(Mineral Resources Infrastructure Work)

NTQF Level -1

Learning Guide # 35

Unit of Competence: - Use Hand and Power Tools

Module Title: **-** Using Hand and Power Tools

LG Code: **MIN MRI1 M10 LO2-LG-35**

TTLM Code: **MIN MRI1 TTLM 0819v1**

LO 2: Select and Use Hand Tools

Instruction Sheet	Learning Guide # 35

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

- Selecting Hand tools
- Checking tools for serviceability and safety
- Reporting faults
- Clamping or fixing materials in position
- Using hand tools safely and effectively
- Locating hand 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 Hand tools
- Check tools for serviceability and safety
- Report faults
- Clamp or fixing materials in position
- Use hand tools safely and effectively
- Locate hand tools safely

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 8.
3. Read the information written in the "Information Sheets 1". Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish from "Self-check 1 up to Self-check 6
5. Ask your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check).
6. If you earned a satisfactory evaluation proceed to "Information Sheet 2". However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Information Sheet 2
7. If you earned a satisfactory evaluation from the "Self-check" proceed to "Operation Sheet 1 in page 26
8. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Select Hand tools

1.1 Meaning of Hand Tools

A tool held on the hand and operated without power and electricity.

1.2 Select appropriate hand tools

Safe and effective use of hand tools is an important part of mining. Accidents can be caused by the misuse of hand tools, therefore it is important for you to become familiar with their safe use. This section provides an overview of the hand tools most commonly used in mining activities.

1.3 Hand Tool Safety: Selecting the correct hand tool for the job is vital for productivity, tool life and safety. Many hand tools operate on the principle of Mechanical Advantage (Through Leverage). This means the longer the effective lever, the greater the applied force (or torque).

1.3.1 Hand Tool safety precautions

- Select and use the correct tool for the job
- Wear appropriate PPE
- Check blades, bits and attachments for sharpness and security.
- Know the capability and limitation of the tool.
- Keep your work area clear of rubbish and off-cuts.
- Never over-reach or apply excessive force when using hand tools.
- If required, firmly clamp or fix any work material in position before using the hand tool on it.
- Check handles for cracks, splinters and general wear and damage.
- Keep handles free of moisture and grease.
- Check that the work area is clear of obstacles that may pose a trip hazard.
- Check that the material you are using the hand tool on is not situated in front of or near power or service lines.

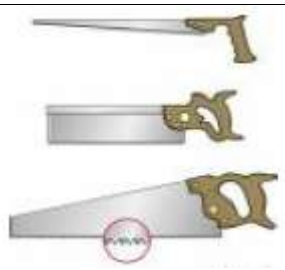
1.4 Common Mining hand tools: During Surface mining activity we might use the following tools:

Clamps	Hammers	Spades
Vices	Measuring tapes	Sledge hammers
Adjustable spanners	Axes	Spanners
Crow bars	Rakes	Wrenches
Pinch bars	Hand augers	Spirit levels and
Bolt cutters	Picks	Wire cutters
Chisels	Mattocks	File
Hacksaws	Pliers	Screwdriver
Handsaws	Shovels	Retractable cutters

1.5 Some Hand Tools with their Application

No	Name	Hand Tool Image	Uses
1	Hoe		• This tool is used to digging and to place concrete, cement mortar in head pan • The blade of the hoe rests on the ground and is moved back and forth to remove and breaking into hardened soil
2	Wheel Barrow		• This tool is used to transport cement mortar or any materials. Sometimes it also be used to measure the quantities of materials for site level concrete mixing
3	Sand screening tool		▪ This tool is used to sieve sand at site.
4	Chisel		▪ This tool is used to remove excess or waste hard concrete
5	Crow Bar		▪ This tool is used in formwork to remove nails from boards
6	Framing Hammer		▪ This tool is used to drive and remove nails
7	Hand Saw		This tool is used in wood works and shuttering

