Ethiopian TVET-System

Furniture Making L-I

Based on Sept. 2012G.C. Occupational standard

Module Title: - Producing Hand Made Timber Joints

TTLM Code: - *IND* FMK1 TTLM -0919v1

This module includes the following Learning Guides

LG20: Plan and prepare for work

LG Code: - IND FMK1 M07 LO1-LG-20

LG21: Make joint

LG Code: - IND FMK1 M07 LO2-LG-21

LG22: Complete housekeeping

LG Code: - IND FMK1 M07 LO3-LG-22

Instruction Sheet	LG20: Plan and prepare for work

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

- OHS requirements
- Wood Joints
- Selection of hand tools and raw materials

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, you will be able to –

- Observe Workplace health and safety requirements,
- identify Product purpose, furniture style and joint type
- select tools, adhesives , fasteners and joint type

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 7
3. Read the information written in the "Information Sheets 1". Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the "Self-check 1" **in page -.** 04
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to "Information Sheet 2". However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	OHS requirements

INTRODUCTION

Before you exercise wood working skills, you have to decide;

Which joint will best suit your need?

What tools you can use?

-What materials will be suitable?

Joint; depend up on the nature of the work under construction the joint may be required to full fill one or more of the ff.

To increase the size of Martials; to make wider board from two or more narrower ones or to extend the length of member such as ridge board or plate.

To form the angle b/n two members as in the case of head & jambs of door & window frame or rails & stiles of door,

To form vertical & horizontal corners on 3 dimensional work such as kitchen units , word robes deep chests or boxes & internal & external angles in wall paneling .

To allow certain amount of movement to occur b/n close fitting parts without cracking or distortion occurring as in the case door panel & the fix dawn of solid timber work top,

To providing anent finish to increase to intersection in molding & to the exposed edge of ply wood black board & the various other man made board now available,

1.1 Occupational Health and Safety (OHS)

Occupational Health and Safety is include Workplace health and safety requirements may include: OHS legislation, material safety management systems, hazardous and dangerous goods codes and local safe operating procedures or equivalent

OHS requirements

1.1.1 General Safety on Hand tools

☞ In wood work, it is important to learn the safe way of doing everything.

☞ If you do not care about safety, you will hurt not only yourself but other people also.

☞ It is important to listen carefully when the instructor is telling what to do and how to do it.

☞ It is also necessary to read and understand carefully about general safety on hand tools.

☞ Each time you learn to use a new tool, you must learn how to use it in a safe way.

☞ The following are the safety rules that you should remember and follow when you are learning bench wood work. These are important in all wood workshops.

☞ Hold the tool in the correct way when you are using it

☞ Be carefully not to hurt your back when you lift heavy things

☞ Put your work in a vice or fix it to the bench with the clamp.

- **Clothes**

These are important in all wood workshops

Wear the right clothes in the work shop. Take of cuts and sweaters. If you wear a tie, put it inside your shirt. Roll up your sleeves. If possible, wear a work shop apron.

Self-Check -1	Written Test

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

1. Which of the following is not involved in an electric shock that kills?

A. slowed heart rate.

B. ventricular fibrillation.

C. Respiratory-center paralysis.

D. Paralysis of the hand or other muscles.

2. If a chemical splashes into someone's eye, the person should rinse the eye with

A. Alcohol. c. mercurochrome.

B. a gentle stream of cool water. d. cold tea.

3. When using a crosscut saw, which of the following is not recommended?

A. Hold the saw at a 45-degree angle.

B. Apply light pressure on the push cuts.

C. Cut with the grain.

D. Cut on the waste side of the cutting line.

4. Most fires can be extinguished by

A. Increasing the heat so the fire burns more quickly.

B. Removing the source of fuel.

C. Increasing the level of oxygen.

D. All of the above.

5. Which type of gloves should be worn when working with sharp edges and rough materials?

A. plastic c. leather or thick fabric

B. lightweight cotton d. rubber

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

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-2	wood joint

1.1 introduction

Furniture is classified into different groups. According to this, there are living room furniture, dining room furniture, study room furniture, bed room furniture, and special furniture such as children's furniture, school furniture, and hospital and pharmacy furniture.

Examples are;

Living room furniture: - Sofa, coffee table, Coffee table, TV-stand, etc.

Dining room furniture:-Dining table, dinning chair, display cabinet, etc.

Study room furniture Bookcase, book shelf, Table, chair, computer stand, etc.

Bed room furniture

School furniture

Hospital and pharmacy furniture

Children's furniture.

The wood joints as commonly used in wood working means the places at which two separate pieces of wood are connected, united or combined together for the purpose of changing direction. There are many kinds of wood joints used in building construction furniture construction.

Wood joint can be classified into two group

Mechanical wood joint: - requires the use of reinforcements like nails, screws or other devices to hold the wood pieces together.

Non-mechanical wood joint: - made by creating a pocket in one piece of wood and a matching projection on the other.

Mechanical wood joint Non-mechanical wood joins

- Butt joint
- Lap joint
- Rabbet joint
- Spin or Biscuit joint
- Miter joint & etc.

Non-mechanical wood joints:

- Dovetail joint
- Dado joint
- Tongue and Groove joint
- Mortise and Ten on joints
- Box joint & etc.

Eight basic woods joint

- Edge
- Butt
- Rabbet
- Dado
- Miter
- Lap
- Mortise and Ten on
- Dovetail

Mechanical wood joint and Non-mechanical wood joints

1**, Butt joints** A butt joint is a joinery technique in which two members are joined by simply butting them together. The butt joint is the simplest joint to make since it simply involves cutting the members to the appropriate length and butting them together. Fastener of some kind is used to keep the joint together and to make it stronger.

Used For simple boxes, cases, cheap drawers, frames and chairs.

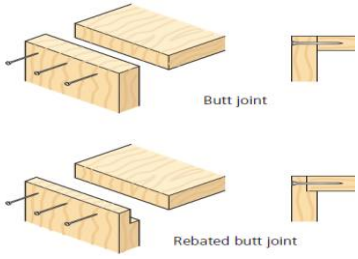
Very weak joint.

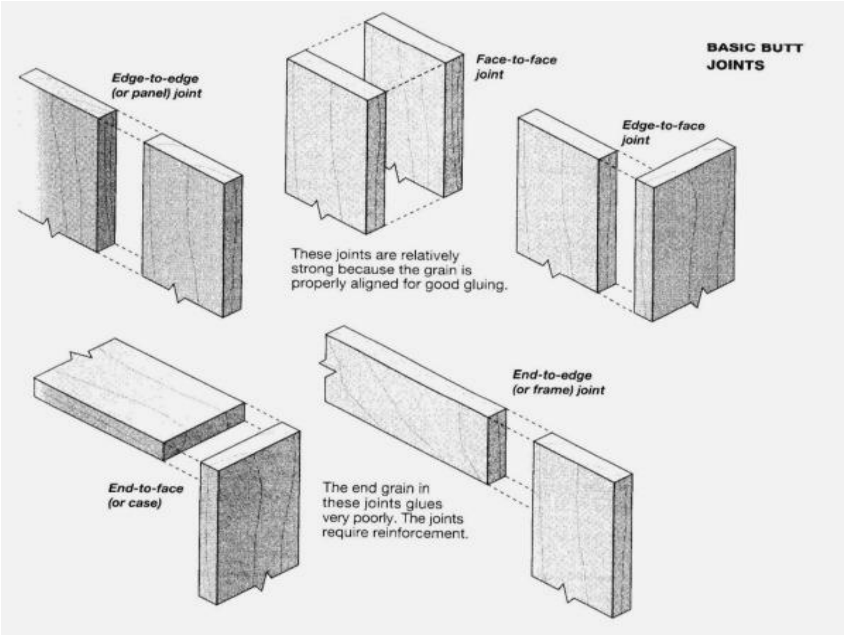
Simple joints

Need nails or screws

Kinds of butt joints

- Edge to edge
- End to edge
- End to face
- Face to face
- Edge to face

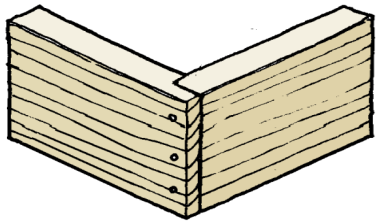


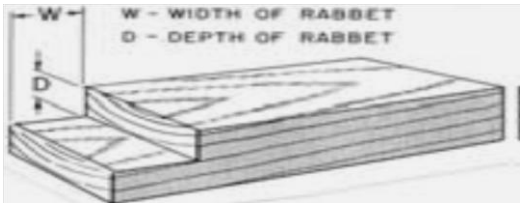


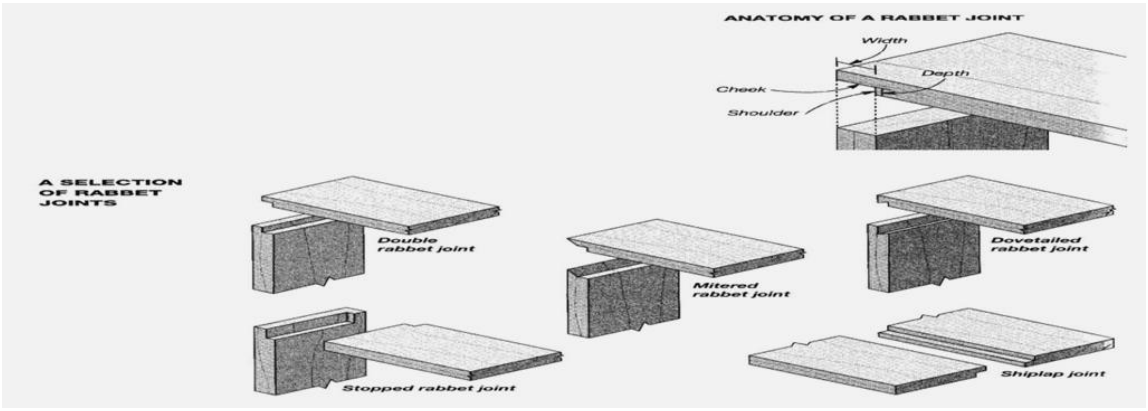
☞ The fasteners used for butt joints are nails, screws, dowels, and glue.

