Foundary works

Level-I

Based on March, 2022 Curriculum Version 1

Module Title: Perform General wood working machines

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Nominal duration: 80 Hours

Prepared By: Ministry of Lobar and Skill

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Acknowledgments

Ministry of Labor and Skills wish to extend thanks and appreciation to the many representatives of TVT instructors and respective industry experts who donated their time and expertise to the development of this Teaching, Training and Learning Materials (TTLM).

Acronyms

ECG	Electrocardiogram
TTLM	Teaching training learning material
LAP	Learning activity performance

Introduction to the module

Wood working Machines used in woodworking and the machine of wood working is very dangerous, particularly when used improperly or without proper safeguards. Workers operating woodworking equipment suffer the following common injuries: laceration, taking away, disengaged fingers, and blindness. Wood dust and the chemicals used in finishing are health hazards, and workers in this industry can suffer from skin and respiratory diseases in the module understand operation of wood work machine

This module is designed to meet the industry requirement under the **Foundry works** occupational standard, particularly for the unit of competency: **Perform general wood working machines.**

This module covers the units:

- Determine and select machines
- Set up and operate machines
- Assure quality of finished component

Learning Objective of the Module

- Determine and select machines
- Set up and operate machines
- Assure finished component

Module Instruction

- ✓ For effective use this modules trainees are expected to follow the following module instruction:
- ✓ Read the information written in each unit
- ✓ Accomplish the Self-checks at the end of each unit
- ✓ Perform Operation Sheets which were provided at the end of units
- ✓ Perform the "LAP test" giver at the end of each unit and
- ✓ Read the identified reference book to get more knowledge and to do examples and exercise

Unit one: Determine work requirements and select machines

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

- Determine and select machines
- Set up and operate machines
- Assure quality of finished component

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

- Determine and select machines
- Set up and operate machines
- Assure finished component

1.1.Occupational Health and Safety requirements ventilation

What is safety and care?

Introduction:

Safety is the first essential requirement and every personnel must learn the safety measures even before he starts working on a machine or on equipment's.

Safety is an attitude, a form of mind of worker. If the attitude of worker towards safety is good and he is safety conscious, then he himself will develop the safe working habits.

Before you can use equipment and tools or attempt practical work in a workshop you must understand basic safety rules. These rules will help keep you and others safe in the workshop.

In general, personnel in the various wood workshops of the TVT know by long training how to use workshop tools, machine tools and equipment. Only trained and competent persons should be admitted to these wood workshops and permitted to operate equipment &tools. Untrained personnel should be discouraged from using workshops unless they have acquired some degree of proficiency as determined by the workshop supervisor.

- **Safety** is a precaution to avoid accident.
- **Care** is a technique of properly handling tools, equipment's& materials.

General Safety Rule

General safety rule is very important to reduce the accident while you working in workshop. Some of them are listed below,

- **Always dress properly**: - Dress properly for your work. While you must wear your aprons are provided so that you can work on the machines. Remove any jeweler, neckties, chains, bracelets, and rings. Roll up your sleeves and tie any hair back in a ponytail before beginning any work
- **Follow directions:-**understanding the procedures of using by hand tools & machines.
- **Keep the shop clean: -** Keep the floor clear of debris and sawdust the floor should be clear of scrap blocks, excessive material, and sawdust. Keep projects, sawhorses, and other equipment and materials you are using out of travel lanes.
- **Learn to use the tools correctly**-Understanding using of hand tools in proper ways.
- **Don't fool around**

Personal Safety

- **Stay alert.**. 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, can be caught in moving parts.
- **Use safety equipment.** Always wear eye protection. Dust mask, non-skid safety shoes, hard hat, or hearing protection must be used for appropriate conditions.

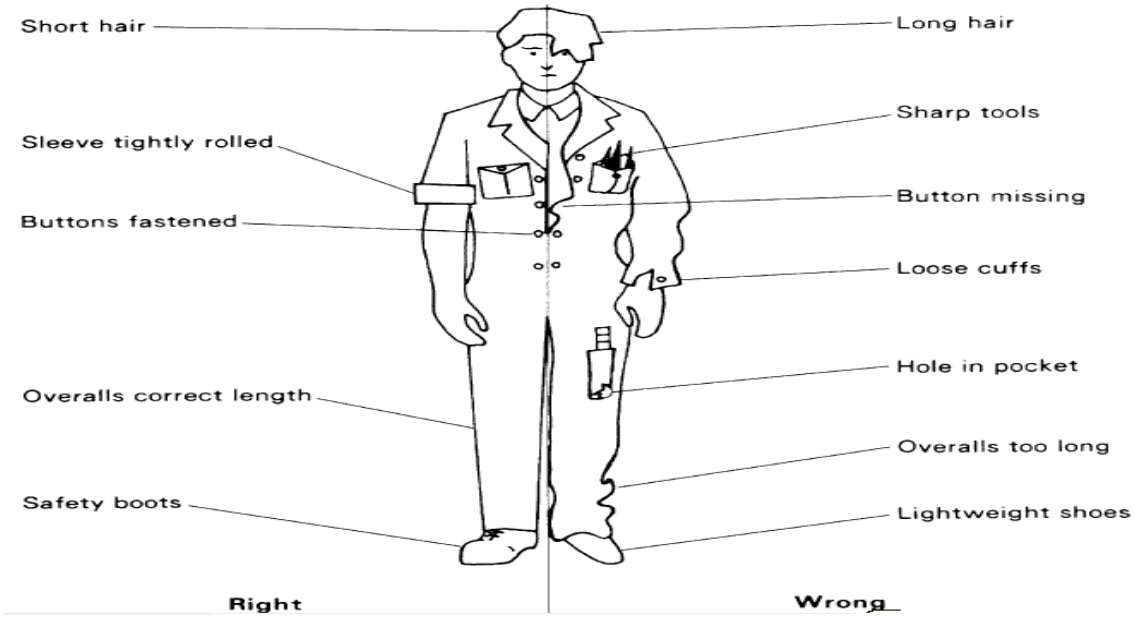


Figure 1 right/ wrong actions

Causes of Accidents

The accidents may take place due to **human causes, environmental causes** and **mechanical causes.** These causes are discussed as under.

- **Human Causes**

1. Unsafe or dangerous equipment's rotating, reciprocating and moving parts.

2. Operating machines without knowledge, without safety precautions, without authority, without safety devices.

3. Accidents generally occur while operating or working at unsafe speed.

4. Accidents may occur while working for long duration of work, shift duty etc.

5. Accidents may occur while working with mental worries ignorance, carelessness, tension, dreaming etc.

6. Accidents occur because of not using personal protective equipment.

- **Environmental Causes**

1. Accidents may occur during working at improper temperature and humidity causes fatigue to the workers so chances of accidents increases with workers having fatigue.

2. The presence of dust fumes and smoke in the working area may causes accidents.

3. Poor housekeeping, congestion, blocked exits;

4. Accidents occur due to not enough light.

5. Improper ventilation in the plant may also leads to industrial accidents.

- **Mechanical Causes**

1. use by old, poor maintained or unsafe equipment may result in accidents.

2. use of unguarded or improper guarded machines or equipment's.

3. Unsafe processes, unsafe design and unsafe construction of building structure may lead to accidents in the place.

4. Accidents occur due to improper material handling system and improper plant layout.

5. Accidents may occur due to not using of safety devices such as helmets, goggles, gloves, masks etc.

Self check 1 multiple choice

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

1. Who should you notify for an unsafe condition?

a. supervisor c. division officer

b. safety officer d. commanding officer

1. Do not allow power cords to kink or come in contact with oil, grease, or what other item?

a. non-skid c. the machinery

b. hot surfaces d. another electrical cord

3. When safety shoes are designed to prevent sparks from causing an explosion, what item removed?

a. the heel c. Steel toe plate

b. shoelaces d. metallic nails

4. In the protective helmet, what factor minimizes injuries from falling objects?

a. The fiberglass bill c. shock-absorbing suspension

b. The electrical rating d. the construction shape

5. What safety item is a must when working in high places?

a. Gloves c. hearing protection

b. Helmet d. safety belt and safety strap

Part two true/false

1. Safety is a precaution to avoid accident?

2. Care is a technique of properly handling tools, equipment's& material?

3. Accidents generally occur while operating or working at unsafe speed?

4. Safety is not an attitude, a form of mind of worker

Part three Explain the following

1. General safety?
2. PPE?
3. Machine safety**?**

1.1.1. Interpreting work requirements.

Work instruction is the procedural way of the task and also the sequential order of work when the trainee makes different projects with the wood working machine in wood work shop. the primary activities prior to take any action should be put safety first and efficiency follows, whatever the operation, the safe way is the right way and the efficient way

The followings are some working instruction

- Know the safe procedures before operating any machine;
- Make sure all guards and safety devices are functioning;
- Ensure that the machine's exhaust system is properly working;
- Avoid reaching across moving machine parts;
- Limit your conversation while the machine is running;
- Do not force stock into the machine;
- Stop the machine completely before removing jammed stock;
- After turning off the power, do not attempt to stop the motion of the cutting edges with a stick or your hand.
- Know the locations of all emergency switches;
- Avoid horseplay;
- Wear approved eye protection;
- Get first-aid treatment for even the slightest cut or scratch.

Selecting appropriate woodworking machines

Material selection is a step in the process of designing any physical object. In the context of product design, the main goal of material selection is to minimize cost while meeting product performance goals. Systematic selection of the best material for a given application begins with properties and costs of candidate materials

Material selection is a difficult task. Regardless of whether the material in question is wood, metal, stone, or plastic, selecting the proper material for a given application is a complex process. Before one even begins thinking about the materials, one must consider the requirements of the manufacturing processes involved, cost targets (and constraints), environmental concerns (in-use and post use), regulatory agency requirements, and often cultural and political considerations as well.

However, material selection is not about finding the "best" possible material for an application. Rather, it is about finding one or more suitable materials that—in combination with an effective design, proper processing, and eventual integration into a final system—result in a product that meets its intended use and satisfies (and hopefully delights) the needs of the end user. Far too often, in our quest to find the best material, we often forget that the real goal is to make the best possible product. The ultimate goal of effective material selection is to optimize the performance of the product itself. While this may seem like a trivial statement, it is an important one.

Need for a Material Selection Procedure:

- Large number of materials developed
- Newer Processing Techniques
- Material-Shape-Process-Function is inter-related

Quantity

After the scope has been analyzed and broken down into construction tasks, each task must be quantified prior to pricing. Equal emphasis should be placed on both accurate quantity calculation and accurate pricing. Quantities should be shown in standard units of measure and should be consistent with design units

Types of basic wood working machines

Basic wood working machines are classified in to five depending on the function. Those are

Section 1. Sawing machines

- Circular saws
- Radial arm saws
- Band saws
- Jig saws

Section 2. Planning machines

- Jointer planers
- Thickness planers

Section 3. drill machines

- Bench type drill
- Floor type drill

Section 4. Sanding machines

- Stroke sanders
- Edge sanders
- Disc sanders
- Belt sanders

Section 5:Grinding machines

Wood lathe machine **Figure 1.1 wood lathe machine**

What Is a Wood Lathe?

A wood lathe is a type of lathe that's designed specifically for woodworking applications. In other words, they are used to cut, sand, drill, face, turn and deform wooden work pieces. They still work like all other lathes by exposing a rotating work piece to a stationary cutting tool. But wood lathes are used specifically to work wooden work pieces. They are not suitable for work pieces made of harder materials, including metal.

Wood lathes are smaller and simpler than their metal counterparts. The speed at which they rotate work pieces is controlled by a basic pulley system. They don't produce as much power as metal lathes, but wood lathes are highly effective at manipulating wooden work pieces.

1.1.2. Circular saws machine

Table saw machine is one of the wood working machines that can be found in all workshops. Circular saw machine is used for ripping, cross cutting, beveling, chamfering, mitering, & grooving.

The universal and variety circular saw:

Universal circular saw machines are is saw that has two arbors so that ripping and cross cut can be mounted at the same time, it designed the heavy work;

Varity has single arbor when changing from ripping to and saw blade changed cross cut the machine must be stopped and saw blade (inter changeable blade). it design the medium work

Table saw

saw is basically made up of a smooth, heavy work surface, a saw which is operated by a motor, a handle for raising and lowering the saw blade, a handle for adjusting the angle of the blade, and a connection for collecting the debris produced whilst cutting.

Collectively A table saw is a versatile machine consisting of a circular saw blade, mounted on an arbor, that is driven by an electric motor (either directly, by belt, or by gears). The blade protrudes through the surface of a table, which provides support for the material, usually wood, being cut. The depth of the cut is varied by moving the blade up and down: the higher the blade protrudes above the table, the deeper the cut that is made in the material

A table saw Size

The size of table saw machine is indicated by the diameter of the cutting tools (circular saw blades) that are mounted (clamped) on the machines. Accordingly, the typical sizes or diameter of the saw blades to be mounted on the machines are 250, 300, 400, or 500mm.the greater the diameter of the saw blades, the larger is the table.

How to remove and replace the blade

☞ **To remove the blade:-**

1. Disconnect the power
2. Remove the throat plate
3. Select a wrench that fits the arbor nut.
4. Loosen the arbor nut.

Note: arbor nut is loosened in the same direction that the saw blade rotates or by turning it in the direction the teeth are pointing

5. Remove the nut, collar and the blade.

☞ **Replacing the circular saw blades:**

The following are the steps to be followed for replacing the circular saw blades.Steps:

1. to replace the circular saw blades, reverse the procedures for removing

2. Make sure that the teeth of the blades point toward the operator

3. Replace the collar and tighten the nut securely.

Note: the arbor nut is tightened against, or opposite, the rotation of loosening during operation.

