Furniture Making Level III

Based on Sep, 2012 Version 5 Occupational Standards and Dec, 2020 V1 Curriculum

Module Title: Constructing Jigs and Fixtures

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LG #17	LO #1- Identify the purpose of the jig or fixture

Instruction sheet

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

- Establishing purpose of the jig or fixture & equipment
- Proposing service life of jig or fixture
- Identifying tolerances allowance
- Establishing materials for jig construction
- Identifying quality requirements for each stage of construction process

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

- Establish purpose of the jig or fixture & equipment
- Propose service life of jig or fixture
- Identify tolerances allowance
- Establish materials for jig construction
- Identify quality requirements for each stage of construction process

Learning Instructions:

Read the specific objectives of this Learning Guide.

1. Follow the instructions described below.
2. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
3. Accomplish the “Self-checks” which are placed following all information sheets.
4. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
5. If you earned a satisfactory evaluation proceed to “Operation sheets

Information Sheet 1. Establishing purpose of the jig or fixture

1.1 Establishing purpose of the jig or fixture

Introduction

The successful running of any mass production depends upon the interchangeability to facilitate easy assembly and reduction of unit cost. Mass production methods demand a fast and easy method of positioning work for accurate operations on it.

Jigs and fixtures: Are production tools used to accurately manufacture duplicate and interchangeable

parts. Jigs and fixtures are specially designed so that large numbers of components can be machined or assembled identically, and to ensure interchangeability of components.

JIGS: It is a work holding device that holds, supports and locates the work piece and guides the cutting tool for a specific operation. Jigs are usually fitted with hardened steel bushings for guiding or other cutting tools. jig is a type of tool used to control the location and/or motion of another tool. A jig's primary purpose is to provide repeatability, accuracy, and interchangeability in the manufacturing of products. A device that does both functions (holding the work and guiding a tool) is called a jig.

An example of a jig is when a key is duplicated, the original is used as a jig so the new key can have the same path as the old one.

FIXTURES:-It is a work holding device that holds, supports and locates the work piece for a specific operation but does not guide the cutting tool. It provides only a reference surface or a device. What makes a fixture unique is that each one is built to fit a particular part or shape.

The main purpose of a fixture is to locate and in some cases hold a work piece during either a machining operation or some other industrial process. A jig differs from a fixture in

that a it guides the tool to its correct position in addition to locating and supporting the work piece.

Examples: Vises, chucks

Self-Check1	Written Test

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

Instruction: I Choose the best answer

1. A fixture does not **(each 2%point)**

(A) Holds the work piece (C) Guide the tool

(B) Locate the work piece (D) All of the above

2. Jigs are not used in **(each 2%point)**

(A) Drilling (C) Tapping

(B) Reaming (D) None

Answer Sheet

Name: _____ Date: _____

Score = _____

Not: Satisfactory rating above 100%

Information Sheet 2:- Proposing service life of jig or fixture

2.1 Proposing service life of jig or fixture

The Fixtures are only the work holding device that , supports and locates the work piece in the desired position to perform any operation.

The main purpose of the fixtures is to hold and locate the work piece during any machining operation and to provide repeatability, accuracy, and interchangeability in the manufacturing of products.

Some important points about fixtures:

- Fixtures are used in multi-dimensional machining like grinding, turning, etc.
- This system found to be heavy in weight, have simple designing.
- Gauge blocks provided for effective handling and the cost is average.
- Fixtures are having specific tools that use particularly in the milling machine, shapers and slotting machines.
- Fixtures are fixed to the machine table.

