



Ethiopian TVET-System



Furniture Making L-II

Based on Sept. 2012G.C. Occupational standard

**Module Title: Assembling furniture components
& fixtures**

TTLM Code: IND FMK2 09 19V1

This module includes the following Learning Guides

LG11: Prepare for assembly works

LG Code: IND FMK2 M04 LO1-LG11

LG12: Assemble components

LG Code: IND FMK2 M04 LO2-LG12

LG13: Secure assembled components

LG Code: IND FMK2 M04 LO3-LG13

LG14: Clean up

LG Code: IND FMK2 M04 LO4-LG14



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

- 1.1 Determining work instruction with Job Requirements
 - 1.1.1 design
 - 1.1.2 tolerance
 - 1.1.3 process
 - 1.1.4 materials, finishes and quantity
- 1.2 . Methods and Processes in components assembling
- 1.3 . Appropriate Tools, Jigs and Material components needed
- 1.4 . Workplace requirements
- 1.5 . OHS requirements
- 1.6 . material safety management systems
- 1.7 . fixing and joining device with work instructions
 - 1.7.1 timber(wood),glues, nails and screws, dowels, knock-down fittings, manufactured board

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 –**

- Use Work instructions to determine job requirements, including design, tolerances, process, materials, finish and quantity.
- Select work area for the task.
- Plan Assembly sequence following work procedure.
- Check quality of product at each stage of the process.
- Observe Workplace health and safety requirements are throughout the work.
- Select and check Tools and equipment suitable to the fixing method for safe operation.
- Collect and make Components, hardware, fittings and attachments ready for use.
- Select Fixing and joining devices in line with work instructions and type of materials to be joined.
- Select and use Jigs for suitability of purpose.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 16.
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 6.
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 #2.
7. Submit your accomplished Self-check. This will form part of your training portfolio.
8. Read the information written in the “Information Sheet 2”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
9. Accomplish the “Self-check 2” in page ___.
10. 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 2).
11. Read the information written in the “Information Sheets 3 and 4”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
12. Accomplish the “Self-check 3” in page ___.
13. 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 3).
14. If you earned a satisfactory evaluation proceed to “Operation Sheet 1” in page __. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #6.
15. Read the “Operation Sheet 1” and try to understand the procedures discussed.
16. Do the “LAP test” in page __ (if you are ready). Request your teacher to evaluate your performance and outputs. Your teacher will give you feedback and the evaluation will be either satisfactory or unsatisfactory. If unsatisfactory, your teacher shall advice you on additional work. But if satisfactory you can proceed to Learning Guide #5



1. Introduction

Completing a piece of furniture relies on a number of processes. One of the Final processes includes assembling completed furnishing components to Create furniture frames and/or a piece of furniture.

Before we look at the assembly process it is important that you understand exactly what furnishing components are?

Furnishing components are pieces of timber or manufactured board that have been pre-machined ready for the assembly process

1.1 Determining work instruction with job requirements

1.1.1. Design Process Control

Designing is the process of finding Solutions to human problems, making use of a range of competencies such as creative thinking, written and graphic communication, research investigation, analysis, synthesis and technical skills.

The main activities of the design process include:

- Designing;
- Making;
- Evaluation.

The broad stages in designing comprise:

- Investigating, clarifying and specifying the task or problem;
- Developing and communicating the design ideas or proposals;
- Making the final design;
- Testing, modifying and evaluating the product.

Design principles

The principles of design describe how elements apply to cabinetry. These principles are harmony, repetition, balance, and proportion.

1. Harmony is the pleasing relationship of all elements in a given product design.

Harmony of color follows three basic rules. This are

- a) Less intense color should be used on large areas.
- b) Bright colors are attractive in small areas.
- c) Complementary colors should be used

2. Repetition means using an element or elements more than once to create a rhythm in design and attract interest .straight lines, curvedlines, spaces, texture, and colors are effective for this purpose.

3. Balance is the use of space and mass to give feeling of stability or equality to design.

1.1.2. Tolerance

All dimensions should have an associated tolerance.

Where appropriate, assemblies meet appropriate geometric tolerances (such as square, straight, angles free from twists)

1.1.3. Production process

Process: Any activity or group of activities that takes an input, adds value to it, and provides an output to a customer. The logical organization of people,

materials, energy, equipment, and procedures into work activities designed to produce a specified end result (work product).

It is very important for businesses to identify the processes that add value, so that they can enhance these processes to the ongoing benefit of the business.

► Processes

Material processing for cabinetmaking fits into three categories. These categories include **separating, forming** and **combining**.

Separating refers to cutting or removing material. Cutting stock on a circular saw, sanding, or tuning a spindle on a lathe are separating operations.

Forming, includes all operation where materials is bent, or formed in to a shape using a mold or form

Combining, includes bonding ,mechanical fastening, and coating .

► Production process

First, selecting and setting up equipment is done – this is **preprocessing**.

Then, sawing, shaping, sanding, assembling, and finishing is done –this is **processing**

Finally, transporting and installing the finished product is done—this is **postprocessing**.

1.1.4. Material

To determine the materials you need for the cabinet, you must first understand the different materials that can be used .The materials for cabinets are classified as follows:

- ✚ **Wood** .Hardwood and softwood lumber,veneer,wood products(panels, molding)
- ✚ **Metals**. Steel, brass, aluminum, and copper edging and hardware.
- ✚ **Plastics**. Sheets, edging, laminated tops, hardware, etc.
- ✚ **Glass**. Sheet, pattern, mirror, stained.
- ✚ **Ceramic tile** .different colors and shapes are available.
- ✚ **Adhesives**. Cements, glues, mastics.
- ✚ **Hardware**. Screws, nails, bolts, hinges, pull.
- ✚ **Finishes**. Paint, enamel,stain,filler, oil, lacquer, shellac, varnish, urethane, etc.

And others, Knockdown fittings



Cabinet Connector

- Ideal for small cabinet Plastic housing, metal connector
- Nylon connector with steel expansion pin
- Set consists of: 1 housing, 1 plug element, 1 fastening screw

Carcass Connector

- Nylon housing with integral die-cast zinc cam



Cabinet Connector

- Ideal for small cabinets

Connector

- Press fit connector (manually or automatic)
- Single sided construction

Carcass

Nylon housing with integral die-cast cam

Zinc die-cast connecting screw



MetalCamHousing•

Fast Fit

Wood thickness: 16mm One piece, one-step connector

- Drilling depth: 12.5mm Turn& lock
- Centre lock position: 8mm Perfect for 16 & 18mm board
- Sold per 100 Ideal for CNC & Nested base machined cabinets
- Fast cap can also be used

FIG:-1-6. Knock Down Fittings

Specification: - Furniture depending on the material used for manufacturing and their suitability for various purposes. Furniture is always intended for a specific purpose, i.e., has a functional purpose. In designing of furniture one must be guided by the following considerations:

- ❖ Convenience of the furniture in service
- ❖ Usefulness , Strength and Reliability



Self-Check -1	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List activities of the design process
2. Enumerate The broad stages in designing
3. What is tolerance
4. Write the materials used for assembling products.

Note: Satisfactory rating - 4 points

Unsatisfactory - below 4 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



Procedure followed during furniture component assembling

- Select components of cabinet that fits gone needs/specification.
- select the right kind of materials
- Have the correct equipment
- Apply glue to surfaces of joints;
- Check carcasses and frames for squareness with a diagonal measuring stick;
- Sight in all directions for winding (if there is any, it may be necessary to correct it by moving cramps
- Flush off joints and edges and glue *on* veneer edging or lipping if required;
- Wash off surplus glue immediately after assembling.
- **Fitting doors and drawers**
Doors and drawers are constructed and fitted after the final assembly of the carcass. Fit any hardware, such as door -Jocks and drawer pulls.
- **Finishing**
Prepare the surface and edges by fine sanding and damping. When they are dry, sand them again ready for varnishing. The varnishing can be done either by spraying or brushing



Self-Check -2	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Enumerate the Procedures followed during furniture component assembling

Note: Satisfactory rating - 3 points

Unsatisfactory - below 3 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

Information Sheet-3	Appropriate Tools, Jigs and Material components needed
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Tools

Lists of tools for assembling furniture

When assembling, make sure all tools and materials are ready so that the assembly can proceed without delay. Cramps opened to the right size, mallet, hammer, nails, screws, dowels, glue, wet and dry rags, pneumatic tools etc., should all be ready at hand.

Selecting jigs

JIGS

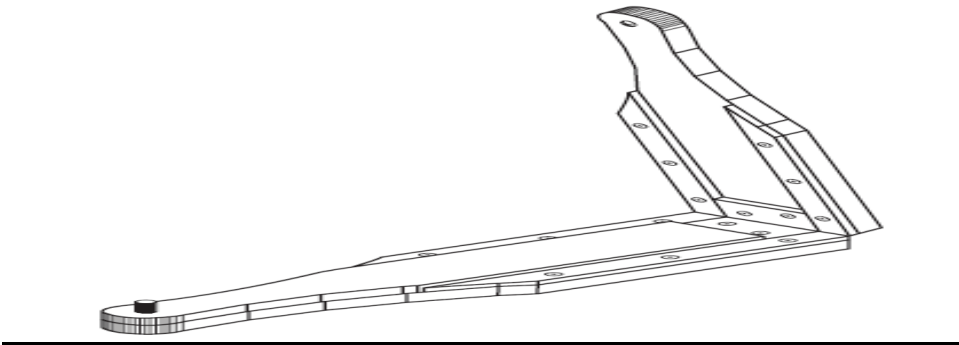
Jigs are work-holders or guides for shaping; thus the bench-hook is a simple form of jig to support small sections of wood during cutting. They are widely used in machine-work, particularly in spindle molding and routing, and the reader is referred to machine-handbooks for details. The term 'jigsaw' is an abbreviation of 'jigger' saw and has no connection

A jig is a device for holding furniture components while they are machined to Shape and size. A jig incorporates a template as a machining guide; there are many types and styles of jigs for a wide range of machinery.

The suitable jig needs to be selected and checked. It is essential that the jig Shape accurately reflect that of the full size set-out drawing of the component, And the template must be accurate to within a **tolerance of ± 0.5 mm** of the set out pattern size.