4. Rotate the blade by hand to make sure that it is running clear.

5. Replace the plate or metal insert.

☛ **What should you avoid when working with a table saw?**

Do not saw freehand. Always hold the stock firmly against a rip fence to position and guide the cut.

- ✓ Do not reach around and over moving blades.
- ✓ Do not feed the work piece faster than the saw can accept.
- ✓ Do not leave a saw running unattended. Turn off the power and make sure the machine has stopped running before leaving the area.

Avoiding kickback

Kickback happens when the blade catches the work piece and violently throws it back to the front of the saw, towards the operator. It can be thrown very hard and can injure the operator. It is not uncommon for the object to have high enough velocity to become embedded in a wall or to cause other damage or injury. **Never stand** in a direct line between the blade and the fence when ripping narrow stock. A kickback can be fatal.

Kick back happens when ripping if:

1. The wood pinches the blade because of internal stresses.

2. The wood is allowed to rise up or moved sideways during a cut, then

Pushed back down, taking too big a bite at the top of the blade.

Kickback can also happen when crosscutting boards with internal stresses.

A chop saw or circular saw is the best preference for cutting poor lumber.

- Blade must be sharp and clean, if not the blade greatly increases friction and decreases the quality of the cut, causing it to burn, Pitch also increases the probability of kickback.
- Saw must be aligned.
- Use the blade guard when possible.

- Push the work piece past the blade. Do not release a work piece until it is past the blade and removed from the saw. Turn the saw off before removing small cut off pieces.
- Always maintain control. Do not execute a cut where you do not have complete control of the situation. Make sure there are no obstructions. Do not cut a work piece that is too large to handle.
- Do not use the rip fence as a guide during crosscuts. If you need to make a series of equal length crosscuts, use a stop block in front of the blade so the work piece is not in contact with the rip fence during the cut. It is easy for the work piece to twist out of perpendicular at the end of the cut and thus get caught by the blade and thrown.
- Check for flaws in the wood. Cutting through a loose knot can be dangerous. Cutting a warped or twisted board along the rip fence is dangerous because it can get pinched between the fence and blade.

❖ Therefore the main points to remember when using a table saw are:

- the sharpness of the blade,
- the squareness of the fence and
- the flatness of the table

❖ **Causes of table saw injuries include**:

☞ Failure to read warning labels and the owner's manual before use.
☞ When the saw is not in use, leaving the blade projecting above the table.
☞ Not using a **push stick** or other such safety device when making cuts that otherwise requires fingers to be come close to the blade.
☞ Failing to be alert and pay consistent attention.
☞ Removing the blade guard
☞ Wood being cut can violently kick back.
☞ Not wearing eye protection and Lack of ear protection. Causes steady loss of hearing.
☞ Wearing clothing that's excessively loose-fitting, and failing to tie back long hair. These are dangerous if they come in contact with the blade.
☞ Blade misadjusted so it’s not perfectly parallel with the fence and the miter slots. If it is not parallel, the work piece can often become pinched between the blade and the fence, inducing violent kickback and causing injury.

☞ Not pushing the material past the saw when finishing a cut. These pieces can get caught and violently drawn into the blade, resulting in kickback.

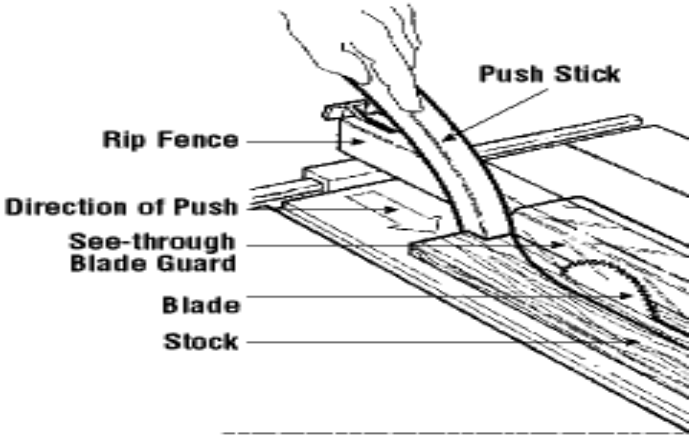


Figure 2 portable hand Saw

procedures should you follow when using a table saw?

- ✓ Wear safety glasses or a face shield.
- ✓ Wear hearing protection that is suitable for the level and frequency of the noise you are exposed to in the woodworking area.
- ✓ Pay particular attention to the manufacturer's instructions on reducing the risk of kickback (when the wood can be violently thrown back toward the operator).
- ✓ Choose proper blades for the type of work being done.
- ✓ Keep blades clean, sharp, and properly set so that they will cut freely without having to force the work piece against the blade.
- ✓ Use the guards provided with the saw or ones designed for use with the saw that you are using.
- ✓ Ensure that the fence is locked in position after the desired width has been set.
- ✓ Hold the work piece firmly down on the table and against the fence when pushing the wood through.
- ✓ Feed stock into the blade against the direction of its rotation.
- ✓ Move the rip fence out of the way when cross cutting. Never use it as a cut off gauge.
- ✓ Use a push stick when ripping narrow or short stock.
- ✓ Keep hands out of the line of a saw blade.
- ✓ Keep the body and face to one side of the saw blade out of the line of a possible kickback.
- ✓ Provide adequate support to the rear and sides of a saw table for wide or long stock.
- ✓ Keep area clean and clutter-free. Operate machines in a non-congested, well-ventilated area.
- ✓ Use the proper sawdust exhaust systems as required by operation.

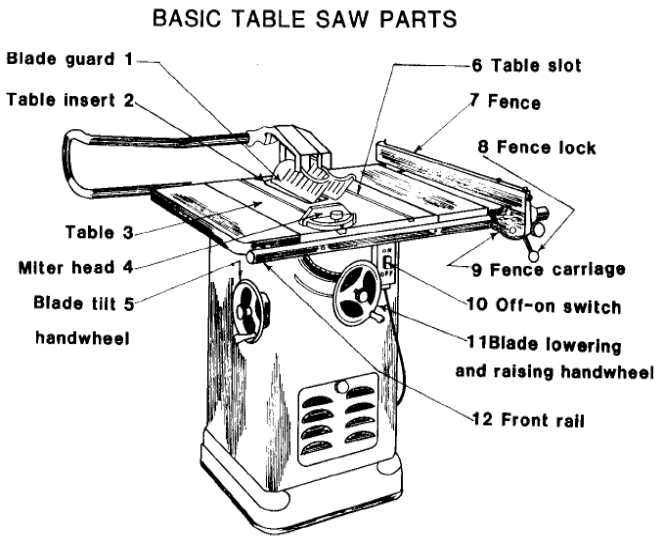


Figure 3 parts of circular saw

Figure 4 circular saw

The essential Part of circular saw

- ✓ **Arbor:-**also called spindle, is a metal rod on which the blade is mounted. Most tables saw machine have tilting arbor, i.e. arbor that can be tilted to the required angle for making angular cuts.

- ✓ **The Table**: The central section of the tabletop on most table saws is made from cast iron, and it is this part of the machine which will determine, to the greatest degree, the accuracy of your cut. It's used to Support the work while cutting is done.
- ✓ **The Blade and Guard**: The blade in a table saw is interchangeable, and you can choose coarser blades or finer blades, depending on the type of wood that you are working with, as well as from a wide range of different designs.

  The Rip Fence: The rip fence, or fence, is the rail which is fitted to the table, along which you slide the wood on to the saw blade. Table saws commonly have a fence (guide) running from the front of the table (the side nearest the operator) to the back, parallel to the cutting plane of the blade. The distance of the fence from the blade can be adjusted, which determines where on the work piece the cut is made.

  The fence is commonly called a "rip fence" referring to its use in guiding the work piece and determining the accuracy of the cut during the process of making a rip cut.

  - **The On/Off switch**: This control should be large and mounted at the front of the machine so that the user can knock the switch to the 'off' position with his knee, without taking his eyes from the saw blade.
  - **Raising wheel**: This controls the blade height and so the depth of the desired cut.

- **Tilting wheel**, made of cast iron, used to tilt the saw blade or tilt the table, depending on the type of saw.
- **Splitter:** A splitter or riving knife is a vertical projection located behind the saw blade. It is slightly narrower in width than the blade and located directly in line with the blade. The splitter prevents the material being cut from being rotated thereby helping to prevent kickback. Operating a saw without a splitter is the cause of many injuries, yet is considered by many to be unnecessary. This is one of the most useful safety devices on a table saw.

Radial arm saw machine

A Radial Arm Saw machine is basically a cutting machine consisting of a circular saw mounted on a horizontal arm that can slide from front to back. On the other hand “Radial arm saw machine” means a machine with a circular blade and motor suspended from a horizontal arm above the work surface which is pulled through the material.

It is sometimes simply called "radial saw,” which is primarily designed for Crosscutting, i.e., cutting long pieces of stock to length and Dadoing, i.e., cutting Grooves across a board's Grain, into one piece of wood into which another piece of wood will fit snugly, however, on most radial arm saws, the saw or the "head" can be pivoted 90 degrees so that it can be used to rip wood with the grain.

It has a suspended blade motor carriage on a yoke, which slid along a long horizontal arm. The yoke allowed the head to tilt for bevel cuts and to swivel for rip cuts. Mounting the arm to a pivoting column allowed miter cuts, and raising and lowering the column changed the blade's depth of cut.

Size: The size of a radial arm saw is determined by the diameter of the blade. Like table saws and miter saws, most radial arm saws are 10" or 12", though larger models are available for commercial use. If you have another saw with circular blades that are the same size as the blades your radial arm saw uses, you can swap blades between saws and save yourself some money.

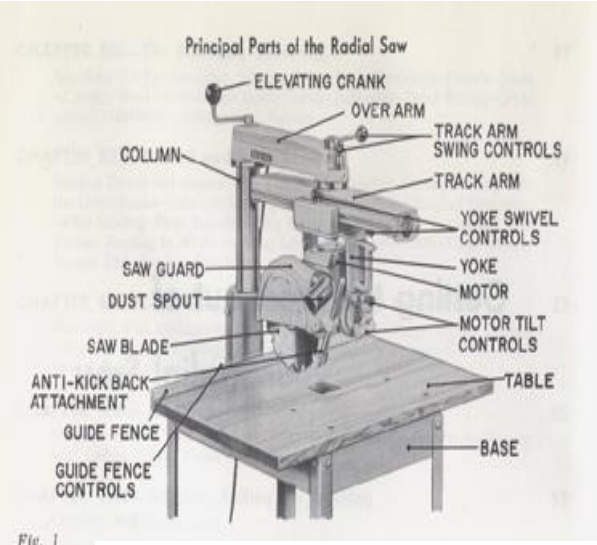


Figure 5 radial arm saw

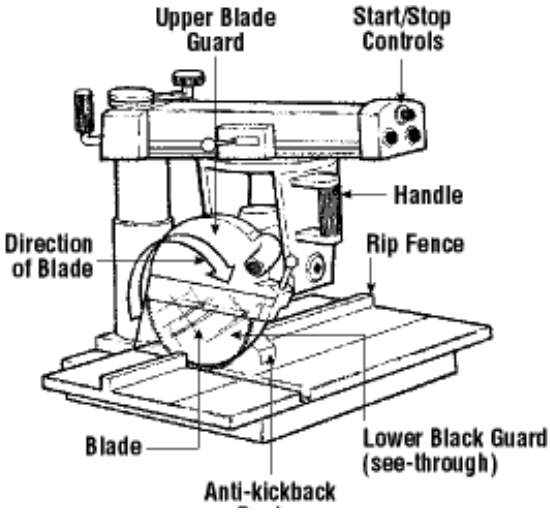


Figure 6 radial arm saw

Basic Radial Arm Saw Parts

Column	Switch
Blade Guard	Track Arm
Blade	Handle
Fence	Table

The essential Part of radial arm saw

1. Arm: a holding motor and blade assemble: can be pivoted on column for making miter cuts.
2. Blade guard: protect the operator from the blade and channels debris to the dust fitting.
3. Miter clamp lock the arm in position for crosscut and miter cuts.,
4. Power switch: an on off switch often equipped with a safety key.
5. Handle: used to pull or push the blade.
6. Bevel clamp: lock a motor and blade assemble at any angle between 00and 900 relative to the blade fro making bevel cut at 900at the table blade can be used to cut rabbet or groove .
7. Yoke: slide along a track in the arm for making crosscut: rotates to position blade parallel to fence for rip cuts,
8. Blade guard clamp: hold blade guard in position;
9. elevating handle : raise and lowers column to adjust depth of cut,
10. Fence: a guide work pieces during rip cut acts as a backstop for work place during crosscuts . kerfs at 900and 450 angle in fence are made as reference point by owner after installing.
11. Table clamp: one of the two thumbscrew clamps tight ended to hold the table and fence assembly together.

14, Front table: comprises a hard board or play wood auxiliary table glued a top particle board sheet bolted to the saw from . Kerfs at 900and 450 angles and rip though in a table are made by owner after installation.