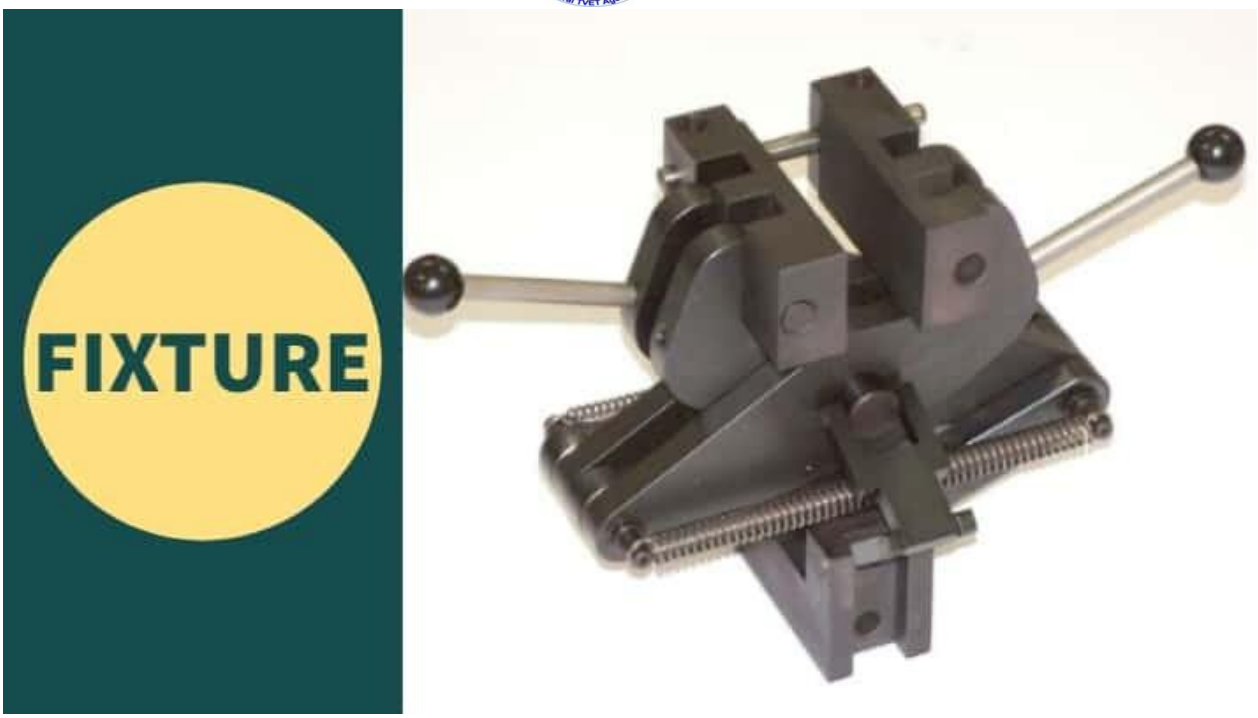

Fig. 1.1 Jig

Essential features of Jigs and Fixture

- Reduction of idle time – Should enable easy clamping and unloading such that idle time is minimum
- Cleanliness of machining process – Design must be such that not much time is wasted in cleaning of scarf's, burrs, chips etc.
- Replaceable part or standardization – The locating and supporting surfaces as far as possible should be replaceable, should be
- Standardized so that their interchangeable manufacture is possible
- Provision for coolant – Provision should be there so that the tool is cooled and the swarfs and chips are washed away
- Hardened surfaces – All locating and supporting surfaces

should be hardened materials as far as conditions permit so
that they are not quickly worn out and accuracy is retained
for a long time

- Inserts and pads – Should always be riveted to those faces of

the clamps which will come in contact with finished surfaces of the work piece so that they are not spoilt

- Fool-proofing – Pins and other devices of simple nature

Incorporated in such a position that they will always spoil the placement of the component or hinder the fitting of the cutting tool until the latter are in correct pos

- Easy manipulation – It should be as light in weight as possible and easy to handle so that workman is not subjected to fatigue, should be provided with adequate lift aids
- Initial location – Should be ensured that work piece is not located on more than 3 points in anyone plane test to avoid rocking, spring loading should be done

Position of clamps – Clamping should occur directly above the points supporting the work piece to avoid distortion and Springing

- Clearance – Sufficient amount of clearance should be provided around the work so that operator's hands can easily enter the body for placing the work piece and any variations of work can be accommodated
- Ejecting devices – Proper ejecting devices should be incorporated in the body to push the work piece out after operation
- Rigidity and stability – It should remain perfectly rigid and stable during operation. Provision should be made for proper positioning and rigidly holding the jigs and fixtures Safety – The design should assure perfect safety of the operator

Self-Check1	**Written Test**

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

Instruction: I Choose the best answer

1. Jigs and Fixtures are used for **(each 2%point)**

(A) Mass production (C) Both 'A' and 'B'

(B) Identical parts production (D) None of the above

2-The use of jigs and fixtures **(each 2%point)**

(A) Facilitates deployment of less skilled labor for production

(B) Eliminates pre-machining operations like marking, measuring, laying out etc.

(C) Reduced manual handling operations

(D) All of the above

3-The following is(are) the function(s) of a jig **(each 1%point)**

(A) Holding (C) Guiding

(B) Locating (D) All of the above

Answer Sheet

Name: _____ Date: _____ Score = _____

Note Satisfactory rating above 100%

Information Sheet 3. Identifying tolerances allowance

3.1. Identifying tolerances allowance

Tolerances allowance:- can be defined as the magnitude of permissible variation of a dimension or other measured value from the specified value

Allowance: It is the difference between the basic dimensions of the mating parts. ... Tolerance: It is the difference between the upper limit and lower Tolerance: It is the difference between the upper limit and lower limit of a dimension.

Three basic tolerances that occur most often on working drawings are:

1. Limit dimensions,
2. Unilateral, and
3. Bilateral tolerances.

Types of Jigs and Fixtures:

There are several types of Jigs and Fixtures available in the market. Also, you can create a Jig and Fixture by yourself to do an operation easily. It is up to you. Although these are some available Jigs and Fixtures in the market.

Types of Jigs:

Plate jig: are in many ways similar to template jig the only difference is that there is a location for built in clamps for holding the work in case of template jig. Bushings may or may not be provided in template jig. The factor on which the availability of the bushing depends is the number of jobs to be manufactured. Plate jigs can also made with legs which help in raising the jig off the table for machining of large work. This style is called table jig.

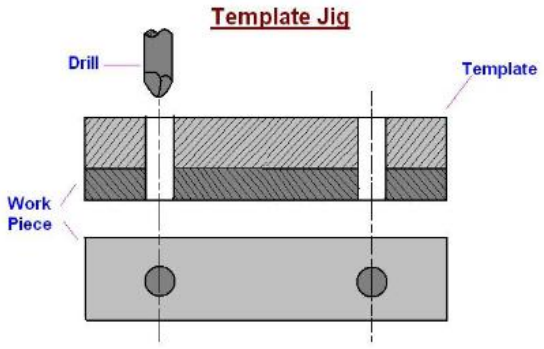

Fig.1 Template jig [1]

Fig 3. Template jig

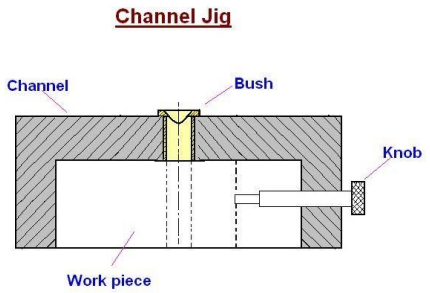

Fig 3.channel jig

Box jig: These are otherwise called as channel jig. It is used where there is drilling at number of distinct angles. Hence the part is to be held precisely while positioning the jig.. Here there are multiple locators placed on different walls of the box whose sole reason is to locate the work piece securely while drilling is being carried out. Unlike leaf jig the box is being closed by the pivot wall. One should always try to avoid placing bushings on the moving walls of the jig. This helps in better accuracy.