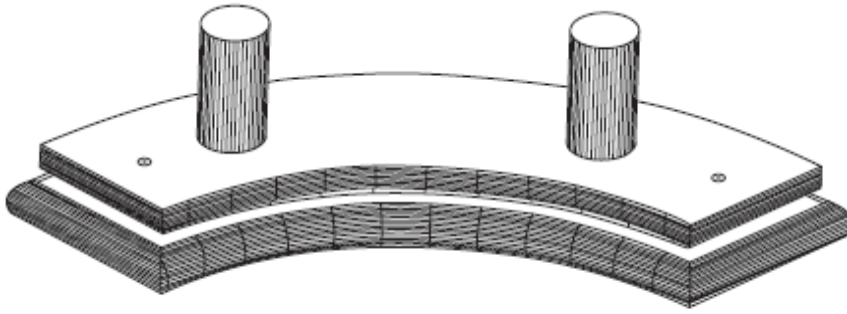
Generally jigs are made up of the following parts:

- base – usually made from 12 to 18 mm MDF or plywood template – shaped to act as the jig
- stops and locators – helps prevent stock from moving
- Handles – used to hold the jig firmly while machining



❖ **External cutting jig**

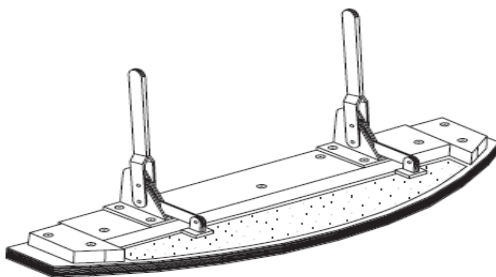
External cutting jigs allow only the outside edge of the work piece to be machined. The bearing collar, or ring fence on a spindle molder runs again. The template and the shape is reproduced on the work piece.



External cutting jig

❖ **Single sided jig**

A single sided jig is a jig which can only be used from one side. Note the darkened surface near the cutting edge – this is coarse abrasive paper glued to the jig to prevent lateral movement of the work piece.



Single sided jig

Jigs must be checked to ensure that they are in good working order, for Example the strength, safety and accuracy of a jig must be assessed. If the jig is not strong enough it will not be safe or accurate for very long. A jig is an Extension of a machine and allows for repetitive machining. It is essential that the jig shape accurately reflect that of the full size set out drawing of the component and the template must be accurate to within a tolerance of +/-0.5mm of the set out pattern size.

Component Parts and Terminology

- 1 - Hanging rail - secures cabinet to the wall
- 2 - Corner blocks add strength and stability
- 3 - Drawer & drawer guides or false front

- 4 – Door
- 5 - Cabinet floor
- 6 - Toe Kick
- 7 - Shelf
- 8 - Face Frame
- 9 - Cabinet Floor
- 10 - Center Stile
- 11 - Exterior Style
- 12 - Exposed Side (End)

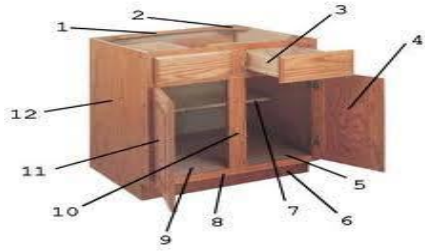


table component parts

Top, rail , leg, stretcher

Self-Check -3	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What is jig mean and write the purpose of jig
2. Write the component parts of office table.
3. Is a material used to move drawers easily?
 - a. Stile B. glides c. hinge D. all
4. From the following components one is used for secure furniture to the wall
 - A. Face frame B. hanging rail c. glides D. stile

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

Information Sheet-4	Workplace requirements
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1.4. Workplace requirements

Workspace (area)

Sufficient clear space needs to be allocated to ensure employees have the full range of movement required to do the job and can move without injury. The space allocated for employees within a workplace needs to be appropriate to the work performed

A Workshop is a building or place where facilities such as machines, tools and workbenches are provided to enable a worker or Student to carry out his or her practical activities in a satisfactory manner. Most of the machines and tools used in the Workshop, if not properly used or handled, may result in injury or damage to the machine or tool. Therefore, it is essential to observe safety precautions. Developing a safe working attitude and adopting safe methods are the surest ways of avoiding unnecessary accidents in the work shop.

Proper work shop lay out must be followed from sawmill process, to product finish and Packing operation.

Current Layout

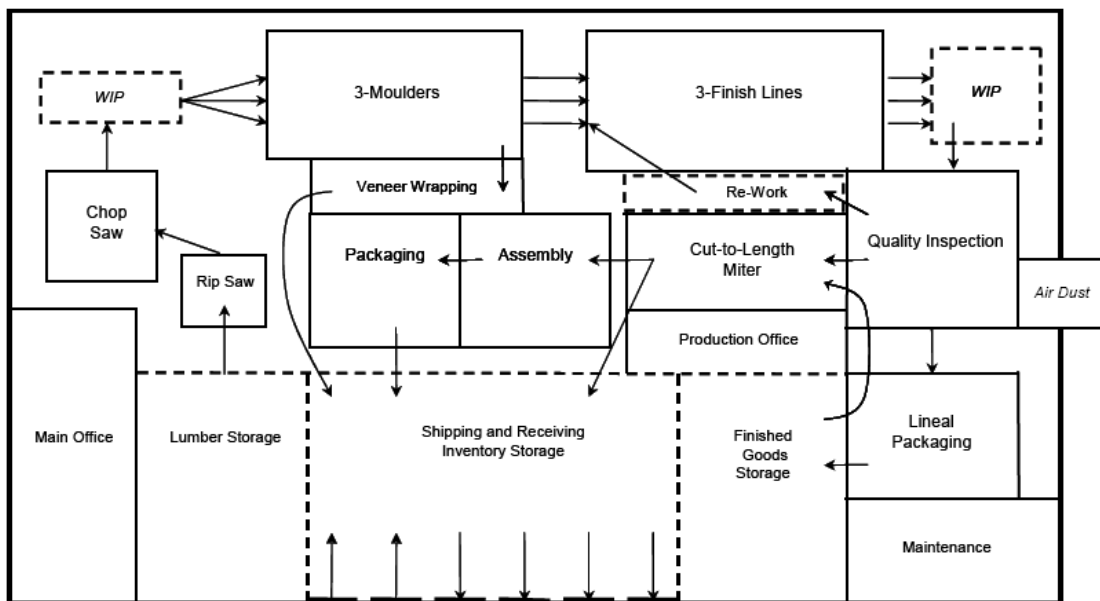


Fig .sample wood shop layout

PLANT LAYOUT

The affect of plant layout on a workplace not only can impact on production volumes but on health and safety.

Employers should consider the following issues relating to plant layout:

- designated raw material and delivery areas
- Raw materials stored in a easily accessible area, close to the start of the production area
- Linear workflow through the production line
- Clear areas of work
- Traffic management and designated forklift and pedestrian segregation
- Reduction of blind spots throughout the plant.



❖ Planning and organizing resources

Planning

It is often helpful if the manufacturing activities are planned carefully ahead of time. This will ensure early completion and avoid unnecessary delays. The planning may be facilitated if questions such as these are asked and acted upon.

1. What will be the appropriate order in which to make the various parts?
2. What are the main steps (procedures) involved in the making of each component part?
3. Will any special template, jig, tools or equipment be required to carry out any of the Operations?
4. What kinds of skills and knowledge will be needed to perform each particular Operation successfully?
5. Do I have the competence and confidence to work with a particular machine or equipment all by myself?
6. For which aspect of the work will help or demonstration be needed From the teacher?

❖ Organizing resources

The next step is to organize the resources and the following procedure may be used:

1. Obtain all the required materials and prepare them' in readiness. Bring the appropriate ones to the Workshop only when they will be needed.
2. Get all tools and equipment ready and in good condition and bring them to the Workshop when they are required.
3. Make arrangements ahead of time to secure any special tools and equipment that need to be borrowed.
4. Arrange the tools and the materials properly on the working bench or area to ensure safe working conditions.
5. All safety devices and guards on machines must be put in place before work begins.

Prepare for assembly

Before work can commence assembling furnishing components, you need to select the necessary tools and equipment and all the necessary components. In This section we will look at:

- ❖ health and safety
- ❖ work instructions ,including job sheet, cutting lists plans, drawings and designs
- ❖ the assembly sequence
- ❖ selecting tools, equipment and work area
- ❖ collecting components
- ❖ selecting fixing and joining devices
- ❖ Selecting jigs.



Self-Check -4	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List outwork shop facilities that our work shop full fill to produce quality product .3pts
2. What is the purpose of planning for production process.(2pts)

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



Information Sheet-5	Workplace requirements
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The statutory requirements for general health and safety at work
 Accident and first aid procedures

- ❖ Fire precautions and procedures
- ❖ Protective clothing and equipment
- ❖ Correct manual lifting and carrying techniques
- ❖ How to use lifting equipment
- ❖ Safe working practices – cutting and forming tools
- ❖ Safe working practices – portable power tools

Health and Safety

Following workplace health and safety procedures is very important to make sure you and your workmates are not injured at work.

Workplaces are potentially hazardous environments. It is vital that the work area is designed or laid out to avoid any risk of injury to you, other employees or visitors to the workplace.

The location of the following items should be considered when setting up a workplace to make sure that everyone works in a safe and secure workplace and that workflow is not inhibited by accident or injury.

First aid box

- ❖ Safety signs e.g. hatched, emergency exit
- ❖ Fire extinguisher installation points
- ❖ Dust and fume extraction
- ❖ Sharpening devices



Self-Check -5	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. List The statutory requirements for health and safety at work place.3pts
2. What are the ways to prevent accident in the work place? 2

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



Information Sheet-6	material safety management systems
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Material Safety Data Sheets (MSDS).

Material Safety Data Sheets

Material Safety Data Sheets (MSDS) are an important part in the correct Handling, transporting, storage and application of hazardous goods and Substances.

This document provides information on the hazards of the product and safe storage, handling and disposal techniques.

The labeling requirements of this scheme are:

- **Symbol** A pictogram must be displayed depending on the specific hazard category or class the substance belongs to under the scheme.
- **Signal word:** - The signal words used in the GHS are “**Danger**” and “**Warning**”.
- **Hazard statement** a phrase assigned to a hazard class and category that describes the nature of the hazards of a hazardous product (**e.g. may be harmful if inhaled**)
- **A precautionary statement a phrase (and/or pictogram)** that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous product, or improper storage or handling of a hazardous product. (**e.g. keep out of reach of children**)Product identifier this includes chemical identity of the substance, for mixtures the label should include the chemical identities of all the hazardous ingredients.
- **Supplier identification** the name address and phone number of the supplier.