2, Rabbet joint

Rabbet joint is made by cutting an "L" groove across the edge or end of one piece and fitting the other piece into it. It is used in making table drawers, boxes, doors, window, frames, etc. The strength of the rabbet joint mainly depends up on the depth, width or length of the rabbit. The width of the rabbet must be equal to the thickness of the stock, and the depth is usually ½ to 2/3 of the thickness.

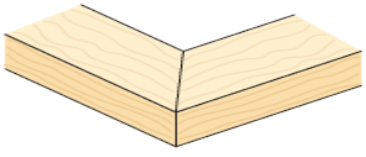






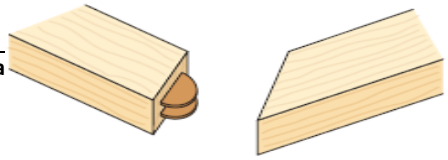
3.Miter joint

The joint is an angle joint that hides the end grain of both pieces. It is rather weak joint unless strengthened with a dowel, splint, or key. It is commonly used corner joints on cabinets and case work. The miter joint is usually cut at 45^0 to form 90^0 angles.

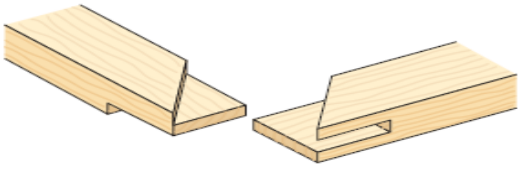


Mitre joint

Mitre joint with loose tongues



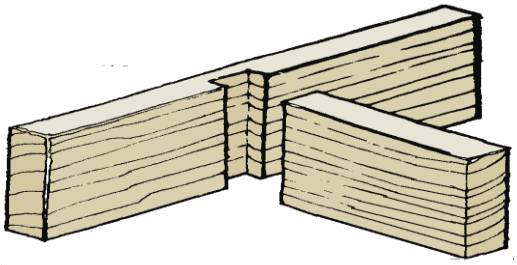
Mitre strengthened using biscuits

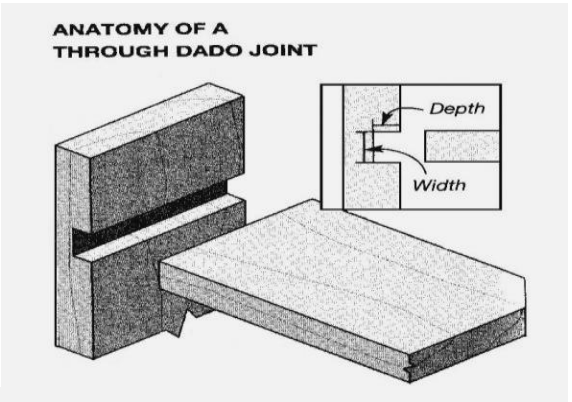


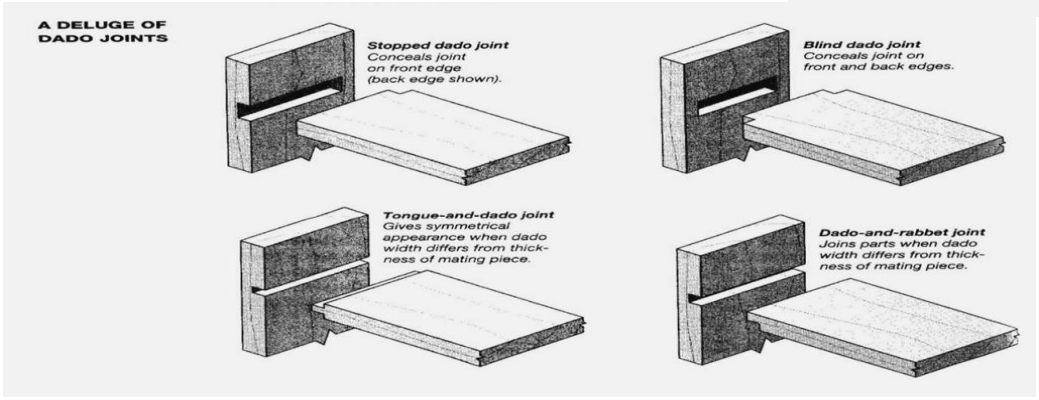
Mitre bridle joint

4. Dado joint

- A groove cut across the grain of a piece of wood, in to which a second piece is fitted is called a dado. The two pieces fitted together in this way are called a dodo joint.
- Dado joint are used in many kinds of wood construction. They are used in window frames, book cases, drawers, and step-ladders.
- A step or blind dado is cut only part way across the first piece. A corner is cut from the second piece to fit into it.
-







5. Lap joints

A lap joint is a joint which we make by cutting an equal amount from each piece. When we have assembled the pieces, their surfaces are flush.

Kinds of Lap Joints

The following are some of the many kinds of lap joints.

Cross Lap Joint

Cross lap joint is used for jointing two cross pieces with flush faces. It is used in the construction of

Furniture and in the construction of frames and house screen.

Middle Lap or T Lap Joints

Middle lap can be used to join bracing members between frames or for forming a strong **T** joint. To

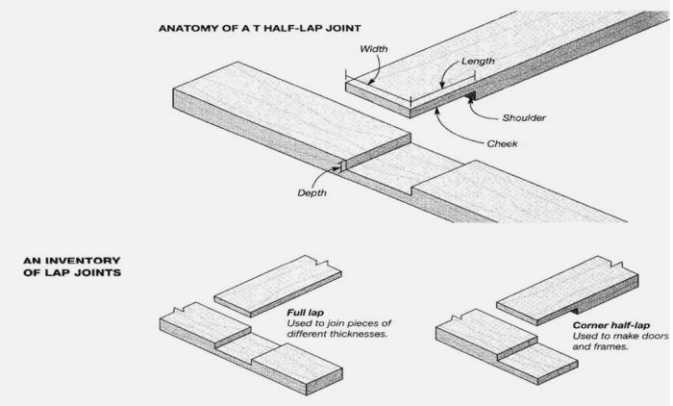
Make a middle half lap, cut an end lap on one member and then cut out a middle lap on the other.

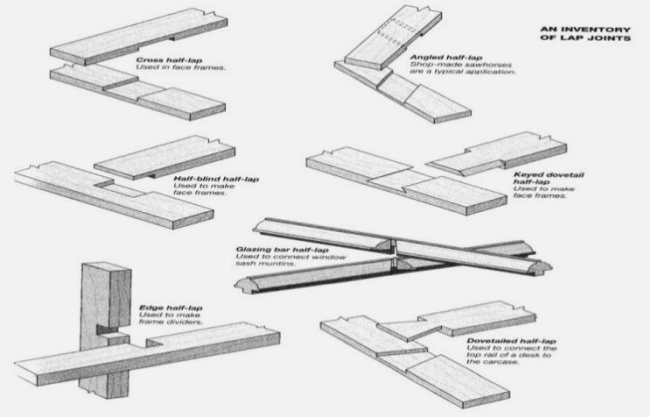
End Lap Joint

End lap joint is used in screen doors, chair seats of any work with corner in which the surfaces of the pieces must be flush.

Half-Lap Joint

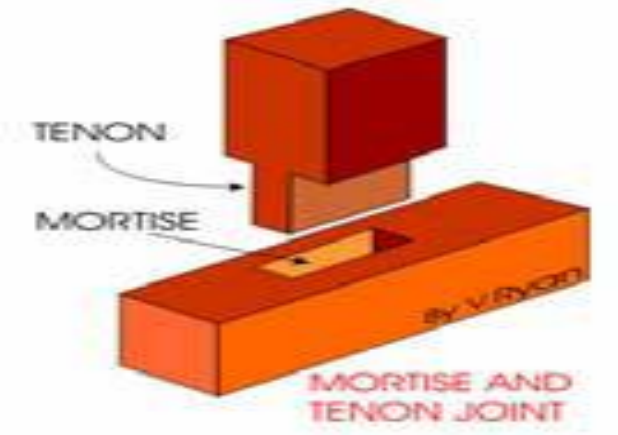
Half-lap joints are used to splice two pieces of wood together.

