Furniture Making

Level II

Learning Guide #1

Unit of Competence: Perform Equipment Maintenance

Module Title: Performing Equipment Maintenance

LG Code: IND FMK2 M01 0919 LO1-LG-01

TTLM Code IND FMK2 M01 TTLM 0919V1

LO1: Prepare for work

Instruction Sheet	Learning Guide #1

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

1.1. Tools and Equipment

1.2. Maintenance supplies

1.3. Basic routine maintenance

1.3.1. Dismantling and assembling

1.3.2. Testing and tightening

1.3.3. Minor adjustments and repairs

1.3.4. Routine servicing procedures

1.4. Identifying fault/unsafe machineries according to enterprise requirements

1.4.1. Standard Operating Procedures (SOPs),

1.4.2. Industry standards

1.4.3. Production schedules

1.4.4. Material Safety Data Sheets (MSDSs),

1.4.5. Work notes and plans

1.4.6. Product labels, manufacturers specifications,

1.4.7. Operators' manuals, enterprise policies and procedures

1.5. OHS requirements

1.5.1. Protective clothing and equipment

1.5.2. Use of tools and equipment

1.5.3. Workplace environment and safety

1.5.4. Handling of materials

1.5.5. Use of firefighting equipment

1.5.6. Organizational first aid

1.5.7. Hazard control and hazardous materials and substances

1.5.8. Safe operating procedures

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

- Identify Tools and supplies required to carry out basic routine maintenance tasks
- Identify Faulty or unsafe machinery and equipment for repair or replacement
- Identify OHS hazards in the workplace

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the information “Sheet 1, Sheet 2, Sheet 3, Sheet 4, and Sheet 5”.
4. Accomplish the “Self-check 1, Self-check t 2, Self-check 3, Self-check 4 and Self-check 5” **in page -7, 8, 12, 17, and 25** respectively.

Information Sheet-1	Tools and Equipment

T

ools

- 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.

Tool and Equipment Safety Rules

- Observe and follow Student Shop Rules as posted.
- Understand and follow manufacturer operating procedures.
- Inspect the tool for damage prior to use.
- Verify all guards are in place and adjusted properly.
- Do not bypass any safety devices.
- Only use the tool when it is secured to the floor via a pedestal or work bench.
- Always stay at the machine while it is running.
- Clean the tool after use.
- Report any malfunction or damage to the Shop Supervisor after tagging the tool “Out of Service, do not use”.
- Always disconnect the plug from the power source before making any adjustments, changing, or physically inspecting the blade.
- Never use another person as a substitute for a table extension or as additional support.
- Do not attempt to cut pieces of stock that are too small to easily hold with your hands. Use clamping devices and/or jig fixtures instead.
- Always stand with your face and body to one side of the saw blade when making cuts.
- Never make free-hand cuts by raising the work piece into the blade.
- Never feed the saw into the work piece at a rate faster than it can accept.
- Never pull the blade beyond the point necessary to make the cut as the back of the blade could lift the work piece and throw it over the fence.
- The saw must have a device installed which will automatically return the cutting head to the back of the track when released from any point of its travel.
- The saw must have a mechanical limit to prevent the cutting head from traveling beyond the front edge of the table.

Operation Sheet 1	Use hand and power tool safely

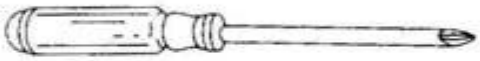
Steps 1- select the right tool for the job

Steps 2- keep tools in good condition

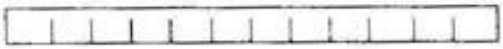
Steps 3- use tools the correct way

Steps 4- keep tools in a safe place

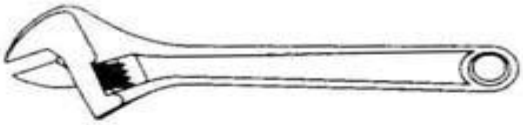
Medium screwdriver



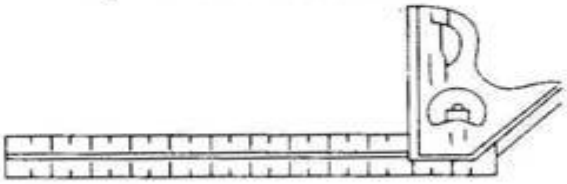
#2 Phillips screwdriver



Straight edge



Adjustable wrench



Combination square

13mm Wrench

- Combination wrench
- Hex key
- Framing square
- Medium size flat blade screw driver

Drilling tools

- ⇨ Drilling tools are used in conjunction with drill bits to drill holes in material such as wood, steel and plastics.
- ⇨ 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.