Occupational Health and Safety legislation

All states and territories have Occupational Health and Safety (OH&S) Legislation that must be followed by all workplaces. WH&S legislation covers

- ❖ building codes
- ❖ Material safety management systems
- ❖ hazardous substances & dangerous goods codes
- ❖ manual handling

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 -6	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. what is the purpose of following MSDS in work place.2pts
2. Enumerate labeling requirements MSDS. 5pts
3. Work place health and safety legislation covers. 1pts.
 - A. building codes
 - B. Material safety management systems&handling manual
 - C. hazardous substances & dangerous goods codes
 - D. all of the above

Note: Satisfactory rating - 7 points

Unsatisfactory - below 4 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



Information Sheet-7	fixing and joining device with work instructions
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1.7.1 Timber (wood),glues, nails and screws, dowels, knock-down fittings, manufactured board

❖ **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
- VI) 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 hightemperature 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

- o A dark radish liquid resin
- o 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.



WOODWORKING ADHESIVES				
THERMOPLASTICS				
Type	Common Form	Minimum Temp°F	Clamp Time	Characteristics/Use
Acrylic Resin	liquid	50	4 hrs	Used to bond edges of solid wood or composites to nonporous substrates like melamine or solid surface materials
Aliphatic Resin (yellow glue)	liquid	50	1 hr	Better water resistance, less creep, and faster tack than white PVA; nontoxic
Cross-linking PVA	liquid	55	1 hr	Similar to yellow glue; high water resistance— appropriate for exterior use
Hot-melt (thermoplastic resin)	Granules, sticks, plugs	350-400	N/A	Used for fast tacking, or temporary assembly; bonds dissolve with heat; low bond strength
Polyvinyl Acetate (white glue)	liquid	60	1 hr	High sheer strength and flexibility, rubbery glue line; no water resistance
THERMOSETS				
Type	Common Form	Minimum Temp°F	Clamp Time	Characteristics/Use
Cyanoacrylate ("super glue")	liquid	40	N/A	Joints are strong and waterproof, low shock resistance; fast-setting; useful for small repairs in wood, plastic, or metals
Epoxy	Two-part heavy liquid	32	1 hr	Must be mixed; useful for bonding difficult materials; waterproof; good gap-bridging strength; fumes pose health risk
Polyurethane (isocyanates)	liquid	50	1-4 hrs	Moisture curing; very water resistant; may cause respiratory reaction; good for oily woods
Reactive Hot-melt (polyurethane)	Sealed cartridges or cans	250	N/A	Resists water and solvents; bond withstands heat; may cause respiratory reaction; special spray equipment needed
Resorcinol/phenol-resorcinol	two-part liquid	70	4-10 hrs	Good water and solvent resistance; must be mixed; formaldehyde emissions are potential health hazard
Urea Formaldehyde (plastic resin)	powder	70	8-12 hrs	High strength; good moisture resistance; must be mixed; excellent for veneering; formaldehyde emissions are potential health hazard
CEMENTS				
Type	Common Form	Minimum Temp°F	Clamp Time	Characteristics/Use
Contact Cement (solvent-borne)	liquid	40	N/A	For bonding to wood composites; emits high VOC emissions, fumes pose health risk, some highly flammable
Contact Cement (waterborne)	liquid	65	N/A	Slow evaporation of water; catalyzed "self drying" formulas require special spray equipment
GLUES				
Type	Common Form	Minimum Temp°F	Clamp Time	Characteristics/Use
Casein Glue	powder	60	2-3 hrs	Moisture resistant but not waterproof; will bond species that feel oily such as teak; will stain dark or acid woods
Hide Glue	liquid and granules	70	2-3 hrs	Bonds dissolve with moist heat; granules must be soaked in water and heated in a glue pot; repairs easily
Hot Animal Glue	powder or flakes	145	2-3 hrs	Speedy assembly is necessary; dries into a colorless, nontoxic, sandable glue line; moisture will soften
Vegetable, Blood Albumin, and Fish Glue	powder or flakes	70 to 230	2-3 hrs	Once used to bond interior plywood veneers, packing tapes and shipping boxes

2. Nails

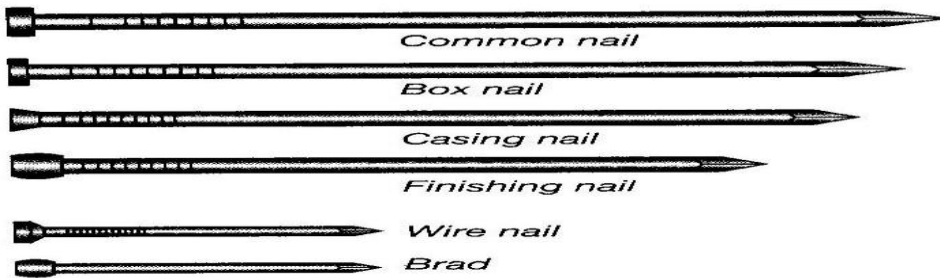
Nails are made of mild steel, iron zinc, copper, brass or aluminum. Mild steel nails are sometimes galvanized or coated to prevent them rusting.

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 blind nailing of flooring and ceiling. They are smaller in diameter than box nails.
- **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

2. Screws

Wood screws have several advantages over nails.

First, screws are harder to pull out. Pull on a screw and pull on a nail—the screw will give greater resistance.

Second, should you tire of an item at sometime in the future; screws usually let you disassemble it without great travail. It is possible to damage the work if it is nailed together and you want to take it apart these advantages cost more in the effort and time it takes to install screws.

Screws are normally used to fasten things such as **hinges, knobs, and so on, to structures, and in the assembly of various wood parts.**

Today, screws are the most commonly used fastener in cabinetmaking. Because they feature great holding power and can be driven easily with a variable-speed electric drill, they are practical and convenient.

As shown below, screws are available with a variety of head shapes and drive configurations. In addition, there are alternatives to the conventional wood screw, such as **dry-wall screws**, and more modern screws with names like "**low-root**" screws, "**cut-thread**" screws, and **steel screws**.

They are not used in heavy building simply because, in this type of work, things are built so that there is a minimum of stress on the fasteners and the withdrawal resistance is not required. Indeed, if stress were created, even the most tenacious screw could not stand up much better than a nail (which is to say very little). The wood screw consists of a gimlet point, a threaded portion, and a shank and head, which may be straight slot or Phillips. Screws of many types are made for specialized purposes, but stock wood screws are usually obtainable in either steel

or brass, and, more rarely, are made of high-strength bronze.

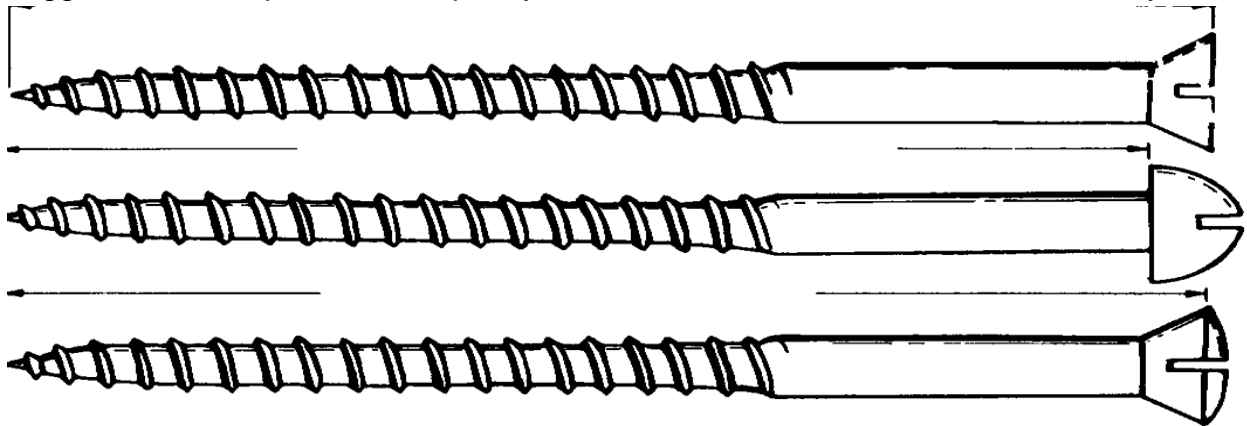
Three types of heads are

Standard:

- The *flat countersunk head*, with the included angle of the sloping sides standardized at 82°
- The *round head*, whose height is also standardized, but whose contour seems to vary slightly among the products of different Manufacturers

The *oval head*, which combines the contours of the flat head and the round head
 All of these screws are available with the Phillips slot, or crossed slots, as well as the usual single straight slot. The Phillips slot allows a much greater driving force to be exerted without damaging the head than the usual straight-slotted head. The greater part of all wood screws used (probably 75 percent or more) used to be the flat-head type. However, this has changed to the Phillips head screw in recent years because of the advent of the inexpensive power screwdriver attachments available on electric drills (cordless drill.). The reversible electric drill combined with the variable speed

Trigger makes it possible to quickly drive a screw and to extract if necessary.