8	Spirit-levels		▪ Use it against smooth surfaces such as walls or while building to ensure that surfaces are straight and corners are at a 90° angle.
9	Pick axes and mattocks		• Picks and mattocks are used to work soil that is hard, rocky or root filled. • A pick has a pointed tip on one end and a chisel like tip on the other. • Mattocks are used for loosening soil that is root filled. • Mattocks have an axe-head on one side and a flat hoe like head on the other.
10	Spades		▪ Spades are useful for cutting and digging heavy soil, digging straight-sided, flat-bottomed trenches, or removing a layer of sod.
11	Shovels		• Shovels are used for digging and lifting loose soil or other substances. • Useful tools to be used if you have a large amount of lightweight material to move is a wide scoop shovel
12	Rakes		▪ Steel garden rakes are used to level and prepare seedbeds for sowing.

13	Hammers		• Hammers are used nail nails or hooks into walls or wood (small hammers). • Rubber hammers are used to level tiles. • If you want to break down walls and concrete structures you need a sledge hammers. • It is essential to use the correct hammer for the specific job. • Small carpentry hammers are provided with an end that can remove nails.
14	Saws		• Generally handsaws are used to saw through wood. • There are specialized saws available that are operated by two people that were designed for cutting down trees. • Bow saws are used to trim trees or cut down branches.
15	Pliers		Pliers are used for various purposes, including: • Tightening wire. • Fixing wire. • Gripping bolts to tighten with a spanner. • Selected pliers are equipped with wire stripping edges and can strip the outer insulating layer off electrical cord
16	Spanners		▪ Various bolts can be fastened or loosened using the spanner of the correct size.
17	Screw drivers		• Tighten or loosen screws of different sizes. • Flat ended screwdrivers are used to tighten or loosen flat head screws, whilst Philips screwdrivers (“star”) are used for star head screws. • Some screwdrivers are magnetic and will hold the screw to the tip of the screwdriver.

Self-Check -1	Written Test

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

Instruction one: Match the following with their similarities from Column "B" to column "A"(5point)

A	B
1. Saws	A. This tool is used to digging and to place concrete, cement mortar in head pan
2. Hoe	B. used to saw through wood.
3. Shovels	C. various bolts can be fastened
4. Spades	D. useful for cutting and digging heavy soil
5. Spanner	E. Used for digging and lifting loose soil or other substances.
	F. Used for drilling metal part

Instruction two: Give shot answer for the following questions

1. Mention at least common mining hand tools?2.5 point
2. Define what mean hand tools? 2.5 point

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-2	Check tools for serviceability and safety

2.1. The importance of Hand Tool serviceability

Routine maintenance tasks refer to on-going, scheduled tasks that are performed in order to keep hand tools and basic equipment functioning properly.

2.2. Hazard identification

A hazard is something with a potential to cause loss or harm. You need to always be aware of potential hazards at work.

Hazards arise from:

- The work conditions
- the use of machinery and substances
- poor work procedures and design
- wrong or out-of-date systems and procedures
- inappropriate actions or behavior

2.3. Hazard classification

Once hazards have been identified, they must be classified. This is done to help prepare a Hazard Management Plan. Hazards are classified into five broad areas.

A. **Physical**- noise, radiation, light, vibration
B. **Chemical**- poisons, dusts
C. **Biological**- viruses, plants. parasites
D. **Mechanical**- tools, electrical equipment
E. **Psychological**- fatigue, violence, bullying

2.4 .Special hazards in a mine environment

- Moving vehicles – dump trucks, loaders, underground shuttle cars
- Gas inflows
- Unstable ground – be aware but normally handled by a senior person

2.5. Sources of Advice

Information about reporting hazards or any concerns you may have about safety risks at work can be reported to a:

- Supervisor
- Health and safety officer
- Health and safety representative
- Health and safety committee (usually found in larger workplaces

2.5 Risk management in the workplace

Risk: The chance of something happening that will have an impact upon objectives. Risk management protects people's safety and creates a safe work environment. In Workplace Health and Safety (WHS) terms, risk management is a way of identifying situations that might cause harm to people or property. It also includes acting to prevent a harmful situation happening or a person being hurt.

