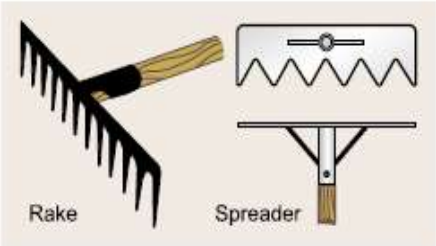
- **Hoes:** The hoe, in addition to being very useful in agriculture, is also a commonly used tool when using labor-based work methods for rural road works. It can be used for excavating soft soils and is often used in combination with stretchers or head baskets. Hoes are also effective when excavating drains, cutting back slopes and removing topsoil. The most efficient way of using the hoe is when the workers can stand slightly below the level being excavated. As it is commonly found and used in farming communities, its use is well known among the workers and would normally not need any instruction in how it is effectively used.
- **Pickaxe and Mattock**



Shovels are used for scooping up material and loading it on to a trailer, truck or wheelbarrow, or throwing it directly to where the material is needed. The shovel has a rounded or pointed blade making it suitable for both digging and loading purposes. A spade has a stronger square shaped blade and is primarily intended for digging in denser soils and is less suitable for throwing or loading activities. The spade is essentially a heavy-duty forged tool. In hard soils, the spade is more efficient because it can be pushed into the ground without bending the blade. Placing a foot on the top of the blade and pressing it down increases the pushing force. This however requires that the worker is provided with boots or shoes with safety metal embed in it.

- **Rakes and Spreaders**

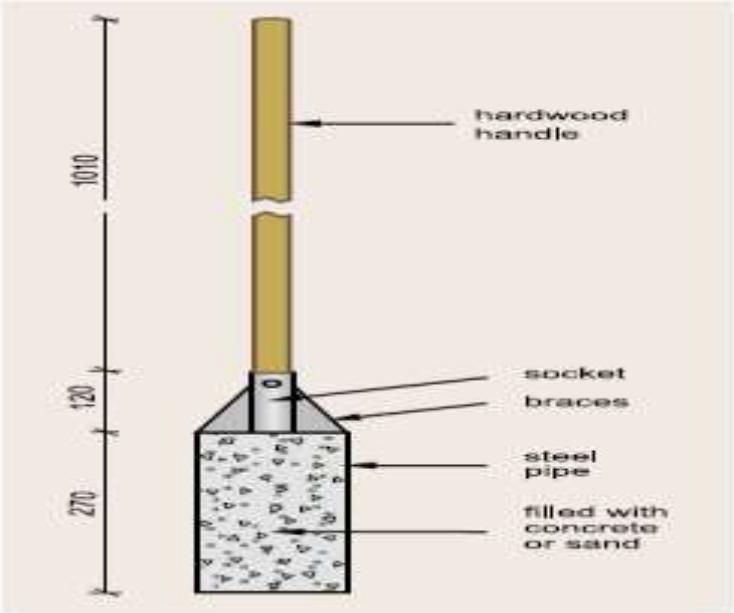
Rakes are used in road works for raking out vegetation from loose soil. Commercially produced rakes have 10 to 16 teeth, each about 75 - 100mm long, with an overall length about 400-450mm. Spreaders are useful when forming the camber and when spreading gravel. Spreaders are made of sheet metal (2 - 3mm thick) with ridges on one side, which are used to level the road surface according to set levels and gradients.



- **Hand Rammers**

Hand rammers are used for compacting soil and gravel. It consists of a weight with a long handle.

The effectiveness of a hand rammer depends on its weight and the area that hits the ground. Ideally, the weight should be as heavy as possible and the area as small as possible (without the rammer penetrating the soil). The weight can be made of various materials such as steel, concrete or solid wood. Rammers made from concrete or wood can be manufactured locally. A rammer that can be handled effectively by a worker should therefore have a weight of some 6 – 8kg. The diameter at the bottom end should be between 13 to 15cm. The handle needs to be long enough to allow the workers to lift the rammer without bending their back.



2.4 Importance of Tools and Equipment

Proper tools and equipment are essential for the effective operation of any civil works site. Equipping the construction site with the correct tools and equipment plays an essential role in achieving timely and good quality results. For every construction activity there is an optimal combination of tools, equipment and labor. Depending on the nature and content of the works, the technical staff needs to know which tools to use and how to effectively combine them with manual labor.

Once on site, equipment requires trained operators and supervisory staff who are proficient in its operation and maintenance.

Faulty equipment is a common reason for delays on construction sites. A major responsibility of the project management is to ensure that tools and equipment are maintained in a good condition and are readily available when required for the various work activities.

When applying labor-based work methods, the use of hand tools supported with selected items of light equipment can produce results comparable with those achieved when using only heavy equipment. For every construction activity there is an optimum combination of equipment and labor. In order to utilize the equipment and labor in the most effective way, the use of equipment needs to be carefully coordinated with the output of the work gangs.

For certain construction activities, particularly hauling of materials and compaction, high labor productivity and good quality of work may be difficult to achieve using only manual labor and hand tools. In such cases, using light construction equipment can increase the efficiency of work.

Site supervisors need to know how to use the tools and how to operate the equipment in order to secure good work progress and the expected high quality results. It is also important that staff know the full potential, as well as the limitation, of the use of manual and equipment-based works methods.

Finally, tools and equipment need regular maintenance, requiring good workshop facilities, a reliable supply of spare parts and qualified mechanical staff.

2.5 Quality of Tools

Hand tools are the main instruments used by the workers to carry out the activities involved in building a road using labor-based work methods. It is therefore important that project staff know how to select and maintain the tools since they have a significant influence on the work outputs.

Hand tools are used much more intensively on labor-based construction work than in agriculture. Many tools commonly used for agriculture work are not strong enough for use on construction sites and will quickly break if used intensively. It is therefore essential that the tools used on a civil works project are properly designed to stand the heavy wear and tear of a construction site.

Providing workers with strong, durable tools helps to increase productivity. If the workers discover that their tools are not very strong, they will tend to use them more gently and less productively so as to avoid breaking them. Broken tools on site cause interruptions to work, and reduces productivity, while the tools are repaired or replaced.
Ergonomically efficient hand tools are comfortable to use, well adapted to particular construction tasks and suit the physical characteristics of the workers
.
Ergonomically efficient tools and correct working techniques allow the workers to use the major body muscles effectively and make the most productive use of their energy. The proper use of suitable tools will also prevent injuries on site.

2.6 Characteristics of Suitable Hand Tools

Hand tools should be of good quality and designed so that they are efficient in use. The tools should be strong enough to withstand intensive use at the work site, and resistant to wear so that they have a long working life. For most tools this means that the metal head should be made from carbon steel, heat-treated to give the correct strength and wear characteristics. For the main excavation and striking tools such as hoes, pickaxes, mattocks and sledgehammers, the tool heads should be forged in a single piece. Cast or fabricated and welded tool heads do not provide sufficient quality.

The timber handle should be made from a tough, preferably light, seasoned hardwood. The wood should be straight grained, with the grain lying along the length of the handle. The handles should not have any splits or knots, since these lead to handles breaking when used.

Tool handles should be smoothly finished and carefully shaped with a raised grip at the end to prevent the workers hands sliding off. Long handled tools are generally preferred since they allow the workers to stand in an upright position, which is less tiring than having to bend or crouch down. The handle should be a tight, secure fit in the head of the tool.

Good quality tools are inevitably more expensive than poor quality tools. However, it is wrong simply to purchase the cheapest tools available. This will only result in problems on site, and the need for the frequent replacement of broken tools. Efficient hand tools allow workers to achieve the maximum productivity from their efforts.

Efficient tool heads should:

• have the correct shape in order to work efficiently,
• be of suitable weight for the strength of the workers, and
• be properly sharpened along the working edges.