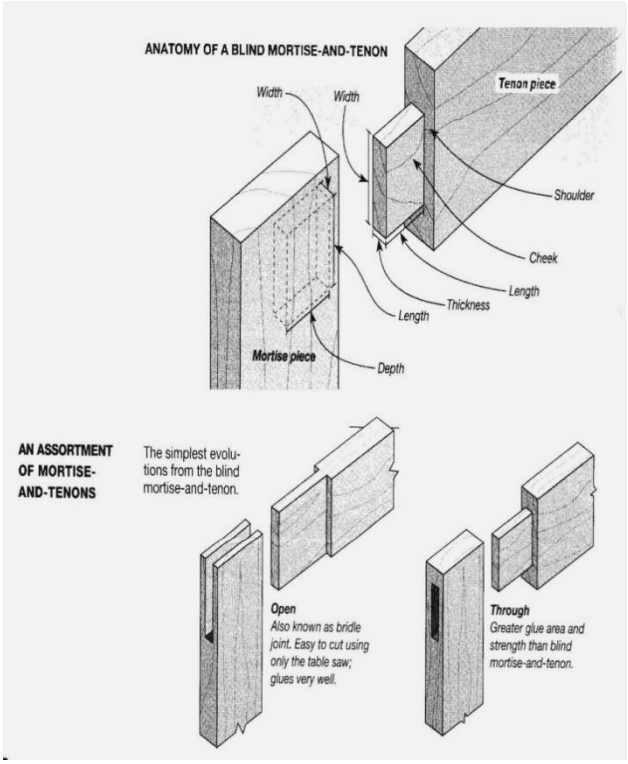


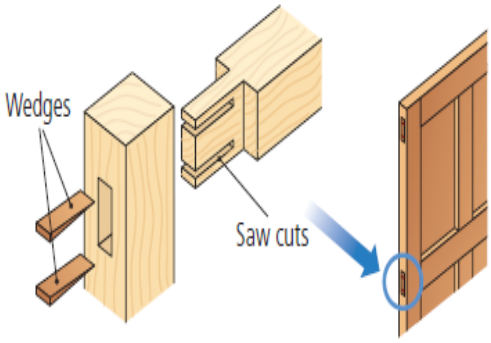


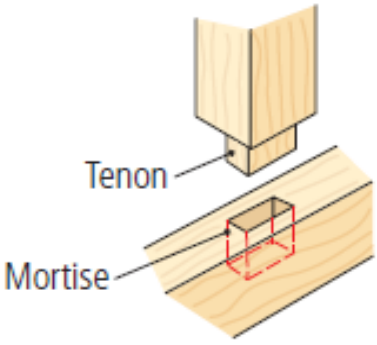
6. Mortise and Ten on Joints

Mortise and ten on joint are used in good leg and rail construction. Such as for making tables, chairs, and benches. It is also used in better quality frames construction. Most common is the blind mortise and ten on. In this, a rectangular opening called the mortise is cut in one piece, and a ten on is cut at the end of the other piece. The ten on should be about one half the thickness of the stock. The types of mortise and ten on joints are the blind, the open, the through and the Hunched mortise and ten on joints.









7, Dovetail joint

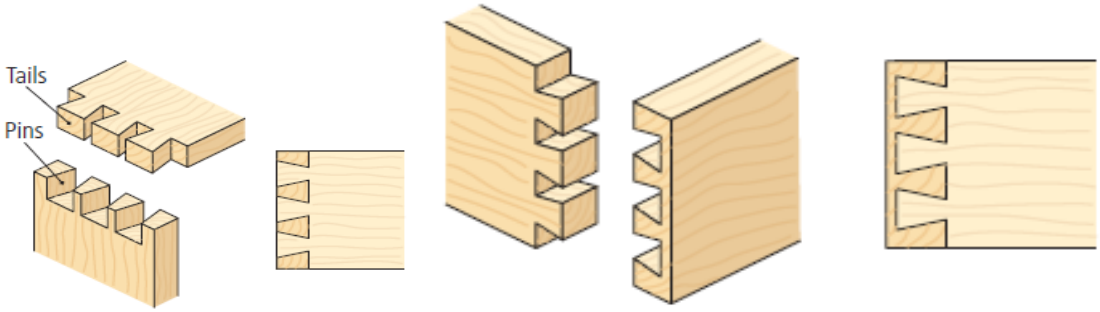
DOVETAIL JOINT is very strong because of the way the tails and pins are shaped.

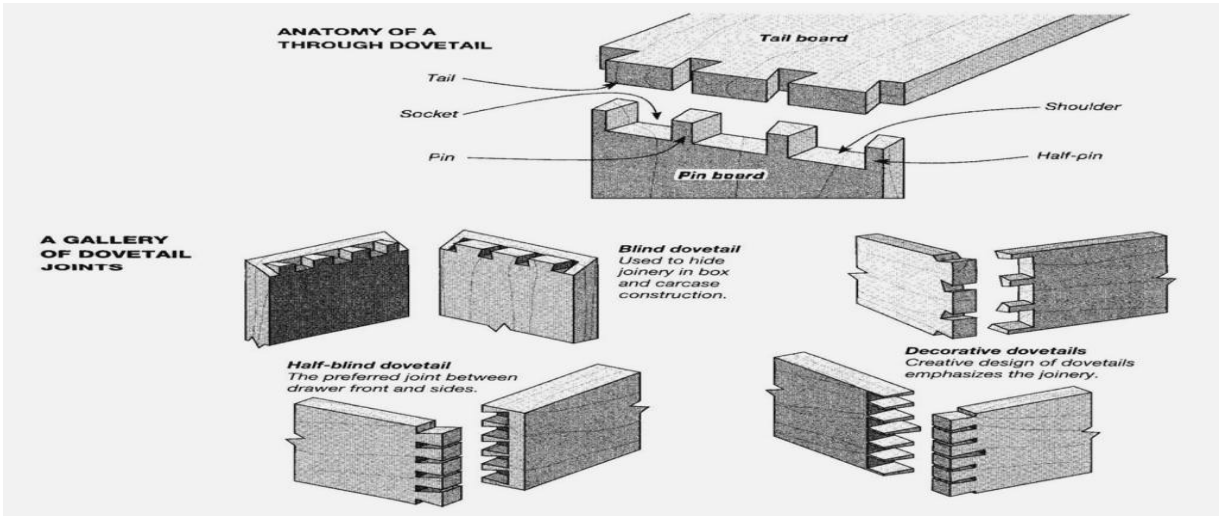
This type of joint is used in high quality furniture for box constructions such as draws, jewelry boxes, **cabinets** and other pieces of furniture where strength is required. In furniture factories, these joints are easily cut by special machines.

There are different types of dovetail joint and when cut accurately they are very impressive and attractive.

Types of dovetail joint

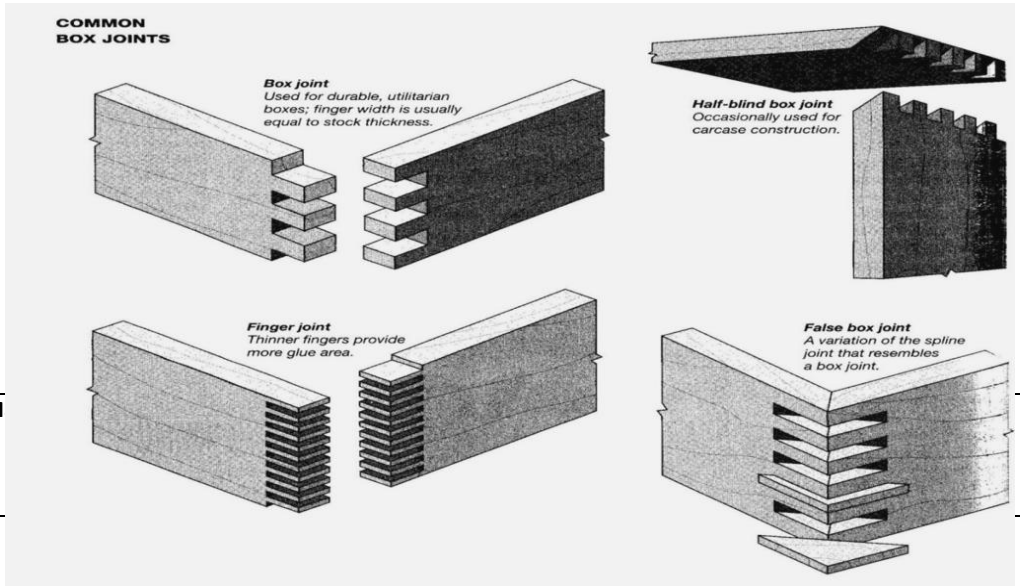
- Through
- Half blind
- Blind





8. Box joints

The box joint is similar to the dovetail, but with non-tapered fingers instead of pins and tails. Since the fingers can slide apartin two directions, the box joint does not resist tension as well as the dovetail. Still, the fingers provide plenty of long-grain gluing surfaces to make this a very sturdy joint.