A. flat head B. round head C. oval head

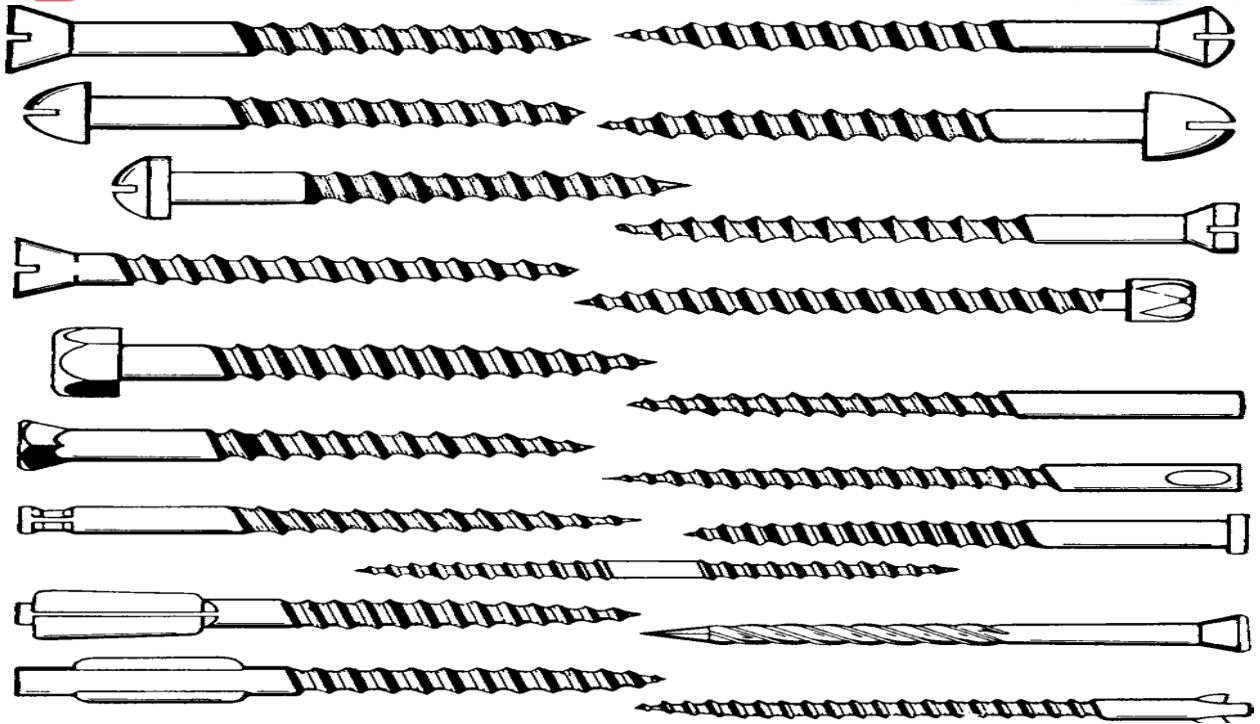
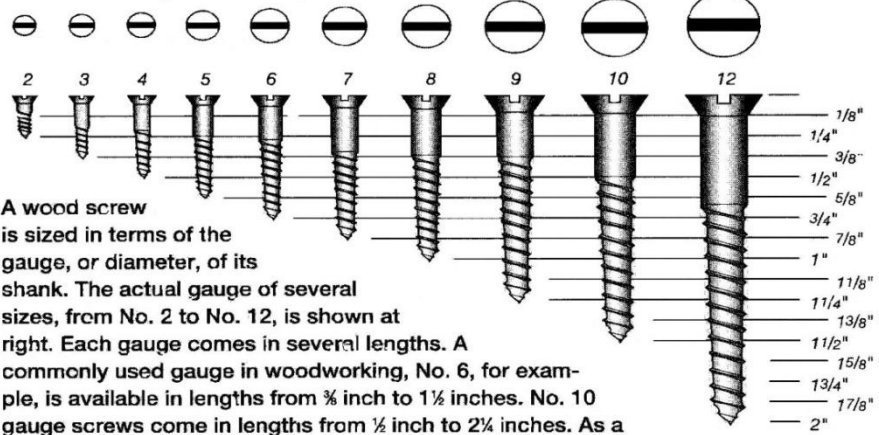


Figure 1-18 various wood screws showing the variety of headshapes available: (A) Flat head, (B) oval head, (C) round head,(D) piano head, (E) oval fillister head, (F) countersunk fillister

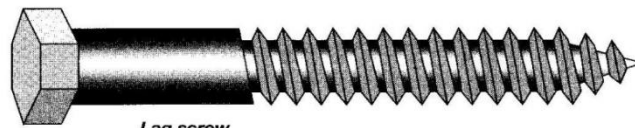
head, (G) felloe, (H) close head, (I) hexagon head, (J) headless,(K) square bung head, (L) grooved, (M) pinched head, (N) roundbung head, (O) dowel, (P) winged, (Q) drive, (R) winged, and(S) winged head. Heads A through G may be obtained withPhillips-type head. Most will never be needed.

SCREW GAUGE (ACTUAL SIZE)

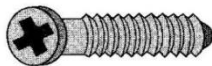


A wood screw is sized in terms of the gauge, or diameter, of its shank. The actual gauge of several sizes, from No. 2 to No. 12, is shown at right. Each gauge comes in several lengths. A commonly used gauge in woodworking, No. 6, for example, is available in lengths from $\frac{3}{8}$ inch to $1\frac{1}{2}$ inches. No. 10 gauge screws come in lengths from $\frac{1}{2}$ inch to $2\frac{1}{4}$ inches. As a general rule, the higher the gauge number for a given screw length, the greater its holding power.

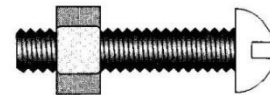
INVENTORY OF SCREWS AND BOLTS



Lag screw
A heavy-duty hex- or square-head screw tightened with a wrench; generally available in diameters from $\frac{1}{4}$ to $\frac{1}{2}$ inch and lengths up to about 8 inches or longer. Used in heavy-duty applications, such as hanging kitchen cabinets or securing parts in outdoor furniture.



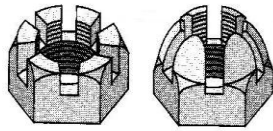
One-piece connector
Has coarse threads and a cylindrical shank; its main advantage is that it aligns parts as it fastens them together.



Round-head machine screw
Tightened with a nut, machine screws are used in assembling knockdown joints.

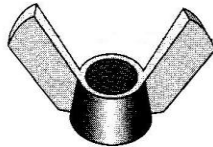


Hanger bolt
A combination bolt/screw with lag threads on one end and machine threads on the other; used in knockdown assemblies such as mounting leg-to-rail joints. (See page 323.)



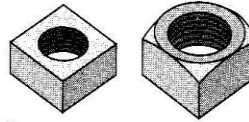
Castellated nuts

Available in flat and crowned versions, the notches provide anchorage for a cotter pin which is installed through a hole in the bolt to prevent the nut from turning.



Wing nut

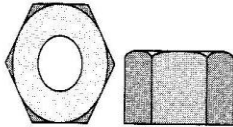
Used in assembling knock-down joints and adjustable assemblies; wings enable nut to be tightened by hand.



Square nut

Cheaper than hex nut; used to tighten machine screws. Available in both flat and crowned versions.

TYPES OF NUTS



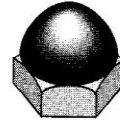
Hex nut

Used to tighten machine screws; available in various sizes and threads.



Knurled nut

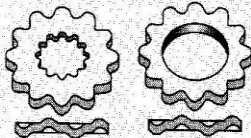
A round nut with a knurled outside circumference to provide better grip for tightening by hand; less obtrusive than wing nuts.



Cap nut

Used to cover exposed screw threads; the hex-shaped shoulder enables the nut to be tightened.

TYPES OF WASHERS



Toothed

Geared or scalloped edges bite into the surface to prevent fastener from turning.



Countersunk

Sometimes referred to as a grommet washer; used in decorative applications with flat- or oval-head screws.



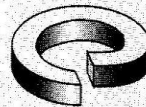
Flat

Prevents a nut or round head screw from digging into the surface.



Flush countersunk

Distributes load of countersunk flat-head screw.



Split lock

Similar to a flat washer that has been cut and bent, a lock washer applies springlike pressure against the nut to prevent it from loosening.

Furniture Dowels

- Glue grooves and chamfered ends are made precisely with minor tolerances
- Suitable for automatic dowel inserting machines



Ø	Length	Finish
8mm	32mm	Pine
8mm	32mm	Hardwood
9.5mm	50mm	Pine
9.5mm	50mm	Hardwood
10mm	50mm	Pine
14mm	75mm	Hardwood

LAMELLO Wooden Plates

- Solid beech wood for excellent strength/stability
- When moistened with PVA glue, expansion will ensure a tight fit / joint

Related Products:

- Lamello Machines
- Glue Applicators
- Clamping Set



Clamping Plate K20

- Fitting aid for workpieces difficult to clamp, e.g. screens, crown moulding etc.
- Used in combination with wooden Lamella plates
- Plastic, barbed crossribs, for use without glue
- 60mm (L) x 24mm (W) x 4.5mm (T)



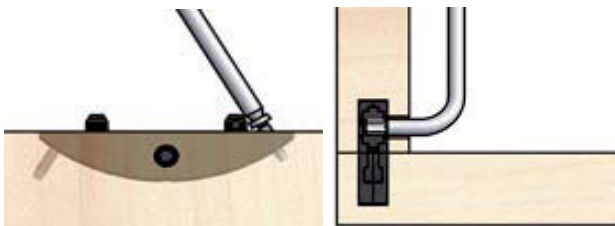
Biscuit-Shaped Connector

- Detachable connections, aligns and connects, 2 functions in one
- Maximum aesthetics due to minimal hole size for opening and closing of the connection
- No torsional movement due to aligning pins
- Various angles possible
- Stackable, since no parts protruding the surface
- Easy installation with any Lamello biscuit joiner, low investment
- Usable in solid wood and wood composites
- Tolerance lateral +/- 0,5 mm (max. +/- 0,75 mm)
- Made of fibre-glass reinforced plastic



1) Drill Ø 6mm hole.

2) Cut grooves 8mm



3) Tighten screws

4) Connect, finished

Self Clamping Biscuit

- Connects and clamps with one strike
- Cut groove in both work pieces simultaneously
- No clamps - no waiting time
- Strong grip in work pieces
- For wood and wood composites
- Easy joining with any biscuit joiner
- No tool investment
- Use on job site





Invisible Joining System/knock down fittings

Various characteristics...

- ❖ **Invisible**
Uncompromising aesthetics in spite of knock down design, no masking caps required (completely hidden).
- ❖ **Resolves clamping problems**
Can be used as hidden clamp; avoiding costly jigs for gluing bulky work pieces
- ❖ **Joins dissimilar materials**
Permits easy combinations of work piece materials such as wood, plastics, aluminum, chromium steel, phenol, HPL (Invis connects all non magnetic materials)
- ❖ **Fast acting assembly aid**
Saves labor costs and time; rapid and clean assembly without additional components, clamp and glue drying time.
- ❖ **Allows accurate disassembly**
Easy and simple assembly and disassembly of knock down work pieces.