2.7 Misusing hand tools problem

- Misuse and improper maintenance increase hazards and commonly result in injury. Some examples of misuse and lack of maintenance include the following:

  - ✓ If a chisel is used as a screwdriver, the tip of the chisel may break off or fly off, hitting the user or other employees.
  - ✓ If a wooden handle on a tool, such as a hammer or an axe, is loose, splintered, or cracked, the head of the tool may fly off and strike the user or other employees.
  - ✓ If the jaws of a wrench are sprung, the wrench may slip.
  - ✓ If impact tools such as chisels, wedges, or drift pins have mushroomed heads, the heads might shatter on impact, sending sharp fragments flying toward the user or other employees.
- Employees who use hand and power tools and are exposed to the hazards of falling, flying, abrasive, and splashing objects, or to harmful dusts, fumes, mists, vapors, or gases must be provided with the appropriate personal protective equipment. All electrical connections for these tools must be suitable for the type of tool and the working conditions (wet, dusty, flammable vapors). When a temporary power source is used for construction a ground-fault circuit interrupter should be used.
- Employees should be trained in the proper use of all tools. Workers should be able to recognize the hazards associated with the different types of tools and the safety precautions necessary.
- Employees and employers should work together to establish safe working procedures. If a hazardous situation is encountered, it should be brought immediately to the attention of the proper individual for hazard abatement.

Self-Check -1	Written Test

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

1. _____ means a tool that is nonpowered or operates only through physical exertion by hand.(3 points)

A. Power tools

B. hand tools

C. equipment

D. portable power tools

2. _____ is a small spirit level of about 80 - 120 mm length..(5 points)

A. Hose level C. line level

B. Sprit level D. try square

3. Which types of hand tools is used for cutting?

A. Axe C. cross cut sow

B. Bow sow D. rip sow E. all

4. *The line level can be used .*

A. to transfer levels C. to set out gradients

B. to check existing gradients D. all

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____

Date: _____

Short Answer Questions

List of Reference Materials

http://navybmr.com/study%20material/NAVEDTRA%2014256A.pdf
https://wwwgroup.slac.stanford.edu/esh/eshmanual/pdfs/ESHch25.pdf

Information Sheet- 2	Checking serviceability and safety of tools

2.1 Conceptual of Serviceability

Serviceability is the measure of and the set of the features that support the ease and speed of which corrective maintenance and preventive maintenance can be conducted on a system.

2.2 Corrective Maintenance (CM) includes all the actions taken to repair a failed system and get it back into an operating or available state. The failure can be unexpected or expected, but it is usually an unplanned outage. Mean Time To Repair (MTTR), the measure used to quantify the time required to perform CM, is also used in determining a system's availability.

2.3 Preventive Maintenance (PM) includes all the actions taken to replace, service, upgrade, or patch a system to retain its operational or available state and prevent system failures. Mean Preventive Maintenance Time (MPMT), a measure commonly used to quantify the time required to perform PM, is also used in determining a system's availability.

2.4 Visual inspection

All tools, testing equipment and PPE should be visually inspected before each use for signs of damage.

Safety Inspections are required to maintain your workplace according to standards established by the Occupational Safety and Health Administration. Among the items requiring inspection are the hand tools used by your employees, including powered hand tools. How you conduct the inspection will depend on your industry and specific hand tools used in your business. In general, you inspect the tools for signs that they are not in good working condition or have been misused. You also must make sure that any personal protective equipment required to use the tools safely is available.

Self-Check -2	Written Test

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

1. _____ are required to maintain your workplace according to standards established by the Occupational Safety and Health Administration 3 points)

C. Safety inspection

C. PPE

D. Visual inspection

D. maintenance

2. List two types of maintenance .(5 points)

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet- 3	Clamp or fix materials in position

3.1 fix materials in position

A **clamp** is a fastening device used to hold or secure objects tightly together to prevent movement or separation through the application of inward pressure. the term **cramp** is often used instead when the tool is for temporary use for positioning components during construction and woodworking; thus a G cramp or a sash cramp but a wheel clamp or a surgical clamp.

There are many types of clamps available for many different purposes. Some are temporary, as used to position components while fixing them together, others are intended to be permanent.

3.2 Uses of clamp

Clamps are versatile tools that serve to temporarily hold work securely in place. They are **used** for many applications including carpentry, woodworking, furniture making, welding, construction and metal working.

Proper use of a bar clamp: Used for woodwork, especially for holding edges when gluing.

3.3 Clamping Principles

- Clamp should firmly hold the work piece without distorting it.
- Should overcome the maximum possible force exerted on work piece by using minimum clamping force
- Easy to operate
- Vibrations should tighten the cams and wedges in the clamp design(if any) and not loosen them

Fig of clamp (3.1)

Self-Check -1	Written Test

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

1. _____ is a fastening device used to hold or secure objects tightly together to prevent movement or separation through the application of inward pressure.(3 points)

A. G-clamp C. clamp

B. C-clamp D. All

2. Which is the principle of clamping points.(5 points)

A. Easy to operate

B. Clamp should firmly hold the work piece without distorting it.

C. a & b d. all

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet- 4	Using hand tools safely and effectively

4.1 Hand and Power Tool Safety

Employers are responsible for maintaining in good repair any tools and equipment supplied to workers. Workers must use tools and equipment properly and report any Defects to supervisors.

Our finest tools are our **hands**. Too often they are damaged by tool accidents. Hands can be caught in Machines, crushed by objects, or cut by sharp-edged tools such as chisels, knives, and saws. Hands can also be damaged by being burned, fractured, or sprained Unless you stay alert.

Eyes are highly susceptible to injury from tool use but eye injuries are almost always preventable. Use the guards and personal protective equipment which we all know are needed but sometimes tend to overlook.

Noise is a hazard inherent in construction. Tools and the working environment can both be noisy, particularly for construction trades operating in plants and mills.

Exposure to excessive noise can impair hearing.

Prolonged excessive exposure can result in permanent damage to the hearing and eventually deafness. Hearing Protection should be worn whenever there is a risk of excessive exposure.

4.2 Importance of Quality Hand tools

Most cost-conscious contractor tends to get maximum use from worn out tools and then to seek out the cheapest replacements when the tool eventually is damaged. However, research has showed that quality tools maintained in good condition more than justify their purchase cost and timely replacement increases productivity. (See Table1)

Table 1: Comparison of cheap poorly maintained with good quality and well maintained hand tools

Poor Quality Hand Tools	Good Quality Hand Tools
Breaks easily	Strong
Wear out quickly	Long lasting
Reduce output of worker	Increase output of worker
Frustrate the worker	Satisfy the worker
More labour cost for contractor resulting in decreased profit	Less labour cost for contractor resulting in increased profit
Frequent replacement cost to contractor resulting in limited profit	Less frequent replacement cost resulting in increased profit

Neglect of tool quality and supply are likely to result in the following major dis-benefits to both the worker and his/her employer (Contractor):

a. Increased worker fatigue
b. Low worker efficiency
c. Low productivity
d. Poor quality work
e. Increased idle time
f. Increased worker time input
g. Reduced worker earnings
h. Disruption to work schedule
i. Reduced flexibility associated with the task-work and piecework systems in accommodating other worker obligations and interests
j. Delay in project completion

4.3 Common Causes of Accidents with hand tools

Typical causes of hand and power tool accidents include the following:

• using the wrong tool for the job
• Tools falling from overhead
• Sharp tools carried in pockets
• using cheaters on tool handles
• Excessive vibration
• using tools with mushroomed heads
• Failure to support or clamp work in position
• Carrying tools by hand up or down ladders
• using damaged electrical cords or end connectors

Self-Check -4	Written Test

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

True / False

1. Employers are not responsible for maintaining in good repair any tools and equipment supplied to workers.(3 points)
2. The goodness or badness of hand tools is not affect productivity of contractor. (2point)

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
2. _____

Information Sheet- 5	Locating hand tools not in immediate using

5.1 Selecting hand tools for road maintenance

This selecting hand tools maintenance is carryout when road surface defective.

Appropriate set of tools for repair work should be made available on site and also identify which tools is required at starting time. The left hand tools is properly locating where the place is free from moist, dust and can damage .