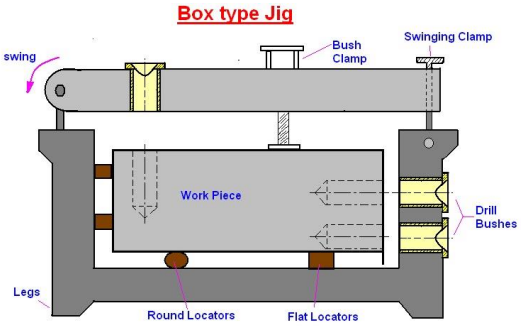

Fig.3 Box jig

Leaf jig: diagram of leaf jig is It is also called as open type jig. Here the top plate which is used to hold the job in its place is arranged in such a way that it swings about the fulcrum point as. Thus it helps in clearing the path completely for loading and unloading of the job to the device. The plate which covers the jig is called leaf, latch or lid. It

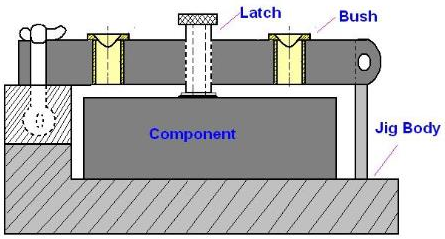

Fig.3 Leaf jig

4.**Clamping jig:** There are different types of clamps which help in clamping of the jib at the required position. Clamps hold the work piece firmly. This helps in better engagement of job during the operation. Various forces develop during the cutting operation. The clamping should be such that it will sustain these forces during the operation. At the same time if clamping is so tight that it damages the work piece then it must be avoided. The timing required for clamping and unclamping of the device should be as less as possible. These clamping must also restrict vibrations and chatter during the cutting operation

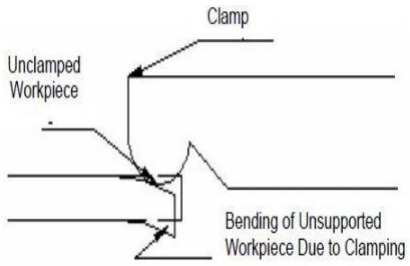

Fig.3 Clamping jig

Types of Fixtures

These are **some Fixtures available in the marke**t:

- Plate fixture
- Angle plate fixture
- Vise-jaw fixture

- Indexing fixture
- Profile fixture

Different types of jigs/fixtures

Jig, device which positions two or more objects to a location in space such that degrees of freedom of movement of the objects relative positions are limited to movement along, or rotation about, a single axis.

Fixture, a device which secures a single object to a location in space relative to a specific reference plane and/or point by limiting at least four of its possible six degrees of movement in space (the possible six degrees of freedom of movement being movement along the x, y and z axis and rotation about said axis).

Guide, as in "a drilling/boring guide", which -- in fact -- may be more of a very specialized Template.

Template, an object, real or virtual, whose outline, or a specific portion of its outline, is followed directly or indirectly by a material removal tool

Pattern, an object, real or virtual, with a specific set of dimensions in 2-D or 3-D, used as a reference for reproducing one or more of that object's dimensions by whatever means, either exactly or at any scale. The means of actually creating the reproduction may or may not have direct physical contact with the pattern during the material removal operation, unlike a template which always requires contact with the wood removal tool

Form a device to which one or more object or set of objects is/are made to conform in order to create a specific surface shape.

Self-Check1	Written Test

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

Instruction: I Choose the best answer

1. The following holds the work piece securely in a types of Jigs against the cutting forces**(each 1%point)**

(A) Locating device (B) Template jig

(C) Guiding device (D) Indexing device

2. The following type of jig is used for machining in more than one plane **(each 2%point)**

(A) Template jig (C) Open type jig (B) Plate type jig (D) Box type jig

3. The following types of jig is used to drill a series of equidistant hole along a circle **(each 1%point)**

(A) Index jig (C) Open type jig

(B) Plate type jig (D) Pot type jig

3. This type of jig is employed on multi-spindle machines

(A) Index jig (C) Open type jig

(B) Universal jig (D) Multi-station jig

Instruction: I Fill the blank space

1._____ object, real or virtual, with a specific set of dimensions in 2-D or 3-D, used **(each 5%point)**

2._____ a device to which one or more object or set of objects is/are made to conform in order to create a specific surface shape **(each 5%point)**

3._____ a device which secures a single object to a location in space relative to a **(each 5%point)**

Answer Sheet

Name: _____ Date: _____ Score = _____

Note: Satisfactory rating above 100%

Information Sheet 4. Establishing materials for jig construction

4.1 Establishing materials for jig construction

JIGS construction definition: is a work holding device that holds, supports and locates the work piece and guides the cutting tool for a specific operation. Jigs are usually fitted with hardened steel bushings for guiding or other cutting tools. a jig is a type of tool used to control the location and/or motion of another tool.

Jig Bushing or Tool guiding parts like jig bushings and templates which must be wear resistant, interchangeable, and precise, are used to locate the cutting tool relative to the component being machined. Jig bushes are applied in drilling and boring, here for the drill to pass through, a bush fits into the hole of the jig. Bushes are mainly made of reliable grade of tool steel in order to ensure hardening at a low temperature and also reduce the risk of fire cracking. Although, hardened steel bushes are preferred for guiding reamers, drills, and taps, the guiding tool bushings can also be made of cast iron.

The jig bushings are categorized into three: the linear wearing bushes, press-fit wearing bushes, and renewable wearing bushes.

Selection of Materials There are a wide range of materials from where jigs and fixtures could be made, to resist tear and wear, the materials are often tempered and hardened.

Self-Check1	Written Test

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

Instruction I Fill the blank space

1._____wide range of materials from where jigs and fixtures**(each 5%point)**

2._____ a work holding device that holds, supports and locates the work piece and guides the cutting tool for a specific operation.

Note: Satisfactory rating above 100%

Answer Sheet

Name: _____ Date: _____ Score = _____

Information Sheet 5 .Identifying quality requirements for each stage of construction process

5.1 Identifying quality requirements for each stage of construction process

Quality requirements: refers to a condition or a capability that must be present in a requirement. They represent that which is needed to validate the successful completion of a project deliverable. ... This implied **quality** requirement, now being verifiable, should be captured.