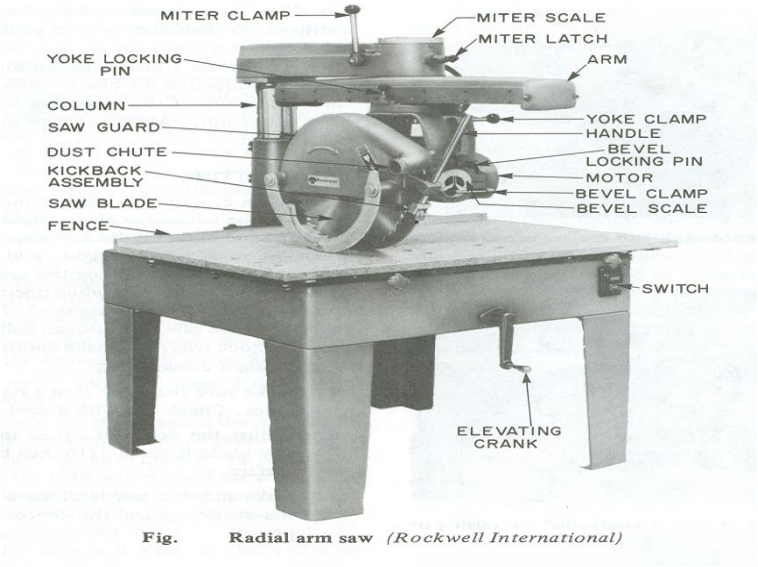


Figure 7 radial arm saw (Rockwell international)

Basic advantages of radial arm saw

- When a radial arm saw is used for *crosscutting*, the stock remains stationary on the saw's table, and the blade is advanced slowly across the stock, In contrast with table saw machine in which the blade is fixed and the material to be cut is slowly moved into the saw blade.
- Long work pieces can be reduced in to the required length without any problem, which is impossible for other machines
- The blade of radial arm saw can rotate full circle since it mounted to the sliding overhang radial arm.
- In radial arm saw machine (RAS) the operation consists of work pieces cut by pulling the rotating blade over the work piece, which makes the cutting operation fully visible to the operator, while for the table saw, the operation consists of work pieces cut by moving them over the rotating blade; which is not fully visible for the operators.

What safety procedures should you follow when using a radial arm saw?

- ✓ Wear safety glasses or a face shield.
- ✓ Wear hearing protection that is suitable for the level and frequency of the noise you are exposed to in the woodworking area.
- ✓ Feed stock against the direction of the blade (the blade should move downward when viewed by the operator).

- ✓ Only use saw blades rotated at or above the speed of the saw arbour. (An arbour is the attachment from motor to blade)
- ✓ Use only the accessories designed for that specific saw and application.
- ✓ Ensure the guard consists of two parts:

1 Upper hood type that covers arbor

2 . Lower guard that rides on the stock, adjusting automatically to the thickness being cut.

- ✓ Stand on the handle side when cross cutting. Pull the cutting head with the hand nearest the handle and maneuver the stock with the other hand.
- ✓ Make sure the hand holding the stock is never in line with the blade.
- ✓ Return the cutting head completely to the back of the saw table after each cut. The saw should be designed so that the blade will not move forward under its own weight or if the machine is vibrating.
- ✓ When ripping, make sure that the overall length of the saw table (both in feed and out feed) is twice the length of the longest pieces of lumber.
- ✓ When ripping, make sure that the stock is fed against the direction of the blade (from the side where the saw blade rotates upward toward the operator). The blade should extend slightly into the table. The motor head must be locked at the correct height and angle.
- ✓ Clamp stock to the table on one side of the saw blade, when making mitre, bevel or compound mitre cuts. Clamping prevents the wood from sliding along the fence during the cut.
- ✓ Turn off the saw when making any adjustments or changes in the set up.
- ✓ Be sure material is held firmly against the guide fence and table before starting a cut. Support long pieces of stock.
- ✓ Always turn the power off and wait until the blade stops rotating before removing wood scraps or leaving the radial arm saw.
- ✓ Devote your undivided attention to the work being performed. Do not talk to others or be engaged in “horseplay” while using the radial arm saw.
- ✓ Always pull the saw through the stock slowly to insure full control. This saw tends to pull itself into the work and it may have to be held back on thick stock.
- ✓ Check the stock for nails, screws, and loose knots before sawing.
- ✓ Allow the saw to reach full speed before starting a cut.
- ✓ Always stand with your face and body to one side of the saw blade.

- ✓ Make measurements by placing the wood to be cut against the stop gauge. When measuring with a tape measure or ruler is necessary, turn off the saw until the measuring is complete

2. What should you avoid when working with a radial arm saw?

- ➢ Do not take your hand away from the operating handle unless the cutting head is behind the fence.
- ➢ Do not remove the stock from a saw table until the blade has been returned to its "resting" position at the back of the saw table. Use a stick or brush to remove scrap from the saw table.
- ➢ Do not cut "free hand". Use the back guide or fence, or other device to keep the work piece from moving.
- ➢ Do not use cracked or dull blades.
- ➢ Do not leave a running saw unattended - leave only after the saw has been turned off and it has come to a complete stop

Band saw Machines

- ➢ Band saw machine :is one of the most important machines to choose, which is primary designed for making curves, circles and irregular shapes on small or relatively large pieces of wood. However, it is great and can also be used for making straight cutting such as re sawing(cutting thick pieces in to two or more thinner pieces) and ripping (cutting along the grain of wood).
- ➢ The size of the band saw is determined by the diameter of the wheel.

Main parts of Band Saw

1. Wheels: the band saw consists of two large wheels around which a continuous band of steel with cutting teeth is driven.

Upper wheel: it is not power driven, it running free during the operation.

The upper wheel may also be titled back or forth to center the blade on the wheels. To protect the teeth of the saw blade,. The upper wheel is also adjusted up or down to put tension on the saw blade.by hand wheel.

Lower wheel: Unlike the upper wheel the lower wheel is power driven, and does not tilt on its axis and also it does not move up and down, and fix with the motor .. Like the upper wheel, the rim of the wheel is covered by a rubber tire

2.Blade Guide Assemblies: Blade guide assemblies are found above and below the table of the band saw.

They must also be moved towards or away from the blade on both side of the blade with a clearance of about the thickness of the piece of paper.

3.Table: like many machine table the band saw table also used to support the work during machining. The table may be tilted; this enables to make cut to the required angle. There is a slot in the table from the center to the edge for removing and replacing the saw blade.

4.**Metal (table) insert**: is a soft metal which is used to cover the opening or the slot on the table. Soft metal is used for the insert because the band saw blade occasionally comes in contact with it. It is replaced when worn.

Guards: is a thin sheet of metal which is used to cover the band saw wheels and are used during the band saw operations.

5.**Blade Tension Adjustments**: As the name implies it used to adjust the blade tension.

Note: too much tension causes blade breakage**.**

6. **Fence**: used for guiding the stock during machining

7.**Control switch**: used to start and stop the motor.

8.**Dust chute**: used to remove the dust from the machine.

Band saw Blades

Band saw blades can be categories or classified based on the width of the blade and the type of the teeth that the blade have.

i. Depending on the width of the blade:

a) **narrow-type** is used to cut a very small radius of curves. The width of the blade ranges from 0-75mm. It can be also used to make sharp curves.

b) **wide-type blade** is used for making curves having a large diameter and also used for ripping and re-sawing operations.

ii. **Depending on the type of teeth:**

- **Standard or regular:** for straight cuts across the grain or diagonal to the grain ideal for intricate curves or cuts when the orientation of the blade to the grain changes during the cut.
- **Skipped-tooth or buttress design:** so called because every other tooth is missing .for long gentle curves with the grain cuts faster but more roughly than a standard blade $A^{1}/_{4}$ Inch skip tooth blade with 4-6teeth per inch .it is good all purpose blade.
- **hook-tooth blade:** For straight cuts and curving with the grain but best for ripping and pre-sawing.

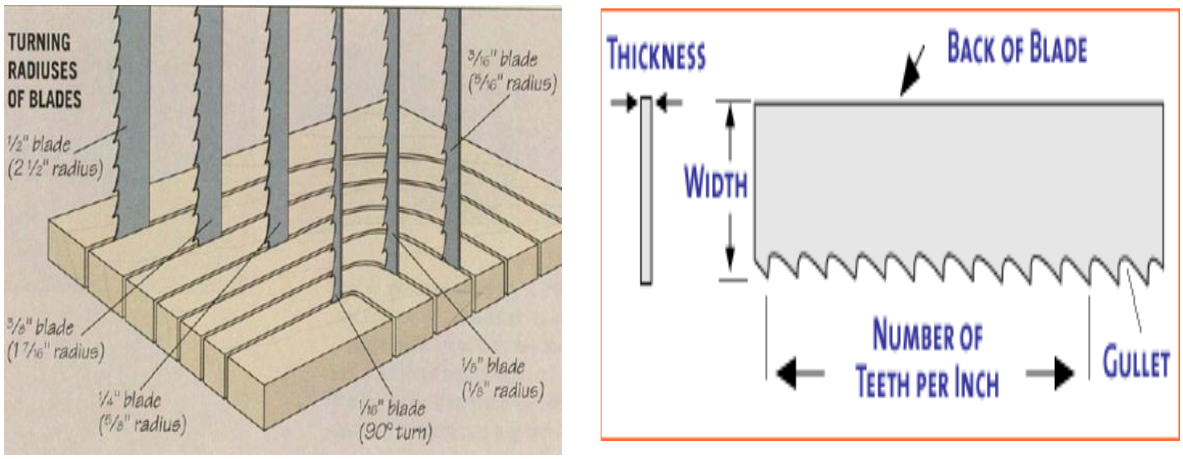


Figure 8 hook-tooth blade

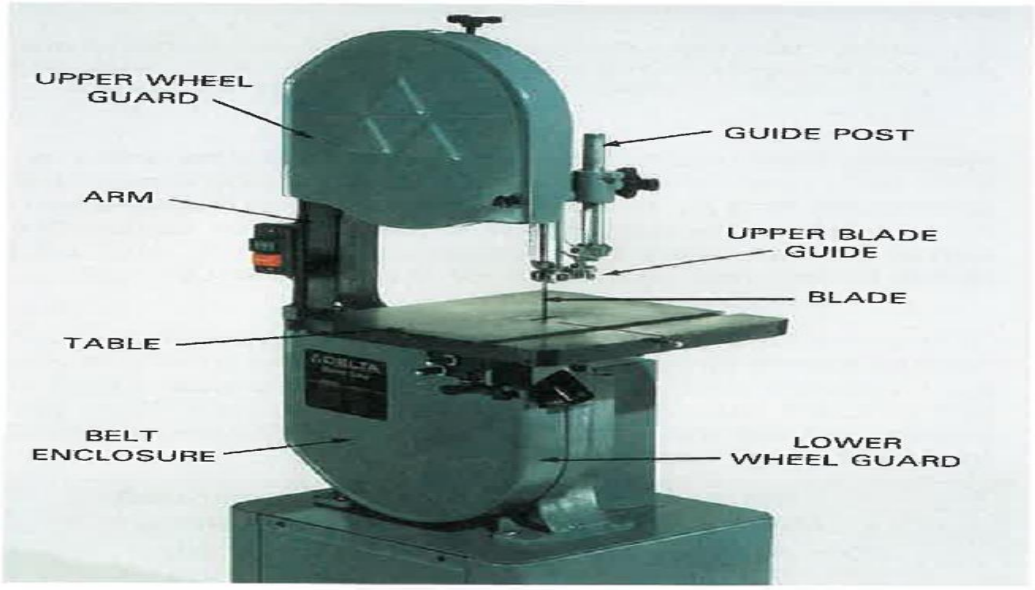


Fig. 15-1. Parts of a standard band saw.
(Delta International Machinery Corp.)

Figure 9 parts of standard band saw

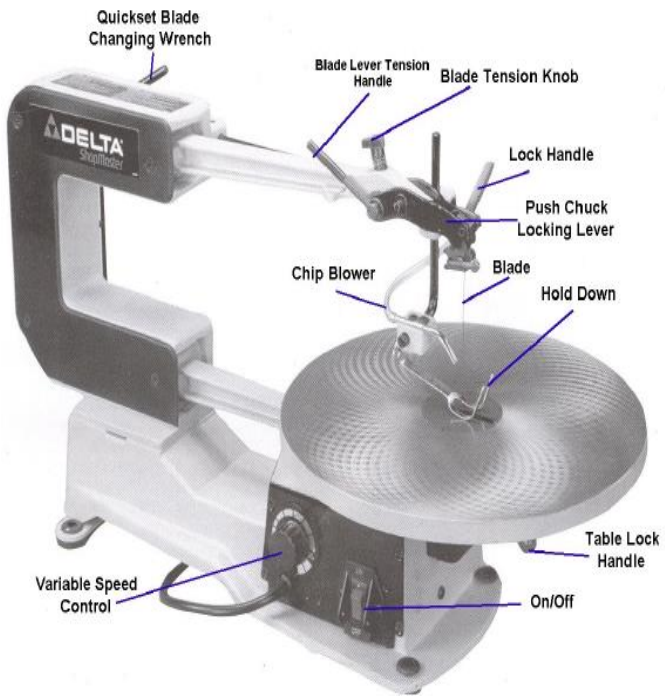
General Safety of Band saw

- ♣ Wear your safety glasses at all times
- ♣ Take off all jewelry
- ♣ Do not wear loose clothing
- ♣ Make sure you are the only person in the safety zone when operating the band saw
- ♣ Keep your material tight against the table
- ♣ Do not race through the blade
- ♣ Keep your hands out of the blade path (off to one side)

- ♣ Clear scrap or cut material with a brush, other scrap material, or your project from the table. Do not use your hands.