Figure hand tools for road maintenance

Self-Check -5	Written Test

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

1. Which one of the following required first on road maintenance.

A. Tape meter B. hand hammer C. shovel d. a&c

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

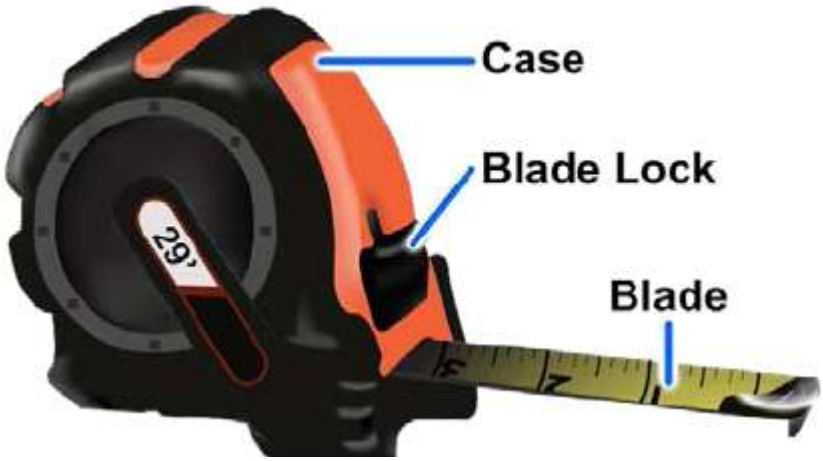
Short Answer Questions

1._____

Operation Sheet- 1	techniques of measuring tape using properly

How to Use a Measuring Tape

Follow these steps to use a measuring tape properly:



1. Pull the tape out to the desired length.
2. Place the hook over the edge of the material you are measuring.
3. Lock the tape in place.
4. Record or mark the measurement.
5. Unhook the tape from the edge of the material.
6. Release the lock and rewind the tape.

Operation Sheet- 1	Techniques of using plumb bob

Method of using plumb bob

Step 1 –The first step is to attach the cord as follows:

Step 2- Insert a string or cord into the cap (*Figure -1*) of the plumb bob. Make sure the cord will support the plumb bob. Pull the cord through the cap.

Step 3- Place cap in the palm of your hand and tie an overhand knot (*Figure -2*) in the cord. Pull the cord, drawing the knot against cap base. Make sure the knot is not too large or tied at an angle, which would affect the hanging of the plumb bob.

Step 4- Install cap into plumb bob body (*Figure -3*).

Step 5- Tighten cap securely in the body and suspend the plumb bob by the cord only. Make sure the knot will support the plumb bob.

Step 6 -Place a ruler on the top of the post so that it extends 2 inches beyond an edge.

Step 7- Position the string and plumb bob so they extend over end of ruler (*Figure -4*) and the plumb bob is just above the ground surface.

Step 8- Have the assistant measure distance from post to string just above the plumb bob (*Figure -5* It should read 2 inches. If it doesn't, move the base or the top of the post right or left until you achieve a 2-inch reading on both rules.

Step 9- Have the assistant measure distance from post to string just above the plumb bob (*Figure -5*). It should read 2 inches. If it doesn't, move the base or the top of the post right or left until you achieve a 2-inch reading on both rules.

Step 10- When extreme accuracy is desired, measurement would be taken to the point of the plumb bob (*Figure -6*).

Step 11- Repeat steps 5, 6, and 7 on the other edge of the post.

Figure -1 — Insert a string.

Figure -2 — Overhand knot.

Figure -3 — Install the cap.

Figure -4— Position the plumb bob

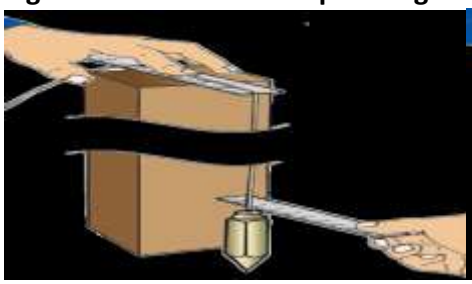


Figure- 5 — Measuring at the point.

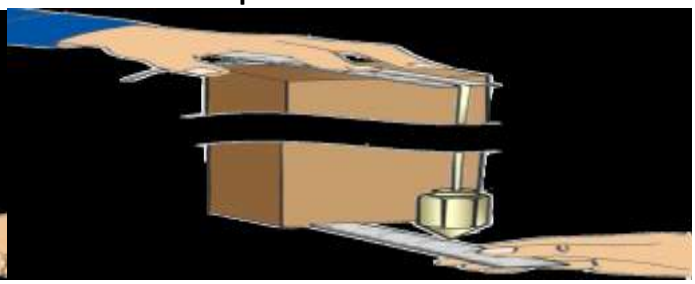


Figure- 6— Measure the distance.

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within ---30 hour.

Task 1- apply method of measuring tape use properly

Task 2- carry out Method of using plumb bob.

List of Reference Materials

1. http://navybmr.com/study%20material/NAVEDTRA%2014256A.pdf
2. https://wwwgroup.slac.stanford.edu/esh/eshmanual/pdfs/ESHch25.pdf

.

BASICINFRASTRUCTUREOPERATIOS
NTQF Level I

Learning Guide-23

Unit of Competence: use hand and power tools
Module Title: Using Hand and Power Tools
LG Code: CON BIO1 M06 LO3-LG23
TTLM Code: CON BIO1 M06 TTLM 0919VI

LO3. Select and use power tools

Instruction Sheet-1	Learning Guide #23

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

- Types and uses of power tools and equipment
- Checking serviceability and safety of tools
- Appling electrical power and air hose
- Identifying hazards for safe placement of leads/hoses
- Effective utilization of power tools
- Connecting electric power
- Using power tools safely

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**:

- Select power tools and equipment consistent with needs of job and in accordance with standard work practice, and report any faults
- Check tools for serviceability and safety, and report faults
- Visually check power leads/hoses for serviceability/safety in accordance with the site safety plan
- Clear route for safe placement of leads/hoses of identified hazards
- Run electrical power leads to power supply.
- Connect electric power leads to the power board or direct to power tool
- Run air hoses out to the compressed air supply and covered where potential trip hazards exist
- Connect hose to power tool and air supply and clamp or fix material in position for power tool application
- Use power tools safely and effectively in application processes

Learning Instructions:

a. Read the specific objectives of this Learning Guide.
b. Follow the instructions described below 3 to 6.
c. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
d. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14** respectively.
e. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -15.**
f. Do the “LAP test” **in page – 16** (if you are ready).

Information Sheet-1	Types and uses of power tools and equipment

Definitions

Portable power tool means a mounted or portable tool that requires a power source to operate, such as electric, pneumatic, liquid fuel, hydraulic, explosive-actuated, and powder-actuated device or power supply. Examples of regulated portable power tools are portable abrasive wheels.

1.1 Types Of Power Tools

The types of power tools are determined by their power source: electric, pneumatic, liquid fuel, hydraulic, and powder-actuated.

Typical injuries include cuts, burns, strains, and sprains. Causes of injuries include electric shock, flying particles and dust in the eye, falls, explosive atmospheres, and falling tools. These are all acute injuries produced by sudden trauma and are identified immediately with the event.

These conditions can develop more subtly and prevention can involve awareness of a variety of precautions including tool selection, work schedules, and work practices.

Always disconnect the power on a portable power tool before changing or adjusting accessories such as drill bits and saw blades. Never operate a power tool with the guard removed or improperly adjusted.

1.2 Advantage and dis- advantage of power tools

The advantage of power tools over hand tools is that they do not rely entirely on the physical strength of the operator to do the job at hand. Power tools are often much faster and, in some cases, more accurate than hand tools. It would be difficult to operate a business without the use of power tools. However, the disadvantages of Power tools are the increased risk of injury if not used properly and elevated noise Levels.

1.3 Guards

The exposed moving parts of power tools need to be safeguarded. Belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating, or moving parts of equipment must be guarded.

Machine guards, as appropriate, must be provided to protect the operator and others from the following:

- Point of operation.
- In-running nip points.
- Rotating parts.
- Flying chips and sparks.

Safety guards must never be removed when a tool is being used. Portable circular saws having a blade greater than 2 inches (5.08 centimeters) in diameter must be equipped at all times with guards. An upper guard must cover the entire blade of the saw. A retractable lower guard must cover the teeth of the saw, except where it makes contact with the work material. The lower guard must automatically return to the covering position when the tool is withdrawn from the work material.

1.4 Operating Controls and Switches

The following hand-held power tools must be equipped with a constant-pressure switch or control that shuts off the power when pressure is released: drills; tappers; fastener drivers; horizontal, vertical, and angle grinders with wheels more than 2 inches (5.08 centimeters) in diameter; disc sanders with discs greater than 2 inches (5.08 centimeters); belt sanders; reciprocating saws; saber saws, scroll saws, and jigsaws with blade shanks greater than 1/4-inch (0.63 centimeters) wide; and other similar tools.