Magnetic micro-adjustable planer and jointer knife alignment gauge - # 30-025

Keeps knives in perfect alignment, accurate to +/- 0.001". Suitable for all planer and jointer knives from 6" – 26" in length. The easiest way to set planer and jointer knives.

Dial-gauge micrometer for knife alignment - # 30-050

Precision built, easy to adjust, mounted on enamel finished alloy steel. Designed to rest squarely on the cutter head for fast accurate knife alignment. Dial is easy to read and adjust.

Dust Collectors

- ➢ Dust collectors contribute to a cleaner more healthful workshop environment.
- ➢ We offer a wide selection of top quality dust collectors to suit all your shop needs

Grease Gun

A grease gun is used to apply grease or oil to car parts, machinery, tools, etc. through the grease nipple. A grease gun can inject grease into areas that are difficult to reach. Using a grease gun can be easy once you have taken it apart and loaded it. By doing this, you immediately see how the gun works and you are ready to use it with no further directions

Self-Check -1	Written Test

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

1. List hand and power tool safely**?** (**4points)**
2. What is the function of grease gun? (**2points)**

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

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

Information Sheet-2	**Maintenance supplies**

Maintenance, Repair, and Operating supply items are supplies utilized in the production process that is not ultimately seen in the end products themselves. Maintenance, Repair, and Operating items may include:

- Gloves
- Safety equipment
- Industrial Equipment (valves, compressors, pumps)
- Consumables (cleaning, laboratory and office supplies)
- Plant upkeep supplies (lubrications, Gaskets, repair tools)

Lubrication is the process or technique of using a lubricant to reduce friction and wear in a contact between two surfaces.

Lubricants can be solids (such as Molybdenum disulfide MoS_2),[1] solid/liquid dispersions (such as grease),liquids (such as oil or water), liquid-liquid dispersions or gases

Self-Check -2	Written Test

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

1. List Maintenance supplies? (**3 points)**

Note: **Satisfactory rating – 3 points** **Unsatisfactory - below 3 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	Basic routine maintenance

Performs routine maintenance on machine/ equipment such as lubricating, cleaning, oil, and checking parts etc…

Basic routine maintenance

- Checking/ cleaning machine parts
- Keep the saw clean
- Keep the blades sharp
- Clean and lubricate parts
- Adjust and inspect the parts
- Changing the motor brushes
- replacing the drive belt
- checking/ changing the friction wheel

General requirements for equipment maintenance include:

- Obtaining a copy of the maintenance schedule recommended by the manufacturer.
- Ensuring that maintenance is performed as required.
- Ensuring that the person(s) performing the maintenance are competent (e.g. licensed mechanic).
- Retaining records of maintenance/service conducted.
- Specifying who is responsible for overseeing equipment maintenance and where the records are kept.
- Set up a system for removal and tagging of damaged or defective tools and equipment.

1.3.1. Dismantling and assembling

Dismantling equipment

The main stages of dismantling are;

- Dismantling proper, taking the machine parts and in a strict sequence.
- Dismantling should commence with the removal of guards, protective devices, followed by disconnection of transmissions and withdrawal of belts, after which the machine is broken-down into its units in a definite order.
- Cleaning can be done by kerosene and petrol
- Cleaning, washing and wiping, drying the dismantled parts.

1.3.2. Testing and tightening

All preparatory measures are carried out during the first stage;

- They include check of the quality of work performed on machine and its output, all inconveniences; weak spots in the machine during its operation and servicing are found out.
- Second stage of the preliminary operations, consists of the following measures;

1) Removing all guards and protective arrangements of machine to facilitate access and inspection of moving and guiding parts of the machine. Removing or loosening flexible transmissions (belt, rope and chain drives etc.
2) Inspecting and checking the condition and position of external rubbing parts subjected to impact loads and high stresses (tables, slides ,carriages, screws etc,)
3) Inspecting and checking the tightness and rigidity of the fixed joints on the machine.
4) Checking the radial and axial play of the movable joints.
5) Checking the smoothness of travel and positions of all moving parts directly by hand or with levers.
6) Checking the condition and action of locking and all fastening arrangements and also the starting, control and braking devices.
7) Checking the foundation bolts.

1.3.3. Minor adjustments and repairs

- Repair means responding to the breakdown of equipment and undertaking work to correct the problem in order to return the equipment to a working condition.
- Before equipment can be repaired, you need to be aware that there is a problem! Therefore, there should be a clearly understood **system for reporting faults and breakdowns** and equipment users should be encouraged to report faults and breakdowns as soon as possible.