Jig Saws machine / scroll saw

Jig saws are useful for precision-cutting intricate curves and patterns on thin stock. They have thin blades that move rapidly up and down through the opening in the saw table. The blade is held in upper and lower chucks that pull it tight and keep it from bending. A hold-down adjusts to the thickness of the wood being cut.



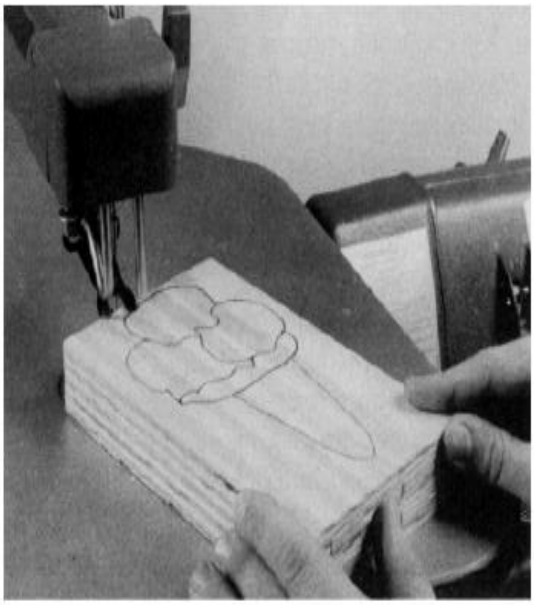


Figure 15-11. Several layers of material can be stacked, fastened together temporarily and cut all at one time for duplicate parts.

Figure 10 Jig Saws machine / scroll saw

The table on a scroll saw needs to be particularly smooth to produce as little friction as possible so that your work pieces will slide around easily. It should also be easy to tilt, so that you can make angled cuts, and must lock firmly in position. There are no fences on scroll saw tables, and all work is done freehand.

Motor Power

Scroll saws need little power to operate efficiently and their motors are rated at around 100 watts. They all use induction motors, and run extremely quietly.

Hold downs

These are used, as the name suggests, to hold the work down onto the table. They are only really needed when working very thin stock, which can get lifted by the blade on the upstroke. They

also serve a secondary function as blade guards, making it difficult to get your fingers too close to the blade.

Guarding

In addition to the hold down, some machines incorporate a Perspex guard that hinges down over the blade. Any fitting that makes a tool safer for the user is normally to be applauded, however these guards are both cumbersome and unnecessary on such a docile machine, and personally I would prefer not to have them.

Blades

There are two different types of scroll saw blade; plain ended and pin ended. The pin ended have a locating pin in each end, similar to a junior hacksaw blade, that makes it very easy to fit and tension them in the machine. The plain ended blades must be held in clamps, and can be a little more fiddly to install. The main difference is that the plain ended blades can be considerably narrower then the pin ended blades as they do not need to have the width to accommodate the pin, obviously. All the machines here can accept either type of blade

Figure 11 A selection of different blades

Scroll saw blades, like jigsaw blades, are available in a range of sizes and patterns to suit different jobs and materials. They are graded from 1 to 12 with the lower numbers having the finer tooth pattern suitable for thin materials and more intricate cutting and the larger number becoming coarser and thicker making them more suitable for heavier work. When installing a blade, always make sure that the teeth are pointing down towards the table.

Cutting speed

When tackling particularly intricate jobs, or when cutting difficult materials, the ability to vary the cutting speed is a great help. All the machines except the Record have variable speed. The Record has a two position selector switch offering high or low speeds

Planning Machines

Jointer planner machine

Jointer" means a machine with a revolving cutter head set into an adjustable table over which the material is passed over the cutter head. The jointer is a machine for power planning stock on faces edge and ends . It is the first tool used to straighten a board by truing one face and one edge, followed by using a thickness planer to make the board an even thickness, and then the other edge is cut parallel with a table saw. The planning is done by a revolving cutter head equipped with three or more knives.

The size of a jointer is designated by the width, in inches, of the cutter head.

The essential Part of jointer machine

a) Table: Table of jointers consists of two parts

i). **The in feed table**

The in feed table, also called the front table, is a part on which the work pieces are placed and fed to the cutters. The in feed table is adjustable in height, which means it can be raised or lowered by means of hand levers or wheels.

ii). the out feed table

The out feed table, also called the rear table, is the part which supports the work piece after it has been cut.

b) Cutter head

Cutter head of jointers is a heavy steel cylinder mounted between the in feed and out feed tables. It is the operative unit of jointers on which two, three or four cutter knives are mounted, and rotate together with it during operation.

Note:-The surfacing capacity of jointers, i.e. their size is determined by the length of the cutter head and that of the knives mounted on it.

c) Fence

The fence of jointers is that part which supports and guides the work piece being fed into the machine. It is set or adjusted vertically at 90 degrees to the machine table for most operations. However, it can

be tilted to various angles, usually up to 45 degrees both ways (forward and backward) from vertical position.

d) <u>The guard</u>

The guard of jointers is protective devices covering the cutter head during thus safeguard the operator.

- Avoid feeding work into the jointer against the grain this may result in chipped and splintered edges.
- Feed work into the jointer with the grain Feed with the grain to obtain a smooth surface..

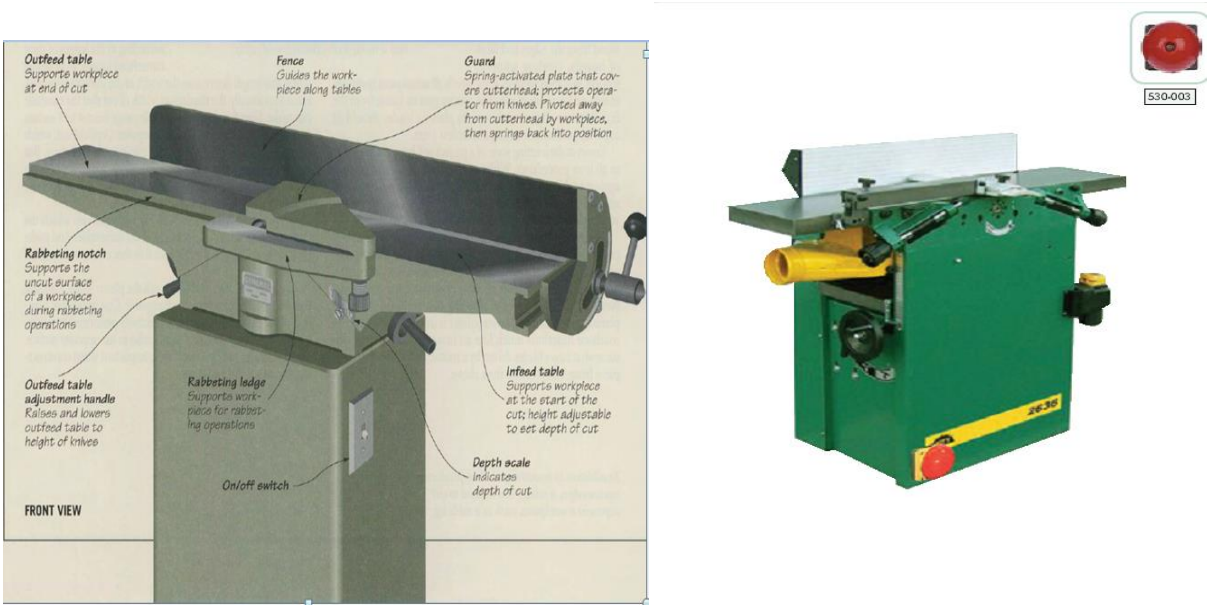


Figure 12 jointer machine

Jointer machine safety

Safety Rules

When you are using a jointer machine:

- ✓ ! Always keep the knives sharp. Dull knives tend to cause kick back, poor planning,
- ✓ Vibration that may allow the board (stock) to kick back.
- ✓ ! Never adjust the fence while the jointer is running.
- ✓ ! Cut with the grain, never plan against the grain.
- ✓ ! Do not try to cut too heavy cut.
- ✓ ! Always put the guard in place, to cover the cutter.
- ✓ ! Keep your finger at least 100mm away from the cutter.
- ✓ ! Never stand in line with the cutter .You must to one side of the jointer.
- ✓ ! Always allow the machine to come to full speed before using it.
- ✓ ! Do not plan pieces of short length. They can only be done by using special push stick.
- ✓ ! Use a brush to clean shavings. Never use your finger.
- ✓ ! Remember to switch off the power after you have finished using the machine. Never
- ✓ Leave the machine running unattended, wait until the cutters stop running.
- ✓ ! Do not plane boards that are shorter than **305mm.**

Thickness planer (surfaces planer)

Planning machines, also called **surfacing machines** that are used for removing irregularities such as rough spots, scratches, twists, etc. which are left on wood surfaces after ripping or crosscutting operation on the circular saws. As a result of removal of irregularities, the wood surfaces will become straight, level and smooth. This process is known as **surfacing**, and hence the name of the machines.

According to the purpose for which they are designed, there are two types of planning machines: **Thickness Planers** and **Jointing Machines**. Jointers and planers or their hand equivalents, are necessary for flattening, squaring, and smoothing wood.

Thickness Planers

"Thickness Planer" means a machine with a revolving cutter head set above an adjustable table on which material is passed under the cutter head by powered rollers

The **thickness planer**, also called **planer**, **surface or thick ness**, is a machine used for planning the opposite faces of work pieces accurately parallel and reducing the work pieces to the required thicknesses. It is a machine which is used to create boards that are of an even thickness throughout their length and flat on both surfaces.

Type of thicknesser machine

A). knife type cutter head thicknesses planer

B), Abrasive thicknesses planer

A). knife type cutter head thicknesses planer: is ether single and double cutter heads

- Singles cutter heads have one cutter heads and
- Double have tow cutter heads which means top and bottom cutter heads

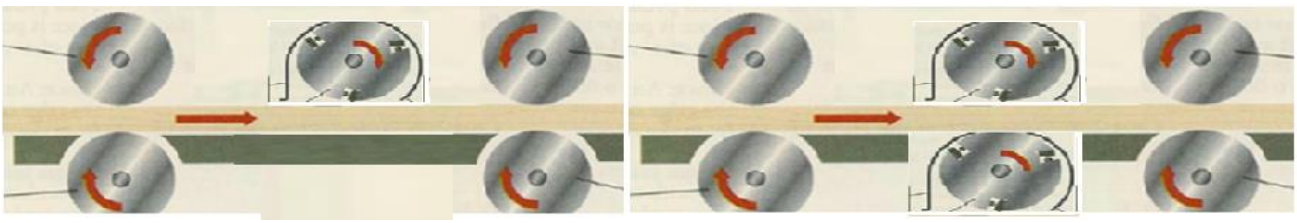
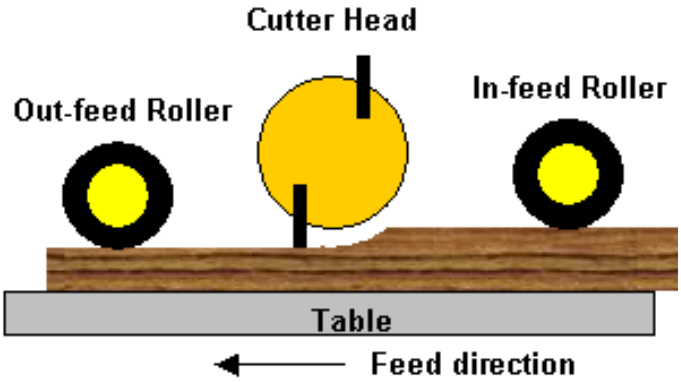


Figure 13 Single cutter head and Double cutter head

Abrasive thicknesses planner: is one of the large abrasive belt that belt moves material from the surface of board.

The advantage of abrasive planer over advantage of the cutter head planer is:-

- ✓ Have a less noise
- ✓ No chipping and splitting
- ✓ The grain is tear out
- ✓ Cut deep with one passes
- ✓ Less danger and kick back
- ✓ Low maintenance and adjustment
- ✓ Maintained by low cost



Main parts of thickness planer

A thickness planer consists of three main elements:

- ✓ **a cutter head**,
- ✓ a set of **in feed** and **out feed** rollers and table.