These tools also may be equipped with a "lock-on" control, if it allows the worker to also shut off the control in a single motion using the same finger or fingers. The following hand-held power tools must be equipped with either a positive "on-off" control switch, a constant pressure switch, or a "lock-on" control: disc sanders with discs 2 inches (5.08 centimeters) or less in diameter; grinders with wheels 2 inches (5.08 centimeters) or less in diameter; platen sanders, routers, planers, laminate trimmers, nibblers, shears, and scroll saws; and jigsaws, saber and scroll saws with blade shanks a nominal 1/4-inch (6.35 millimeters) or less in diameter. It is recommended that the constant-pressure control switch be regarded as the preferred device.

Other hand-held power tools such as circular saws having a blade diameter greater than 2 inches (5.08 centimeters), chain saws, and percussion tools with no means of holding accessories securely must be equipped with a constant-pressure switch.

1.5 Electric Tools

These tools are used in smaller factories where the operation of a compressor is deemed uneconomical. Most static tools such as bench grinders and drill presses operate on electricity. With the increasing use of rechargeable battery or cordless drills, electrical tools can be used well away from a mains power supply. Employees using electric tools must be aware of several dangers. Among the most serious hazards are electrical burns and shocks.

Electrical shocks, which can lead to injuries such as heart failure and burns, are among the major hazards associated with electric-powered tools. Under certain conditions, even a small amount of electric current can result in fibrillation of the heart and death. An electric shock also can cause the user to fall off a ladder or other elevated work surface and be injured due to the fall. To protect the user from shock and burns, electric tools must have a three-wire cord with a ground and be plugged into a grounded receptacle, be double insulated, or be powered by a low-voltage isolation transformer.

The following general practices should be followed when using electric tools:

- Operate electric tools within their design limitations.
- Use gloves and appropriate safety footwear when using electric tools.
- Store electric tools in a dry place when not in use.
- Do not use electric tools in damp or wet locations unless they are approved for that purpose.
- Keep work areas well lighted when operating electric tools.

Ensure that cords from electric tools do not present a tripping hazard. In the construction industry, employees who use electric tools must be protected by ground-fault circuit interrupters or an assured equipment-grounding conductor program.

1.6 Portable Abrasive Wheel Tools

Portable abrasive grinding, cutting, polishing, and wire buffing wheels create special safety problems because they may throw off flying fragments. Abrasive wheel tools must be equipped with guards that:

(1) Cover the spindle end, nut, and flange projections;

(2) Maintain proper alignment with the wheel; and

(3) Do not exceed the strength of the fastenings.

Before an abrasive wheel is mounted, it must be inspected closely for damage and should be sound- or ring-tested to ensure that it is free from cracks or defects. To test, wheels should be tapped gently with a light, non-metallic instrument. If the wheels sound cracked or dead, they must not be used because they could fly apart in operation. A Stable and undamaged wheel, when tapped, will give a clear metallic tone or "ring." To prevent an abrasive wheel from cracking, it must fit freely on the spindle

.When using a powered grinder:

- Always use eye or face protection.
- Turn off the power when not in use.
- Never clamp a hand-held grinder in a vise.

1.7 Pneumatic Tools

Commonly called air tools, these operate at higher revolutions per minute (RPM) than electrical tools and therefore do the work more quickly. Pneumatic tools alleviate some of the common dangers associated with using electrical tools such as having electrical leads running across workshop floors, dangers associated with working in damp or wet conditions and sparking of the machines in volatile fume areas such as paint workshop areas. Pneumatic tools are lighter to handle than those powered by electricity. Pneumatic tools are powered by compressed air and include chippers, drills, hammers, and sanders.
There are several dangers associated with the use of pneumatic tools. First and foremost is the danger of getting hit by one of the tool's attachments or by some kind of fastener the worker is using with the tool.

Pneumatic tools must be checked to see that the tools are fastened securely to the air hose to prevent them from becoming disconnected. A short wire or positive locking device attaching the air hose to the tool must also be used and will serve as an added safeguard.

Eye protection is required, and head and face protection is recommended for employees working with pneumatic tools.

Screens must also be set up to protect nearby workers from being struck by flying fragments around chippers, riveting guns, staplers, or air drills.

Wear safety glasses and safety shoes that protect them against injury if the jackhammer slips or falls.

A face shield also should be used. Noise is another hazard associated with pneumatic tools. Working with noisy tools such as jackhammers requires proper, effective use of appropriate hearing protection.

1.8 Liquid Fuel Tools

Fuel-powered tools are usually operated with gasoline. The most serious hazard associated with the use of fuel-powered tools comes from fuel vapors that can burn or explode and also give off dangerous exhaust fumes. The worker must be careful to handle, transport, and store gas or fuel only in approved flammable liquid containers, according to proper procedures for flammable liquids.

Before refilling a fuel-powered tool tank, the user must shut down the engine and allow it to cool to prevent accidental ignition of hazardous vapors. When a fuel-powered tool is used inside a closed area, effective ventilation and/or proper respirators such as atmosphere-supplying respirators must be utilized to avoid breathing carbon monoxide. Fire extinguishers must also be available in the area.

1.9 Powder-Actuated Tools

Powder-actuated tools operate like a loaded gun and must be treated with extreme caution. In fact, they are so dangerous that they must be operated only by specially trained employees.

When using powder-actuated tools, an employee must wear suitable ear, eye, and face protection. The user must select a powder level -- high or low velocity -- that is appropriate for the powder-actuated tool and necessary to do the work without excessive force.

The muzzle end of the tool must have a protective shield or guard centered perpendicular to and concentric with the barrel to confine any fragments or particles that

are Projected when the tool is fired. A tool containing a high-velocity load must be designed not to fire unless it has this kind of safety device.

To prevent the tool from firing accidentally, two separate motions are required for firing. The first motion is to bring the tool into the firing position, and the second motion is to pull the trigger

1.10 Hydraulic Power Tools

Common jacks such as bottle jacks and trolley jacks use hydraulic power. Hydraulic Power is slow when compared to other forms of power but it is able to deliver the very high pressures required to lift trucks (trolley jacks) or bend heavy pipe (hydraulic pipe Bender).
The fluid used in hydraulic power tools must be an approved fire-resistant fluid and must retain its operating characteristics at the most extreme temperatures to which it will be exposed. The exception to fire-resistant fluid involves all hydraulic fluids used for the insulated sections of derrick trucks, aerial lifts, and hydraulic tools that are used on or around energized lines. This hydraulic fluid shall be of the insulating type. The manufacturer's recommended safe operating pressure for hoses, valves, pipes, filters, and other fittings must not be exceeded.

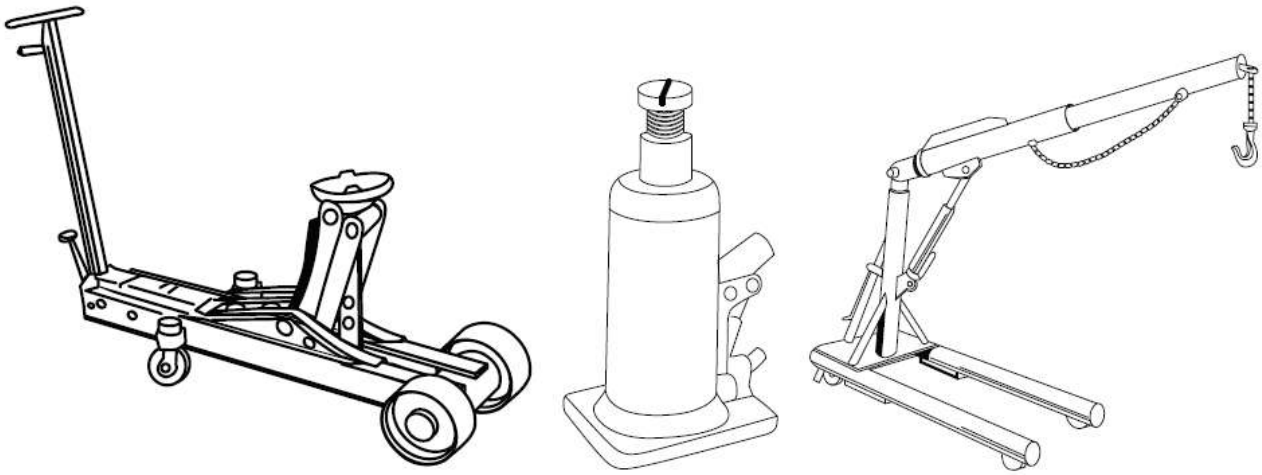


FIG 1.1 Hydraulic Power Tools

1.12 Grinding and sanding tools

Tools that grind or sand away material use an abrasive action. These tools are available as air-powered or electrical-powered tools and increasingly as fully portable battery-

powered tools. The most common abrading tools are angle grinders, vertical grinders, straight grinders, sanders and polishing buffs.