- **Simple repairs** can be done by the in-house or external **maintenance and repair team**.
- **More complex repairs** will be carried out by **specialized maintenance personnel**

Basic repair operations

The operations involved in woodworking machinery can be classified into 5 basic types;

1) Local tightening up of loosened worn parts.
2) Local fastening of worn, broken parts.
3) Partial adjustment of position, interconnection and interaction between individual parts of machine.
4) Partial restoration of broken parts.
5) Partial replacement of worn, broken or missing parts.

1.3.4. Routine servicing procedures

- Different maintenances strategy is going to be formulated; there are many maintenance procedures that could be chosen, from sophisticated procedures to low level procedures.
- In reality there is a mix between different procedures due to the variety equipment in the plant and because of economic consequences the equipment causes if a scheduled stop occur.

A) ***Operate to break down (unplanned corrective maintenance) (O.T.B.D)***

- ✓ If all maintenance jobs carried out in the plant are O.T.B.D, maintenance will result in low availability performance and high maintenance coast.
- ✓ Coast for down time will be extremely high.
- ✓ Maintenance is controlled by the unplanned demand for maintenance.
- ✓ Maintenance effectiveness is low; maintenance work is pressing and some- times dangerous due to the fact that safety procedures are often neglected.
- ✓ Sometime this maintenance procedure has to be practiced purposely because of economic or technical reasons.
- ✓ But only for equipment which this procedure has been decided for. If all maintenance are carried out are break down jobs, the maintenance strategy is completely wrong.

B) Fixed time maintenance (F.T.M)

- ✓ Fixed-time maintenance will result in less expensive maintenance and less down-time compared to operate to breakdown procedure.
- ✓ Fixed-time maintenance work is established for important machinery. Components whose life-time can be estimated are replaced or reconditioned.
- ✓ Preventive maintenance base only on the fixed-time maintenance procedure will not give the expected results since parts are having individual life time.
- ✓ Some parts will be replaced too often, and results in unnecessarily coast. Some parts will go breakdown and creates high down time costs.

C) Condition-based maintenance, (C.B.M)

- ✓ Condition-based maintenance will result in optimized availability and maintenance cost and is giving the best profitability.
- ✓ This maintenance procedure can be considered as just in time maintenance.
- ✓ Condition-monitoring of equipment while in operation will make possible planning corrective maintenance and a flexible maintenance planning coordinated with production planning production down-time due to e.g. changes of tools, changes of product etc., will be utilized for maintenance work.
- ✓ This maintenance procedure has resulted in extremely low down-time and high availability.

D) ***Design out maintenance, (D.O.M.)***

- ✓ This maintenance procedure means that actions are taken to design out failures completely. The failure newer occurs again after the design out action has been taken.
- ✓ Follow up of carried out maintenance is crucial to be able to practice this procedure.
- ✓ It must be known what is going on with the equipment in the plant, if there are any repetitive failures and the reason there of.
- ✓ When a failure is designed out the need of maintenance will decrease and the availability performance arise?
- ✓ When designing /procuring machinery, maintenance demands should be far more emphasized.
- ✓ To buy the cheapest equipment will very often result in high costs for maintenance, low availability and short technical life-time.

Information Sheet-4	Identifying fault/unsafe machineries according to enterprise requirement

- ✓ High quality equipment is normally more expensive but will result in lower costs for maintenance, better availability performance and longer technical life-time.

E). Life-time extension, (L .T .E.):-

- ✓ Life-time extension shall always be in mind of maintenance people. If the life-time of parts can be extended by making some modification, renewal of material etc.,
- ✓ The demand for both preventive and corrective maintenance will decline. Follow up of maintenance carried out is essential to practice the L.T E. procedure.

F). Redundancy, (R.E. D.):

- ✓ Redundancy means that a spare machine or part is installed in parallel with the original.
- ✓ This means that the spare machine or part can be stated and connected to the production line, if the original one stops unforeseen.
- ✓ This procedure is very expensive to as it requires double function of equipment.
- ✓ If an unplanned stop create big losses or other consequences and is inevitable, the procedure must be practiced if it is economically.

Self-Check -3	Written Test

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

1. What are general requirements for equipment maintenance? (**2 points)**
2. List Routine servicing procedures? (3 points)
3. List Basic routine maintenance? (2 points)

Note: **Satisfactory rating – 7 points** **Unsatisfactory - below 7 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Questions

1.4.1. Standard Operating Procedures (SOPs),

- A **standard operating procedure**, or **SOP**, is a set of step-by-step instructions created by a business to help workers carry out routine operations.
- Their purpose is to achieve efficiency, quality output and uniformity of performance, while reducing miscommunication and failure to comply with industry regulations.