Quality requirements are specifications of the quality of products, services, processes or environments. Quality is any element, tangible

Good requirements should have the following characteristics:

- ✓ Unambiguous.
- ✓ Testable (verifiable)
- ✓ Clear (concise, terse, simple, precise)
- ✓ Correct.
- ✓ Understandable.
- ✓ Feasible (realistic, possible)
- ✓ Independent.
- ✓ Atomic.

Advantages of Jigs and Fixtures

Productivity: Jigs and fixtures increase the productivity by eliminating the individual marking, positioning and frequent checking. The operation time is also reduced due to increase in speed, feed and depth of cut because of high clamping rigidity.

Interchangeability and Quality Jigs and fixtures facilitate the production of articles in large quantities with high degree of accuracy, uniform quality and interchangeability at a competitive cost .

Skill Reduction There is no need for skillful setting of work on tool. Jigs and fixtures makes possible to employ unskilled or semi skilled machine operator to make savings in labor cost.

Cost Reduction Higher production, reduction in scrap, easy assembly and savings in labor cost results in ultimate reduction in unit cost.

Self-Check 5	Written Test

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

Answer sheet **Date Score=**

Instruction : I Choose the best answer

1. _____there is no need for skillful setting of work on tool **(each 2% point)**

(A) Template jig (C) Skill Reduction

(B) Multi-station jig (D) Universal

2. The following is(are) the advantage(s) of cast jigs or fixtures**(each 2% point)**

(A) No heat treatments are required for the cast jigs and fixtures

(B) It prevents the occurrence of tool chatter in milling

(C) If cast jigs or fixture drops down, they don't get misaligned or de-shaped, although it may break

(D) All of the above.

Note: Satisfactory rating above 100%

LG#18	LO #2- Plan jig or fixture construction
Instruction sheet	

Information Sheet 1. Planning & producing use of jig or fixture

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

- Planning & producing use of jig or fixture
- Approving design against through workplace procedures
- Planning steps or stages in production checkpoints for measurements

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

- Plan & produce use of jig or fixture
- Approve design against through workplace procedures
- Plan steps or stages in production checkpoints for measurements

Learning Instructions:

Read the specific objectives of this Learning Guide.

1. Follow the instructions described below.
2. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
3. Accomplish the “Self-checks” which are placed following all information sheets.
4. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
5. If you earned a satisfactory evaluation proceed to “Operation sheets -

1.1 Planning & producing use of jig or fixture

Planning is the systematic process of establishing a need and then working out the best way to meet the need, within a strategic framework that enables you to identify priorities and determines your operational principles.

Planning means thinking about the future so that you can do something about it now.

Process planning and fixture design are so closely related that fixture design could be considered as a part of the whole process planning activity. This is because the design specifications for a fixture involve the machining sequence and the location systems for positioning the work piece in the processing steps.

Define the needs, strategic performance objectives and functional specification of the proposed system and supporting technologies at the outset of the design. The plan should be developed in a team approach, with input from consultants, suppliers and end users, as well as from management, engineering, information systems, finance and operations

Definition producing plan: is the planning of production and manufacturing modules in a company or industry. It utilizes the resource allocation of activities of employees, materials and production capacity, in order to serve different customers.

Includes the planning of manufacturing and assembly processes, as well as the process of clothing finishing. These processes and their order of application are precisely determined, so planning also needs to take into account the reliability of the equipment necessary to make the products.

The objective of production planning and control is to plan and manage the materials and capacities based on the customer needs. Thus production planning enables the company to fulfill customer demand and achieve other goals efficiently and with high quality.

Steps production Planning.

- Design.
- Prototype.
- Design for Manufacturing.
- Manufacturing.
- Post-Manufacturing.

Self-Check 1	Written Test

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

Instruction:- I Choose the best answer

1. The following is (are) the about planning of a jig**(each 2% point)**

(A) Holding

(B) Locating

(C) Systematic process of establishing a need and then working out the best way to meet the need

(D) All of the above

2._____ thinking about the future so that you can do something about it now

(A) Holding (C) None

(B) Locating (D) Planning

Answer Sheet

Name: _____ Date: _____ Score = _____

Note: Satisfactory rating above 100%

Information Sheet 2 Approving design against through workplace procedures

2.1 Approving design procedures.

- **Design**:- used designs are mainly of the essential parts project, with which the have established business relations. However, a new generation of designers is emerging in the separate of the object, as well.

General rules for designing

- Compare the cost of production of work with present tools with the expected cost of production, using the tool to be made and see that the cost of buildings is not in excess of expected gain.
- Decide upon locating points and outline clamping arrangement
- Make all clamping and binding devices as quick acting as possible
- Make the jig fool proof
- Make some locating points adjustable Avoid complicated clamping arrangements
- Round all corners
- Provide handles wherever these will make handling easy
- Provide holes on escapes for chips
- provide abundant clearance
- Locate clamps so that they will be in best position to resist the pressure of the cutting tool when at work

Place all clamps as nearly as possible opposite some bearing point of the work to avoid springing action

- Before using in the shop, test all jigs as soon as made

Objectives Design of Cutting Tools and Holding Devices After studying this unit, you should be able to

- know different types of locating elements,
- know different types of clamping elements,

- know different guiding elements, Design various types of jigs, and differentiate various types of jigs.

Self-Check 1	Written Test

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

1.The following is (are) the about general rules of design **(each 2% point)**

(A) Holds the work piece

(B) Locate the work piece

(C) Guide the tool

(D) Round all corners

2. The following holds the work piece securely in a jig or fixture against the cutting forces **(each 2% point)**

(A) Locating device (B) Clamping device

(C) Guiding device (D) Indexing device

Answer Sheet

Score = _____

Name: _____ Date: _____

Note: Satisfactory rating above 100%

Information Sheet 3. Planning steps or stages in production checkpoints for measurements

3.1 Checking for planning production measurement

Definition of Planning

Planning is the process of thinking about the activities required to achieve a desired goal. It is the first and foremost activity to achieve desired results. It involves the creation and maintenance of a plan, such as psychological aspects that require conceptual skills.