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		<p>Example 1: Table</p> <ul style="list-style-type: none"> ■ Combine different materials ■ Small transportation volume ■ Simple packing of the individual parts
		<p>Example 2: Finished profile</p> <ul style="list-style-type: none"> ■ Connect finished anodized aluminium profiles ■ Connect aluminium profiles perfectly without welding ■ Small transportation volume
		<p>Example 3: Handrail</p> <ul style="list-style-type: none"> ■ Tighten joints without additional assembly aids ■ Accurate aligning of the parts ■ Short assembling times
		<p>Example 4: Cupboard</p> <ul style="list-style-type: none"> ■ Smaller consumption of joiners through center wall studs ■ Small transportation volume ■ Fulfill high requirements for hygiene (Laboratory, clean-room technology, ...)
		<p>Example 5: Stainless handrail</p> <ul style="list-style-type: none"> ■ Connect finished polished pipes ■ Connect stainless steel perfectly without welding ■ Small transportation volume



Self-Check -7

Written Test

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

1. What are the basic fixing and joining materials?3pts.
2. What is the advantage of knock down fittings than others 3.pts
3. List the type of glue .4pts

Note: Satisfactory rating - 10 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



LAP Test	Practical Demonstration
-----------------	--------------------------------

Name: _____ Date: _____

Time started: _____ Time finished: _____

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

Task 1. Name: _____ Date: _____

Time Started: _____ Time Finished: _____

Instructions: You are required to perform the following-after read and interpret the working and assembling drawing.

Then perform the following task in front of your trainer:

- A/ Prepare the work place
- B/lay out component parts depend on the specification
- C/ Assemble components by screw /nail
- D/ Finishing the with sofa stain

Request your trainer for an evaluation and feedback.



Instruction Sheet	LG12: Assemble components
-------------------	----------------------------------

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

- Lay out assemble components
- Usage of hand and power tools
- Quality Checklist for assembled frames
- Hinged joining/ putting in place/ fitting
- Repairing procedures for unfitted/defective materials
- Procedures on how to store a finished Products

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 –**

- Layout and joinComponents using jigs and appropriate fastenings.
- UseHand and/or power tools and equipment as required.
- Check Assembled frame for compliance with specifications.
- Prepare, assemble and fitcomponents are as per specification.
- Repair or tagFrames which do not meet quality specifications for further processing or recycling/disposal.
- organize and storeFinished products in holding area



Information Sheet-8	Lay out assemble components
----------------------------	-----------------------------

There are many different components used in the assembly process. These include **carcasses, frames, panels, tops, ends, shelves, moldings, and drawer Components, rails and stiles for panels and doors.**

Furnishing components can also consist of hardware such as **drawer runners, hinges; knock down fittings** and other **decorative items.**

Assemble components

Components may be put together to make carcasses, doors, drawers, frames, Shelves, ends, tops and other basic assemblies.

In this section we will look at:

- ❖ Assembling
- ❖ Checking the quality
- ❖ Storing completed pieces.

Assembling

Before commencing the assembly of a furniture frame or piece of furniture it is important to make sure that you have everything you need to complete the job. This includes:

- Access to a suitable assembly area _ enough space and work bench
- Suitable personal protective equipment
- Work instructions or relevant job sheet, cutting lists or assembly plan.
- Should include tolerance information, materials needed, the finish and The quantity required

Make sure all components required have been machined, prepared and Are ready for assemble

Self-Check -8	Written Test
----------------------	---------------------

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

1. What are the precondition requirements before commencing assembling?

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

Information Sheet-9	Usage of hand and power tools for Assemble furniture components
----------------------------	--

<ul style="list-style-type: none"> ❖ measuring tapes or rulers ❖ hammers ❖ mallets ❖ squares ❖ bevels ❖ chisels ❖ planes 	<ul style="list-style-type: none"> ❖ hand saws ❖ power saws ❖ power drills/screwdrivers ❖ clamps/cramps ❖ screwdrivers and/or spanners ❖ pincers ❖ pneumatic tools, compressor and spray equipment
---	---

- appropriate tools and equipment are available _ including jigs and Clamps glue or adhesive is accessible, including equipment to remove excess Glue or adhesive
- Necessary decorative items and hardware are on hand.

A *clamp* is a device used for pressing two pieces of stock together. There are many different types of clamps, and all vary in the amount of pressure they may exert on the stock. Below is a list of the most popular wood clamps in use today.
Types of clamps

- a) Bar clamp
- b) Wood clamp or Hand screw clamp
- c) C-clamp
- d) Spring clamp
- e) Screw clamp
- f) Strap or band
- g) Screw clamp
- h) Toggle clamp
- i) Pipe clamp
- j) One handed bar clamp
- k) Miter clamp



The type of clamp you choose is determined by the size and amount of pressure you need. Pipe clamps, for instance, are long and have the greatest cranking power. Adversely, spring clamps are small and have less compression strength.

Clamping tools

- **Cauls:** Rigid wooden planks that are clamped to panel glue-ups, one on top and another directly below it, to keep the
- Individual boards aligned to each other (right).

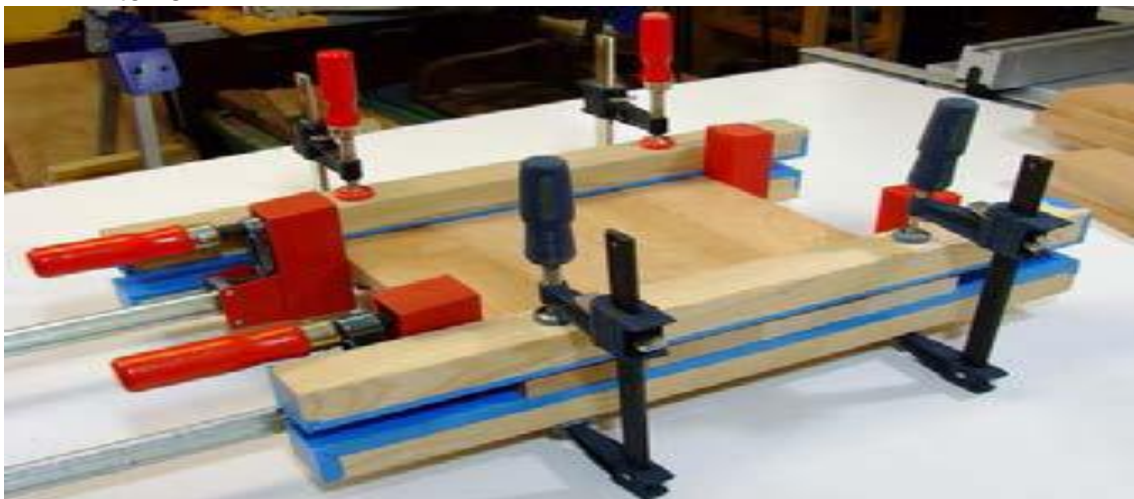
- **Cellophane Tape:** Attached to cauls to prevent from sticking to excess project glue

- **Wax paper:** Prevents projects from bonding to the table

- **Riser blocks:** Lifts project off the table for ease of clamping

- **Squares:** Allows you to check if stock is square (90°)

- **Wet paper towel:** Excess glue is the enemy of stain! Remove it before it sets. When glue sets, it seals the wood and prevents stain from soaking into the fibers. The result is one big ugly yellow mark. To avoid excess glue, don't apply more glue than what the joint can allow. If glue does squeeze out onto your project, wipe it immediately with the wet paper towel.





Self-Check -9	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Write the **Clamping tools**
2. **Write at least 5 types of clamps**

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



Quality Checklist for assembled frames

Inspection or checking of components or products with required specifications is very minutely related with quality control. It is generally an accepted fact that no two things can ever be exactly same. It also holds true with manufactured parts. Therefore certain variations or deviations in dimensions and other product specifications are accepted.

Generally, there are three basic areas of inspection namely

1. receiving inspection,
2. in-process inspection and
3. Final inspection.

In the receiving inspection, inspections are performed on all incoming materials and purchased parts.

In the in-process inspection the products are inspected as they are in processed in stages from starting station to finished station.

In the final inspection, all finished products or parts are inspected finally prior to delivering them to the customer.

Carry out the required quality checks, to include **ten** from the following, using appropriate equipment:

<ul style="list-style-type: none"> ✓ dimensions ✓ positional accuracy ✓ finish ✓ flatness ✓ distortion/straightness 	<ul style="list-style-type: none"> ✓ completeness ✓ squareness ✓ profile (where appropriate) ✓ function (where appropriate) ✓ alignment 	<ul style="list-style-type: none"> ✓ fit/component security ✓ freedom from damage ✓ orientation
--	--	--

Quality check & Finishing

1. Dimensions and image match plans
2. Construction is square, symmetrical, round, etc.
3. Joinery is strong, clean, and smooth. Proper growth ring usage.
4. Functionality: Project performance and operation, usability
5. Millwork and Hardware (panels, drawers, molding, accessories, etc.)



Self-Check -10	Written Test
-----------------------	---------------------

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

1. Write the 3 basic stage of inspection

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



Components can be fitted together using a range of industry practicedMethods. These may include:

- ❖ dowel joins
- ❖ plate or biscuit joins
- ❖ corner blocks nailed, screw and glued
- ❖ fixing cleats (screw, nailed, glued)
- ❖ knock down fittings
- ❖ stapling, nailing, screwing and gluing as required
- ❖ machine or hand cut joins
- ❖ glued pressed, laminated, brick method cut from solid, kerfs or steam bent
- ❖ other machine or hand cut joins eg mortise and ten on, dovetail, box
- ❖ Join, bridle, halving, rebate (stopped or through) tongue and groove or machine join
- ❖ adequate glue control and use including selection of glue for relevantProcess

Cabinet hard ware

Unlimited selection of hard ware items for furniture cabinet work & building construction. The larger pieces of very useful hard ware are drawer rollers ball bearing, swivels for simple chairs.

Furniture & cabinet hard ware is used for decoration & its necessarily to be very accurate (exact) when locating drilling & chiseling when making the final attachments.

N.B. If the hard wares are attached before the finishing it is not applied. It is often removed again until all finish work is done replaced.

Advantage of hard wares

- ❖ To give decorative face (objects)
- ❖ To give using pulls & pushes of the project
- ❖ All hard ware's are free from the natural & artificial things.
- ❖ To give good appearance
- ❖ To give durability
- ❖ To give balance
- ❖ To give strength

Hinge

Hinge is the most common & available for assembly. It has different styles or types of hard wares.