Health and safety

- Procedures are extensively employed to assist with working safely.
- They are sometimes called safe work methods statements (SWMS).
- They are usually preceded by various methods of analyzing tasks or jobs to be performed in a workplace, including an approach called job safety analysis, in which hazards are identified and their control methods described.
- Procedures must be suited to the literacy levels of the user, and as part of this, the readability of procedures is important

1.4.2. Industry standards

- In manufacturing, a measure of excellence or a state of being free from defects, deficiencies and significant variations.
- It is brought about by strict and consistent commitment to certain standards that achieve uniformity of a product in order to satisfy specific customer or user requirements.
- A **technical standard** is an established norm or requirement for a repeatable technical task. It is usually a formal document that establishes uniform engineering or technical criteria, methods, processes, and practices. In contrast, a custom, convention, company product, corporate standard, and so forth that becomes generally accepted and dominant is often called a *de facto* standard.
- A technical standard may be developed privately or unilaterally, for example by a corporation, regulatory body, military, etc. Standards can also be developed by groups such as trade unions and trade associations. Standards organizations often have more diverse input and usually develop voluntary standards: these might become mandatory if adopted by a government (i.e., through legislation), business contract, etc.
- The standardization process may be by edict or may involve the formal consensus of technical experts.

1.4.3. production schedules

Complete, thorough, and current documentation is essential to an effective maintenance program.

Whether you are performing preventive, predictive, or reliability-centered maintenance, keeping track of equipment condition and maintenance performed or planned is critical.

- Maintenance recommendations contained in this report should be used as the basis for establishing or refining a maintenance schedule.
- The maintenance recordkeeping system must be kept current so that a complete maintenance history of each piece of equipment is available at all times.
- This is important for planning and conducting an ongoing maintenance program and provides documentation needed for the Power.
- Regular maintenance and emergency maintenance must be well documented, as should special work done during overhauls and replacement.

1.4.4. Work notes and plans

Importance of taking notes

- **Taking notes helps you remember**
  - Unless you have the memory bank of a super computer, you need to take down notes to remember things.
  - Even if you're good at memorizing stuff, taking notes will relieve the mind of that extra task of recalling things at the office.
- Taking notes sharpens your focus
- Taking notes is your document of proof

Four Tips to Take Notes Effectively

- Use pen and paper
- Learn shorthand
- Just highlight the key points
- Prepare a written report immediately after the work

Work notes and plans

Circular saw		
Maintenance	Time-frequents	Remark
General cleaning of the machine and around the machine	Daily	With compressed air and broom
Cleaning of the saw table	Daily	With compressed air
Cleaning of the motor area	Daily	With compressed air, broom or clothe
Observing the saw blade	Daily	Dull and damaged saw blade leads to unsafe operation of the circular saw and unclear saw cut
Changing of the saw blade	If dull or necessary	Dull and damaged saw blade leads to unsafe operation of the circular saw and unclear saw cut
Control of the adjustment of the riving knife	Daily	Incorrect adjustment of the riving knife leads to an unsafe operation of the circular saw
Control of v-belt tension	Weekly	If one belt is worn both belts have to be replaced
Creasing / oiling of the saw table	Four month	Thin film of oil or grease have to be applied to prevent rust
Greasing of the slide of sliding table	Two month	Saw dust will stick on the slide if too much greased

Thickness planner		
Maintenance	Time-frequents	Remark
General cleaning of the machine and around the machine	Daily	With compressed air and broom

Cleaning of the table	Daily	With compressed air
Cleaning of the cutter-block	Daily	With compressed air
Cleaning of the rubber rollers	Daily	With oil products, not acid products
Cleaning of the motor area	Daily	With compressed air, broom or clothe
Oiling of the feed chain of the feed rollers	Weekly	
Control of v-belt tension	Weekly	If one belt is worn both belts have to be replaced
Observing the cutting knifes	Daily	If one cutting knife is dull all cutting knifes have to be changed
Creasing / oiling of the work table	Four month	Thin film of oil or grease have to be applied to prevent rust

Surface planner		
Maintenance	Time-frequents	Remark
General cleaning of the machine and around the machine	Daily	With compressed air and broom
Cleaning of the in-feed and out-feed table	Daily	With compressed air
Cleaning of the cutter-block	Daily	With compressed air
Cleaning of the motor area	Daily	With compressed air, broom or clothe
Control of v-belt tension	Weekly	If one belt is worn both belts have to be replaced
Observing the cutting knifes	Daily	If one cutting knife is dull all cutting knifes have to be changed
Creasing / oiling of the work table	Four month	Thin film of oil or grease have to be applied to prevent rust

1.4.5. Product labels, manufacturers specifications,

- This information should form the basis of any inspection schedule. If this documentation isn't available it may be possible to get copies from the manufacturer or supplier or download information from the internet.
- Labels allow items to be identified and are often the first point of contact between the customer and the product.
- This is the primary function of labels, allowing for items to be differentiated even if they belong to the same brand.