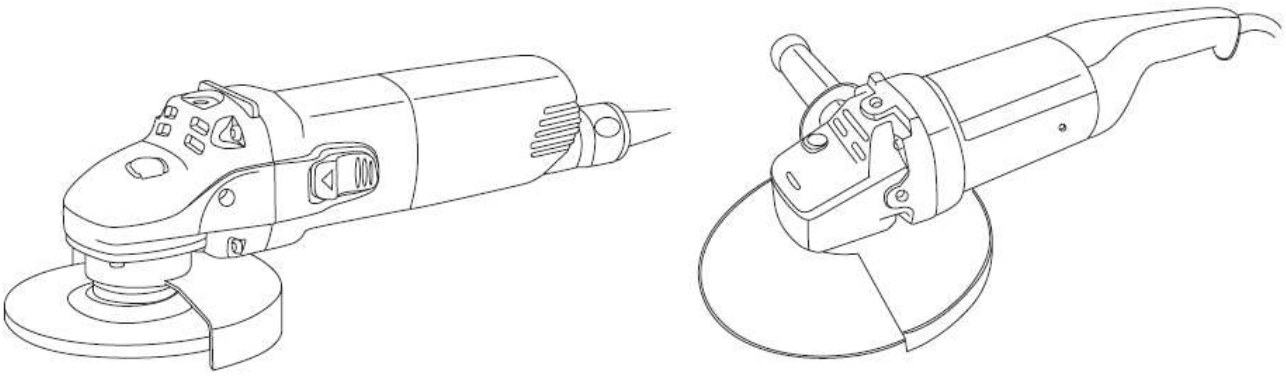


FIG 1.2 Grinding and sanding tools

1.13 Drilling tools

Drilling tools are used in conjunction with drill bits to drill holes in material such as wood, steel and plastics. Most drills are pistol grip drills although larger varieties will be Fitted with two handles for better grip and stability. Drills used for drilling on chassis may be magnetic. There are other added features of pistol grip drills which make them more Versatile, such as reverse rotation, torque settings making them useful as an electric screw driver and a hammer action setting. All these features are available in a cordless drill.

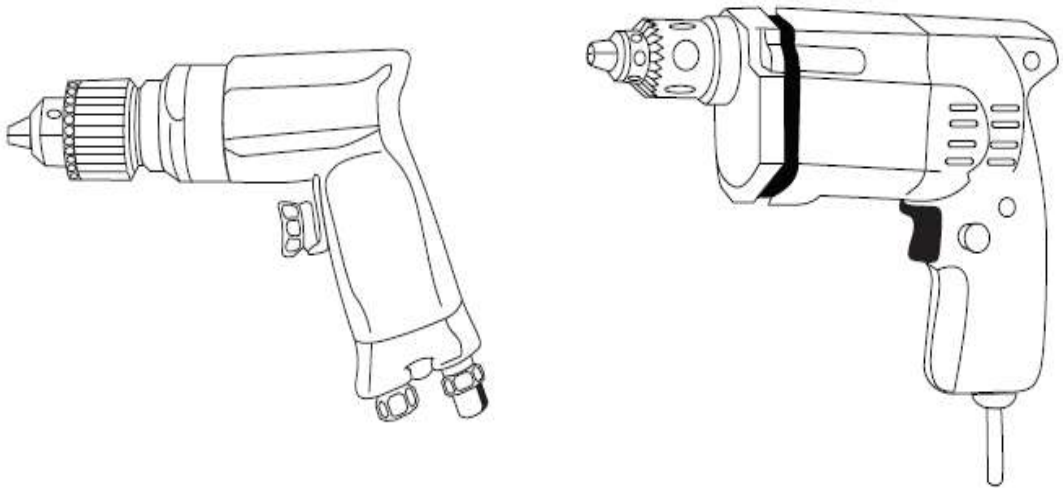


FIG 1.3 Drilling tools

1.14 kanga hammers

A jackhammer (pneumatic drill or demolition hammer) is a pneumatic or electro-mechanical tool that combines a hammer directly with a chisel larger jackhammers, such as rig mounted hammers used on construction machinery, are usually hydraulically powered.

1.15 Impact or Hammer Drill

Using an impact or hammer drill requires considerable control.
Feed the attachment slowly and carefully into the material or the drill may jam and stop suddenly,
Severely twisting or breaking your arm. When drilling into floors, ceilings, and walls, beware of plumbing — and wiring!

1.16 Drill Presses

On many jobs, either conventional drill presses or the more mobile electromagnetic drill presses are used.
They permit more accurate drilling.
• Make sure no loose hair or loose or torn clothing can be caught in the drill bit and cause serious injury.
• Before doing any drilling on a work piece on a conventional drill press, make sure the work is securely clamped to the drill table.
• Electromagnetic (“mag”) drills are only “attached” if switched on.
• “Mag” drills if “attached” on vertical or overhead ferrous surfaces must also be secured by safety chain in case of power loss.
`

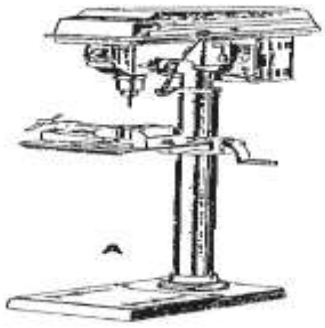


Fig 1.4 Drill Presses

1.17 Sawing tools

Sawing tools use a sawing action, which means that they go back and forth using their teeth to remove pieces of material.

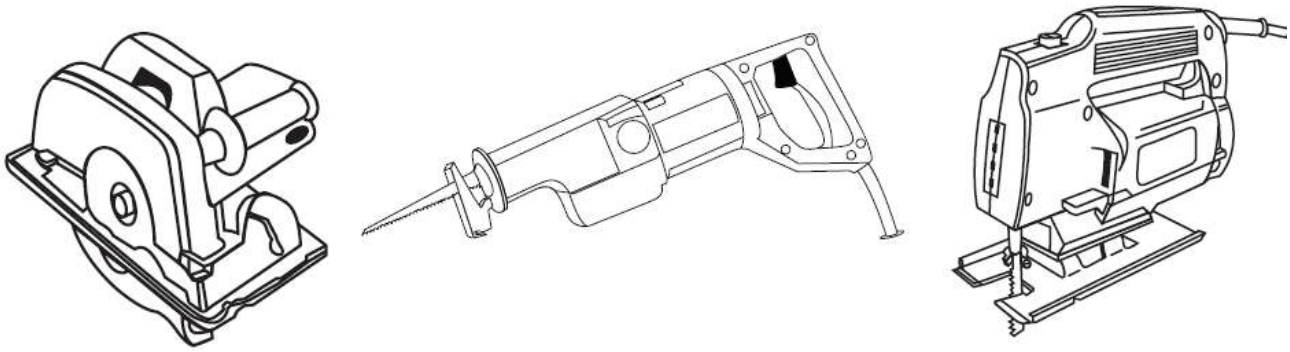


FIG 1.5 Sawing tools

2.1 General Guidelines

- Whenever possible, select tools with large handles relative to the tool body, to reduce vibration.
- Select tool handles covered with cork, rubber, or plastic bonded to steel to reduce vibration.
- Use tools with two handles to make holding and manipulation easier.
- Always refer to the operator's manual before using a tool the first time.
- Choose tools with a trigger strip rather than a trigger button. This spreads force over a greater area, reducing muscle fatigue .
- Make sure there's adequate lighting for safe tool use.

2.2 Inspection and Repair

Frequent inspection of power tools is essential to keep hazards from developing. Inspection will also help to identify operating defects and possibly avoid costly breakdowns.

A regular schedule for inspection — daily, weekly, or monthly depending on requirements — will help to ensure that all power tools are in safe operating condition.