Self-Check 2	Matching

The greatest advantage of the basic box joint over the dovetail is its ease of construction. As shown on page the joint can be cut with a table saw and a simple jib Variations of the box joint, such as the half-blind joint and the false box joint, are mot: complex, but they can all be done by machine.

9. Spin Biscuit joint

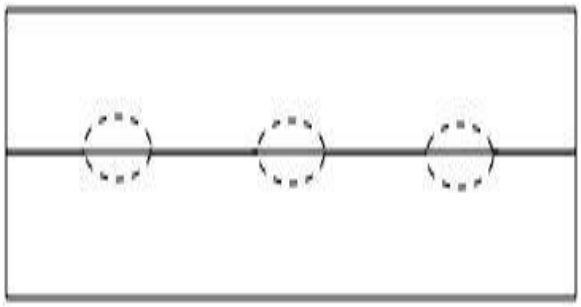
A butt joint that is reinforced with football- or lozenge-shaped wooden "biscuits."

Biscuits are usually made from compressed wood, frequently birch wood.

When the biscuit comes into contact with glue in the biscuit slot, it swells thus creating a tighter joint. Sometimes called a plate joint.

Used to strengthen end butt joints or edge joints.

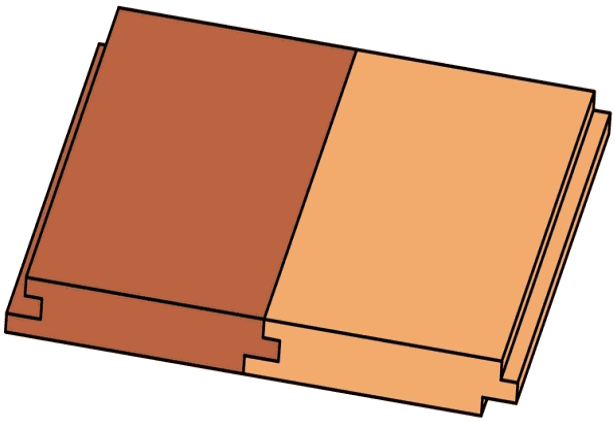
Not as strong as dowel joints.

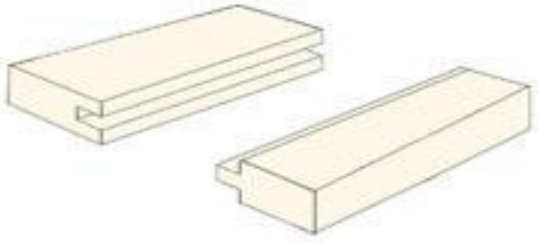


A type of a spline joint.

10, **Tongue and Groove joint**

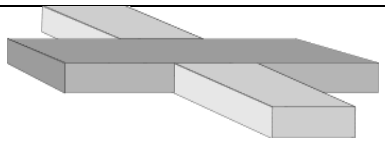
Used on hardwood Flooring





Match Type: Match column **A** with the descriptions in Column **B**. Write the letter of the correct answer on the space provided before the no.

COLUMN A	COLUMN B
1. Halved lap joint 2. Butt joint 3. Dovetail joint 4. Glue 5. Mortise and 6. Ten joint 7. Dowel 8. Miter joint	**A.** Very strong and neat joints used primarily to make drawers and boxes. **B.** It is mostly used for char &table legs and for heavy doors and gates **C.** the simplest joints

	D.  E. it is used to strengthen the butt, miter and rebated joints with glue. F. Adhesive G. A joints with 45% markings so to form a 90% corner when joined.

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-3	Selection of hand tools and raw materials

3.1 **Material selection**

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

Selection of hand tools and raw materials

The correct selection and use of hand tools will help you do the job safely ,and with a minimum expenditure /costs/ of time .When used incorrectly , a hand tool may be

damaged ; but more importantly, you or someone else may be injured .It is to your advantage to learn to properly work with hand tools

- **Choosing a Tool**

  There is a tool for every purpose, and each tool was especially designed for a particular purpose. Using another tool as a substitute for the correct tool is inviting injury. The screw driver was made for setting and removing screws, using it as a wood chisel is unsafe. Try square is a precision tool designed for checking and lay out work. It should not be used to open paint cans or to drive nails. Select the correct tool and use it properly.

- **Arrangement of Tools at Work Station**

  Place heavy tools in the center of the bench where they will not be pushed off and fall. Place tools with cutting edges, such as chisels, saws, and dividers, so that no one will be injured.

- **Carrying Tools**

  Keep the sharp edge or point of a tool down when you are carrying it. Do not swing your arm or raise it above your hand. Do not carry sharp tools in your pockets. Carry only a few tools at a time.

- **Using Tools**

  Hold the tool in the correct way when you are using it. The way to hold most tools that have sharp edge is with both hands. When you cut something, for example with a knife, the cutting movement must be away from yourself and away from other student. Be careful when you use your hand finger or thumb to keep the tool in the right place when you are starting to cut something or when you are cross-cutting or ripping. Use the tool in the correct way and for the correct purpose.

  - **Lifting Up Something Heavy**

    Be carefully not to hurt your back when you lift heavy things. Use the strength of your arms and legs. Ask someone to help you. You can use long boards to help you. You can use long boards to help you move heavy thing.

  - **Fixing the Wood You Are Working On**

When possible, put your work in a vice or fix it to the bench with the clamp. This is especially important when you are using chisels, gauges or carving tools.

- Do not leave nails sticking out of a board. Always remove them or knock the end flat with a hammer.
- Never put nails in your mouth. If you cough or fall, you may swallow them.
- Do not use tools that are not sharp. They may slip and hurt you or another student.
- When someone asks for a tool, always give it to him in your hand. Do not throw it or push it to him.
- Be sure that the handles of hammers, mallets and files are not loose. Do not use tools with broken handles or without handles.
- Put your work, boards and other pieces of wood away carefully in the correct place. Do not leave them where they can fall on someone, or on the floor where they may cause an accident. For the same reason, do not throw waste on the floor. Put it where your instructor tells you to. Keep all materials, tools, and equipment in their correct places.

Self-Check -3	**Written Test**

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

1 What is main goal of material selection?

2 What is the use of correct selection hand tools will helps to?

3 What do you do when you lift heavy things

4 When someone asks for a tool

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

OPERATION SHEET-1	Make Rabbet joint

OPERATION TITLE: Making Rabbet joint

PURPOSE: Making rabbet joint is very important to meet the expected output.

CONDITIONS OR SITUATIONS FOR THE OPERATIONS: The learner should perform this activity with complete protective equipment.

EQUIPMENT TOOLS AND MATERIALS : (Tape rule, Try square, Mallet, Back saw, Marking gauge, Chisel, Bench vice, Hammer, Nail set, Nail, Glue, Pencil, work piece)

PROCEDURE:

Laying out a rabbet joint

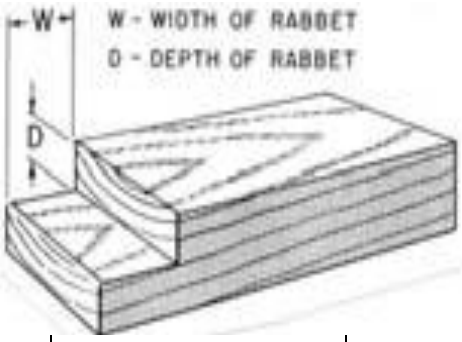
1. Be sure that the stock is square before attempting to lay out the rabbit.
2. Mark the width of the rabbet by placing one piece on the other or by measuring the exact thickness of the piece which is to fit into the rabbit. Make a light mark with a knife or sharp pencil.
3. At the mark, square a line across the surface with a try square. Also square lines down the edges.
4. Mark the depth of a rabbet with a marking gauge.
   Cutting the rabbet

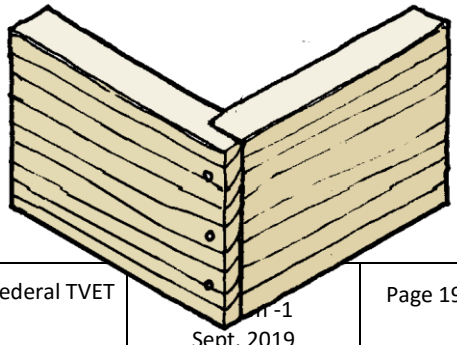
1. Place the stock in the vice and cut the check with a back saw. Cut in the waste stock.
2. Lay the piece on the bench hook or fasten it in the vice and cut the shoulder with a back saw.
3. Finish the rabbet with a chisel.
   Assembling and fastening rabbet joint

1. Place the rebated piece in the vice. Drive the nails through the butted piece while it lays on the bench.
2. Apply the glue to the rabbet and butted piece.
3. Hold the butted piece in your left hand and drive in the nails.
4. Set the nails with the nail set.
   PRECAUTIONS: Observe safety in work place.

QUALITY CRITERIA: 1. Select the wood with good quality.

2. Cut the rabbet as required and make the joint in good quality.





ERATION SHEET-2	

OPERATION TITLE: Making a miter joint

PURPOSE: Making miter joint is very important to meet the expected output.