1.4.6. Operators' manuals, enterprise policies and procedures

- **Manua**l describes how to operate the machine properly and safely.
- Be sure to follow the safety tips and instructions stated in the manual
- Before beginning any work on the machine read and understand safety and the respective safety guidelines.

➢ The **operations manual** is the documentation by which an organization provides guidance for members and employees to perform their functions correctly and reasonably efficiently.

➢ It documents the approved standard procedures for performing operations safely to produce goods and provide services.

✓ The **policies and procedures** were explained in detail to each employee during their first week of employment with the company.

✓ Every company has different **policies and procedures**. Your first day you will be given a packet that outlines what the company expects as far as dress code, behaviors, time off and holidays.

✓ It is good to keep it on hand to reference when questions arise about what the company allows and doesn't allow.

Self-Check -4	Written Test

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

1. What is **an operation manual**? (**2 points)**

Note: **Satisfactory rating – 2 points** **Unsatisfactory - below 2 points**

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Short Answer Question

Information Sheet 5	OHS requirements

1.5.1. Protective clothing and equipment

Woodworking workers exposes to a variety of hazards, including kickbacks, flying wood chips, noise, wood dust, and chemical hazards. Personal protective equipment (PPE) can help protect against these hazards

Personal Safety

- **Stay alert.** Watch what you are doing, and use common sense when operating a power tool. Do not use a power tool while tired or under the influence of drugs, alcohol, or medication. A moment of inattention while operating power tools may result in serious personal injury.
- **Dress properly.** Do not wear loose clothing or jewelry. Contain long hair. Keep your hair, clothing, and gloves away from moving parts. Loose clothes, jewelry, or long hair can be caught in moving parts.
- **Avoid accidental starting**. Be sure the Power Switch is off before plugging in. Carrying power tools with your finger on the Power Switch, or plugging in power tools with the Power Switch on, invites accidents.
- **Remove adjusting keys or wrenches before turning the power tool on.** A wrench or a key that is left attached to a rotating part of the power tool may result in personal injury.
- **Do not overreach.** Keep proper footing and balance at all times. Proper footing and balance enables better control of the power tool in unexpected situations.
- **Use safety equipment.** Always wear eye protection. Dust mask, non-skid safety shoes, hard hat, or hearing protection must be used for appropriate conditions.

1.5.2. Use of tools and equipment safety

Tool safety

- **Do not force the tool.** Use the correct tool for your application. The correct tool will do the job better and safer at the rate for which it is designed.
- **Do not use the power tool if the Power Switch does not turn it on or off.** Any tool that cannot be controlled with the Power Switch is dangerous and must be replaced.
- **Disconnect the Power Cord Plug from the power source before making any adjustments, changing accessories, or storing the tool.** Such preventive safety measures reduce the risk of starting the tool accidentally.
- **Store idle tools out of reach of children and other untrained persons.** Tools are dangerous in the hands of untrained users.
- **Maintain tools with care.** Keep cutting tools sharp and clean. Properly maintained tools with a sharp cutting edge are less likely to bind and are easier to control. Do not use a damaged tool. Tag damaged tools “Do not use” until repaired.

- **Check for misalignment or binding of moving parts, breakage of parts, and any other condition that may affect the tool's operation.** If damaged, have the tool serviced before using. Many accidents are caused by poorly maintained tools.
- **Use only accessories that are recommended by the manufacturer for your model.** Accessories that may be suitable for one tool may become hazardous when used on another tool.

Woodworking tools can be dangerous if not used properly.

- Only use woodworking machines that you have been trained to use properly and safely.
- Read the owner's manual carefully.
- Make sure you understand instructions before attempting to use any tool or machine. Ask questions if you have any doubts about doing the work safely.

What safety procedures should you follow when using woodworking machines?