Defective tools should be removed from service, tagged, and be either repaired or replaced. Workers should be trained to inspect the tools they use and to report defects to their supervisor. The extent of the inspection and the responsibility for maintenance or Repairs must be clearly communicated so there is no misunderstanding. Workers should not carry out makeshift repairs.

Self-Check -1	Written Test

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

True / False

1. _____ means a mounted or portable tool that requires a power source to operate .(3 points)

   A. Electrical power
   B. Equipment
   C. portable power tools
   D. hand tools

2. _____ are powered by compressed air and include chippers, drills, hammers, and sanders. (2point)
   A. Pneumatic Tools
   B. Portable Grinders
   C. Powder-Actuated Tools
   D. Liquid fuel tools
3.

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

https://protect.iu.edu/doc/environmental-health/pdf/IU%20Hand%20and%20Power%20Tool%20Safety.pdf
http://www.techni-tool.com/site/PROMO/2012-02/2012-02-Brady_5S_HandBook.pdf
https://www.baylor.edu/ehs/doc.php/306124.ppt

http://navybmr.com/study%20material/NAVEDTRA%2014256A.pdf

https://www.osha.gov/Publications/osha3080.html
https://www.ilo.org/wcmsp5/groups/public/---asia/---ro-bangkok/documents/genericdocument/wcms_101009.pdf

https://youtu.be/puGg_UzpVo4

Information Sheet-2	Checking serviceability and safety of power tools

2.3 Formal visual inspections

An important part of a maintenance regime is the formal visual inspection. Such inspections are necessary because they can reveal most potentially dangerous faults. They can normally be carried out by a member of staff who has sufficient information and knowledge of what to look for, what is acceptable, and who has been given the task of carrying out the inspection (that is, they are competent to do the task). To avoid danger, trained people should know when the limit of their knowledge and experience has been reached. Simple, written guidance relating to the formal visual inspection can be produced that summarizes what to look for and which procedures to follow when faults are found or when unauthorized equipment is found in use.

2.4 This guidance can also help equipment users.

- These inspections can help to control the risks and to monitor the user checks. A competent person should carry out regular inspections that include checks similar to those in but undertaken in a more formal and systematic manner.
- As part of the visual inspection, you should also consider whether: the electrical equipment is being used in accordance with the manufacturer's instructions;
  the equipment is suitable for the job; there has been any change of circumstances;
- Additional checks could include removing the plug cover to ensure: there are no signs of internal damage, overheating or water damage to the plug;Nthe correct fuse is in use and it is a proper fuse, not a piece of wire, nail etc; the wires including the earth, where fitted, are attached to the correct terminals the terminal screws are tight; the cord grip is holding the outer part (sheath) of the cable tightly; and no bare wire is visible other than at the terminals.

  For molded plugs the fuse can be checked. The formal visual inspection should **not** include taking the equipment apart. This should be confined, where necessary, to the combined inspection and testing.
- The formal visual inspections should be carried out at regular intervals. The period between inspections can vary considerably, depending on the type of equipment, the conditions of use and the environment. For example, equipment used on a construction site or in a heavy steel fabrication workshop will need much more

frequent inspection than equipment such as computers in an office. In all cases, however, the period between inspections should be reviewed in the light of experience. Faulty equipment should be taken out of service and not used again until properly repaired. If necessary, it should be tested.

- The pattern of faults can help managers decide what action to take, depending on whether the faults show:

✓ the wrong equipment is being selected for the job;
✓ further protection may be necessary in a harsh environment; or
✓ the equipment is being misused.

2.5 Combined inspection and test (PAT)

- The checks and inspections outlined in the previous paragraphs should reveal most potentially dangerous faults. However, some faults, such as loss of earth integrity (eg broken earth wire within a flexible cable), deterioration of insulation integrity, or contamination of internal and external surfaces, cannot be detected by visual examination alone. Such faults can only be reliably detected by a combined visual inspection and test. This should be carried out periodically to back up the checks and inspections and is likely to be justified: Whenever there is reason to suppose the equipment may be defective and this cannot be confirmed by visual examination; after any repair, modification or similar work; or at periods appropriate to the equipment, the manner and frequency of use and the environment.

The inspection carried out in conjunction with testing should usually include checking:

✓ the correct polarity of supply cables;
✓ the correct fusing;
✓ effective termination of cables and cores;
✓ That the equipment is suitable for its environment.

2.6 Maintenance, test records and labelling

- There is no legal requirement to keep maintenance logs for portable electrical equipment. However, a suitable log is useful as a management tool for monitoring and reviewing the effectiveness of the maintenance plan.

  The log can include faults found during inspection, which may be a useful indicator of places of use or types of equipment that are subject to a higher than average level of wear or damage. This will help monitor whether suitable equipment has been selected. Entries can also highlight any adverse trends in

test readings that may affect the safety of the equipment, and as a result enables remedial action to be taken. Be careful when interpreting trends where a subsequent test may be done with a different instrument, as differences in the results may be due to difference in the instruments rather than deterioration in the equipment being tested.

Self-Check -2	Written Test

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

Say True / False

1. An important part of a maintenance regime is the formal visual inspection..(3 points)
2. The formal visual inspections should be not carried out at regular intervals. (2point)

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-3	Appling electrical power and air hose

Introduction

3.1 Air hose

A hose is a flexible hollow tube designed to carry fluids from one location to another. Hoses are also sometimes called pipes (the word pipe usually refers to a rigid tube, whereas a hose is usually a flexible one), or more generally tubing

Applications mostly use nylon, polyurethane, polyethylene, PVC, or synthetic or natural rubbers, based on the environment and pressure rating needed. In recent years, hoses can also be manufactured from special grades of polyethylene (LDPE and especially LLDPE). Other hose materials include PTFE (Teflon), stainless steel and other metals.

Air hoses are used in underwater diving, such as scuba diving, to carry air from the surface or from air tanks or diving pumps to the diver. Air hoses are therefore a necessary part of standard diving dress and any type of surface supplied diving equipment. They are an essential part of scuba diving equipment, used to deliver pressurized air from the first stage of a diving regulator to the other components. Air hoses are used between locomotives and railroad cars for their brakes, and are also used between those tractors and semi-trailers which use air brakes

Fig 3.1 air hose

3.2 Electric Power Tools

There are many hazards to be aware of while using electric type power tools. Among the most serious are electrical burns and shocks. According to OSHA, “approximately 350 electrical related fatalities happen each year.” Among the following are prevention methods that can be utilized to reduce risk and exposure to electrical burns and shocks:

- Storage of electric powered tools shall be in a dry place.
- Wear proper PPE such as eye protection and foot protection.

- Arrange cords from presenting tripping hazards.
- Don't carry a tool by its cord.
- Avoid using electric tools in wet or damp places unless they are approved for that use.
- Assure adequate lighting is provided while using electric tools.
- Utilize GFCIs or an assured grounding program. GFCIs are required in the construction field.
- Only use tools that are double insulated or cord ends containing three prongs.

The potential for current to flow through a worker from a faulty tool is determined in part by working conditions. Wet or damp conditions can reduce resistance and can greatly increase the chance of current flow and injury from electric shock

Grounding of electric power tools and the use of ground fault circuit interrupters (GFCIs**)** will protect the worker under most circumstances. GFCIs are required by law (Construction Regulation, section 195) wherever portable power tools are used outdoors or in wet conditions. GFCIs detect current leaking to ground from an electric tool or cord and shut off power before injury or damage can occur.

Double-insulated tools provide reliable shock protection without third-wire grounding. Tools with this type of protection are permanently marked double insulation or double-insulated. These tools have been tested and listed by Underwriters Laboratories and will carry the UL symbol. Many manufacturers are also carrying the symbol as shown in to identify double insulation.

- All tools should be tested regularly for effective grounding with a continuity tester
- Tools should have dead front plugs
- Make sure the casings of double-insulated tools are not cracked or broken and are free of moisture, oil, and grease

N.B Multimeters are used for testing circuits.

Self-Check -1	**Written Test**

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

Say True / False

1. A hose is a rigid hollow tube designed to carry fluids from one location to another.(3 points)

2. Storage of electric powered tools shall not be in a dry place. (2point)
3. Which types of hazards to be aware of while using electric type power tools

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-4	Identifying hazards for safe placement of leads/hoses

Introduction

Hazard: The inherent potential to cause physical injury or damage to the health of people.