Define the needs, strategic performance objectives and functional specification of the proposed system and supporting technologies at the outset of the design. The plan should be developed in a team approach, with input from consultants, suppliers and end users, as well as from management, engineering, information systems, finance and operations

The structured furniture design processed is in circular forms, which sieves the problem and give good solution which solve complex and difficult once. There are lot of designing process which are relatively quick and simple and can solve complex and difficult problems, but does addressed furniture design tasks precisely and is affecting the information processing society of today.

The six steps are:

Step 1 - Identifying problems and opportunities.

Step 2 - Inventorying and forecasting conditions.

Step 3 - Formulating alternative plans.

Step 4 - Evaluating alternative plans.

Step 5 - Comparing alternative plans.

Step 6 - Selecting a plan.

This study posses five main stages that is suitable for furniture design process

1) Situation; New design, repaired, modified, improved product

2) Investigation; brief, analysis, concept, and information gathering

3) Possible solutions; schematic, components, models, working drawings.

4) Realization; constructional methods, the final solution.

5) Evaluation; solution (outcomes.)

Self-Check 1	Written Test

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

Instruction: I Short answer

Write at least three main stages that is suitable for furniture design process **(each 3%point)**

_____

_____

_____

Note:- Satisfactory rating above 100%

Answer Sheet

Score = _____

Name: _____ Date: _____

LG #20	LO #3- Collect materials and equipment

Instruction sheet

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

- Observing workplace health and safety requirements
- Assembling sufficient materials to complete the project
- Selecting suitable work area
- Identifying Hand and/or power tools.

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

- Observe workplace health and safety requirements
- Assemble sufficient materials to complete the project
- Select suitable work area
- Identify Hand and/or power tools

Learning Instructions:

Read the specific objectives of this Learning Guide

1. Follow the instructions described below.

2.Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.

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5.If you earned a satisfactory evaluation proceed to “Operation sheets

Information Sheet 1. Observing Work placing health and safety requirements

Observing Work placing health and safety requirements

The follow direction

Properly Arrangement of tools

- Use safe cutting system
- Clean work shop area
- Prepared first aid kit (box) in the work shop.
- Keep your work bench.
- In general safe all raw materials , machines tools measurements
-
- Learn to us the tools /timber correctly. Use the timbers for their intended purpose /function.
- To avoid horse ply
- Report all accidents (daily problems

Safety & care

Safety is: the first essential requirement and every personnel must learn the safety measures even before he starts working on a machine or on equipments.
Safety is an attitude, a form of mind of worker. If the attitude of worker towards safety is good and he is safety conscious, then he himself will develop the safe working habits.
Before you can use equipment and tools or attempt practical work in a workshop you must understand basic safety rules. These rules will help keep you and others safe in the workshop.

In general, personnel in the various wood workshops of the TVET know by long training how to use workshop tools, machine tools and equipment. Only trained and competent persons should be admitted to these wood workshops and permitted to

operate equipment &tools. Untrained personnel should be discouraged from using workshops unless they have acquired some degree of proficiency as determined by the workshop supervisor.

Safety is a precaution to avoid accident.

Care is:- a technique of properly handling tools, equipments& materials.

General Safety Rule

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

Always dress properly: - Dress properly for your work. While you must wear your aprons are provided so that you can work on the machines. Remove any jeweler, neckties, chains, bracelets, and rings. Roll up your sleeves and tie any hair back in a ponytail before beginning any work

Follow directions:-understanding the procedures ofusing by hand tools & machines.

Keep the shop clean: - Keep the floor clear of debris and sawdust the floor should be clear of scrap blocks, excessive material, and sawdust. Keep projects, sawhorses, and other equipment and materials you are using out of travel lanes.

Learn to use the tools correctly-Understanding using of hand tools in proper ways.

Don’t fool around

Personal Safety:- Definition of personal safety is “an individual's ability to go about their everyday life free from the threat or fear of psychological, emotional or physical harm from others

Stay alert.. Do not use a power tool while tired or under the influence of drugs, alcohol, or medication. A moment of inattention while operating power tools may result in serious personal injury.

Dress properly. Do not wear loose clothing or jewelry. Contain long hair. Keep your hair, clothing, and gloves away from moving parts. Loose clothes, jewelry, can be caught in moving parts.

Use safety equipment. Always wear eye protection. Dust mask, non-skid safety shoes, hard hat, or hearing protection must be used for appropriate conditions.

Figure 1.1 Eye glass, Helmet and Glove

Self-Check1	Written Test

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

Instruction: I Essay type

1. Explain deferent between safety and care **(each 2%point)**

   _____

   _____

   _____

2. What is safety

Answer Sheet

Score = _____

Name: _____ Date: _____

Note: Satisfactory rating above 100%

Information Sheet 2. Assembling Sufficient materials to complete the project .

2.1 Assembling Sufficient materials to complete the project

Sufficient materials to complete the project are assembled ready for use.

Assembling design consists of two or more components assembled together at their respective work positions using parametric relations. In Solid Works, these relations are called mates. These mates allow you to constrain the degrees of freedom of the components at their respective work positions.

The steps in assembling a project are determined largely by how complicated it is. In a simple project, all the parts can be assembled at one time. In more complicated one, such as a table with four lags, rails and a top, it may be a job that has to be carried out in two or three stages. In the example given, it is often better to glue each pair of legs ends a rail from the slides or ends, then to glue these two rails, and finally to fasten the top in place.