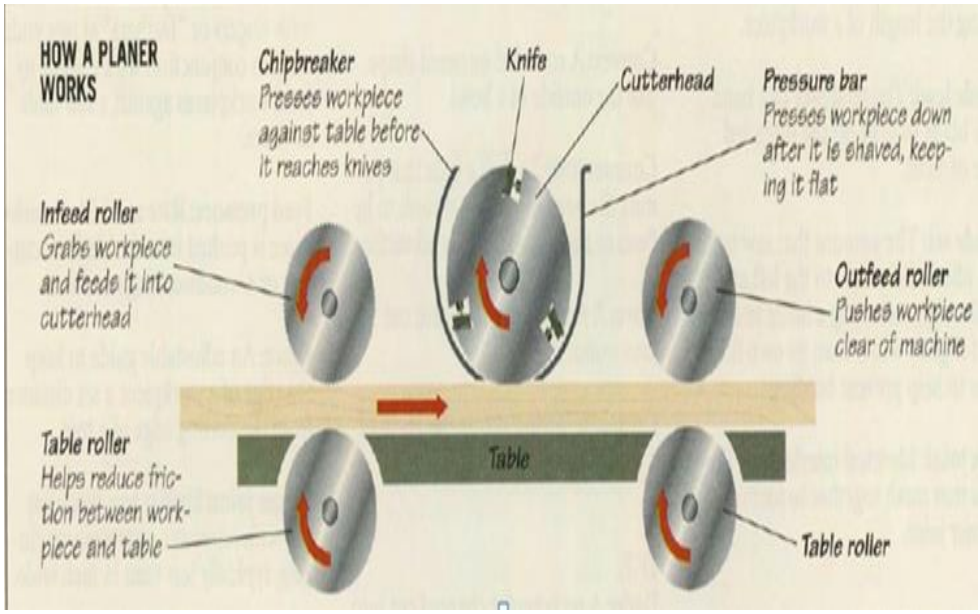


Figure 14 thickness planer

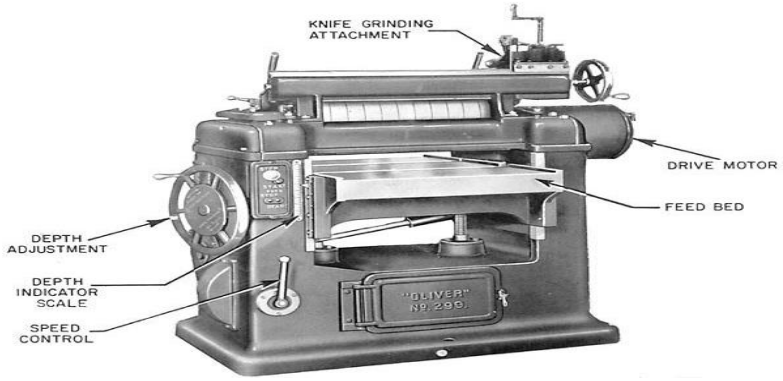


Figure 15 how a planner works

Main parts of thickness planer

i Table: The table, also called bed of thicknesses, is that part on which the work piece rides during machining. The table is adjustable in height relative to the cutter head to control the resultant thickness of the board.

ii Cutter head: The cutter head is a heavy steel cylinder cutter knives are mounted. It is similar to the cutter head of the jointers.

NOTE: the size of the thickness planers depends on the length of the cutter heads or the cutter knives and the width of the table .

iii Feed mechanism : The feed mechanisms of thickness planers is (set of in feed and out feed rollers which draw the board through the machine;)the part which moves the stock through the machines, thus advancing the stock to the rotating cutter head and moving away the stock after it has been planed.

- ✓ The feed mechanism of typical thickness planes consists of the following parts:

A, In-feed rollers: - is the front top and bottom feed rollers that grasp the stock and feed it to the rotating cutter head

B. Out-feed rollers: - is rear top and bottom feed rollers used to feed the stock out of the machine after it has been planned to thickness

C. Feed chains: - are devices used to transmit rotary motion from the feed drive motor to the feed rollers.

D. **Chip breaker:-** has dual functions: is located behind the carriage in feed rolles

- it serves as chip breaker to break the kick back chips into smaller pieces;
- hold the stock down and grip to the cutter head during planning.

E. pressure bar: - is located behind the cutter head .which is spring loaded and up and down. and used to hold the stock down during machining to prevent vibration.

v. Thickness control handles (or hand wheel): Thickness control handle or hand wheel is used to adjust the table in height for controlling the thickness of the stock being machined. On some machines, there is an electrical control for raising or lowering the table.

vii. Feed-control level: Feed control lever is that part which engages or disengages the feed mechanism. It operates the in-feed and out-feed rollers which feed the stock to the cutter. On some machines, the feed-control lever not only operates the in-feed and out-feed rollers but also regulates the rate of feed from slow to fast

Thickness planer Safety

- **Safety checks, to demonstrate:**
- Correct positioning of in feed table and guards and electrical isolation when planing is complete, leaving the machine safe for the next operator, i.e.
- Adjusting the in feed table to a minimum cut
- Lowering the bridge guard to its lowest position, fully covering the cutter block
- Locking the machine to off

1.2.1. Drill Press machine

A drilling machine, also called **drill press**, is one of the most versatile machines in the workshops. It's used to cut holes into or through metal, wood, or other material to make all standard size of holes.

Drilling machines use a drilling tool that has cutting edges at its point. This cutting tool is held in the drill press by a chuck and is rotated and fed into the work at variable speeds.

Drilling machines may be used to perform other operations. They can perform **countersinking**, **boring, counter boring, spot facing**, **reaming, and tapping** .

Drill press operators must know how to set up the work, set speed and feed, and provide for coolant to get an acceptable finished product. The size or capacity of the drilling machine is usually determined by the **largest piece of stock** that can be center-drilled (by the distance from the **column**

to the center of the chuck.) A common size is 15 inches. For instance, a 15-inch drilling machine can center-drill a 30-inch-diameter piece of stock.

Other ways to determine the size of the drill press are by the largest hole that can be drilled, the distance between the spindle and column, and the vertical distance between the worktable and spindle.

Main parts of Drill Press

Figure 15 drill press

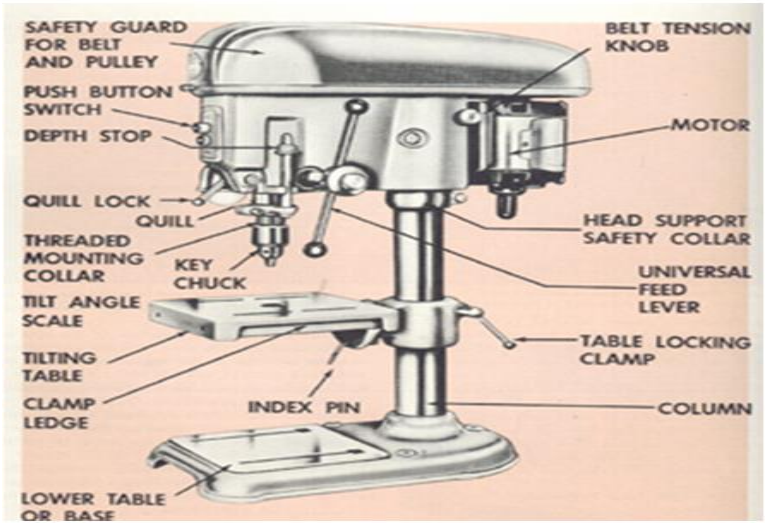


Figure 17 drill press

Table: a part that holds the work piece. It is adjustable for height. Some can be tilted to angles other than 900 to enables inclined holes to be drilled.

1. **Base**: made from cast iron, which supports the column and other parts of the machine.

2. **Column:** made of machined steel, on which the table, head and motor assembly are fitted.
3. **Lock ring:** a part of drilling machine which prevents the table from supporting down ward and should be securely tightened when adjusting the table height.
4. **Feed lever:** also called operating handle. Which is use for raising and lowering the spindle (on which the chuck is fitted) during the drilling operation
5. **Quill**: moves up and down by means of operating handle. In most models the length of the quill stroke is about 4 inches. The quill may also be locked in any position. Adjusting stops are provided to limit the stroke of the quil to any desired depth.
6. **A chuck**: a part which inserted in the bottom of the quil. It holds the cutting tools and is tightened by means of a chuck key.
7. **Head**: the drill press head is mounted at the top of the column. It consist the motor assembly, the spindles, quil, and stepped pulleys belts.

Belt Guard: is a safety device which covers the belts.

Start and stop switch: used for starting and stopping the motor.

☞ **Sand contours.** Shape parts on your drill press using an inflatable drum sander. You can adjust the stiffness of the drum by adding or removing air. Pumped up, it acts like a typical drum sander. Drain some air out and the sander will conform to the shape being pressed against it, gently rounding the corners, as shown in the photo above. The drum mounts to a metal base clamped to your.

☞ **Use an angled ramp.** Instead of tilting the drill press table, drill angled holes on a shop-made ramp. The ramp allows you to keep your table set square and gives you an instant, accurate setup for drilling angles. Cut the ends of the ramp using a miter saw or your table saw's miter gauge.

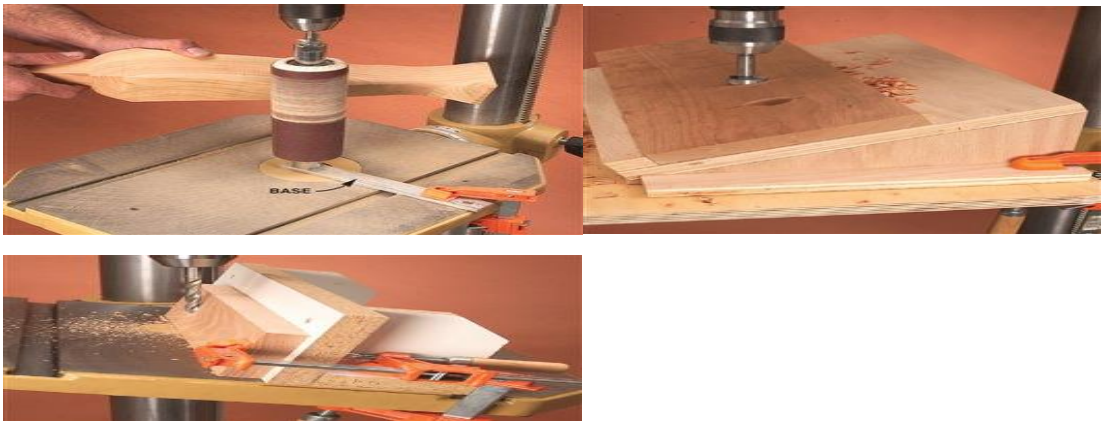


Figure 18 Sand contours Use an angled ramp

Drill Press machines safety

wood sanding machine

There are many kinds and sizes of sanding machines ranging from small portable power sander to large multi-belt sanding machines. But, the common types installed in the school work shops include, the spindle sander, disc sander and belt sander. Each is built in a number of different styles and sizes according to the work to be done.

A sander is a power tool used to smooth wood and automotive or wood finishes by abrasion with sandpaper. Sanders have a means to attach the sandpaper and a mechanism to move it rapidly contained within a housing with means to hand-hold it or fix it to a workbench.

The most and the only important function of sanding machine is, it is a machine used to sand down wood and other materials to shape it and make ready for finishing purposes. The purpose of each of these sanding machines is to sand wood smooth before finishes are applied.

Common type of sanding machines

The following notes cover some of the more common sanding machines available within the furniture industry.

Belt sander and drum sander are used on flat surface

Spindle and disc sander are used curve and irregular shaped work,

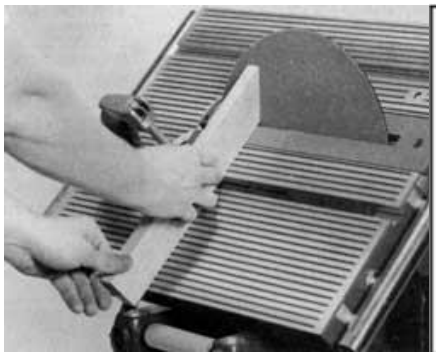
A) Belt sander. The best sanding machine belt that moves around two pulley ,on a belt sander sanding accomplished ether by the belt travel across the face of the work while it is hold stationary . or by holding the work on the travel belt. The belt sander positioned vertical or horizontal which is used to regular and irregular shapes and flat surface

B). Disc sanders: is used to mainly for sanding straight curve concave and edge stock

C). Spindle sanders: is the vertical spindle that project through the horizontal table it has a removing Spindle on which an abrasive sleeve is fasted, this produce a smooth finish.

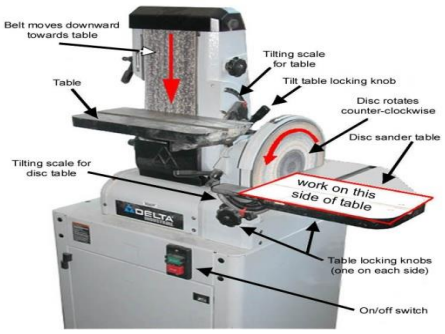
D) Belt Stroke sanders: is the best machine for sanding large surface such as the top of desk table and cabinets.

E) Edge sander: is a belt sander with the narrow belt in a vertical position which is used to sanding for metal polished and hard wood stock



A) 19 Belt sander &dick sander

B) 20 dick sander



C) 21 spindle sander

D) 22 Belt stroke sander

E) 23 edge sander

Grinding machine

Grinding is the process of removing metal by the application of abrasives which are bonded to form a rotating wheel. When the moving abrasive particles contact the work piece, they act as tiny cutting tools, each particle cutting a tiny chip from the work piece. It is a common error to believe that grinding abrasive wheels remove material by a rubbing action; actually, the process is as much a cutting action as drilling, milling, and lathe turning. The grinding machine supports and rotates the grinding abrasive wheel and often supports and positions the work piece in proper relation to the wheel.

The grinding machine is used for roughing and finishing flat, cylindrical, and conical surfaces; finishing internal cylinders or bores; forming and sharpening cutting tools; snagging or removing rough projections from castings and stampings; and cleaning, polishing, and buffing surfaces. Once strictly a finishing machine, modem production grinding machines are used for complete roughing and finishing of certain classes of work.

Figure 24 Pedstal grinding machine

Safety

1. Operate only with the instructor's permission and after you have received instruction.
2. Remove jewelry, eliminate loose clothing, and confine long hair.
3. Make sure all guards are in place and operating properly.
4. Work area should be prepared for safe operation. (Flammables, etc)
5. Always use proper personal protective equipment (face shield should be used).
6. All materials should be inspected for defects such as warps, knots and foreign objects.
7. Make all adjustments with the power off and machine unplugged.
8. Tool rests must be adjusted to within 3 mm (1/8”) of the grinding wheel.
9. Spark deflectors must be adjusted to within 3 mm (1/8”) of the grinding wheels.
10. Do not grind on the side of the grinding wheels. Only the face of the wheel must be used.
11. Stand to one side when starting the machine.
12. Immediately report to instructor when grinding wheels are excessively smaller

Have become cracked.