4.1 The main hazards with electricity are:

- Contact with live parts causing shock and burns.
- faults which could cause fires;
- Fire or explosion where electricity could be the source of ignition in a potentially flammable or explosive atmosphere, e.g. in a spray paint booth.

4.2 Types of electric hazard

There are four main types of injuries:

1. Electrocution (fatal),
2. Electric shock
3. Burns and
4. Falls.

These injuries can happen in various ways: Direct contact with exposed energized conductors or circuit parts.

Electrical accidents are largely preventable through safe work practices. Examples of these practices include the following:

- deenergizing electric equipment before inspection or repair,
- keeping electric tools properly maintained,
- exercising caution when working near energized lines, and
- using appropriate protective equipment.

Fig 4.1 Types of hazard

4.3 Safety precautions

- the manufacturer's specifications and operating instructions for these tools will be read, understood, and complied with; hearing and eye protection will be worn by the worker and others in the vicinity;
- before using the tool, the worker completes a pre-task inspection to check that the tool is clean, operating correctly and the barrel is free from obstructions; and
- Warning signs are posted where these tools are used and protective screens or shields are set up in areas where nearby workers may be exposed to flying fragments, chips, dust, and excessive noise.

Self-Check -1	Written Test

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

4. List main hazards with electricity are**(** 3 points)
5. list injuries can happen direct contact with exposed energized conductors or circuit parts .(5 points)

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer

1. _____
2. _____

Information Sheet-5	Effective utilization of power tools

5.1 Effective worker

- **As a portable (hand and power) tool user**

✓ Only uses tools for which he or she has the training to use safely, knows their limitations and hazards, and has been properly authorized
✓ Uses tools according to training and authorization. If using a power tool, makes sure the tool has proper guards.
✓ Uses the appropriate tool for the task
✓ Always visually inspects tools before use and removes from service any found to be defective. Tags the tool out of service and notifies supervisor.
✓ Stops work immediately if a tool becomes damaged
✓ Practices good housekeeping
✓ Maintains tools in his or her care and stores them safely
✓ Wears personal protective equipment (PPE) as required

- **As a machine tool user, in addition to the requirements above**

✓ Completes any required training and/or demonstrates competency in safe machine tool operation before using equipment
✓ Is knowledgeable of safety requirements and machining guidelines and adheres to them, including following shop-specific safety rules and meeting machine-specific competency standards
✓ Works alone only if allowed by shop-specific safety rules or the machine-specific competency standard. If working alone notifies someone (the shop custodian or supervisor, for example).
✓ Understands and practices approved machine safeguarding methods
✓ Does not defeat or remove safety devices or guards or operate machines without safeguards in place and in proper working order
✓ Reports machine safeguarding malfunctions or problems to supervisor and machine custodian immediately
✓ Reports unauthorized or unsafe use of machine tools if observed

Self-Check -1	Written Test

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

True /False

3. workers Stops work immediately if a tool becomes damage .(3 points)
4. while Using tools no need to training and authorization.(5 points)

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-6	connecting electric power

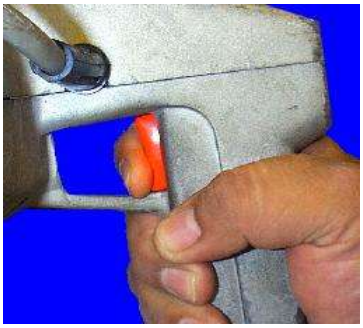
6.1 Safety Switches

Safety switches require constant-pressure of a switch or control that breaks the power when the pressure is released. The following hand-held power tools must be equipped with safety switches:

- Drills.
- Tappers.
- Fastener drivers.
- Horizontal, vertical and angle grinders with wheels larger than 2” (5.08 centimeters) in diameter.
- Disc sanders with discs larger than 2” (5.08 centimeters) in diameter.
- Belt sanders.
- Reciprocating saws.
- Saber saws.
- Scroll saws.
- Jigsaws with blade shanks greater than ¼ inch (0.63 centimeters) wide.

6.2 Powering on and Off

- Switch off tools before connecting them to a power supply.
- Disconnect the power supply before making adjustments or changing accessories.
- Do not disconnect the power supply of the tool by pulling or jerking the cord from the outlet.
- Remove any wrenches and adjusting tools before turning on a tool.
- Do not bypass the ON/OFF switch and operate the tools by connecting and disconnecting the power cord.
- Do not walk around with a plugged-in tool with your finger touching the switch.
- Do not bush away sawdust, shavings or turnings while the tool is running.
- Do not leave a running tool unattended. Do not leave it until it has been turned off, has stopped running completely, and has been unplugged.



6.3 How to Checking Electric cords and plugs

• Inspect regularly and make sure they are in good condition.
• Never cut off, bend, or cheat the ground pin on three prong plugs.
• Use cords fitted with dead front plugs

These present less risk of shock and short-circuit than open front plugs and prevent strain on current carrying components when the cord is accidentally pulled.

• Check extension cords and outlets with a circuit-tester
• Don’t use extension or tool cords that are defective or have been improperly repaired.
• Don’t wire plugs into outlets. Disconnecting will take too long in an emergency.
• Protect cords from traffic.
• Extension cords should be kept clear of sharp objects, heat, oil, and solvents that may damage or soften the outer insulation. Do not use light-duty power cords.

Self-Check -1	Written Test

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

1. Which one of the following is Checking Electric cords and plugs around them.(3 points)

A. Inspect regularly and make sure they are in good condition.
B. Cut off, bend, or cheat the ground pin on three prong plugs.
C. Use cords fitted with dead front plugs
D. all

2. _____require constant-pressure of a switch or control that breaks the power when the pressure is released.(5 points)

A. ON/OF
B. Safety switch
C. Electric cords
D. all

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
2. _____

Information Sheet-7	using power tools safely

1.1 safety importance using power tools

Safety is a very important factor in the use of power tools and cannot be overemphasized. by observing the following safety guidelines, you can ensure maximum benefits from the tools you use and reduce to a minimum the chances of serious injury.

- Never operate any power equipment unless you are completely familiar with its controls and features.
- Inspect all portable power tools before using them.
- See that they are clean and in good condition.
- Make sure there is plenty of light in the work area.
- Never work with power tools in dark areas where you cannot see clearly.
- Before connecting a power tool to a power source, be sure the tool switch is in the “off” position.
- When operating a power tool, give it your full and undivided attention.
- Do not distract or in any way disturb another person while they are operating a power tool.
- Never try to clear a jammed power tool until it is disconnected from the power source.
- After using a power tool, turn off the power, disconnect the power source, wait for all movement of the tool to stop, and then remove all waste and scraps from the work area. store the tool in its proper place.
- Never plug the power cord of a portable electric tool into a power source before making sure that the source has the correct voltage and type of current called for on the nameplate of the tool.
- Do not allow power cords to come in contact with sharp objects, nor should they kink or come in contact with oil, grease, hot surfaces, or chemicals.

1.2 CARE OF ELECTRIC POWERTOOLS

In order to achieve and maintain maximum performance, all electrical power tools must be given proper care. The following is a list of guidelines that will help keep your power tools in a “ready to use” condition.

1. Keep all power tools, especially the housing intake and exhaust holes, clear and free of dust and dirt at all times.
2. Examine power tool cords for exposed loose wires and for damaged insulation.
3. Wipe power cords frequently to prevent deterioration from oil or grease.
4. Check cord plugs for loose prongs or cracked casings.
5. Never hold or drag electrical tools by the cord at any time.
6. To prevent rusting, apply a light coat of oil to cutting surfaces of tools.
7. Store power tools in properly designated containers when not is use.

Self-Check -1	Written Test

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

I. CHOSE THE CORRECT ANSWER

1. Which of the following can care of electric power tools (3point)
   A. Check cord plugs for loose prongs or cracked casings.
   B. Never try to clear a jammed power tool until it is disconnected from the power source.
   C. Never hold or drag electrical tools by the cord at any time.
   D. all

2. Never work with power tools in dark areas where you cannot see clearly. (2point)

   A. TRUE B. FALSE

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____

2. _____

Operation Sheet- 1	Techniques Of Adjusting Saw And Preparing Work Materials

Techniques of Adjusting Saw and Preparing Materials

STEP 1. Take some time to familiarize yourself with the circular saw you're using.
STEP 2. Wear gloves and eye protection to keep yourself safe while you work.
STEP 3. Measure and mark your work material where you'll be making your cuts.
STEP 4. Place your material on a saw table or between two sawhorses.
STEP 5. Use the central lever to set the blade to the desired cutting depth
STEP 6. Adjust the pivoting scale to angle the blade for beveled cuts.