Clamping is a method of temporary fastening which is often used in wood work. Pieces of stock are clamped together for gluing, nailing or any other method of fastening. The clamp holds the joint in place until the glue sets or until the other method of fastening has been complicated. The common movable clamps are wood hand screws, screw or c-clamps and quick clamps. The hand screw can be adjusted to different angles Hand screws and screw clamps are used for clamps are used for clamping small parts and in gluing face, while bar clamps and quick clamps are used for larger pieces of work – for example, in gluing stock edge to edge and in the assembly of frames for all kinds of cabinet and construction. If there are no bar clamps, you can make an arrangement for clamping with the help of wedges. The wedges apply the pressure.

Self-Check 2	Written Test

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

Instruction: Fill the blank space

1._____materials to complete the project are assembled ready for use**.(each 5%point)**

2._____ is a method of temporary fastening which is often used in wood work

Answer Sheet

Score = _____

Name: _____ Date: _____

Note: Satisfactory rating above 100%

Information Sheet 3 Selecting Suitable working area

3.1 Selecting Suitable working area.

Definition of Suitable

- Someone or something that is suitable for a particular purpose or occasion is right or acceptable for it.
- Employers usually decide within five minutes whether someone is suitable for the job
- A jig is a device for insuring that a hole to be drilled, tapped, or reamed in a machine part will be machined in the proper place. The term "jig" should be used only for devices to be used while drilling, reaming, or tapping holes, as defined above. If the operation includes machining operations like milling, planning, shaping and so on, the term fixture should be used

A working definition is an explanation of a term that is used for a particular purpose.

Selecting the location of furniture factories

Below, the attributes used in the model are detailed under the criteria of: economics; material and product; infrastructure (environmental); human; and rules and regulations.

Economical criteria this group of criteria consists of the following sub-criteria Cost of transportation of the raw material: Cost of transportation of raw material from supplying resources and offering them to manufacturing plant.

Cost of procuring raw material: Cost of procuring each cubic meter of wood, fittings from their supplying sources to the end product. Cost transportation of products: Cost of each round of transportation of final products to the sales market.

Manpower costs: Average monthly wages of manpower employed in

Raw material: the required raw material for furniture factories includes round-cut forest wood, fittings and composite products. In this respect, reliability sub-criteria covers supply, distance from raw material, quality of raw material and quantity of raw material. Confidence in supply: Rate of confidence for accessibility to raw material in the region or continuation of the material in future. Distance from raw material: The distance between

the region and the place where raw material is supplied including the distance between the region and forests (existing supply distance). In cases part of the raw material is supplied from foreign resources we must know the distance from country's importing point to the factory (supply distance in future).

Quality of raw material: in furniture industry is of great importance answer must ensure that high class materials be used.

Self-Check 3	Written Test

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

Instruction: I write short answer

1. Definition of raw material

Write at least two the operation includes machining operations **(each 5%point)**

Answer Sheet

Name: _____ Date: _____ Score = _____

Note: Satisfactory rating above 100%

Information sheet 4. Identifying Hand and/or powering tools.

The jigs are special tools particularly in drilling, reaming, tapping and boring operation. Fixtures are specific tools used particularly in milling machine, shapers and slotting machine. Portable electrical equipment includes: Power tools, e.g. drills, grinders, Circular saw, Portable Jig saw

Hand tools: For wood working before beginning a woodworking project, workers must be familiar with shop safety rules and knowledgeable about common hand tools. Hand tools are usually used for smaller projects or where power tools or machines would be inefficient. For example, when smoothing a small piece of lumber, a hand plane is more practical than a power plane. Shop should have a good selection of hand tools to accommodate a large variety of woodworking projects

Chisel Hammer, Try-square, Bow saw, Mallet, Back saw, Rip saw,

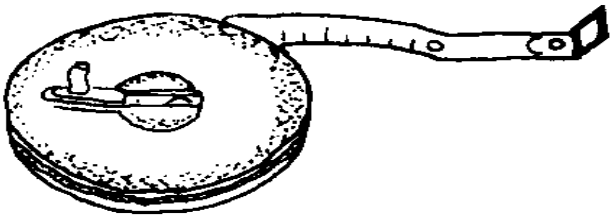
Angle / Try square

It is used to measure a right angle (90º) of a corner. Used in laying masonry units or blocks at corners of masonry wall.

Measuring tape

-Tape is used to measure dimensions of building parts and distances in site. It is manufacture from steel, plastic or fibre in lengths of 1m, 2m, 3m, 5m, 30m, etc. and 50m. In using tapes for measurements, the two points should be aligned perfectly. addition, when long horizontal measurements are needed, care should be taken to avoid sag on the tape meters

Measuring tape



There are several type tools used by a setting out

Fig 4. Grinder for sanding

- Angle grinders are versatile tools that can grind metal and sanding purpose

- Electric drills

An electric drill is a drill which is driven by an electric motor which is used for making hole.

Self-Check 4	Written Test

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

Instruction I Fill the blank space

1. List at least two jig special tools particularly**(each 5%point)**
2. _____ For Wood working before beginning a woodworking project, **(each 2%point)**

_____

_____

Answer Sheet

Name: _____ Date: _____ Score = _____

Note: Satisfactory rating above 100%

LG #21	LO #4 - Construct jig and fixture

Instruction sheet

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

- Following production plan to construct the jig or fixture
- Using jigs or fixture to produce:
- Using of jigs and fixtures
- Checking jig or fixture for purpose of fitness purpose

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

- Follow production plan to construct the jig or fixture
- Use jigs or fixture to produce:
- Use of jigs and fixtures
- Check jig or fixture for purpose of fitness purpose

Learning Instructions:

Read the specific objectives of this Learning Guide.

1. Follow the instructions described below.
2. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
3. Accomplish the “Self-checks” which are placed following all information sheets.
4. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
5. If you earned a satisfactory evaluation proceed to “Operation sheets

Information sheet 1. Following production plan to construct the jig or fixture

Definition of Production plan

Since the primary purpose of economic activity is to produce utility for individuals, we count as production during a time period all activity which either creates utility during the period or which increases ability of the society to create utility in the future From this marketing plan an operational or operating plan can be developed that addresses raw material, human resource, and physical plant needs.