It indicates their placements on the doors. The hinge is either fully visible on the surface (half hidden) blind door.

Types of hinges

- ❖ **Invisible hinge**: are mounted so that they are concealing ted form view when doors are closed.
 - ❖ **Combination hinge**: is often used on desks & chests & drawers.
 - ❖ **But hinge**: are the most commonly used for hinges when fixed lids & doors to boxes & cabinets respectively.
- They are available in lengths from 2mm to 150mm & are made of brace, steel, plastic or nylon.



- ❖ **Back flap hinge:** are widely used on the fronts of writing bureau & the leaves of drop leaf tables.
 - They are either recessed in to the surface or simply screwed directly on to it.
 - They are made of brass or steel are in available in length from 20mm to 75mm.
- ❖ **Strap hinge (Tee hinge):** are used for securing garage, doors, shed doors, & light gates.
 - They are usually made of mild steel.
 - When used for outside they may be coated black to prevent rusting.
 - The common size ranges from 50mm to 300mm.
- ❖ **Hook & band hinge:** are used for securing the heavy gates & doors.
These are made up of mild steel & to individual specifications.

Flush Door Hinge

A flush door hinge makes only the barrel of the hinge visible. A recess does not have to be cut in the frame to accommodate this hinge.

Butterfly Hinge

Butterfly hinges resemble the wing shape of a butterfly. These hinges are typically used for lightweight doors.

Knuckle Hinge

A knuckle hinge has a decorative knuckle. It has a threaded part that is screwed into a hole in the frame and the door.



Concealed Hinge

Concealed hinges cannot be seen when the cabinet door is closed. This hinge typically comes in either 25mm or 36mm.

Handles

Single past knobs & pulls are usually put on small drawers doors that open easily.

They are installed by marking to the location desired & drilling a hole to accommodate the correct size of screw drawer & doors, pulls with to posts & screws required very accurate the centre drilling to make the handle align for accurate fit.

Are fixed to the outside of cabinet doors & drawers & also serve as ornaments.

Various materials are used for including brass, copper, plate, stain nickel, antique brass & plastic they are often die cast.

❖ **Types of handles**

Knob: This is round or circular in shape.

Pulls (ring or finger) : which have either a hole (eye) or else a resist in to which the fingers are inserted.

C- Shape handle: used for holding process & it has like C- letter shape.

❖ **Casters**

Are wheels fitted to the legs bases of furniture to enable the furniture to be moved about easily?

They are arranging of designs & sizes.

They are supplied in set of four.

❖ **Types of casters**

- Ball caster
- Round socket caster

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- Plate caster
- Screw caster
- Grip neck socket caster
- Tubular caster

❖ Catches

The metal devices used for securing doors & falls in position.

Two types of catches.

- **Spring action type** : that has automatic closing & opening the door
- **Non spring type**: having for closing only.
- **Roller mortise catch**: has a roller bolt housed in a metal case in the form of mortise lock, mortised in to the edge of or end of the door & a metal trick plate fixed to the side of the cabinet.
- **French catch**: is similar to the mortise catch except that the bolt is V- shaped & does not roll.
 - The case is also mortised in to the edge of the door & the strike plate is fixed to the edge of the cabinet.
- **Non spring catch**: need to a bottoms of knob on the outside of the door to operate the opening device of the catch.

The two commonly used members of this category are the surface cupboard catch & push the button cupboard catch.

❖ Locks

Are used for locking doors & drawers of the cabinet work.

❖ Types of locks

- **Straight lock**: is used for doors & drawers.
 - They are usually screwed flat on to the inside face of the door or drawer without a recess.
- **Cut lock**: is known as till lock. Is the fitted into a recess made of in the face of the door or in drawer front?
 - They fit flesh with the face of the door or drawer front & they are stronger than straight lock.
- **Box lock**: is used for lids of boxes & desk top flaps. This has a catch plate carrying two projecting pins.
 - The catch plate is fixed to the side while the lock is let in flush on the inside of the box.
- **Mortise lock**: are normally used for larger & thicker doors.

A mortise (a recess) is made in the front edge of the door to receive the body of the lock.

Hard ware's/fitting s

Are fittings that are used for finishing a piece of furniture or cabinet work?

They play an important role /part in the final finish and appearance of the furniture or cabinet.

The quality of the fitting /hard ware depends largely on their :

- Material ; from where they are made
- Method used for construction
- The kind of finish applied to them

The steps in installing hardware are as follows;

1. Choose the correct size and kind of hard wares.

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2. Find the positions of the hard ware according to working drawing.
3. Determine the distance of the hardware's will be set on the face, edge and end of furniture.
4. Extend the marks on the edge or at the required position with sharp pencil and try square.
5. Cut out a place where marked for the installation of hard wares.
6. Place the hard ware in its correct position and make the positions of the holes for the screws with a pencil.
7. Drill pilot holes in to the wood that smaller than the size of the screws.
8. Drive the screws with the screw driver to fasten the hard ware's firmly.

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Operation Sheet 1	CONTENT-
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Install Concealed Hinges

Step 1- Mark the center of the hinge location on the back of the door and cabinet side or face frame. Use a template to ensure that the hinge marks are exactly the same top and bottom.

Step 2- Use a drill guide and jig or a drill press to bore the cup mortise. This mortise dimension is typically 35mm dia. x 8-mm deep. Check your hinge installation directions for specific mortise dimensions.

Step 3- Fasten the hinge-cup component to the door with the supplied hinge screws. Use a combination square to make sure the hinge arm is perpendicular to the door edge.

Step 4- Follow the manufacturer instructions or use a jig to position the mounting plate on the hinge center mark that you made on the cabinet side.

Step 5 -Adjust the door position by loosening or turning the hinge adjustment screws.

N.B:- Refer the following picture to accomplish the operation sheet

How to Install Concealed Hinges



1 Mark the center of the hinge location on the back of the door and cabinet side or face frame. Use a template to ensure that the hinge marks are exactly the same top and bottom.



2 Use a drill guide and jig or a drill press to bore the cup mortise. This mortise dimension is typically 35mm dia. x 8-mm deep. Check your hinge installation directions for specific mortise dimensions.



3 Fasten the hinge-cup component to the door with the supplied hinge screws. Use a combination square to make sure the hinge arm is perpendicular to the door edge.



4 Follow the manufacturer instructions or use a jig to position the mounting plate on the hinge center mark that you made on the cabinet side.



5 Adjust the door position by loosening or turning the hinge adjustment screws.



Self-Check -11

Written Test

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

1. Write the connecting and joining materials
2. Write the kinds of hinge
3. What are the advantage of hardware

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



Information Sheet-12	Repairing procedures for unfitted/defective materials
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REPAIRING FINISHES

Finishes deteriorate, they get damaged, and they can be repaired. Some finishes are easier to repair than others, as I've explained in previous chapters, but most damage that occurs to most finishes can be fixed. Within the furniture industry a specialty, distinct from finishing itself, is dedicated to repairing finishes. It's concentrated in furniture factories, furniture stores, and moving companies, where most damage to finishes occurs. There are four general types of damage that occur to finishes, and sometimes through the finishes into the wood beneath:

- Superficial damage to the surface of the finish in the form of light scratching, light cracking, and dullness
- Damage to the color in the finish
- Damage to the color in the wood
- Damage through the finish and into the wood itself in the form of deep scratches or gouges



Superficial damage to penetrating finishes (oil, oil/varnish blends, a wiping varnish applied thin) is easy to repair. More substantial damage (color problems, gouges, and deep scratches) on surfaces finished with these penetrating finishes is almost impossible to repair, because there is no film thickness to work with. Once damaged, they'll never look undamaged. All types of damage to film finishes, on the other hand, can be repaired, but concealing color problems, gouges, and deep scratches often requires a high degree of skill.

REPAIRING SUPERFICIAL DAMAGE

Superficial wear or surface deterioration is the most common type of damage and is the easiest to repair. There are three ways to repair this kind of damage:

- Apply a coat of paste wax or oil/varnish blend to the surface and wipe off the excess.
- Rub the surface of film finishes with steel wool or rubbing compounds to cut through the damage or dullness and expose unaffected finish below.
- Apply another coat of the original finish, or apply French polish or padding lacquer on top of the damaged finish, to cover up the problem.

Defect of materials, is occurred during production proceeds and assembling process ,which means that natural defects and artificial defects .

Natural defects, Knots should maintained by the application of surface operation Eg.(By producing wooden plug by knot borer and replacing with wooden plug similar to grain direction and kind of wood .

Artificial defects are defects during seasoning,machining, assembling, improper packing, and transporting of the product.

E.g. .color variation of the furnishing product

Color variations are repaired by the application of staining agent.

Frames which do not meet quality specifications are repaired or tagged for further processing or recycling/disposal. Unfitted materials are materials or component parts of furniture miss matching the needs /specification of customer.

What is specification?

Specification is a guide lines for the manufacturing of the product /service that full fill minimum Requirement the needs of customers.

Example, Specification of office Table

- Made of high quality laminated particle board.
 - Table top made of 25mm thick particle board,
 - Drawer, leg & panel thickness 18mm.
 - Has side table with 3 Drawers Fixed Pedestal,
 - CPU holder & storage space , internet, tell end electric device mounted on the table .
- Main table size: 180/200*80*75 cm (L*W*H)



Self-Check -12

Written Test

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

- 1. A document shows the shape, size and type of materials describe the needs of customer is
 A. Bill of material B. specification C. cutting list D. all

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



Information Sheet-13	Procedures on how to store a finished Products
----------------------	--

Materialshandling and storage

Storage of finished product

Storage of finished products must ensure that there is no obstruction to traffic, components are not damage in storage, incompatible items are not stored together, and products are arranged to match the sequence of work.

When storing materials, employees shall:

- (1) Prevent creating hazards when storing materials by being aware of the material's height and weight; how accessible the stored materials are to the user – consider the need for availability of the material; and the condition of the storage ware house. All finished product stored in tiers must be stacked, racked, blocked, inter-locked, or otherwise secured to prevent sliding or collapse.
 - (2) Keep storage areas free from accumulated materials that may cause slips, trips, falls, or fires or that may contribute to harboring pests.
 - (3) Materials must not be stored on scaffolds or runways in quantities exceeding those needed for immediate operations.
- b. Additional safe material storage practices include:
- i. Ensuring shelves and racks are sturdy and in good condition.
 - ii. Finished goods rooms must be free from ,dust and 'derbies',
 - iii. Check the room well ventilated and clean.
 - iv. Stacking all materials on a flat base.
 - v. Placing heavier objects closer to the floor and lighter/smaller objects higher.
 - vi. Not stacking items so high that they could block sprinklers (18" of clearance) or come in contact with overhead lights or pipes.
 - vii. Using material-handling equipment or a ladder and fork lift to place, transport finished product to finished product store room.