CONDITIONS OR SITUATIONS FOR THE OPERATIONS: The learner should perform this activity with complete protective equipment.

EQUIPMENT TOOLS AND MATERIALS : (Tape rule, Try square, Miter box saw, Bench vice, Hammer, Nail set, Nail, Glue, Splint, Clamp, Pencil, work piece)

PROCEDURE:

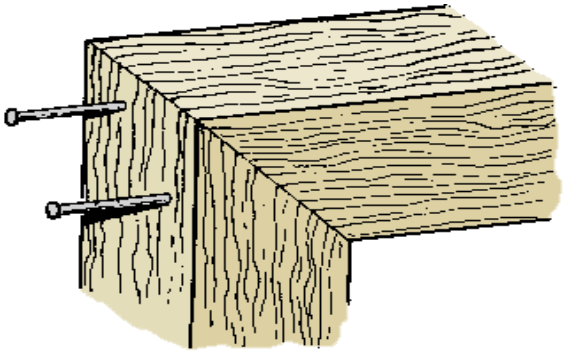
1. Make a molding which will be suitable for the picture to be formed.
2. Mark the length and the width of the picture along the rabbet edge of the molding mark two pieces for the ends and two for the sides.
3. Place the molding in the miter box with the rabbet face down.

4. Hold the molding firmly to the frame of the box. Lower the saw until it touches the moldings on the waste side of the mark.
5. Cut the molding with light, even strokes, opposite pieces of the picture frame should be exactly the same length.
6. Make a trial assemble to see all joints fit properly. If necessary, trim all the pieces lightly with a block plane.
7. Assemble the picture frame by one of the following methods
    - With nails
    - With a spline

PRECAUTIONS: Observe safety in work place.

QUALITY CRITERIA: 1. Select the wood with good quality.

2. Cut the miter as required and make the joint in good quality.



Miter joint

OPERATION SHEET-3	**Make** Mortise and Ten on joint

OPERATION TITLE: Making Mortise and Ten on joint

PURPOSE: Making Mortise and Ten on joint is very important to meet the expected output.

CONDITIONS OR SITUATIONS FOR THE OPERATIONS: The learner should perform this activity with complete protective equipment.

EQUIPMENT TOOLS AND MATERIALS : (Tape rule, Try square, Mallet, Back saw, Mortise gauge, Chisel, Bench vice, Clamp, Glue, Pencil, work piece)

PROCEDURE:

How to make a ten on

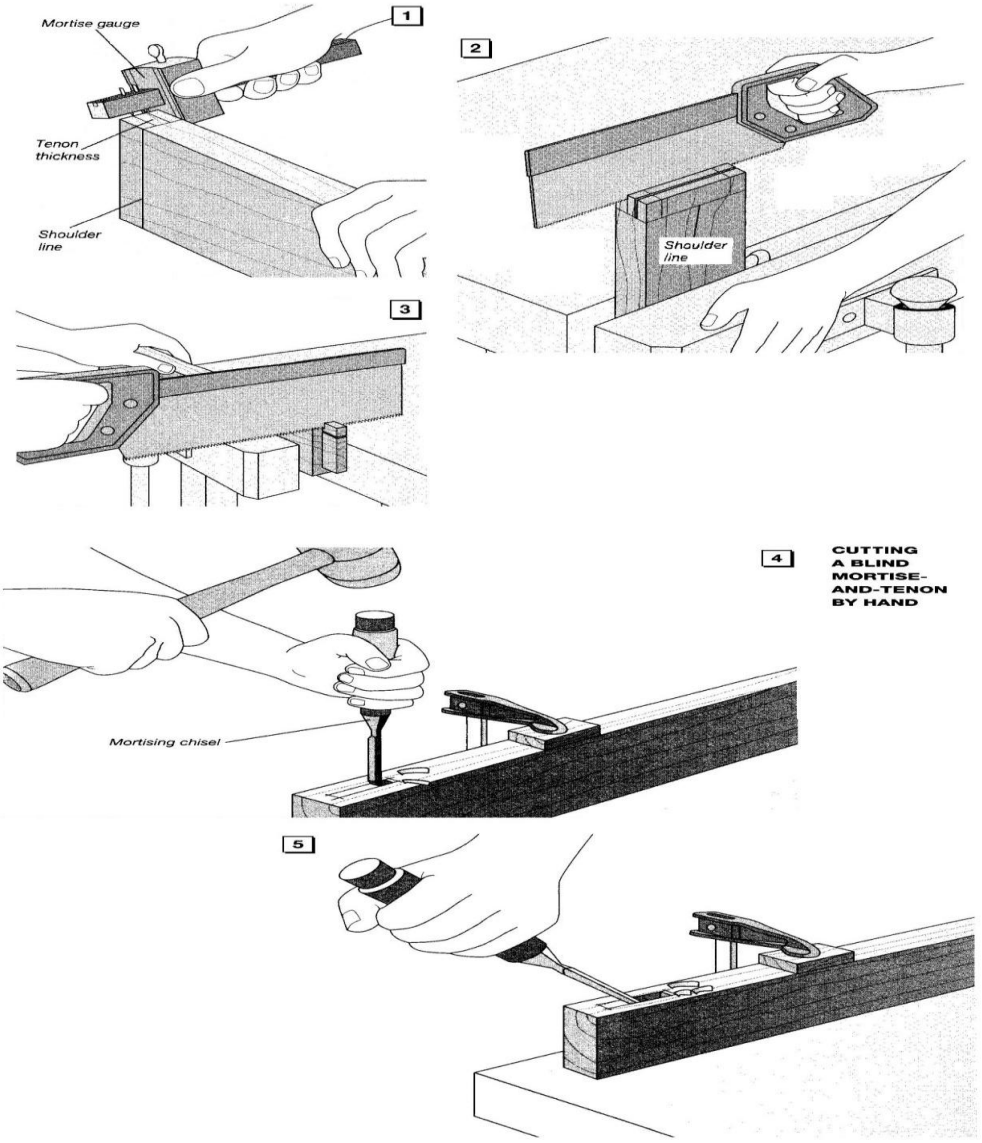
1. Read the working drawing
2. Lay out the ten on on the rail according to the dimensions of the working drawing
3. Fasten the rail vertical in the vice

4. Cut the ten on with a back saw. The saw line should be barely on the waste side of the gage line.
5. Place the rail horizontally in a vice or bench hook. Cut on the waste side of the marked lines to remove the surplus stock. Continue cutting until the ten on is completed.
6. Fit the mortise and ten on pieces for a trial assembly. The pieces should fit snugly without being driven. If necessary, pare the sides of the mortise or the ten on until you get a proper fit.
7. Make final assembly of the mortise and ten on joint by gluing and clamping

How to Make the Mortise

1. Make and square, to the given dimensions, the pieces that are to be jointed.
2. Study your working drawing. Determine the thickness and width of the mortise.
3. NOTE: The shoulder is equal to the shoulder of the ten on. The width is equal to the thickness of the ten on. The length of the mortis depends upon the width of the ten on.
4. Mark the length of the mortise with a sharp pencil and try square.
5. Set a marking gauge to the width. You must gauge each shoulder from the same face.
6. Choose a mortising chisel with a width the same as that of the mortises you want to cut- for example, a chisel with a width of 16 mm wide makes sure that the chisel is sharp. If it is not sharp, you will probably hurt yourself.
7. Grip the chisel firmly in your left hand. Keep the bevel down.
8. Hold the mallet in your right hand. Keep it in your hand all the time you are making the mortise. Allow the second finger of this hand to guide the chisel, putting it in the right position for each cut.
9. Stand where you can sight along the chisel in line with the mortise.
10. Put the chisel, with the bevel down, at the centre of the mortise. Make one V-cut after another to reach the bottom of the mortise. In each cut, pry in wards after you have driven the chisel to the bottom of the cut.
11. Hit the chisel with firm blow. Take about 2 mm for each cut in hard wood and about 3mmin soft wood. Be sure to keep between the lines.
12. When you have reached the bottom of the mortise with V-cuts, turn the chisel round, putting the bevel up. Make vertical cuts. Hold the mallet in the same way. Each time you make a cut break off the shaving and put the chisel in position for the next cut with the second finger of the right hand the hand which is holding the mallet.

13. While you continue cutting, carefully sight also the chisel and mortis to keep the chisel straight. Sight from both sides and end before you taken the lost cut.
14. With each cut, drive the chisel to the bottom of the mortise. When you can do it properly, work as quickly as you can.



PRECAUTIONS: Observe safety in work place.

QUALITY CRITERIA: 1. Select the wood with good quality.

2. Make mortise and ten on as required and make the joint in good Quality.

3, use the given dimension

Instruction Sheet 1	**LG21:- Make joint**

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

- interpret design
- Lay out/mark lines
- methods of cutting and joining
- Fasteners/joining materials and adhesives
- Joint quality finish requirements, accurate measurement & calculation

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

- Cutting and joining based on design.
- understand the properties of wood, strength and dimensional stability
- explain the types of fasteners, and adhesives its appropriate used
- produce different types of joint

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 7
3. Read the information written in the "Information Sheets 1". Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the "Self-check 1" **in page 28**
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to "Information Sheet 2". However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.