13. Small work pieces should be held with locking pliers.

14. Do not leave the machine until the grinding wheels have come to a full stop.
15. Grinding materials generate a lot of heat, be careful as it may cause a burn.
16. Clean up workspace.

1.2.2.Select consumable Materials.

Select materials

Material selection is a step in the process of designing any physical object. In the context of product design, the main goal of material selection is to minimize cost while meeting product performance goals. Systematic selection of the best material for a given application begins with properties and costs of candidate materials

Material selection is a difficult task. Regardless of whether the material in question is wood, metal, stone, or plastic, selecting the proper material for a given application is a complex process. Before one even begins thinking about the materials, one must consider the requirements of the manufacturing processes involved, cost targets (and constraints), environmental concerns (in-use and post use), regulatory agency requirements, and often cultural and political considerations as well.

However, material selection is not about finding the "best" possible material for an application. Rather, it is about finding one or more suitable materials that—in combination with an effective design, proper processing, and eventual integration into a final system—result in a product that meets its intended use and satisfies (and hopefully delights) the needs of the end user. Far too often, in our quest to find the best material, we often forget that the real goal is to make the best possible product. The ultimate goal of effective material selection is to optimize the performance of the product itself. While this may seem like a trivial statement, it is an important one.

Need for a Material Selection Procedure:

- Large number of materials developed
- Newer Processing Techniques
- Material-Shape-Process-Function is inter-related

Quantity

After the scope has been analyzed and broken down into construction tasks, each task must be quantified prior to pricing. Equal emphasis should be placed on both accurate quantity calculation and accurate pricing. Quantities should be shown in standard units of measure and should be consistent with design units

Self check 1 multiple choice

Directions: choose the correct answer from the given questions listed below. Use the Answer sheet provided in the next page:

1. What saw has an arm that limits the length or width of a cut?
   a. band c. radial arm
   b. compound miter d. table
2. Which of the following saws is pivoted to the correct angle and dropped onto the material?
   a. band c. radial arm
   b. compound miter d. Table
3. Which of the following saws is designed for making curved cuts?
   a. band c. radial arm
   b. compound miter d. Table
4. What shop tool is considered the oldest of all woodworking machines?
   a. Drill press c. Planer
   b. Jointer d. Woodworking lathe
5. What shop tool is also called a single planer?
   a. bench grinder c. surfacer
   b. shaper d. tile saw

Self-check #2

1. In table saw how far above the stock to be cut should you set the saw blade?

   a. 13mm (1/2") b. 3mm-6mm ($^{1}/_{8}$-1/4") c. 25mm (1") d. 19mm (3/4")

2. In table saw what is the distance between the fence and the blade where the use of a push Stick is indicated?

   a. 150 mm (6") b. 300 mm (12") c. 75 mm (3") d. none of the above

3. Boards shorter that 6" should not be cut on the radial arm saw.

   A. True B. False

4, In Band saw machine how far should the safety guard be above the stock?

   a. 13 mm (1/2") b. 19 mm (3/4") c. 6 mm (1/4") d. 25 mm (1")

5. Where should you place the hold down foot when cutting stock on the scroll saw?

a. ½" (12.5mm) above the work piece c. 1/8" (3mm) above the work piece

b. ¼" (6mm) above the work piece d. lightly against the work piece

6.What is the maximum depth of cut on a jointer?

a. 19 mm (3/4") b. 9 mm (3/8") c. 3 mm (1/8") d. 25 mm (1")

7. What is the minimum length of work piece that can be safely used on a jointer?

a. 250 mm (10") b. 125 mm (5") c. 300 mm (12") d. 600 mm (24")

8.What is the maximum amount of cut recommended for a thickness planer.

a. 3 mm (1/8 inch) b. 6 mm (¼ inch) c. 9 mm (3/8 inch) d. 13 mm (½ inch

9. What should the user do when choosing stock to be planed?

a. Not worry too much about stock condition

b. Choose short stock under 300 mm (12") in length

c. Check material for loose knots, nails and other foreign objects

d. All of the above

10**.** what should be done with the tool rests on the grinder?

a. Loosened before use

b. Move till they are touching the grinding wheels

c. Placed 3 mm (1/8 ") from grinding wheel and tightened securely

d. Ignored, they are of no use

Answer self-check #2

1. ----------
2. ----------
3. ----------
4. ----------.
5. ----------
6. ----------
7. ----------
8. ----------
9. ----------
10, ----------

Operation sheet # 1

Operation title; cutting sanding drill and born the wood

Purpose; cutting the wood with the grain is used when we constructs any furniture products.

Condition; be fore starting check & prepare the machines & materials

Equipment; tools & materials

>**Circular saw machine** -stock

-meter

-try square

PROCEDURE

- ✓ Check & ensure that the ripping saw is place run free.
- ✓ Set the fence at the required distance away from the saw (blade)
- ✓ Sett he saw to project about 6 mm above the board to be ripped.
- ✓ Adjust & set the saw safety guard in position.
- ✓ Switch on the machine. Stand away from the saw.
- ✓ Press the board against the fence & push it forward. Keep the board against fence
- ✓ Switch off machine after working

Precaution. The blade must be sharp.

- The saw should equipped with a guard & splitter
- Set the blade so it extends about 3mm above the stock to be cut.
- Stock should be surfaced & at list one edge joined before being cut on the saw.
- The position of the stock should be controlled either by the fence or the miter gauge never cut stock freehand.
- Use only stock that is free of knots splits & warped.
- Stop the saw before adjustments to the fence or blade.
- Use a push stick to move a small piece.
- After finishing the work must be clean the blade & the surface.

Quality criteria; _Smooth cutting

_ Dimension of the given

Lap test	**Practical Demonstration**

Name:_____ Date: _____

Time Started: _____ Time Finished: _____

Instructions: <u>You are required to perform the following-</u>

request the carry out measurement and calculations

measurement bill of material cutting list cutting waste & cost calculation

then perform the following task in front of your trainer:

1. Request your trainer for an evaluation and feedback.

Unit Two: Set up and operate machines

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

- Selecting and setting up Tools/cutters.
- Adjusting guards/stops.
- Setting -up Woodworking machines.
- Positioning work to be machined.
- Machining Materials

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

- Select and setting up Tools/cutters.
- Adjust guards/stops.
- Set -up Woodworking machines.
- Position work to be machined.
- Machine Materials

2.1. Selecting and setting up Tools/cutters.

There are a number of items frequently used in wood finishing projects. This list does not include all the supplies needed, but what is most commonly used. Always consult the label of the Min wax® products you are using to see if special application tools are required.

Rags	Stir Sticks
Brushes	Safety Glasses
Sandpaper	Rubber Gloves
Paper Towels	Drop Cloths or Newspapers

Repairing wood major wood defect

Dent and open place is the wood are especially noticeable if left UN couched. Most case the defect

Required more repair work than just sanding

Dent; if the wood fiber is not broken the dent can be removing easy you can raise the small Dent by applying drop of warm water in the spot

Open defect: open defect that should filled included crack split and open joint this defect Can be repairing with deferent type of filler collard stacked plugs or stick shellac

For best results and your own safety, always read and follow all label warnings and instructions carefully.

Brushes

Table saw blades

BLADES.—Combination blades are all-purpose blades for cutting thick and thin hardwoods and softwoods, both with or
across the grain. They can also be used to cut plywood and hardboard.

Ripping

- Use for cutting with the wood grain
- Have few teeth and a large gullet for good chip removal
- Use for cutting across the wood grain

Crosscutting

- Use for cutting across the wood grain
- Have many teeth (48 or more) and a small gullet for a smooth cut

Combination

- Use for cutting with or across the grain and miter cuts
- Usually have a series of four to five teeth similar to a crosscut divided by a large gullet

Plywood

- Use for cutting plywood or other sheet goods
- Usually made from HSS with many fine teeth (100 or more)

Hollow Ground

- Use for making smooth cuts across the wood grain
- Ground thinner in the body than the teeth to prevent binding

Dado

- Use for cutting grooves and dados in dimensional lumber and sheet goods
- Manufactured as stacked, one-piece or two-piece adjustable units

Thin Kerf

- Use for cutting dimensional or engineered lumber
- Have thin profiles for easier cutting and less material waste

Abrasive

- Use for cutting masonry, tile or steel
- Compatible with most circular saws of the same diameter as the blade

Diamond

- Use for cutting glass, concrete or ceramic materials

- **Steel blades** are inexpensive and work well for cutting softwood; however, they dull quickly in hardwood.
- **High-speed steel blades** (HSS) are harder than steel blades and stay sharper longer.
- **Carbide blades** have carbide tips attached to their teeth. They're more expensive than other blades but stay sharp much longer than steel or high-speed steel.
- **Diamond blades** use diamond-tipped teeth designed for cutting ceramic tile, glass and concrete.
- **Abrasive blades** are made of abrasive material for cutting concrete, brick, cinder block and other masonry materials and metals.

Operate a Table Saw

1. Inspect, clean, and lubricate a table saw.
2. Select appropriate blade for the job; remove and replace table saw blades.
3. Make a crosscut to fixed size.
4. Make a rip cut to fixed size.
5. Lay out and cut a miter.
6. Install dado head to fixed size.
7. Cut a dado to fixed size.
8. Cut a groove to predetermined size.
9. Set up and adjust molding head to cut molding pattern.
10. Make a rabbet to fixed size, using supplementary rabbet fence.

11. Make a series of duplicate crosscuts.
12. Set up saw for tenoning and make a tenon of predetermined size.

Identification the selective tools/ equipment's

1. .There is a number of items (Tools and equipment's) frequently used in wood finishing projects. This list does not include all the supplies needed, but what is most commonly used.
2. .Safety Glasses Brushes Sandpaper
3. Gloves Drop Cloths or Newspapers .rags, brushes, rubbing pads, and spray gun
4. Sand paper, chisel, sponge, hand plane. Scraper jointer surface planer & sander

a. **Jointer**: - The main function is to produce a smooth, square edge and face on a piece of lumber& to surface one face of a board as long as the cutter head of the jointer is wider than the board.

b. **surface planer:** The main function is to produce a smooth, square edge and face on a piece of lumber& to surface one face of a board and produce a uniform thickness of the stock

c. **Scraper**: - A sharp scraper in the hands of an experienced worker can produce a surface so smooth that it is hard to duplicate even with very fine sand paper

d. **Sand paper**: is paper used for the purpose of sanding and smoothing stoke sanding is done with coat abrasive (commonly called sanding paper or abrasive paper

e. .**Gluing**: - assembling the parts of a project with glue can affect the finish because glue acts as a sealer that wills prevent subsequent finishing materials from penetrating in to the wood. If glue is smeared on the face of a board & not completely removed, a lighter colored blemish will appear in the finish

- If you use too much glue it will deep & also over the face
- If too little glue is used the joint will be weak
- So it is important to use just the right amount of glue

❖ The best way to remove glue before sanding is to let it dry & then shave it from the surface using a sharp chisel /scraper

1 Hand planer: - is the best way to remove mill marks, however, a belt sander can also be used on boards with only slightly apparent marks.

- A plane shaves a thin slice of wood off the face of the board.

- The blade should be sharp & slightly round at the corners
- The corners are rounded to prevent them from digging in to the wood

The step in these Preparation Preparing surface to finishing Are as follows

i. Check all surfaces to see that all marks have been removed with the hand plan or scraper
ii. Remove all glue mark on surface especially around the joint
Iii .raise dent in the wood by marking the dents area moist with water
iv. Fill small knot, whole check or other defect with wood plastic or dough
V. smooth the surface with sand paper.

❖ **Wood Fillers**: - wood fillers are used for the purpose of leveling the surface of wood by filling the open pores or cavities in the cell. When the pores are filled the wood surface is smooth, hand and ready for any finish .All woods are composed of fillers or cells. While growing, these cells are filled with water sap, or resin .When the wood is seasoned and dried the cells are filled with air. In the open grain woods, the pores or cavities in the cell are fairly large, while in close grain woods, the cells are very small, the fiber being closely woven together. The close-grain woods are often finished without the use of filler. The filler should be transparent as possible in order to preserve the natural color beauty of the wood.

1. **Types of wood Fillers**

There are 2 common types of wood filler, namely

- ♦ Liquid filler (on **close grain wood**)
- ♦ Paste filler **(on open grain wood)**

❖ **Liquid filler: -** Liquid filler is transparent-It is usually used on close grain wood.

Liquid filler is made of drying oils varnish, turpentine. Japan, and A coarse material such as, silica or substrate, such ascent Starch, china clay, whitens carbonate or magnesia. Liquid fillers are

Applied to wood evenly length wise of the grain, as in varnishing and without being rubbed off if they contain much varnish, they Should be allowed to dry.

❖ **Past Filer**: Paste fillers are made from ground silicon linseed oil, turpentine

Dryers and colors. They are used to fill open-grain wood.

❖ **Removing Glue from the Wood**

Here are some tips to help you avoid getting glue on the wood:

- Don't put excessive amounts of glue in the joints. Only when gluing up boards edge to edge should you apply glue liberally. In this case you will want squeeze-out to indicate that you've applied enough glue and tightened the clamps adequately.
- Cut your mortises or dowel holes a little deeper to allow excess glue to collect at the bottom instead of being squeezed out.