Self-Check -2	Written Test

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

1. Writ the importance of hand tool serviceability? 4 point
2. Write the difference between risk and hazard? 4 point
3. List the classification of hazards? 2 point

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-3	Report faults

Introduction

In this session we explore possible problems and malfunctions that might be experienced during the use of hand tools and explore how this may be remedied. We will further discuss the importance of reporting problems that with tools and equipment as well as the correct procedure to follow to report a problem or malfunction.

3.1 Problems and malfunctions of hand tools

All tools require regular maintenance to work properly. Clean all tools after each use with water and treat with a penetrating oil to prevent rust. Tools that require a sharp edge must be sharpened regularly as sharp tools are safer and more efficient to use.

- Various sharpening methods are used depending upon the tool.
- It is important to become familiar with the methods relevant to the tools you use.
- Check tools regularly for loose nuts and screws and tighten as needed.
- Sand rough handles and repair cracks as soon as they are noticed to prevent injury.
- Store tools in a dry area out of the elements.
- Hanging tools against a wall is an ideal way to organize the store tools in a shed.

3.2 Reporting problems and defective tools

Broken or damaged tools can cause injury or accidents in the workplace. The quicker problems are reported, the quicker the tool can be fixed or replaced and the less the risk or injury.

Broken or incomplete tools must not be used but placed in a special place for it to repaired or adapted. This will prevent injury and will enhance the life of the tool. Persons with proper training and skill should repair tools. Preventative maintenance like fastening loose nuts or shafts will greatly reduce the need for large-scale repairs.

3.3 Reporting problems and malfunctioning of tools

- Every work site has its own set of procedures and systems to deal with the organizing, issuing and controlling tool stock.
- It is important that you find out who is responsible for different aspect regarding tools and equipment on the job where you work.
- Also you should know who you have to report problems or defects to.
- Do not attempt to fix, maintain or use a tool if you have not been trained to do so.
- It is essential that problems and malfunctions be immediately reported to the correct person to prevent risk of injury through the use of the tools.

Self-Check -3	Written Test

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

Say true if the statements is correct and say false if the statement is incorrect

1. All tools require regular maintenance to work properly. 2point
2. Broken or damaged tools can cause injury or accidents in the workplace. 2point
3. The quicker the tool can be fixed or replaced and the less the risk or injury. 2point
4. Broken or incomplete tools must not be used but placed in a special place for it to repaired or adapted. 2point
5. Supervisors need to be trained to check that laborers use tools in a proper way. 2point

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-4	Clamp or fix materials in position

4.1 Definition of Clamping

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.

4.2 Rules for clamping

1. Always use a piece of scrap wood between each jaws of the clamp and the work piece to prevent damage.
2. When a clamp is positioned, close the jaws until the clamp feels tight, when gluing, some will be squeezed out around the joint, a sign that it is tight enough.
3. Clamping pressure should be applied at right angles to the glue line otherwise slippage may result.
4. Do not over tighten; if the fit is accurate only moderate pressure is required, the purpose of a clamp is only to maintain uniform pressure between the two surfaces, not to force them to fit.

4.3 Principles of Clamping

A. Principles of Clamping Position:

- Clamping system should be positioned at thick sections of the work piece.
- Clamping should be positioned to direct the clamping force on a strong, supported part of the work piece.
- Clamping on unsupported part bends slender work pieces, affects accuracy of operation.
- Clamping system should not obstruct loading and unloading of the work piece.
- Clamping system should not obstruct the paths of cutting tool.
- Operator should be able to operate clamps easily and safely
- A vertical hole drilled in the bent work piece would become angular when the unclamped work piece springs back to its original shape.