Self-Check -13

Written Test

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

1. What are the requirements of ware house or stores rooms of finished product full filed.

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



Furniture making

NTQF Level -II

Learning Guide -3

Unit of Competence: - Produce Furniture Components and Fixtures

Module Title :- Producing Furniture Components and Fixtures

LG Code: IND FMK2 M04 LO3-LG-3

TTLM Code: IND FMK2 MO4 TTLM 0919v1

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LG13: Secure assembled furniture components

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

- Tagging and Reporting
- removing procedure of wastage
- Storage requirements/methods of storing finished products

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 –**

- Tag and report Faulty or defective equipment in accordance with workplace procedures.
- Remove Waste and scrap are d following workplace procedures.
- Clean, inspect Tools and equipment used for serviceable condition and storage requirement is appropriately in accordance with workplace procedures.
- Maintain Equipment and work area clean-up in accordance with workplace procedures.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 16.
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 ___.
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 #2.
7. Submit your accomplished Self-check. This will form part of your training portfolio.
8. Read the information written in the “Information Sheet 2”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
9. Accomplish the “Self-check 2” in page ___.
10. 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 2).
11. Read the information written in the “Information Sheets 3 and 4”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
12. Accomplish the “Self-check 3” in page ___.

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13. 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 3).
14. If you earned a satisfactory evaluation proceed to “Operation Sheet 1” in page __. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #6.
15. Read the “Operation Sheet 1” and try to understand the procedures discussed.
16. Do the “LAP test” in page __ (if you are ready). Request your teacher to evaluate your performance and outputs. Your teacher will give you feedback and the evaluation will be either satisfactory or unsatisfactory. If unsatisfactory, your teacher shall advise you on additional work. But if satisfactory you can proceed to Learning Guide #5

Information Sheet-14	3.1. Tagging & reporting defective equipments
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LO3- Secure assembled Components

What is the problem?

Damaged or faulty portable electrical tools and equipment in use at workplaces.

What are the risks?

Workers may be at risk of electrocution, electrical shock or injuries from a fire

What is a solution to the problem?

Establish an inspection and testing regime for electrical tools and equipment that includes:

- A COMPETENT PERSON REGULARLY ELECTRICALLY testing and inspecting tools, extension leads and portable electrical equipment – inspection tags should be fitted
- RECORDING INSPECTION DETAILS IN AN EQUIPMENT register
- TAGGING OUT AND REMOVING ALL FAULTY EQUIPMENT for repair or disposal
- USING ONLY COMPETENT PEOPLE TO REPAIR DAMAGED electrical leads, tools and equipment

Tag finished product if pass the the inspection test

Red tag if the product have major defects



Report format for defective equipment

Gear Drive Repair Report

LOCATION: BUILDING 511, 1 ST FLOOR		MACHINE: THICKNESS PLANER # 5			
GEAR DRIVE TYPE: REDUCER 1:20		SERIAL NO.: 10245156			
DATE OF PUTTING IN OPERATION: 5/20/1997		MANUFACTURER: SCM ITALY			
DATE OF REPAIR: 5/26/2000		AUXILIARY DRIVES:			
SPECIAL MAINTENANCE REQUIREMENTS:		<input type="checkbox"/> BELTS			
OIL GRADE 05		<input type="checkbox"/> CHAIN			
		<input checked="" type="checkbox"/> COUPLING FLEXIBLE COUPLING			
		<input type="checkbox"/> OTHERS			
PART	FAILURE		PART	FAILURE	M A R K
AUXILIARY DRIVE	CHAIN OR BELT BROKEN		GEARS	SEAT WORN OUT	
	SPROCKET/PULLEY WORN OUT			BROKEN TEETH	
	KEYWAY PROBLEM			WORN OUT TEETH	X
	DRIVE SHAFT BENT			OTHERS	
	COUPLING DAMAGED		LUBRICATION	NO OIL	
	COUPLING RUBBER BROKEN			LITTLE OIL	X
	OTHERS			DIRTY OIL	
SEALING	LIP SEAL DEFECTIVE			WATER IN OIL	X
	HOUSING SEAL DEFECTIVE			BREATHER DEFECTIVE	
	OTHERS			OTHERS	
SHAFT	SEAT OF BEARING WORN OUT		HOUSING	CRACKED	
	SEAT OF LIP SEAL WORN OUT			PROBLEM WITH BOLT CONNECTION	
	BENT OR BROKEN			PROBLEM WITH PIN CONNECTION	
	OTHERS			OTHERS	
BEARINGS	WORN OUT		BASE PLATE	LOOSE, WEAK	
	EXCESSIVE DAMAGED			PROBLEM WITH BOLT CONNECTION	
	OTHERS			PROBLEM WITH FOUNDATION	



Self-Check -14	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. What are the risks?

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____

**Removing procedure of wastage**

The industrial waste and scrap consists of spoiled raw-materials, rejected components, defective parts, waste from production departments etc. involves some commercial values. They should be disposed of periodically and proper credit of the amount should be taken in the books of accounts. Hence, waste management places an important role in managing operations. Wastes can be categorised into obsolete, surplus and scrap items.

1. **Obsolete items:** These are those materials and equipments which are not damaged and Which have economic worth but which are no longer useful for the Company's operation owing to many reason such as, changes in product line, process, materials, and so on.

2. **Surplus items:** These are those materials and equipments which have no immediate use but have accumulated due to faulty planning, forecasting and purchasing. However, they have a Usage value in future.

3. **Scrap:** It is defined as process wastage, such as, turnings, borings, sprues and flashes. They may have an end-use within the plant having commercial values. Hence, should be disposed of periodically.

Removing wastes and scraps following workplace procedures

- ❖ Always clean the work shop after done/ work.
- ❖ Separate workshops e.g.:- finishing machine, assembling, main store, and office & class room.
- ❖ Remove out wastage raw material in the container.
- ❖ Apply 5s procedure



Self-Check -15	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Ways to remove waste and scraps

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



Furniture making

NTQF Level -II

Learning Guide -4

Unit of Competence: - Produce Furniture Components and Fixtures

Module Title :- Producing Furniture Components and Fixtures

LG Code: IND FMK2 M04 LO4-LG-4

TTLM Code: IND FMK2 M04 TTLM 1219v1

LG14: Cleanup work area.

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LG14: Cleanup work area

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

- Methods of properly collecting and storage of materials & equipments
- Maintenances & lubrication of equipments / machines/ parts
- Maintenances & lubrication of hand and portable powered tools
- Methods on reporting defective products

- 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 –**
- Faulty and/or defective equipment is tagged and reported in accordance with workplace procedures.
- Waste and scrap are removed following workplace procedures.
- Tools and equipment used are cleaned, inspected for serviceable condition and stored appropriately in accordance with workplace procedures.
- Equipment and work area clean-up is maintained in accordance with workplace procedures.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described in number 3 to 16.
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 ___.
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 #2.
7. Submit your accomplished Self-check. This will form part of your training portfolio.
8. Read the information written in the “Information Sheet 2”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
9. Accomplish the “Self-check 2” in page ___.
10. 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 2).
11. Read the information written in the “Information Sheets 3 and 4”. Try to understand what are being discussed. Ask you teacher for assistance if you have hard time understanding them.
12. Accomplish the “Self-check 3” in page ___.
13. 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 3).
14. If you earned a satisfactory evaluation proceed to “Operation Sheet 1” in page __. However, if your rating is unsatisfactory, see your teacher for further instructions or go back to Learning Activity #6.

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Information Sheet-16	4.2. Maintenances & lubrication of equipments / machines/ parts
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- Lubrication is the science of reducing friction.
- The friction is caused due to rubbing surfaces of bodies having relative motion.

The purposes of lubrication are to:

- ◆ reduce friction;
- ◆ reduce or prevent wear;
- ◆ carry away heat generated;
- ◆ protect the bearing against corrosion

To perform these functions, various types and grades of lubricants (oils, grease, synthetic lubricants, solid lubricants and mist lubricants, etc) are available and various methods and systems (manual, semi-automatic, automatic, bath, feed, splash, centralized and decentralized systems etc) are used. Few surface treatments (coatings, plating and vapor deposition etc) are used for lubrication purposes also. Determining the quantity, quality and frequency is actually techno-economic judgment.

General Instructions for a Repair/maintenance Job within the Workshop

Working Steps	Comments
1. Prepare Workplace for disassembling	<ul style="list-style-type: none"> • Remove parts, tools and jigs from previous jobs from the working area • Clean up the working area • Provide container for used oil • Provide new cleaning rags to clean up spilled oil and grease
2. Safety Check	<p>Ask yourself the following questions:</p> <ul style="list-style-type: none"> • Do I have the permission to do the job? • Am I skilled/trained to do the job? • Are there any hazards for me, for my colleagues or for the environment? E.g. Machine under pressure, machine under vacuum, machine filled with a hazardous medium, hazard because of electric shock
3. Sketch the outside Machine Contours	<ul style="list-style-type: none"> • To make sure that the machine can be re-assembled properly even after a longer period (e.g. Break because of lack of spare parts) • Consider that a colleague of you might re-assemble the machine. • Store the draft together with the machine parts
4. Remove Oil	<ul style="list-style-type: none"> • Before opening any part of the machine, remove oil • Catch the oil in an adequate container and store it for disposal • Do not spill oil
5. Mark all Parts before starting to disassemble	<ul style="list-style-type: none"> • To make sure that the machine can be re-assembled properly even after a longer period (e.g. Break because of lack of spare parts). Consider that a colleague of you might re-assemble the machine. • Use letter or number punch to mark parts • It is also possible to mark parts using a center punch, a small chisel or water and kerosene resistant paint
6. Draft a plan in your mind on	<ul style="list-style-type: none"> • Use all available resources like manuals, drawings • Think first before starting to screw!