- Always wear safety glasses or goggles, or a face shield (with safety glasses or goggles).
- Wear dust masks when required.
- Wear hearing protection that is suitable for the level and frequency of the noise you are exposed to in the woodworking area. If you have trouble hearing someone speak from three feet away, the noise level from the machine is too high. Damage to hearing may occur.
- Use gloves to protect hands from splinters when handling wood but do not wear them near rotating blades and other machinery parts where the gloves can catch.
- Wear protective footwear when required.
- Make sure the guard is in position, is in good working condition, and guards the machine adequately before operating any equipment or machine. Check and adjust all other safety devices.
- Make sure the equipment is properly grounded before use.
- Check that keys and adjusting wrenches are removed from the machine before turning on the power.
- Inspect stock for nails, staples, loose knots or other defects before cutting, planing, routing or carrying out similar activities.
- Make sure that all machines have start and stop buttons within easy and convenient reach of an operator. Start buttons should be protected so that accidental contact will not start the machine. A collar around the button 3 to 6 mm (1/8 to 1/4 inch) above the button is recommended.
- Ensure that all cutting tools and blades are clean, sharp, and in good working order so that they will cut freely, not forced.
- Turn the power off and unplug the power cord (or lock out the power source) before inspecting, changing, cleaning, adjusting or repairing a blade or a machine. Also turn the power off when discussing the work.
- Use a "push stick" to push material into the cutting area. Jigs are also useful in keeping hands safe during cutting procedures. Keep hands out of the line of the cutting blade.
- Clamp down and secure all work pieces when drilling, sanding, cutting or milling.
- Use good lighting so that the work piece, cutting blades, and machine controls can be seen clearly. Position or shade lighting sources so they do not shine in the operator's eyes or cause any glare and reflections.

- Ensure that the floor space around the equipment is sufficient to enable you to machine the size of work piece being processed safely without bumping into other workers or equipment.
- Use extension tables or roller supports for large work-pieces. Supports should be placed on both sides (infeed and outfeed).
- Woodworking machines should be fitted with efficient and well-maintained local exhaust ventilation systems to remove sawdust or chips that are produced.
- Electric power cords should be above head level or in the floor in such a way that they are not tripping hazards.
- Keep work area free of clutter, clean, well swept, and well lit. Spills should be cleaned up immediately. Floor areas should be level and non-slip. Good housekeeping practices and workplace design will reduce the number of injuries and accidents from slips, trips, and falls.
- Keep the area free from water and moisture. Do not use electrical equipment outdoors in the rain.
- Always keep your attention on the work. For example, if you must talk to another person, turn off the equipment first.

1.5.3. Workplace environment and safety

What should you avoid when working with woodworking machines?

- Do not wear loose clothing, work gloves, neckties, rings, bracelets or other jewellery that can become entangled with moving parts.
- Avoid awkward operations and hand positions where a sudden slip could cause your hand to move into the cutting tool or blade.
- Do not stand directly behind stock that is being cut, planed, or jointed to avoid injury from kick-back.
- Do not remove sawdust or cuttings from the cutting head by hand while a machine is running. Use a stick or brush when the machine has stopped moving.
- Do not use compressed air to remove sawdust, turnings, etc. from machines or clothing.
- Do not leave machines running unattended (unless they are designed and intended to be operated while unattended). Do not leave a machine until the power off is turned off and the machine comes to a complete stop.
- Do not try to free a stalled blade before turning the power off.
- Do not distract or startle an operator while he or she is using woodworking equipment.
- Horse play should be prohibited. It can lead to injuries.

1.5.4. Materials handling

- Facility layout should encourage an even flow of materials and keep backtracking and crisscrossing to a minimum.
- Operators shouldn't have to stand in or near aisles.
- Arrange the machines so that the materials handled by the operator require minimum movement and changes of heights.
- This applies to both incoming supply and outgoing stock**.**

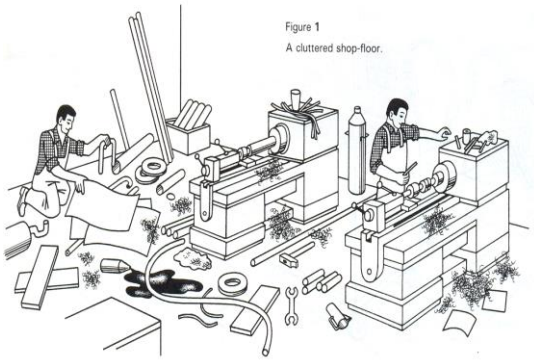


Figure 1
A cluttered shop-floor.