B. Principles of Clamping Strength:

- The clamping system should be capable to hold the work piece securely against the forces developed during operation.
- Clamping device should be capable to be unaffected by the vibrations generated during an operation.
- The clamping force should not dent or damage the work piece with excessive pressure.

- For clamping weak and fragile work piece, clamping force should be equally distributed over a wider area of the work piece.
- While clamping soft work piece, clamps should be fitted with pads or softer materials such as Nylon or Fiber to prevent damage and denting of the work piece.
- Clamping faces should be hardened by proper treatments to minimize their wearing out.

C. Principles of Clamping Productivity:

- Clamping time should be minimized by using hand knobs, knurled screws, hand wheels and handles, and so that clamp can be tightened or loosened manually
- Most of the clamps use hexagonal nut or hand nut Hand operated clamping devices

D. Principles of Clamping Operator Fatigue:

- Operator fatigue should be taken into account.
- Clamping should be operator friendly.
- Clamping and releasing should be easy and less time consuming.
- Maintenance should be easy.
- It is better to use pneumatic or hydraulic clamping which reduces operator fatigue and saves clamping time.
- Hand nuts are more convenient for the operator than hexagonal nuts because a spanner is not required to tighten them.

4.4 Types of Clamps and their function

No	Name of clamp	Image of clams	Function
1	Bench vise		▪ Used to secure an object to allow work to be performed on it ▪ Vises have two parallel jaws, one fixed and the other movable, threaded in and out by a screw and lever.
2	G Clamp		It can be used to clamp a work piece to a work surface or two parts of a work piece together. Jaw openings range from about one inch to over 8 inches.. The end of the screw section normally has a swivel head which enables the clamp to sit on irregular surfaces.

3	Hand Screw Clamps		Metal Hand Screw Clamps are mainly used in metal work; however they do have a use to clamp small items. Wooden Hand Screw Clamps are ideal for furniture repairs, the adjustable jaws will also fit angled material
4	Sash Clamp		The clamp has a flat bar with a fixed jaw that adjusts with a screw action and a sliding jaw that is locked in positioned along the bar to suit the job being undertaken. These clamps are for big tasks such as sash windows, table tops, doors etc.
5	Pipe Clamps		These are very similar to the Sash cramps but using a round shaft instead of the flat bar. The length is determined by the length of the pipe used, they can be lengthened by adding additional length of tube
6	Bench Clamps		2 piece bench clamp which are designed to fit workbenches with holes 18-38mm. Clamping range 0-80mm. Those shown include quick release clamping action.
7	Quick Action Clamp		One hand operated clamp (operates like sealant guns) ideal for quickly and easily clamping all kinds of work pieces. Simple single finger release.
8	Quick Grip		Features one-handed operation with adjustable pressure, best for thin pieces as the jaws do not close square.
9	Power Clamp		Exact application of force and maximum power in a single movement.

10	Screw Clamp		Fast and powerful closing / opening due to special thread and handle grip
11	Speed Clamp		A metal bar with serrations. As the clamping pressure is applied the serrations lock & secure the sliding head.

Self-Check -4	Written Test

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

1. Write the advantage of clamping system? 3point
2. Mention the principles of clamping? 3point
3. List at least four types of clamping? 4pont

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-5	Use hand tools safely and effectively

5.1 Safe Use of Hands Tools

Hand tools include a wide variety of non-powered devices such as spanners & shifters, pliers, hammers, and screwdrivers. These tools may seem harmless, but they are the cause of many injuries. The two most common hazards associated with the use of hand tools are misuse and improper maintenance.

- Misuse occurs when a hand tool is used for something other than its intended purpose.
- Improper maintenance allows hand tools to deteriorate into an unsafe condition.