how to disassemble the machine	
7. Disassemble the Machine	<ul style="list-style-type: none"> • Use the proper tools • Don't use any force and take care not to damage any part • Remove first couplings, pulleys, sprockets from the shafts • Open the housing • Remove shafts, bearings, sealing • Store all parts properly in a box with a soft surface. For sensitive parts put some cleaning rag around
8. Sketch the inner Assembly	<ul style="list-style-type: none"> • If necessary sketch the inner assembly. Consider that a colleague of you might re-assemble the machine. • Especially take note of spacer rings. Sketch the position of them.
9. Clean all Parts	<ul style="list-style-type: none"> • Clean all parts using kerosene; Use scraper to remove old seal • During cleaning look already for damages
10. Determine the Damages	<ul style="list-style-type: none"> • Try to find the causes for the overhauling • Transfer all your findings to the maintenance history log

Working Steps	Comments
11. Distribute Work and Actual Repair	<ul style="list-style-type: none"> • Measure seats from all bearings and seals • Order spare parts and give parts to the machine shop • Weld broken parts, remove all dents from sealing surfaces, gears and other important parts • Dynamic balancing of parts
12. Break	<ul style="list-style-type: none"> • Break because of lack of spare parts and machine shop work • Store all parts properly (for longer storage, put some grease on critical parts and cover the whole machine with plastic foil)
13. Prepare Workplace for re-assembling	<ul style="list-style-type: none"> • Remove parts, tools and jigs from previous jobs from the working area • Clean up the working area
14. Re-assembling	<ul style="list-style-type: none"> • Before re-assembling make a plan in your mind on how to mount all parts. • Polish all seats of bearings and sealing • Do not use any unnecessary force! • Use the proper tools and methods for the installation of bearings and sealing • Do not over-grease bearings; Apply also grease to lip-rings and O-rings • To adjust bearing clearance, backlash and axial play of shafts use the proper measuring method and exactly fitting spacer rings • Use new flat seals or sealant • Use new bolts and nuts for re-assembling
15. Oil Filling	<ul style="list-style-type: none"> • Check the Machine-File or in the Owner-Manual to determine the proper type of oil • Do not overfill the reservoir; Do not spill oil; Check the sealing surfaces against oil leaking
16. Test Run	<ul style="list-style-type: none"> • Before installation the machine a test run should show the proper repair of the machine. In case of a problem it is easier to solve it with in the workshop.



Self-Check -16

Written Test

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

1. What is lubrication
2. What are the purpose of lubrication
3. List the type of lubricants used in wood machine maintenance.

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



Information Sheet-17	4.3. Maintenances & lubrication of hand and portable powered tools
-----------------------------	--

A good crafts man must have good tools and be able to keep them in good condition at all times. Respect and care for your tools and learn how to select the right tool for the work to be done.

Safety rules during repair activities

- When you enter a production area log in. When you leave the place log out.
- Inform other colleagues when you start with activities they should know.
- Make sure that a machine you start to work on is electrically disabled.
- Be careful when opening any machine, which works under pressure or vacuum, like pumps, fans, compressor, hydraulic equipment or others. They can be still under working pressure and harm you.
- Be careful when opening any machine/parts, which can possibly contain products, like pipes, tanks, boilers, pumps and others. These products can harm your eyes, your body or even your breathing.
- When handling heavy parts/tools use always a lifting device or ask your colleagues for help. You can seriously damage your back.
- When handling oil or grease, try to avoid spill or if spilled then remove it immediately.
- When working with oxy-acetylene burner, take care of fumes from old oil, grease or parts of products. Keep your head out of the fume or wear a suitable mask.
- Do not light a fire near petroleum or other inflammables.
- When opening bolts use the correct size of tools. Besides damaging the bolts you might slip off and damage your hands.
- When storing shafts or other round shaped parts prevent them from rolling of the working table using for example wood.

You must always make up your mind at the beginning of any job to do your best to produce a piece of quality work and realize that a piece of quality work and realize that this cannot be done with blunt and badly maintained tools.

Generally a fault in the finished work can be attributed to the tools being wrongly selected or wrongly used. It should therefore be your habit to sharpen and keep your tools in good condition at all times.

Two distinct operations are required for maintaining sharp and keen cutting edges,

- grinding and
- sharpening

Report all breakage or damage to tools or machinery to the instructor immediately.

Moreover, if a machine is running poorly, making an unusual sound, or is out of adjustment, the student shall turn it off immediately, unplug it so that others don't use it, and inform the instructor directly. If conditions of the shop are such that a hazard is beyond the control of the teacher then it will be reported to the principal

LAP Test	Practical Demonstration of book shelf
-----------------	--

Name: _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within -8hrs-- hour.

Task1. Read assembling drawing and use standard dimension of book shelf

Task2. Prepare materials and tools according to the sequence order

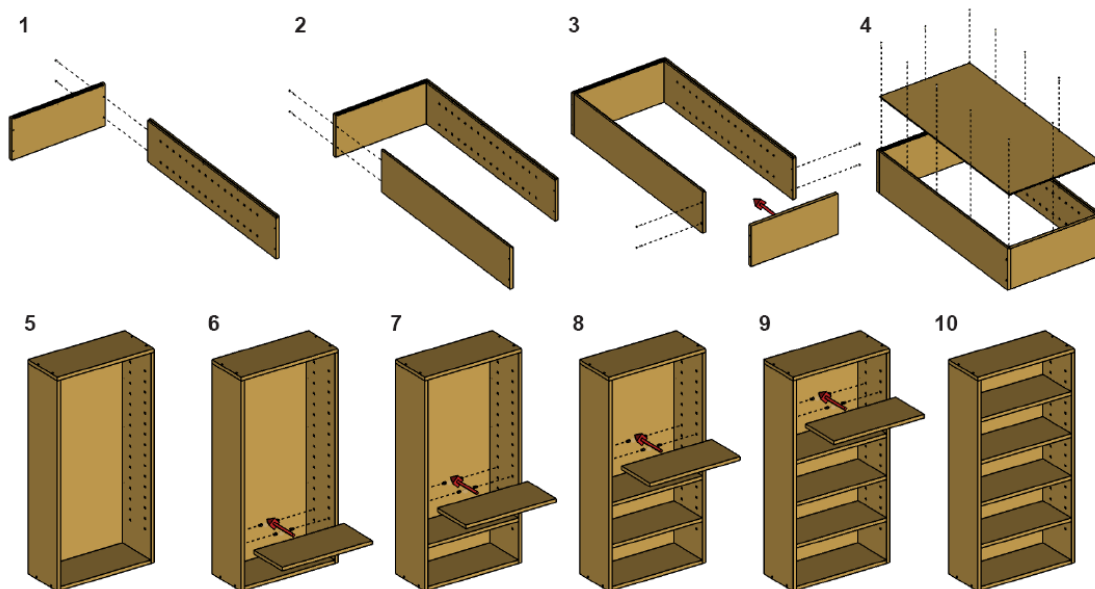
Task3. Assemble the component parts depend on the specification.

Task4. Measure, the check squareness of the product.

Task5. Apply sofa stain with spray gun or brush.

Task 6.store the product according to safety requirement

Use the following assembling sequence





Self-Check -17	Written Test
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Directions: Answer all the questions listed below. Use the Answer sheet provided in the next page:

1. Write the distinct operation followed in hand tools maintenance

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



Information Sheet 18	Methods on reporting defective products
-----------------------------	---

Inspection report

1. Inspection Information			
Client	xxxxxxx		
Supplier	xxxxxxx	Factory	Wanza furniture production plc
P.O.Box	xxxx	P.O.quantity	Xxxxx,50 pcs
Product	Office table	Item. No	xxxx
Inspection date	xxxx	Location	Addis Abeba
Inspector	xxxxx	Reviewed by	xxxx

2. Product photo

3. INSPECTION STANDARD

Inspection Type: Final Randomly Inspection

Default Level:ISO2859 Standard, Single Sampling Plans, Level II (Normal)

Fixed samples AQL, Critical = Not allowed, Major = 2.5 , Minor = 4.0

Defect Specify: Appointed by Client

Specification as description as below:

Critical Defect: A "Critical" defect is on one's judgment and experience indicates is likely to:

- (1) Result in hazardous or unsafe use, operation, or maintenance of the product, or
- (2) Prevents the functioning of the product.

Major Defect: A "Major" defect is one other than critical, which is likely to result in the failure or to reduce materially the usability of the unit of product for its intended purpose.

Minor Defect:A "Minor" defect is one that is not likely to reduce materially the usability of the unit of product for its intended purpose or is a departure from established standards having little bearing on the effective use or operation of the unit of product.

4. INSPECTION RESULT

Category	Result			Comment
Quantity	<input checked="" type="checkbox"/> Conform	<input type="checkbox"/> Not conform	pendi <input type="checkbox"/> g	
Appearance /functionality	<input type="checkbox"/> Conform	<input type="checkbox"/> Not conform	pend <input type="checkbox"/> g	Beyond AQL
Product style and color	<input type="checkbox"/> Conform	<input type="checkbox"/> Not conform	pend <input type="checkbox"/> g	
Data measurement	<input type="checkbox"/> Conform	<input type="checkbox"/> Not conform	pend <input type="checkbox"/> g	Remark point 1&2
Packing	<input type="checkbox"/> Conform	<input type="checkbox"/> Not conform	pend <input type="checkbox"/> g	Remark point--
Shipping mark	<input type="checkbox"/> Conform	<input type="checkbox"/> Not conform	pend <input type="checkbox"/> g	
Overall conclusion	<input type="checkbox"/> CONFORM <input type="checkbox"/> NOT CONFORM <input type="checkbox"/> PENDING NOT CONFORM PENDING DUE TO BEYOND AQL/REMARK POINTS 1,&2			



Self-Check -18	Written Test
-----------------------	---------------------

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

1. Inspection report includes all except
 - A. Type of product
 - B. Date of inspection
 - C. name of inspector
 - D. type of machine to produce the product
2. Write the types of defect

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points

Answer Sheet

Score = _____
Rating: _____

Name: _____

Date: _____



List of Reference Materials

1. Modern cabinet making by William D. Umstatted, Charles W.david
2. General wood working by CHRIS H. GRONEMAN/ Third Edition
3. General wood working by CHRIS H. GRONEMAN/ Six Edition
4. Working with Wood by SACKKEY (motivate series)