7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	interpret design

2.1 interprate design

Design is a process. The process can be simple or complex. It can take a few minutes or several years to accomplish. It can involve one person or a group of people. There are intuitive processes and there are systematic processes. This chapter focuses on the processes of designing furniture.

Scale and Proportion; Scale and proportion are dependent upon physical and spatial relationships, although important distinctions need to be made between these terms.

Scale is based upon the size of one thing relative to another, such as the size of a sectional sofa in relation to the size of a room. Proportion is the geometric correlations between parts and between parts and the whole. o Scale; furniture very often appears larger smaller in its intended spatial context than it did in the shop where it was fabricated.

The perception of scale depends upon the size of the furniture and the spatial context in which it is placed. When the surrounding spatial environment changes, the relative perception of size will change as well though the proportions of the furniture have not changed. o Proportion; is not about size, nor is it about the perception of scale. It is the mathematical relationships of a part, or parts of a design, to other parts within a given field or frame of reference. We recognize furniture by its proportions, identifying the relationships between seat pan to seat back and leg dimensions to table height dimensions.

- Making Prototypes; Detail studies can be modeled or drawn at full scale and are useful in resolving difficult or complicated aspects of design. When the opportunity arises, making a working prototype at full scale can help test and analyze aspects f the design. A working prototype allows one to refine design ideas before committing to production.

Furniture design is deeply rooted in the human condition. It is a social science that belongs to the humanities, an applied art that draws upon many design disciplines, and is dependent upon a working knowledge of materials and fabrication techniques. It is a holistic and interdisciplinary field of study.

Design skills include the ability to graphically communicate and physically model ideas. Though technical instruction can be taught, design skills need to be exercised and will improve with experience. Furniture designers need to learn how to design, sketch, draw, draft,

Self-Check #1	**Written Test**

Directions: Answer all the questions listed below

1. What is design?
2. What is the use of design?

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

Answer Sheet

Score = _____

Rating: _____

Information Sheet-2	Lay out/mark lines

Name: _____ Date: _____

2.2 Lay out/mark lines

Lay 0ut is the plan or design or arrangement of something or the act or process of arranging editorial

Content, advertising, graphics, and other information to fit within certain constraints.

Layout is the process of setting out material on a page or in a work.

OBTAINE MESURMENT

Purpose: To measure is the act or process of determining the extent, quantity, degree, capacity, dimension, volume, and so forth, of a substance by comparing it with some fixed standard, which is usually fixed by law. A measure may relate to any of these standards.

Tools

- Straight age -
- Using compasses
- Miter square
- Combination square
- Marking gauge
- Try square
- Panel gauges
- Cutting gauge
- Marking knife

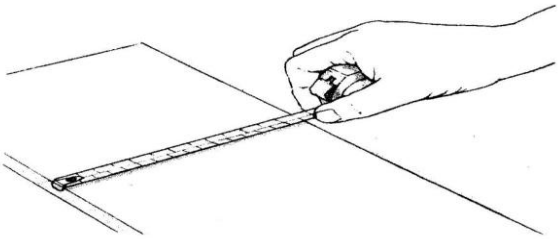
Procedure:

Obtain measurement

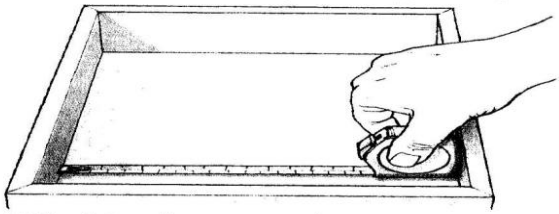
Every wood work shop should be adequately equipped with a reasonable quantity and Varity of tools and equipment for work to be done efficiently. It is necessary for you to be not only familiar with the names of the tools but able to identify and correctly. to make it easier to understand the correct application of the various tools they are grouped in to classes as follows: holding and supporting tools, geometrical tools, percussion and impelling tools, boring cutting tools, sharing and paring tools and abrading and scraping tools. The discussion centers on their type, description and uses.

Measurements are hand tools that are used to get the appropriate measurements of materials a job.

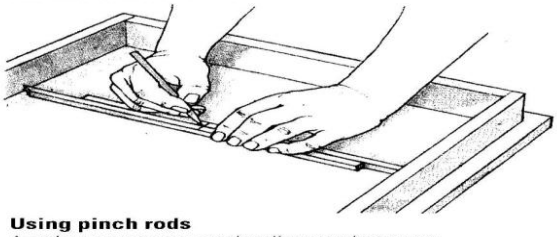
- Order of Obtain measurement
- Select your measurement tools
- Check the measurement tools up & down
- Select marking tool
- Measure & marking the true length



Measuring from edge to edge
When taking external measurements with a tape measure, hook the tip over one edge of the workpiece and read off the dimension against the opposite edge.

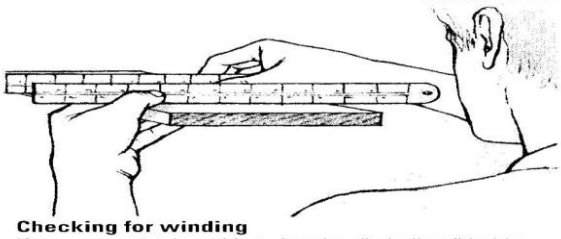


Taking internal measurements
When measuring between two components, the hook riveted to a retractable tape measure slides backward to align with the tip of the tape. Read off the dimension where the tape enters its case, then add the length of the case to arrive at the true measurement.

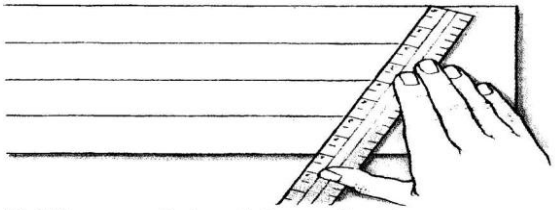


Using pinch rods
Another way to gauge the distance between components is to bridge the gap with two battens held side by side. Draw a mark across both battens to register their relative positions — then, without releasing your grip, transfer them to the work.

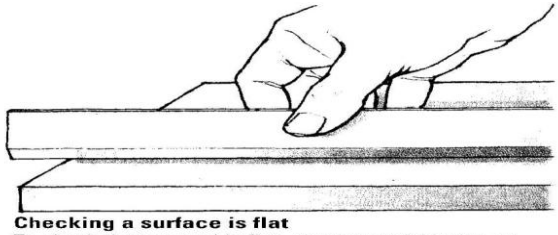
MARKING TOOLS



Checking for winding
If you suspect a board is twisted or "winding," hold a steel rule across each end; if the rules appear to be parallel, the board is flat.

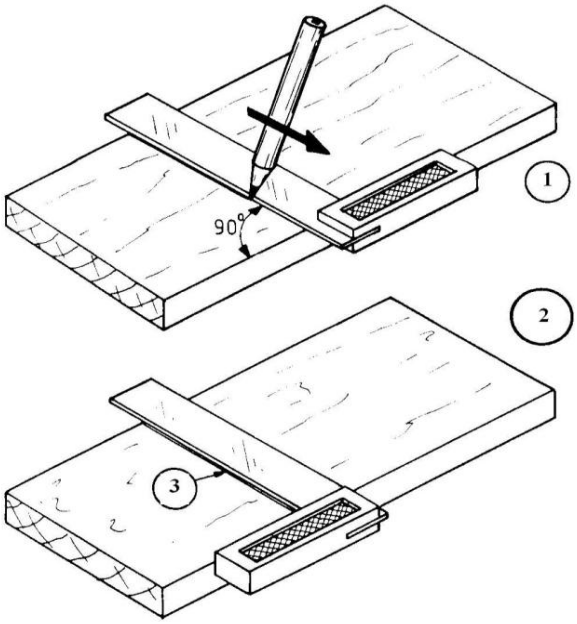


Dividing a workpiece into equal parts
You can divide a workpiece into equal parts using any rule or tape measure. To divide a board into quarters, for example, align the tip of the rule with one edge and the fourth division with the opposite edge, then mark off the divisions between.



Checking a surface is flat
To check that a panel is flat, place a straightedge on the surface. A bump will cause the tool to rock; chinks of light showing beneath the straightedge indicate hollows. Turn the straightedge to various angles to gauge whether the entire surface is flat.

Self-Check #2	Written Test



1 Squaring a pencil line

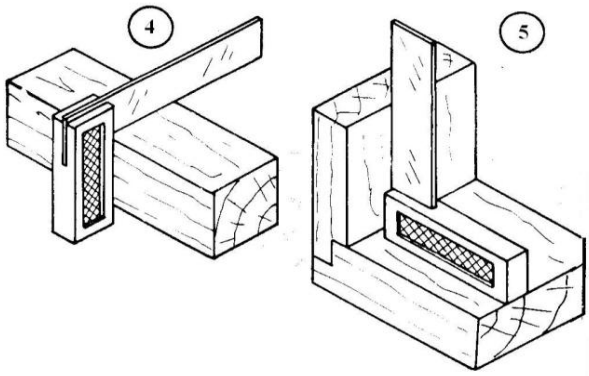
Because the stock is thicker and heavier than the blade, it should be held firmly against the edge of the workpiece.