- Cut a chamfer around the edge of your mortises and a countersink in your dowel holes to hold excess glue and to keep it from squeezing out (Photo 2-20). You can cut the chamfer with a chisel or rasp and the countersink with a needle-nose rasp, a countersink bit, or an oversized drill bit, used carefully so it doesn't cut too deeply.
- Have both a damp and a dry cloth nearby so you can remove any glue you might get on your hands. Wipe your hands with the damp cloth, and then quickly dry them so you won't wet the wood.

There are two ways to remove glue from the wood:

- Re-dissolve it and wash it off.
- Scrape or sand it off. .

Removing Glue Splotches after Staining

- **Remove glue by scraping** not sanding
  - Sanding forces glue into the wood causing an imperfection.
  - Repair dents with a damp cloth and a hot iron.
  - A smoothing plane like the one below is used is used to provide a smooth surface to the wood. This hand tool removes any surface blemishes or marks

❖ **Scrapers**

The fastest, cleanest, safest, and most enjoyable tool to use for removing mill marks and other defects in wood is the scraper. There are two kinds: the hand scraper, which you hold directly in your hand, and the

Cabinet scraper, which is held in a cast-iron body that has a flat sole and two handles. (There is also the common paint scraper; however, this tool has limited use in woodworking.) Both scrapers are misnamed because they don't scrape the wood at all but rather slice very thin shavings.

.Every cabinetmaker there had several hand scrapers in his tool kit. I was employed as the shop finisher at the time and was taught to use the hand scraper to remove cured runs and sags in my finishes and to cut back and level a finish rapidly in order to create a mirror-flat surface. The hand scraper cuts off ribbons of finish far faster than sandpaper can scratch the finish off. It doesn't gum up the way sandpaper does, and it's more economical.

To use the hand scraper, hold it between the thumbs and forefingers of both hands at an angle of about 50 to 70 degrees above the wood surface or until you feel the burr on the scraper edge catch. Then push it away from you or pull it toward you, cutting a ribbon. You can also shift one hand to the reverse position and scrape sideways, perpendicular to your body. If dust is your only product, the scraper is not sharp.

Hand scrapers: can also be used to smooth contoured surfaces: A straight hand scraper will follow a convex curve, and a French-curved scraper will get into concave contours.

The cabinet scraper cuts the same way as the hand scraper. However, the cabinet scraper has a flat sole, which makes it easier to maintain a level surface . 1 fined it particularly useful when I want to even the raised edges of glued-up boards that didn't come together flat. I begin by **Either scraper** is more forgiving than a hand plane. Because of the high cutting angle, a scraper tends not to tear the grain; you don't have to worry as much about grain direction, swirls, or knots. You can scrape with, against, or across the grain

2.1.1. Adjusting guards/stops.

Engineering Controls

For hand-fed jointers, horizontal head:

♣ Enclose cutter head with an automatic (spring loaded, self-enclosing) guard that exposes the cutter head only when the stock is being fed. The guard must automatically

adjust to cover the unused portion of the head, and it must remain in contact with the material at all times. The figure at the right shows the appropriate use of a self-adjusting guard.

♣ Adjust the cylindrical cutter head so that the knife projects no more than 1/8 inch beyond the cylindrical body of the head.

♣ Adjust the cutter head so that the clearance

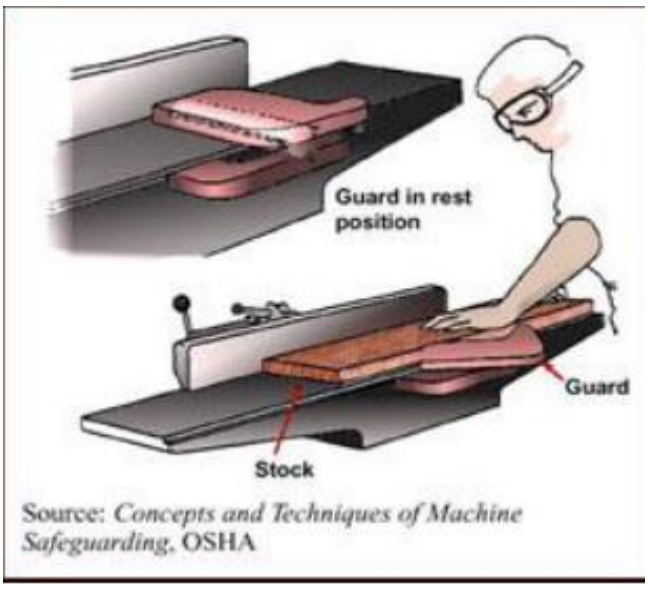


Fig 1 - Jointer with self-adjusting guard

♣ between the path of the knife projection and the rear table is no more than 1/8 inch.

♣ Keep the clearance between the table and the head as small as possible.

Fig 2 - Jointer Blade

Completely enclose cutter head, except for slot to apply the material for jointing.

This guard can be part of the local exhaust system. Work Practices

♣ Use hold-down push blocks when jointing wood narrower than 3 inches.

♣ As a general rule, never joint pieces of material that are less than four times the width of the bed opening.

♣ **Kickbacks** - Stock may be thrown back at the operator after being caught by the knives.

This also may expose the operator's hands to the knives.

Possible Solution and Work Practices

♣ Avoid deep cuts. They increase the likelihood of kickbacks and require a larger table opening.

Flying chips - The cutting action of the knives may throw wood chips and splinters.

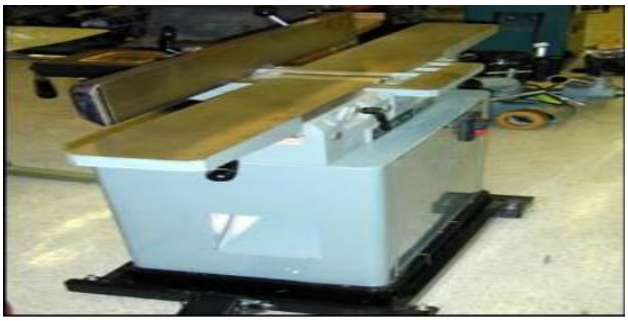


Fig Adjusting guard

Adjusting the jointer

1. Adjusting the out feed table

The out feed table of jointers must be adjusted such that its horizontal plane is tangent to the cutting circle of the knives. This mean that it‘s top must be exactly the same height a the cutting knives at their highest point of revolution.

2.Adjusting the in feed table

In order to make a cut on jointers, the in feed (front) table must be lower than the out feed table. The difference in height between the two tables determines the depth of cut. The amount of waste wood to be cut away. The in feed table is adjusted in height by loosening the lock on the right side and then turning the handle beneath the table to raise or lower it.

3.Adjusting the fence The adjust the fence at 900 angles to the table:

STEPS

- loosen the knob or lever that holds the fence in position;
- set the fence at 900 angle to the table;
- Check the angle by holding a square against the fence and the table
- Lock the fence to that position.
- To adjust the fence at any angle other than 900 :

operations

In operation, the board to be jointed is held with its face against the fence and the edge to be jointed resting on the in feed table.

• The board is fed across the cutter head and onto the out feed table.

• The knives in the revolving cutter head remove an amount of material and the relationship of the two tables and the fence keeps the board oriented in such a way that the result is an edge which is flat along its length and perpendicular to the board's face.

• A jointer may also be used to flatten the face of a board, in which case the sole focus is to produce a flat surface on the face of the board and the fence is not used. This procedure is often performed prior to edge jointing so that the board has a flat reference face for subsequent operations.

2.1.2. Setting -up Woodworking machines.

Proper Setup and Use

Prior to use:

Evaluate the work piece material type and appropriateness of the saw and saw blade. Inspect the material for nails, screws, or other foreign objects. Ensure the material is flat and straight so that it will lay flat on the table.

Determine the location and angle(s) of cuts required.

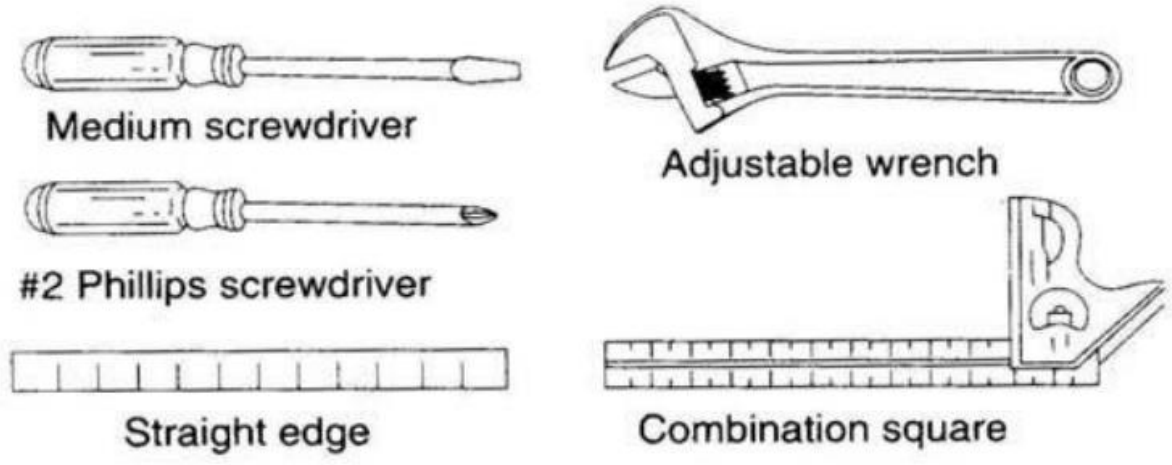
Determine the required fixturing/tooling/clamping/supports needed.

Obtain personal protective equipment (safety glasses /shields) hearing protection and remove all loose clothing, jewelry and securely tie back all long hair/beards.

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.



Steps 1- select the right tool and equipment for the job

Steps 2 - keep tools in good condition

Steps 3 - use tools and Equipment the correct way

Steps 4- keep tools in a safe place

Combination wrench

- **Hex key**
- **Framing square**
- Medium size flat blade screw driver Waste Disposal and Recycling

1. Be responsible for cleaning up workstations, tools and the shops.

2. Sort waste by category as required using approved containers.

3. Sort recyclable liquids and solids into proper approved storage container.

What should you do before using woodworking machines?

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, planning, 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

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.

2.1.3. Positioning work to be machined.

General Rules for Correct Operations:

Correct working position:

Stand in front of the machine facing towards cutting direction.

Make sure that nobody is standing in the dangerous area.

Keep the area in front and behind the machine clean in order to insure that you stand safely and firmly on the floor.

Work piece handling:

Lay hand flat on the work piece.

Keep your fingers close together and thumbs close to the fingers.

Push work-piece steadily forward and do not pull back.

When cutting long boards, ask a helper to support the end.

Always mind the position of your fingers.

Use a push stick for narrow and short pieces.

correct Position of Saw Blade On Wheel.

- The saw blade should not run in the middle of the rubber bandage because if it does, the setting of the teeth might be changed or affected as tension is applied.
- If the blade runs on the rear part of the rubber, the upper wheel must be tilted until the blade slips to the front part of the brim on the wheel.
- This adjustment is done carefully and making sure the machine is OFF.
- The position of the saw blade on the wheel should be closely observed during the adjustments

Correct Adjustment of Side Bearings

A pair of saw blade side bearings guides the saw blade.

One bearing is fixed above the working table, the other below Extra care must be observed when making some adjustments on the guides. If adjustment is necessary, the guides have to be set simultaneously. The Side Bearing (1) is adjusted to allow slight clearance for the blade of 1/10 mm on both sides. The distance from the side bearing to the tooth ground of the saw blade should be about 2 mm.The Thrust Bearing (2) keeps the saw blade from the back. Adjustments should be made to allow 0.5 to 1-mm space between the saw back.

2.2.1. Machining Materials.

Some of engineering materials are characterized by low machinability. The present trend is to create new and smaller products of higher quality in a shorter time and at a lower cost. To achieve some of the stated objectives, there is a need to use hard and resistant materials which usually have low machinability. For example, the high evolutionary improvement of Diesel motor is mostly due to the fuel pump with working pressure of approximately 2000 bars. In this waythe Diesel motor is more economical by approximately 5 liters/100 km, and the car acceleration ishigh. To achieve

high pressure, the tolerances are very small and materials must have an elevated hardness in order to be wear resistant.

A lot of research is going on in machining of low machinability materials. Specifically, the newresearch is focused on manufacturing processes, new tools and machining systems. This keynote paper deals with machinability testing methods, standards and Integrated Machinability Testing Concept. It also describes new solutions in machining low machinability materials

Machinability

Machinability means "easiness of machining" [1]. The general criteria are:

- tool life;
- surface roughness;
- surface integrity;
- magnitude of cutting forces or energy (power) consumption, etc.

Which criterion or criteria will be chosen for determining machinability varies in accordance with therequirements of the particular operation or task to be performed.

According to M.E. Merchant [2], F. W. Taylor was one of the most creative thinker who had done the most extensive machinability testing. In his work presented at the ASME Winter Conference in New York in 1906, more than a century ago, Taylor raised three significant questions: "What tool shall I use? What cutting speed shall I use? What feed shall I use?".
After so many years and having new facilities such as electron microscopes, computers, intelligent machining systems, etc., we still have serious difficulties to find the right answer to the questions.
Probably, we should apply new approaches to find the solution.
One approach could be the "Integrated Machinability Testing Concept" proposed by the first author which will be discussed in this paper later.

Unit three: Assure quality of finished components

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

- Evaluating machined components.
- Doing necessary rectification.
- Cleaning and maintaining machines and tools.
- Performing housekeeping.