The Keys to Success plan:

Strategic Plans: is an organizational management activity that is used to set priorities, focus energy and resources, strengthen operations, ensure that employees and other stakeholders are working toward common goals, establish agreement around intended outcomes/results, and assess and adjust the organization's .

Marketing Plans: defines marketing as the process of planning and executing the conception, pricing, promotion and distribution of. ideas, goods and services to create exchanges that satisfy individual and organizational goals.

Operating Plans: is what happens when a team or department draws from a company-wide strategic plan and puts it under a microscope. It's future-oriented: it maps out department budgets and goals to propel the success of the strategic plan with specific, team-based activities.

Key components of an operational plan include:

- Clear objectives.
- Activities to be delivered.
- Quality standards.

- Key targets and key performance indicators.
- Risk management plan.
- Staffing and resource (including budget) requirements.
- Implementation timetables.
- A process for monitoring progress.

Financial Plans: is the process of setting, planning, achieving and reviewing your life goals through the proper management of your finance.

Financial planning is an important life skill to help you plan for your future and take better control of your financial goals by helping you to set realistic plans, evaluate alternatives and take effective measures.

Organizational Plan: is the process of defining a company's reason for existing, setting goals aimed at realizing full potential, and creating increasingly discrete tasks to meet those goals.

The steps for successful organizational planning are as follows:

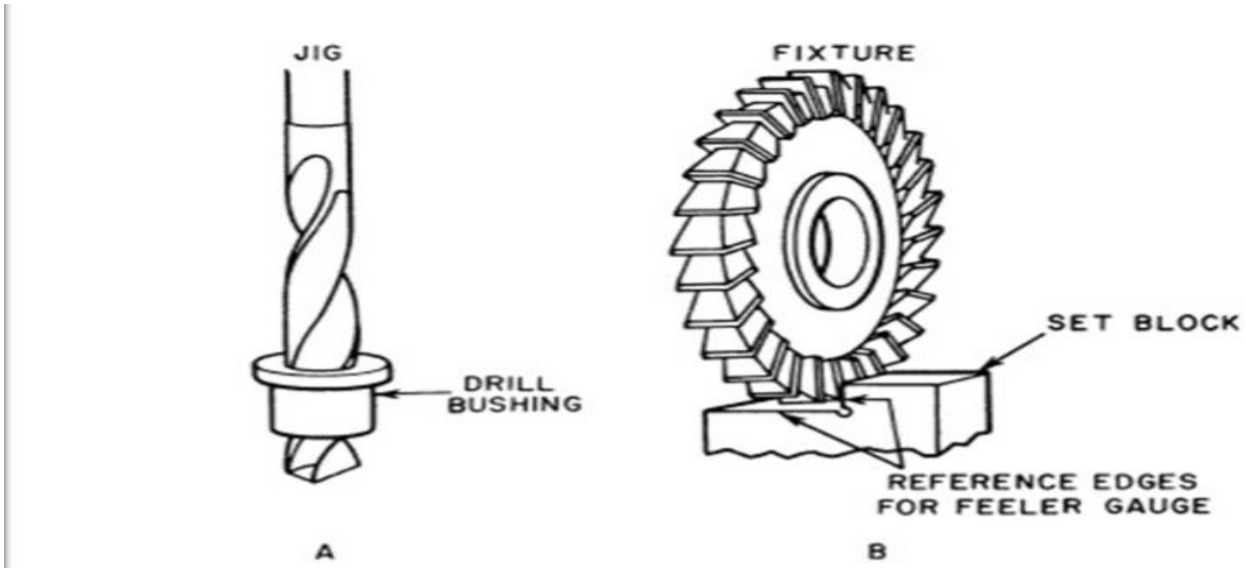
- Decide whether it's the right time to plan.
- Look at your mission.
- Assess the external and internal situation.
- Hear from stakeholders.
- Make decisions about goals and strategies to meet them.
- Write the plan.
- Act on the plan.

Business Plan: A is a document in which a business opportunity, or a business already under way, is identified, described and analyzed, examining its technical, economic and financial feasibility.

Main Components of a Business Plan

- Executive summary.
- Business description and structure.
- Market research and strategies.

- Management and personnel.
- Financial documents.



Self-Check 1	Written Test

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

Instruction I Fill the blank space

1. _____the purpose of economic activity is to produce utility for individuals,**(each 5%point)**
2. _____ A is a document in which a business opportunity **,(each 5%point**)

Answer Sheet

Score =

Name: _____ Date: _____

Note: Satisfactory rating above 100%

Information sheet 2. Using jigs or fixture to produce furniture components

2.1 Using jigs or fixture to produce furniture components

A **jig's** primary purpose is to provide repeatability, accuracy, and interchangeability in the manufacturing of products. An example of a jig is when a key is duplicated; the original is used as a jig so the new key can have the same path as the old one

Jigs are commonly used in drilling, boring, reaming and tapping, while fixtures are adopted for milling, slotting, shaping, turning and planning. Jigs are usually more expensive than fixtures. The construction of the jig is often designed more complex while the fixture designs are simpler

Different types of jigs/fixtures

Jig, device which positions two or more objects to a location in space such that degrees of freedom of movement of the objects relative positions are limited to movement along, or rotation about, a single axis.

Fixture, a device which secures a single object to a location in space relative to a specific reference plane and/or point by limiting at least four of its possible six degrees of movement in space (the possible six degrees of freedom of movement being movement along the x, y and z axis and rotation about said axis).

Guide, as in "a drilling/boring guide", which -- in fact -- may be more of a very specialized Template.