5.2 All Hand Tools

- Ensure you are properly trained to safely use the tool.
- Ensure you have the correct PPE for the task, some tools require different PPE to others.
- If the tool has guarding or other safety devices they shall be fitted as per the manufacturers specifications
- Inspect the tool for damage and or wear before use.
- Specially designed tools may be needed in hazardous environments. (Always use non-sparking tools in the presence of flammable vapors or dusts. Insulated tools with appropriate ratings must be used for electrical work).
- Never modify or alter a tool from its original manufacturers design.
- Never use homemade tools unless authorized to do so (check the prohibited items register).
- Never use a tool that is prohibited from site (check the prohibited items register).
- If in doubt stop the task and seek further advice before recommencing.

5.2 What follows are some tips on routine maintenance safely and effectively

- Use the correct tool for the job.
- Keep tools in good condition. Handles should be tight and free from defect.
- Cutting tools should be kept sharp.
- Wedges and punches should be free from "mushroom heads".
- Use and maintain power tools according to their operator instructions.
- Make sure power tools are properly grounded or are double insulated.
- Switch off and unplug power tools before changing blades or servicing and repairing.
- Wear clothing that is free of strings or loose ends that could catch.

- Wear appropriate personal protective equipment (PPE), such as glasses, goggles, dust masks, face shields, hearing protection, etc.
- Keep by standers at a safe distance.
- Keep all guards and shields in place.
- Unplug and store tools after use.
- Consider keeping power tools locked up to prevent unauthorized use.
- Check water and oil levels in machinery.
- Check and maintain cables and plugs.

Self-Check -5	Written Test

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

1. Write the advantage of safe use of hands tools?2.5 point
2. List at least four tips on routine maintenance safely and effectively? 2.5 point

Note: **Satisfactory rating – 2.5 points** **Unsatisfactory - below 2.5 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-6	Locate hand tools safely

Proper Storage of Tools & Equipment

6.1 Importance of proper storage of tools and equipment

- It is an important factor for safety and health as well as good business.
- Improves appearance of general-shop and construction areas.
- Reduces overall tool cost through maintenance.
- This also ensures that tools are in good repair at hand.
- Teaches workers principles of (tool) accountability.

6.2 Pointers to follow in storing tools and equipment:

- Have a designated place for each kind of tools.
- Label the storage cabinet or place correctly for immediate finding.
- Store them near the point of use.
- Wash and dry properly before storing.
- Store knives properly when not in use with sharp edge down.
- Put frequently used items in conveniently accessible locations.
- Gather and secure electrical cords to prevent entanglement or snagging.
- Cutting boards should be stored vertically to avoid moisture collection.
- Metal equipment can be stacked on one another after drying such as storage dishes and bowls.

Make sure the areas where you are storing the equipment are clean, dry and not overcrowded.

Self-Check -6	Written Test

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

1. **Write at least three importance of proper storage of tools and equipment?** 2.5 point
2. **Mention at least four pointers to follow in storing tools and equipment.** 2.5 point

Note: **Satisfactory rating - 2.5 points** **Unsatisfactory - below2.5 points**

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Operation Sheet 1	Steps taken to conduct risk management.

Steps taken to conduct risk management

Step 1- hazard identification: identify and classify the problem

Step 2- risk assessment: determine how serious the problem

Step 3- risk elimination or control: decide and action what needs to be done to solve the problem

Step 4- documenting risk assessment: Access procedures to maintain the elimination or control of the risk

LAP Test	Practical Demonstration

Name: _____ Date: _____

Time started: _____ Time finished: _____

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

Task 1. Mention the steps taken to conduct risk management

List of Reference Materials

1. Drilling, mining, quarrying, civil infrastructure, 2015
2. Hand and Power Tools Safety, Environmental Health and Safety Department, 2012 http://www.utdallas.edu/ehs
3. Learner guide primary agriculture Select, Use and Care for Hand Tools and Basic Equipment and Infrastructure.
4. Safe use hand and power tools, 2012