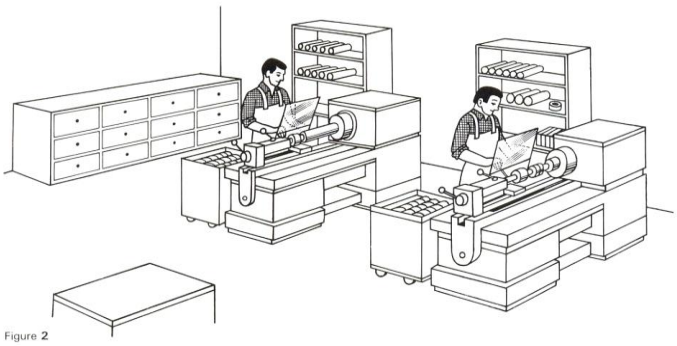


Figure 2
The same shop-floor after removal of all unnecessary items

1.5.5. Use of firefighting equipment

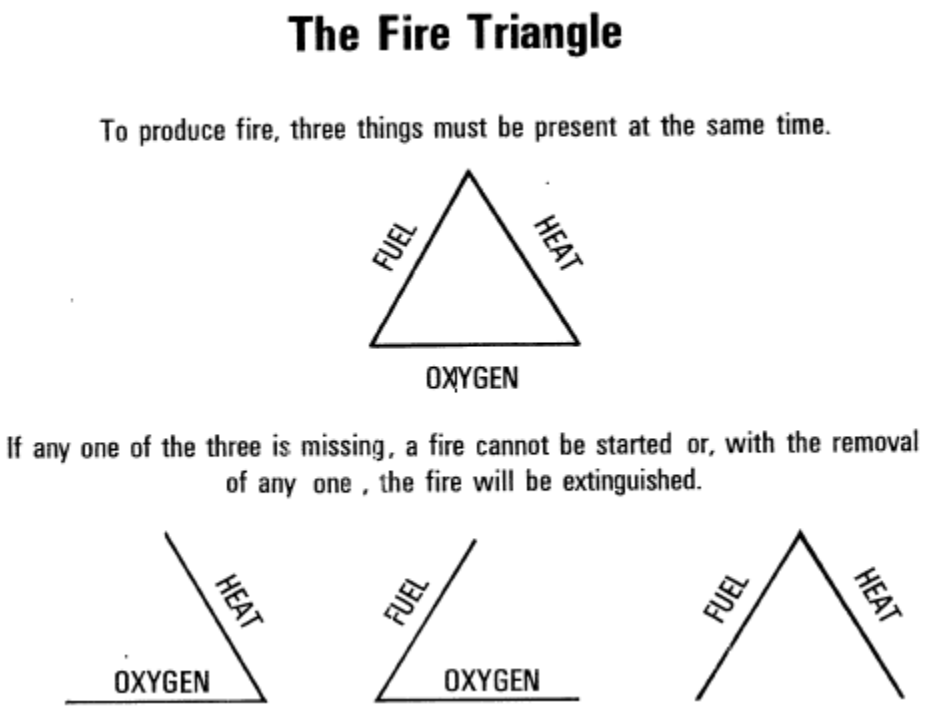
Classes of fires

- Class A Fires that occur in ordinary combustible materials such as wood, rags, and rubbish
- Class B Fires that occur with flammable liquids such as gasoline, oil, grease, paints, and thinners
- Class C Fires that occur in or near electrical equipment such as motors, switchboards, and electrical wiring
- Class D Fires that occur with combustible metals such as magnesium

Components of the fire triangle

- Fuel any combustible material
- Heat enough to raise the fuel to its ignition temperature
- Oxygen--Necessary to sustain combustion

(NOTE: To produce fire these three elements are necessary and must be present at the same time. If any one of the three is missing, a fire cannot be started or, with the removal of any of them, the fire will be extinguished.)