2. After reversing the square the line should coincide again

Testing a try square for true (which means that its angle between blade and stock is exactly 90 degrees), is done by squaring a line from the face edge across the face side of the workpiece.

3. Pencil line

Reverse the square and look if the pencil line still coincides with the blade.



4. Checking for squareness on the outside

5. Ditto for the inside

USE of a try square:

a. Squaring lines around the wood
b. Testing wood for squareness
c. Marking out lines across the grain.

Directions: Answer all the questions listed below

1. What is the simplest, most common measuring tool?

A. Digital measuring device

B. Flat steel rule

C. Measuring tape

D. Wooden folding rule

2. Marking gages are normally made from which of the following materials?

A. Copper or tin

B. Paper or plastic

C. Plastic or glass

D. Wood or steel

3. List dawn the layout tools at list (4)

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-3	methods of cutting and joining

2.3 methods of cutting and joining

Sawing methods:-Sawing wood quickly and accurately by hand depends on the proper;

Set-up always support the work piece adequately on saw horses and keep it in place with clamps or vice.

- Never attempt to steady a work piece with your free hand.
- Set-up your work at a comfortable height allows you to maintain your balance while sawing.

Posture: - hold the saw blade in line with your arm and shoulder.

Sawing angle: - varies with the type of cut. The saw is held closest to vertical for rip cuts & lower for crosscut.

- ❖ Holding a saw at 900 to the work-piece is the quickest way to shear through wood but the resulting cut edges are invariably rough & splintered.
- ❖ For finer cuts, lower the angle of the saw.
  - ☞ Start the operation as low an angle as possible then raise it to about 600 for rip cuts and to about 450 for crosscuts
  - ☞ To completely eliminate rough edges and splintering, keep the saw at an angle of about 200

Joining methods

Most joints are permanently fastened together with glue and sometimes screws or nails.

The following are common methods of strengthening joints.

- Dowels
- Spines and Biscuits
- Key
- Glue Blocks
- Corner Blocks

Dowels

You can put a dowel into  butt, miter, lap joints etc. to add strength to the joint.

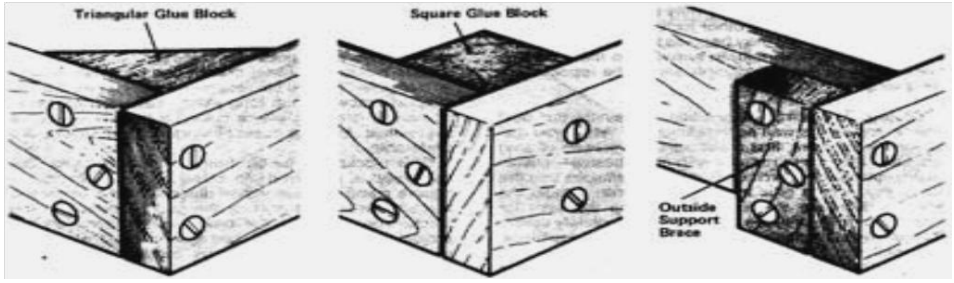
For a Spline to add strength to a joint, its grain must run across the joint, not parallel to it.

Biscuits

- Using thin wood wafers called biscuits can strengthen wood joints by providing more glue bonding area.
- You can use a biscuit joiner (also called a plate joiner) to cut precision mating slots in boards for the biscuits.

Glue Block-small triangular or square blocks.

Corner Blocks-larger than a glue block.



The wood joints as commonly used in wood working means the places at which two separate pieces of wood are connected, united or combined together for the purpose of changing direction. There are many kinds of wood joints used in building construction furniture construction.

Self-Check #3	Written Test

Directions: Answer all the questions listed below

1. The common methods of strengthening joints

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-4	Fasteners/joining materials and adhesives

2.4 Fasteners/joining materials and adhesives

2.3.1 Nails

Nails are made of mild steel, iron zinc, copper, brass or aluminum. Mild steel nails are sometimes galvanized or coated to prevent them rusting.

Kinds of nails

- Common nails
- Box nails
- Casing nails
- Finishing nails
- Brand nails

Common nails: - have heavy, flat heads and are slightly larger in diameter than Box nails. It is used for rough construction work.

Box nails: - are not as large in diameter as common nails but they used in box Construction and in certain types of carpentry where common nails Would be too large.

Casing nails:- are used when large heads are undesirable as in bind nailing of Of flooring and ceiling. They are smaller in diameter than box Nils

Finishing and Brand nails:-are the most slender of all nails and they have the Smallest heads. They are used in fine wood working

Such as in the inside finishing of homes and in blind Nailing of furniture.

Classification of Nails:-

The nail size unites called a" **penny** "which is abbreviated lower case letter 's' .It indicates the length of the nails

2.3.2 Riveting

Riveting is another going method f sheet metal parts. It the process of joining or fastening two or more pieces of metals together with rivets.

Commonly two types of rivets are used in fastening the metal. There are the solid rivets and pop rivets.

Solid rivets are metal pins that look like bots without threads. They are made of soft metals in many sizes and shapes of heads. Rivets hold the work permanently .The head and the shank are the parts of rivets. The size of the rivet is measured by length of the shank and diameter of the shank

Types of rivets

There are various types of rivets. They are named according to the shape of the head. The choice the head is determined by the following factors.

1. Surface finish required

2. Strength of the riveted joint

3. The function of the finished articles

Some the common rivets are the pan head, mushroom head, Flat head, snap head, counter sunk head, bifurcated and conical head rivets

Screws and Nails

- Given the many types of nail, pin and screw those are manufactured,

you can be sure that there will be one to suit any application.

Inevitably, over time, you will build up a huge collection of fixings

(hardware), and it is always worth the effort to keep them sorted into

different sizes and types ready for use.

- Nothing is more frustrating than to reach the assembly stage of a

piece of work and find you cannot complete it for the lack of the right

size of screw and nail.

- It is very easy to ruin the work by making do with something fairly close, but if it is a little too long or too wide, it can easily split the wood.

- Use small jars or tins to store different types, sorting them by size and length, and labeling them so that they are easily identified.

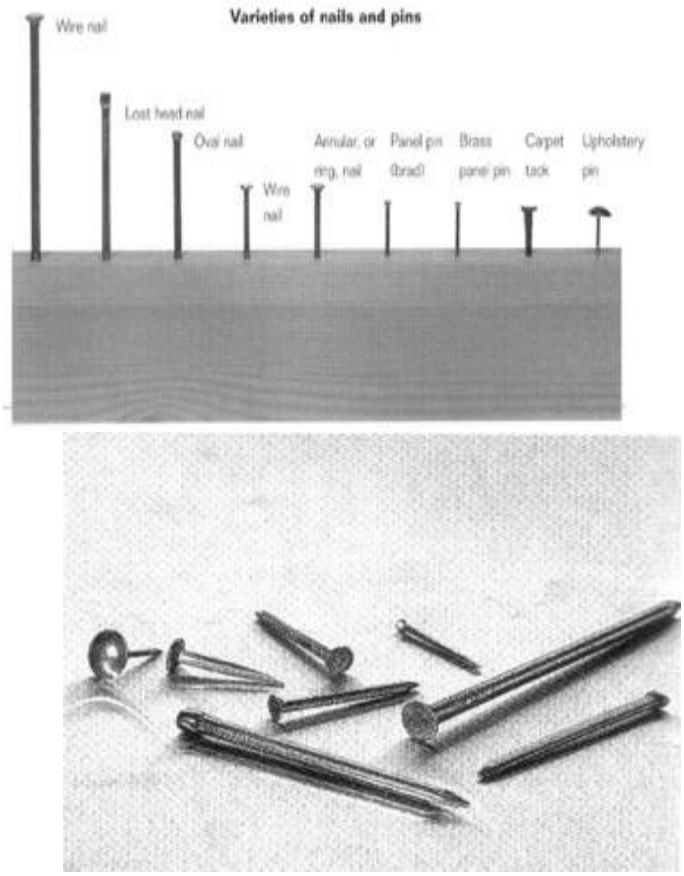


Figure 1 – Sample of nails and pins

Screws

- These provide a more positive fixing than nails and generally are more Useful for strong construction work.

- The size of the screw is determined by the size of the shank or the

Diameter of the gauge, and is denoted numerically.

- A No. 4 gauge is slightly smaller than 3 mm (1/8 in) in diameter and about the smallest size in common use; a No. 12 is 6mm (1/4 in) in Diameter and used for heavy-duty constructional work.
- The gauge of the screw does not change with the length of the screw.
- In general, the smaller the gauge, the shorter the range of lengths that Will be available.
- For general cabinetwork, a No. 8 screw is a convenient size, and is Available in lengths from 19-75mm(3/4-3in).
- Regardless of size, all screws should be long enough to pass through the piece to be secured and penetrate approximately three-quarters of the depth of the second component.
- If there are lots of screw holes in a piece, wrap a piece of tape around the bit to mark the depth on the bit.