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

- Evaluate machined components.
- Do the necessary rectification.
- Clean and maintaining machines and tools.
- Perform housekeeping

3.1. Evaluating machined components.

Quality inspection has undergone a lot of changes in terminology, methods, stages with more and more sophisticated equipment's and gauges / tools available for the purpose. The significant changes in a nut shell are,

1. The term Inspection was replaced by Quality control which thereafter was renamed as Quality Assurance. Today the concept is TQM or Total Quality Management which calls for quality management of not only production processes but also all other supporting services until the time the product reaches the customer.

2. Final product inspection? is replaced by inspection from design stage through components to sub-assembly to finished product and finally even at the delivery stage to the customers.

Quality of a product can be assured or controlled by:

Inspection Method can be100% inspection or a sample inspection.

Statistical Quality Control Method:

Various types of control charts Pareto analysis automated control

Different Inspection methods are adopted to assure the quality of materials, parts, components, equipment, finished products, process or methods of production etc. Inspection and testing is done by competent and technically qualified personnel called inspectors. It is a type of first action in the chain leading to customer satisfaction. This inspection sorts out given lot or batch into two categories good or bad, low quality or high quality, acceptable or non-acceptable etc. It is essentially a sorting process. It is not a preventive process.

The responsibility of inspection and testing lies with the Inspection or Quality Assurance department. This department is responsible for checking the following aspects,

1. The purchase department has procured material, parts, components etc as per the specifications or standards.

2. The production department has produced standard quality products and standard processes, methods of production and tools and equipment are used in that department.

3. The repair and maintenance department has worked properly to repair and maintain the tools and equipment used in the factory.

4. The stores department has taken proper care in storing material until they are used and finished products until they are sold.

On the basis of information given and suggestions made by this department, after the inspection and / or testing is over, the concerned department takes corrective steps to improve the defects or arrange to supply fresh acceptable lot so that production process is not disrupted.

Technological development has made the work of inspection and testing more precise. Inspectors are now equipped with better means to judge and take proper decision on quality.. Absolutely correct decision is possible, but the decision should be design, specification and need of the product oriented. Therefore, the inspectors have to be very conversant with the gadgetry they use while performing their duties.

In no case, should the inspection department accept substandard goods etc or reject the goods etc on simple grounds. No doubt, it may be very difficult to decide whether the goods procured or manufactured in house conform to the specification or not, but the problem can be solved by proper justification of the facts. Sometimes in borderline cases the components are tried out in the assembly and accepted or rejected. Trying out on the assembly is advisable when large machinery is getting assembled on the shop floor. The efficiency of a manufacturing firm depends on the decisions of this department.

Consequences of accepting defective goods:

1.Spoilsthequalityofproducts .
2.Increasescustomersdissatisfactionduetoinferiorquality.
3.Resultsinlossoftradeormarkets
4. Increases cost of production in the form of higher rate of spoilage and defective, rework on defectivetc.
5.Resultinproductionstoppageduetopoorqualityofmaterial,partsetc.
6. Increases servicing, repairing and replacement costs, etc

On the other hand the acceptance of materials, parts on the basis of strict specification also increases the cost of production. It may also result in stoppage of work for want of material etc as per the strict specifications. It is very difficult and moreover costly to procure material etc on the basis of strict specifications. The solution for this we have already outlined in the aforesaid paragraphs.

As mentioned earlier in this article sub-assemblies or semi finished products during process are inspected which is called stage inspection. It saves the cost of further work in defectives. 100% inspection of the finished goods does not serve the purpose fully, because there may be trouble during the production processes. Nowadays for quick and reliable inspection special

automatic devices are built into the machines which reduce the work of inspection to a great extent. Due to something going wrong in the process, the defective products may come out, defective products may have been received from the preceding process etc. in most of the cases it becomes possible for the workers connected with that process to find out the fault and to determine the responsibility for that fault. The workers may themselves be at fault. A worker is the best judge of his own work but it is not advisable to allow him or to expect him to serve at his own judge. It may create unnecessary conflict and may give rise to conflict. Therefore, for impartial and effective inspection to assure the quality at this stage, inspection department should be entrusted with the responsibility of inspecting the products during the process.

Finished products should be tested to know the performance or chemical properties. Sometimes, testing may destroy the whole product e.g. a gun shot or a missile or a rocket. In such circumstances only samples are tested.

Products should also be inspected or tested while delivering the same to customers. They must be delivered to customers with zero defect because the product is the ultimate image of the compan

3.2. Doing necessary rectification.

A circular saw is basically a power-saw that adopts an abrasive disc with teeth and blades properly designed to cut materials through a rotational motion around an arbour. This simple, but efficient tool is able to process different materials such as metal, plastic and wood. In addition, it may be easily hand-held or installed on a machine tool. Circular saws were born at the end of the 18th century and spread in sawmills quickly enough, confirming the advantage offered by their utilisation

Normally,te material part to be worked is fixed in a vise while the saw is slowly moved across it, but other solutions use a fixed saw with materials slowly advanced toward the saw blade. The teeth shape is especially designed for when a tooth strikes the material, the chips formed are driven out of the working area, preventing it from hindering the blade

A Practical Guideline

in the Design and use of Woodworking Tools Circular saw blades, either with carbide or diamond inserts, are customarily embedded in wood working machines once they permit a precise and efficient manufacturing of wooden products starting from raw-shaped solid wood chunks or laminate panels, allowing efficient processes and improving the overall industrial quality and competiveness of the final

product. However, the parameters associated with blade design must be defined with caution, aiming to avoid undesirable cutting performance and consequent relevant detrimental impacts on both processes and equipment. Thus, based on the literature, the present investigation intends to collect and gather a consistent information set regarding the effect of changes in tool design parameters on manufacturing, particularly in the case of wood machining by circular saw blades with reinforced tips. The general outlook provided aims at pointing out essential frameworks and practical guidelines for a better comprehension of the most adequate criteria to be used in the design and choice of tools for each specific manufacturing condition.

3.3. Cleaning and maintaining machines and tools.

Maintenance

What is 'maintenance'?

Maintenance includes all technical, administrative and managerial actions during the life cycle of an item a work place (building), work equipment or means of machinery intended to keep it in, or restore it to, a state in which it can perform the required function protecting it from failure or decline.

Maintenance activities include:

- inspection
- testing
- measurement
- replacement
- adjustment
- repair
- fault detection
- replacement of parts
- Servicing.

1. Importance of maintenance

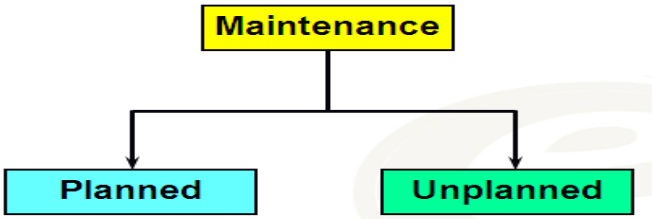
To All equipment required for production is operating at 100% efficiency at all times.

To production capacity, productivity and business profit

To Equipment breaks down leads to inevitable loss of production.

To An improperly maintained machine will require expensive and frequent repairs,

Type of maintenance



Planning maintenance

Explain Planning of jobs or Job-planning can occur at any stage during the life of a works order or maintenance job.

Equipment procedures, documents, skills or equipment can easily be focused upon. A work order cannot be considered planned until all of these have been considered,

Planning of maintenance jobs basically deals with answering two questions,

"What" and "**How**" of the job; *i.e.*

. "What jobs/ activities are to be done" and "how those jobs and activities are to be done".

- The maintenance jobs for development of appropriate job plans using most suited techniques,tools, materials and special facilities etc.
- As the job planning forms the basic foundation, over which the efficiency and cost of further actions (e.g. scheduling, execution and control etc) depends,

Un planning maintenance

In such maintenance, repair is done after failure has already occurred. The equipment is allowed to run undisturbed till it fails. Off-course lubrication and minor adjustments (for pressure and flow etc) are done during this period. Only when the equipment fails to perform designated functions or comes to a grinding halt, any maintenance or repair job is taken.

Cleaning maintenance

Cleaning maintenance is the cleaning of equipment's, components, working tools, hands tool or working gloves and workplace etc, before taking repairs, during and after repairs is of main importance, but is often not given due consideration.

Cleaning is often considered "donkey's job" and is left to some unskilled worker to decide and do. But the type and extent of cleaning is purely a technical requirement, depending on the subsequent jobs to be done.

Lubrication

Lubrication is one of the most important functions of maintenance. Lubrication for the machine plays the same role as blood for the human being.

For the production department, it is essential that machinery be correctly and sufficiently lubricated. Too often, machinery failures result from the wrong lubricants, or over/ under lubrication (too much or too little of the right lubricants).

Over lubrication causes churning and heating and also wastes costly lubricants. Many problems are caused by the use of incorrect (or non-optimal) oil or grease and failure to change or top-off fluids regularly.

FunctionofLubrication

The main functions of lubrication in bearings, gears. Shaft and other rotating and sliding components are as follows—

1. Friction and Wear Control.
2.rust Control.
3. Temperature Control.
4. Contamination Control.
5. Power and Work Transfer.

3.4. Performing housekeeping.

House Keeping

Keeping of work shop clean & store the tools in proper place is to ensure our body & tools from the accidents of machine while working & breakage of tools respectively. The workshop is kept in different ways .Some of themes are:

- Work benches should be free &clean of clutter.

- Tools & equipment‘s should be safely stored.
- Keep the floor clean &clear.
- Immediately wipe of spilled liquids which can create a slippery surface.

Fire prevention

- When using power tools it is the responsibility of the student to be aware of a tool getting hot.
- If this happens immediately turn it off, unplug it, and report it to the teacher.
- If a tool emits a burning smell inform the instructor immediately.
- Any finishing materials should not be used near an open flame.
- This would also include thinners and paints.
- Rags that have absorbed any amount of linseed oil, solvents, stains, paints, or any other finishing products must be disposed in an approved covered metal container as a precaution against sp ontaneous combustion.
- Report to the instructor any odor of gas. Gas can not only cause a fire or an explosion,
- It can al so make people ill.
- When unplugging an electrical cord, always do so by the plug itself and not by the cord.
- This causes damage to the wires and can eventually be the cause of a fire.

Ten Commandments of Machine Safety

1. **Pay Attention**: Not paying attention is the number one cause of accidents. Think. Think. Think.

   Keep your mind on your work. Give your work your undivided attention. Do not look around, talk to others, or use a machine without rehearsing the cut in your mind first.

2. **Keep Machine Guards In Place at all times**. Guards are there to protect you. If a guard has

   been removed tell the teacher so that he/she may put it back on before you begin.

3. **Do Not Over Reach:** Never reach across or over a moving blade.

4. **Know The Fly Zone**: Know where the wood is going to go, kick back, or fly if you lose control

   of it, and do not stand in that area. For example: A drill press will spin the wood clockwise, so the long side of the material should be to the left. A table saw will throw the wood backward, so stand to the side.

5. **Proper Tool Use**: Only use a tool for what it is made for. Understand grain direction, rip-cuts,

cross-cuts, blade direction, and proper blade installation. Turn off a tool when you are finished and wait for it to come to a complete stop before leaving. Blades are often felt before they are heard.

6. **Proper Wood Size**: Many accidents occur simply because a person attempts to cut a piece of wood that is too small or too big. Smaller pieces of lumber are easily grabbed by the blade and the hand holding the wood quickly follows. Because lumber that is too large must be forced into the blade, the extra force required can cause slipping, thrusting, or sudden release. Body parts then lunge forward into the blade. Oversized lumber is under control of the blade, not your hands.

7. **Special Set-Up Approval**: A special cut requires guards to be removed, and if not done correctly will cause serious injury. Always inform the teacher of any special set-up you are thinking on attempting.

8. **Proper Hand Placement:** Always hold the wood firmly. Never cross your arms. Do not push wood hard towards the blade. Do not force wood. You may slip and fall into the blade.

9. **Keep Fingers Clear**: Keep your fingers clear of blades, rotating parts, pinch points, and electrical plugs by maintaining a clearance of 2 to 4 inches. To assure your safety and the safety of others, only cut wood that is a minimum of 12‖ long and 3‖ wide (the 12/3 rule). You must inform the instructor before cutting any piece smaller than the 12/3 rule.

10. **Keep Work against the Fence and On the Table**: Wood should be firmly against the fence and the table before cutting. The blades and cutters are designed to drive/throw/press the wood against the fence and table. In other words, if you don‘t have wood there, the blade will put it there for you, along with your hand

self check 1

1. The most common Phillips screw driver has what maximum numbered size?

a.2 c.6

b. 4 d. 8

2 . What type of screwdriver will tighten and loosen six-point star head screws?

a. allen c. ratchet

b. Jeweler's d. torx

3. What type of screwdriver will tighten and loosen hexagonal slot head screws?

a. allen C. ratchet

b. Jeweler's d. torx

4. If a screwdriver is exposed to excessive heat, the blade will undergo what change?

a. increase in rust c. reduction of hardness

b. melting d. tempering of the tip

5.On a screwdriver, what action, if any, can be done to restore a worn straightedge?

a. file the blade tip c. remove the handle and use the other end

b. heat the tip and reshape it d. nothing; the screwdriver has to be replaced

part two matching

A	B
1.Maintenance	A. the maintenance is to time and schedule that the jobs
2. planning maintenance	B. the maintenance is Breakdown & EmergencyMaintenanc
3. UN planning maintenance	C. the machine plays the same role as blood for the human
4.cleaning maintenance	D. Technical, administrative during the life cycle
5. Lubrication maintenance	E. Cleaning components, working tools, hands tool or working gloves and Workplace

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