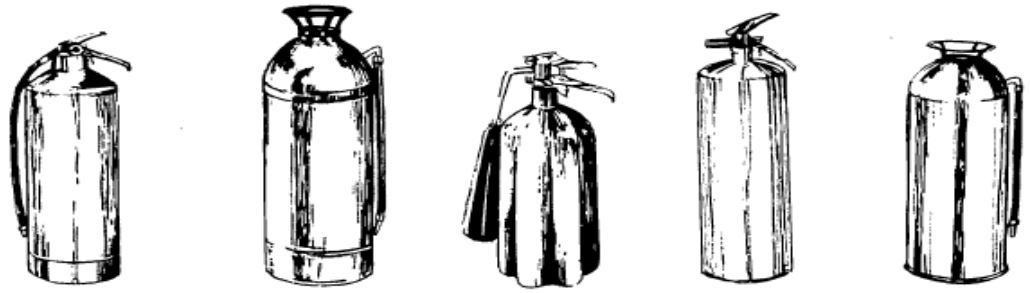


Types of fire extinguishers

A. Pressurized water Operates usually by squeezing a handle or trigger; used on Class A fires

B. Soda acid Operates by turning extinguisher upside down; used on Class A fires
C. Carbon dioxide (CO) Operates usually by squeezing handle or trigger; used on Class B and C fires
D. Dry chemical--Operates usually by squeezing a handle, trigger, or lever; used on Class B, C, and D fires (NOTE: On Class D fires, dry sand is as effective as any dry chemical other than Purple X. The cost of the Purple X chemical places it out of reach of most shops.)
E. Foam Operates by turning extinguisher upside down; used on Class A and B fires

Types of Fire Extinguishers



Pressurized Water | Soda-Acid | Carbon Dioxide | Dry Chemical | Foam

1.5.6. Organizational first aid

⇒ Make sure that you know where the first aid box is so that you can use it at once in an emergency.

⇒ When an accident occurs, inform the person responsible for first aid immediately.

⇒ If someone receives an electric shock, switch off the power immediately and call for medical help.

⇒ If someone has severe bleeding from a cut, take a clean piece of cloth and press it on the cut. When the bleeding stops, take the pat away. Gently clean the wound outwards with cotton wool or a swap soaked in clean water. Gently dry around the wound with clean cotton wool and apply a plaster or bandage.

1.5.7. Hazard control and hazardous materials and substances

Types of Hazardous Wastes

1. Wastes that have common hazardous properties such as ignitability and reactivity.
2. Wastes that contain leachable toxic components

Risk control of general hazards

Effective machinery and equipment risk controls reflect some or all of the following characteristics:

- The hazard is controlled at its source

- Contact or access to the hazard is prevented
- Sturdy construction (correct materials with few points of potential failure)
- Fail-safe (failure of the control system to be effective will result in machinery shut-down)
- Tamper-proof design (as difficult as possible to bypass)
- Presents minimum impediment to machinery and equipment operator
- Easy to inspect and maintain
- Does not introduce further hazards through the risk control action.

Risk control of mechanical hazards

- Separation is a simple and effective machinery and equipment risk control and may be achieved by distance, barrier or time.
- Distance separation means a person cannot reach the hazard due to distance.
- Barrier separation means an effective barrier or guard denies access and controls ejection of parts, products or waste.
- Time separation means at the time of access, the machinery and/or equipment is disabled.

Risk control of non-mechanical hazards

The first step in selecting suitable and effective controls for non-mechanical hazards is to understand the nature of emissions that can be released by machinery and equipment in the workplace, where those emissions collect and the way they may cause harm

- Separating people from non-mechanical hazards is necessary where the emission cannot be controlled at the source through elimination or substitution.
- Guarding may also serve to mute noise emissions through application of sound absorbing materials.
- Oil leaks from machinery and/or equipment may present a serious slip hazard. By preventing oil leaks through routine maintenance, or containing leaking oil with a drip tray or through spill containment strategies, the risk the hazard presents is controlled.

1.5.8. Safe operating procedures

Pre-Operational Safety Checks

- ✓ Locate and ensure you are familiar with all machine operations and controls.
- ✓ Check workspaces and walkways to ensure no slip/trip hazards are present.
- ✓ Ensure all guards are fitted, secure and functional. Do not operate if guards are missing or faulty.
- ✓ Ensure all locks are securely tightened.
- ✓ Ensure table and work area is clear of all tools, off-cut timber and sawdust.
- ✓ Start the dust extraction unit before using the machine.

Self-Check -5	Written Test

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Directions: Answer all the questions listed below.

1. PPE	A, safe and healthy equipment
2. Before Starting work	B, Remove rugs within one meter of work area.
3. During Work	C, Set up work area
4. At Finish the Job	D, sign and avoid warning
5. machine safety	E, goggle
6. workplace safety	F, Clean up thoroughly
7. Maintain the equipment	G, keep all tools clear of a work table
8. Post Warning	H, Find the causes of damage
9. Furnishings	I, free from dust and scratch
10, Protect Floor	J, use proper hand tools to dismantle the machine

OTHER REFERENCES

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- Woodworkers' Guide to Sharpening, by John English, Fox Chapel Publishing, 2008
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- Sharpening, by Nick Engler, Rodale Press, 1994
- The Complete Guide to Sharpening, by Leonard Lee, Taunton Press, 1995
- How To Sharpen Every Blade in Your Woodshop, by Don Geary, Betterway Book machinery component maintenance and repair