Operation Sheet- 2	Techniques of Making Clean, Precise Cuts

Techniques of Precise cutting wood with circular saw

STEP 1. Position the line on the base plate labelled "0" over your cut line
STEP 2. Activate the saw blade by pulling the trigger on the rear handle.
STEP 3. Push the saw slowly and smoothly along the surface of the material.
STEP 4. Release the trigger to stop the blade after each cut.
STEP 5. Unplug the saw when you're done using it.

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within --- 1hour.

Task 1- apply techniques of adjusting saw and preparing work materials

Task 2- apply techniques of precise cutting wood with circular saw

List of Reference Materials

1. http://www.powertoolinstitute.com - A video that addresses the importance of keeping the work area safe, electrical safety, developing good personal work habits, and proper tool use and

2. Power Tool Safety Training:-
   https://www.baylor.edu/ehs/doc.php/306124.ppt

BASIC INFRASTRUCTURE OPERATION
NTQF LIVELE I

Learning Guide-24

Unit of Competence: Use Hand and Power Tools
Module Title: Using Hand and Power Tools
LG Code: CON BIO1 M06 LO4-LG24
TTLM Code: CON BIO1 M06 TTLM 1019

LO4. Clean up

Instruction Sheet	Learning Guide #

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

- Safe keeping of tools and equipment
- Cleaning and checking hand and power tool
- Locating and storing hand and power 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**:

- Ensure power tools are located safely when not in use
- Clear work area and dispose of or recycle materials in accordance with project environmental management plan
- Clean, check, maintain and store machinery, tools and equipment in accordance with manufacturer's recommendations and standard work practices

Learning Instructions:

3. Read the specific objectives of this Learning Guide.
4. Follow the instructions described below 3 to 6.
5. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3 and Sheet 4”.
6. Accomplish the “Self-check 1, Self-check t 2, Self-check 3 and Self-check 4” **in page -6, 9, 12 and 14** respectively.
7. If you earned a satisfactory evaluation from the “Self-check” proceed to “Operation Sheet 1, Operation Sheet 2 and Operation Sheet 3 ” **in page -15.**
8. Do the “LAP test” **in page – 16** (if you are ready).

Information Sheet-1	Safe keeping of tools and equipment

1.1 Maintenance and Repair of Hand Tools

Depending on the number and types of tools on site, a set of tools for repair work should be made available on site. Although the hand tools on site may be of good quality, they still need regular maintenance to remain effective. When tools have been used for some time, handles eventually need to be replaced and cutting edges require sharpening. If the workers are equipped with poorly maintained hand tools, their performance will be compromised. Establishing repair facilities on site is therefore justified through the savings made by repairing tools rather than buying new ones, and through an increase in worker productivity when supplying the workforce with tools in good condition. The cost of the services of a blacksmith and a carpenter to sharpen tool cutting edges and carrying out other repairs can therefore easily be justified.

The site camp will need a work place for repairing tools, equipped with effective sharpening instruments and a sufficient supply of spare parts.

Self-Check -1	Written Test

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

1. the hand tools on site may be of good quality, they still need _____ to remain effective a.(3 points)

   A. defective C. Local resources
   B. regular maintenance D. Services

2. The _____ will need a work place for repairing tools, equipped with effective sharpening instruments and a sufficient supply of spare parts. .(5 points)

   A. Site work C. site camp
   B. Site job D. all

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
2. _____

Information Sheet-2	Cleaning and checking hand and power tool

2.1 Clean up working area and tools

Cleaning site and Removing waste materials

Cleaning site is much safer for the workmen than a dirty one and also used to construct the building components without problems (injuries) the preliminary site works for a construction project usually begin after the site facilities are set up.

Cleaning the site can be done by a combination of manual and mechanical methods.

Suitable arrangements for the safe disposal of waste materials must be provided. If possible, waste materials should be collected and disposed their source area. Where this procedure is impossible, these materials should be stared in a safe way (area) until they can be disposed of.

Accumulation of waste should not be allowed where it will interfere with the operation of the machine or with the safety of the workmen.

Cleaning tools are very essential to remove loose particles, dusts, grasses, etc before and after using the tools and also from the formwork sheathing material. Some of these cleaning tools are:-

a) Fiber brush
b) Brooms
c) Cleaning machine

i) Single bag dust extractor

It is used to keep the workshop free of dust and shavings, this is essential when machining.

ii) Small extractor

This can be attached to power tools or used to clean around the bench, from safety clothes and from the formwork sheathing.

- The high sped blast of compressed air is very dangerous, and can cause serious injury or even death, if improperly used.

Compress air lines often contain amount of water, due to condition. This is usually automatically extracted by an air filter as shown on the diagram

Self-Check -1	Written Test

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

1. Cleaning the site can be done by a combination of _____ and _____methods. (3 points)
   A. Manual
   B. Machine
   C. manual & machine
   D. all
2. One is cannot be using as cleaning tools .(5 points)
   A. Brush
   B. Broom
   C. Cleaning machine
   D. all
   E. No answer

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
2. _____

Information Sheet-3	Locating and storing hand and power tools

3.1 Storage

Tools are issued to the workers every Morning by the storekeeper, and returned in the afternoon after completion of Works. The supervisors need to ensure that the workers are issued the correct type of tools according to the work Activities they will be carrying out. The Storekeeper is responsible for keeping full records of the tools and controlling the issue of tools to the workers. The total number of tools on site needs to be Counted and reported regularly back to project management. The size of the store depends on the quantity of tools to be stored. When the work site is very isolated, the store has to be well stocked and will therefore be larger. Tools should be stored in a dry and secure place. They should be stacked neatly so that they can easily be counted. Stack different items and items of different sizes separately. Employ a watchman to guard the stores when the storekeeper is off duty.

Self-Check -1	Written Test

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

1. _____ is responsible for keeping full records of the tools and controlling the issue of tools to the workers.(3 points)

   A. Supervisor B. project manager

   B. Storekeeper D. site manager

2. The size of the store depends on the quantity of _____ to be stored.(5 points)

   A. Workers C. man power

   B. Raw materials D. Tools

Note: **Satisfactory rating - 3 and 5 points** **Unsatisfactory - below 3 and 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1. _____
2. _____

Learning Guide-20

LO1

Self check 1

1. c

2. a

Self check 2

1. b
2. b
3.

- ✓ Test the sharpness of tools on wood, not on your hand.
- ✓ Be careful when using your thumb as a guide during cutting the wood.
- ✓ Make sure your hands are not in front of sharp edged tools that are in use.
- ✓ Keep cutting tools sharp

Self check 3

1. b
2. c
3. c
4.

1. Keep all tools in good condition with regular maintenance.
2. Use the right tool for the job.
3. Examine each tool for damage before use and do not use damaged tools.
4. Operate tools according to the manufacturers' instructions.
5. Provide and properly use the right

Self check 4

1. waste management
2. water quality protection
3. noise, vibration;
4. dust and clean-up management

2.Environmental Health and Safety

Learning Guide-2

Self check 1

1. B
2. C
3. E
4. D

Self check 2

1.c

2.

1. **Corrective Maintenance**

2. **Preventive Maintenance**

Self check 3

1. c
2. d

Self check 4

1. false
2. false

Self check 5

1. d

Learning Guide-23

Self check 1

1. c
2. a

The trainers (who developed the LEARNING GIDE)

No	Name	Level	Emil
1	**GirumTadesse**	**B**	**Girumtadesse2011gmail.com**
2	**Wegderesfwkadu**	**B**	**Meherete2009@gmail/com**
3	**Begnakumsa**	**B**	**Begnakumsa5@gmail/com**
4	**MohammedNurgeba**	**B**	**mnurgeba@yahoo.com**
5	**Tihtenatadele**	**B**	

The facilitator (who the LEARNING GIDE)

No	Name	Qualification level	TVET Bureau
1	AYELE ESHETE	A	(ADIS ABABA TVET Bureau)