Wood Screw

- The standard traditional wood screw, with a single slotted head and tapered shank.
- It requires a clearance hole of the correct size, countersunk to Accommodate the head.
- It is the cheapest type of general-purpose screw and it is made in mild steel with a self-color finish.
- This means that the steel is untreated and will corrode easily in damp Conditions.

Figure 2 – Sample wood screw Figure 3 – Sample round head screw Figure 12 – Recessed cup washer

Adhesives

Types of glues and their uses

Good glue makes the glued joints and part seven stronger than the wood. When we apply glue, it spreads over the surface and goes into the pores of the wood.

There are six kinds of glue

i) Animal glue

ii) case in glue

iii) polyvinyl-resin glue

iv) plastic- Resin glue

v) Fish glue

v) Resorcinol-resin Glue

you must keep all liquid, except the animal glue, tightly covered, when liquid gives become too thick to use, add worm water to make them like a thin cream.

i) Animal glue:- this type glue is made from hides, bones, refined and made into

the final form of thin sheets, flakes, or powder. It also comes in

Liquid form commercially. Animal glue is applied hot and sets

very rapidly. It is, therefore, difficult to use on Projects with

many joints. It is not water proof & should be used in humid

Regions.

ii) Case in glue: - this is a product made from the curd or milk. It is sold in

Powdered form of light yellow or white color. This glue is strong and water Resistant and can be quickly prepared in smaller large quantities. It is use in Furniture and boat construction when humidity is high. Before mixing the powder water, read carefully the direction.

iii) Polyvinyl-resin glue:- this is a white, clean liquid, fast-setting, strong and Easy to use .It will not stain light woods or fabrics. It is used extensively in Furniture making. It is not water proof and should not be used in assemblies that will be subjected to high humidity or water It does not resist high Temperature and should not be used in the building of such articles as TV Cabinet or radio.

iv) Plastic-resin glue:-this glue is urea, a formaldehyde powder mixed with water to proper consistency. It is extensively used is gluing ply wood for exterior uses on airplanes and boats & for other exposed surfaces.

v) Fish glue: - It comes in liquid form. It is made mostly from the tissues and scales of fish occasionally from animal parts. It is slightly more Expensive than other glues. It is their fore, used primarily to repair delicate & valuable wooden objects.

vi) Resorcinol-resin glue: - this type of glue comes to the wood worker in two components.

- ♦ A dark radish liquid resin
- ♦ A powdered or liquid hardener (catalyst)

These components are mixed together for use. It is water proof. It is therefore, an excellent glue for surfaces exposed to and for furniture and cabinet work used in humid places.

Glues

White glue (polyvinyl acetate, or PVA): PVA glue is a white liquid, usually sold in plastic bottles.

It is recommended for use on porous materials -- wood, paper, cloth, porous pottery, and non-structural wood-to-wood bonds.

It is not water resistant. Clamping is required for 30 minutes to 1 hour to set the glue; curing time is 18 to 24 hours.

In choosing wood joints for furniture construction, you will need to give consideration to their: -

strength,

Appearance

Difficulty or construction

2.4 Joint quality requirements

Strength; the joint must be designed as to give adequate strength in service.

The strength of joint is depend on the three factors

The amount of glue

The material used

How will the joint is made.

The larger glue area is the joint will be strong.

Simplicity; the joint should be simple whatever in producing a joint without reason.

Appearances; the joint should have clean lies & closed fitting.

Weather resistance; is the most important when considering items of joinery exposed to the elements

Self-Check #4	**Written Test**

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

1. What is the use of glue?

2 . List the types of nails?

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

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-5	Joint quality finish requirements, accurate measurment & calculation

2.5 Joint quality requirements

Strength; the joint must be designed as to give adequate strength in service.

The strength of joint is depend on the three factors

- The amount of glue
- The material used
- How will the joint is made.

The larger glue area is the joint will be strong.

Simplicity; the joint should be simple whatever in producing a joint without reason.

Appearances; the joint should have clean lies & closed fitting.

Weather resistance; is the most important when considering items of joinery exposed to the elements.

Accurate measurement & calculation ?

It is important to make sure all measurements are accurate to ensure correct material requirements

and to reduce wastage. Measurements that are incorrect can be costly to fix, or the standard of work

may not be satisfactory.

Self-Check #5	Written Test

Instructions: give short answer the ff question

1. What is the use accurate measurement?
2. The strength of joint is depend on the three factors

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Instruction Sheet	LG22: Completing house keeping

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

- Unused materials are stored and recycled
- Cleaning of tools and work area

This guide will also assist you to attain the learning outcome stated in the cover page.

Specifically, upon completion of this Learning Guide, you will be able to –

- Store un use materials
- Clean tools
- Clean work shop.

Learning Instructions:

1. Read the specific objectives of this Learning Guide
2. Follow the instructions described in number 3 to 7
3. Read the information written in the "Information Sheets 1". Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
4. Accomplish the "Self-check 1" **in page 49**
5. Ask from your teacher the key to correction (key answers) or you can request your teacher to correct your work. (You are to get the key answer only after you finished answering the Self-check 1).
6. If you earned a satisfactory evaluation proceed to "Information Sheet 2". However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #1.
7. Submit your accomplished Self-check. This will form part of your training portfolio.

Information Sheet-1	Unused materials are stored and recycled

1 Unused materials are stored and recycled

Good organization of stored materials is essential for overcoming material storage problems whether on a temporary or permanent basis. There will also be fewer strain injuries if the amount of handling is reduced, especially if less manual materials handling is required. The location of the stockpiles should not interfere with work but they should still be readily available when required. Stored materials should allow at least one meter (or about three feet) of clear space under sprinkler heads.

Recycle Wood Waste and Sawdust

For many years wood waste was open burned or disposed of in landfills. As the cost of both wood and disposal will continue to rise, and open burning is usually no longer an option, it makes sense to find ways to recycle wood waste. Recycling options include:

- use in particle board, chip core, laminates
- absorptive materials
- shredding or grinding to use as animal bedding, sludge stabilizer, mulch or decorative landscaping material (this also reduces the volume for storage until use)
- use in pulp and paper manufacturing (usually softwood only)
- using as fuel for energy and heat recovery either for on-site or off-site energy recover y facilities where other sources of waste wood can be combined Benefits
- Efficient use of raw materials
- reduction of wood wastes Watch-Outs
- some wood wastes need to be dried or pelletized before being used as fuel which adds equipment and expense
- burning treated or coated wood can release regulated hazardous air pollutants
- be familiar with applicable regulations before installing and operating a wood boiler
- waste streams should not be combined (i.e., mixing sawdust, wood chips, end pieces, etc.) as it may inhibit secondary use

Self-Check #1	Written Test

Instructions: give short answer the f/f question

1. . What are the advantages of storing hand tools by types?
2. What are the objectives of recycled wood waste materials?
3. Tool boxes Uses?
4. Tool boxes are usually made?

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

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet-2	Cleaning of tools and work area

2 Cleaning of tools and work area

Implement housekeeping activities

Regular inspections are carried out in the work area according to workplace procedures and standards.

Areas and amenities are cleaned and maintained in accordance with Occupational Health and Safety (OHS) and 5S procedures.

Disposal of waste and dangerous chemicals are checked in accordance with OHS regulations and organizational policies.

Effective housekeeping results in:

- fewer tripping and slipping accidents in clutter-free and spill-free work areas
- decreased fire hazards
- lower worker exposures to hazardous substances (e.g. dusts, vapours)
- better control of tools and materials, including inventory and supplies
- more efficient equipment cleanup and maintenance
- better hygienic conditions leading to improved health
- more effective use of space
- reduced property damage by improving preventive maintenance
- less janitorial work
- improved morale
- improved productivity (tools and materials will be easy to find)

Arrange necessary items in good order so that they can be easily picked up for use

Prevent loss and waste of time

Easy to find and pick up necessary items

Ensure first come – first – served basis

Make work flow smooth and easy

Cleaning as a Way of purifying the Spirit Cleaning as Inspection

CLEAN YOUR WORKPLACE COMPLETELY

Easy to check abnormality Prevent machinery and equipment from deterioration Keep workplace safe and easy to work

Some sweep practices . . . .

Clean-up Day3-5 minutes cleaning day Assign owner to each machine or area Combine cleaning with inspection Make daily maintenance points clear by providing visible instructions Provide necessary tools for critical points of cleaning Prevent causes of dust and dirt

Maintain high standards of housekeeping and workplace organization at all times

- ☞ Maintain cleanliness and orderliness
- ☞ Prevent miss-operation
- ☞ Make it easy to find out abnormality
- ☞ Standardize good practices

Self-Check #2	Written Test

Instructions: give short answer the ff question

1. List at least three the effective of housekeeping results?

2. Why cleaning tools & work area?

3. What are the advantages of storing hand tools by types?

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

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Reference

1. General wood working by CHRIS H. GRONEMAN/ Third Edition
2. General wood working by CHRIS H. GRONEMAN/ Six Edition