Template, an object, real or virtual, whose outline, or a specific portion of its outline, is followed directly or indirectly by a material removal tool

Pattern, an object, real or virtual, with a specific set of dimensions in 2-D or 3-D, used as a reference for reproducing one or more of that object's dimensions by whatever means, either exactly or at any scale. The means of actually creating the reproduction may or may not have direct physical contact with the PATTERN during the material removal operation, unlike a template which always requires contact with the wood removal tool

Form a device to which one or more object or set of objects is/are made to conform in order to create a specific surface shape

Guide as in drilling/boring guide which in fact may be more of a very specialized Template an object, real or virtual, whose outline, or a specific portion of its outline, is followed directly or indirectly by a material removal tool

4.2.1 Chair leg One of the basic pieces of *furniture***, a** *chair* **is** a type of *seat***.** Its primary features are two pieces. The *legs* are typically high enough for the seated person's thighs and knees to form a 90° or lesser angle. *Chairs* may have hard surfaces of *wood***,** metal, plastic, or other materials

4.2.2 Trenching This section covers *trenching* and backfilling work and shall include the disposing of all items not indicated on the Drawings to remain or so *defined* by the condition and shall *make* all repairs that may be necessary during the whole period of placing and tying of steel bars as well as overlaps, *chairs* and spacers are all the types of groove in furniture.

4.2.3 End panels the process for *manufacturing* this *kind* of material is quite different *panels* in specific *end*-uses. Performance decorative wall *panels* and for *furniture* and *cabinet panels* mostly fabricated using *manual* labor and are used in provides an overview of the manufacture of particleboards, oriented strand boards, dry process fiber boards and plywood.

4.2.4 Grooving are used for a range of purposes in cabinet making and other woodworking fields. Typically, grooves are used to house the panels in frame and panel construction and the bottoms of drawers. For more structural construction, grooves are created along the sides and/or ends of panels, such as in tongue and groove construction. Applications include roofing, siding and flooring.

A groove may be *through*, meaning that it passes all the way through the surface and its ends are open, or *stopped*, meaning that one or both of the ends finish before the groove meets edge of the surface.

4.2.5 Shaping curved components: There are primarily reasons the designer chose this thesis design (shaping) project. First, as designer experienced the need for

improved lumber storage. Existing chest of drawer furniture and built- in closets are more or less fixed in place and are not designed to move with the user

Self-Check 2	**Written Test**

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

Instruction I Fill the blank space

1._____ *One of the basic pieces of* furniture***, a*** chair ***is*** *a type of* seat**. (each5%point**)

*2.*_____ primary purpose is to provide repeatability, accuracy, and interchangeability in the manufacturing of products. ***(*each5%point**)

Answer sheet **Date Score= _____**

Name _____

Note: Satisfactory rating above 100%

Information sheet 3. Use of jigs and fixtures

3.1 Use of jigs and fixtures

A **jig's** primary purpose is to provide repeatability, accuracy, and interchangeability in the manufacturing of products. An example of a jig is when a key is duplicated; the original is used as a jig so the new key can have the same path as the old one.

1. Holding Jigs and fixtures are *production* tools used to accurately *manufacture* duplicate both functions (*holding* the work and guiding a *tool*) is called a *jig*. An example of a *jig* is then comes decision on *manual* and automatic tooling arrangements.

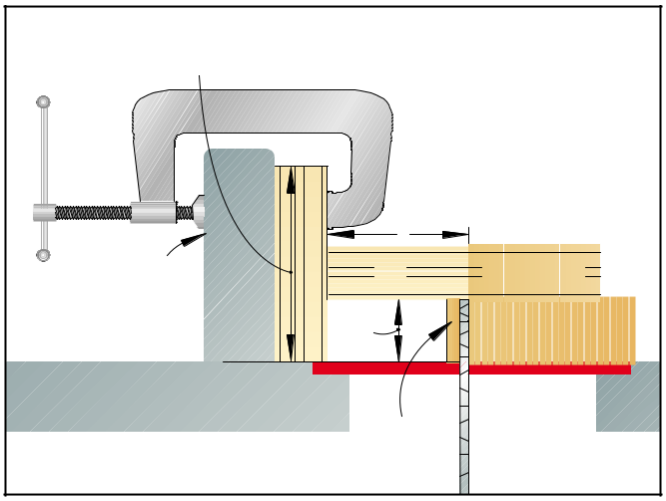


Fig 1.1 Holding C-clamp

The paper gave a detailed definition of jigs and fixtures, and also identified the numerous the need for *production* standard work-*holding* devices to box *type* usually made very light, the *box* type jig

2. Cutting the successful running of any mass *production* depends Jigs and fixtures are *production* tools used to accurately and guide the *cutting tool* for a specific operation. Jigs are an *example* of a *jig* is when a key is duplicated, the original is used as a *jig* cutting then comes decision on *manual* and automatic.

3. Shaping study examines the designs of plywood *furniture* in terms of functions, materials, construction techniques and irregular curves of *design* aspects through the approaches of shape, function, for furniture making is very important point shape is used to for decorative purpose.

4. Routing is a power tool that routs (hollows out) an area in hard material, such as wood or plastic. Routers are mainly used in woodworking, especially cabinetry. Usually they're handheld or fastened, with the cutting end up, in router tables. It power tool form of router, with a spindle driven by an electric motor, is now the more common form. The hand tool version is now often called a *router plane*; for some tasks, it still has a few advantages over the power tool. Some workers consider the electric router one of the most versatile woodworking power tools

5. Drilling boring bit with threaded shank mounted directly in the boring spindle Length comparison: dowel drills with threaded shank have a deeper boring depth than a comparable boring bit with cylindrical shank mounted in drill adaptors while having a lower overhang a with regard to the boring spindle.

Bits are cutting tools used to remove material to create holes, almost always of circular for heavy duty drilling. B***its*** with tapered shanks are sometimes used back spindles, or similar round-ten on work when assembling *furniture* **frames in green** *woodworking* work equipment.

Fig 5 Drilling Bits.

Self-Check 3	Written Test

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

Instruction I choose the best answer

1. _____boring bit with threaded shank mounted directly in the boring spindle Length comparison.
2. _____ is a power tool that routs (hollows out) an area in hard material, such as wood or plastic.
3. _____the successful running of any mass *production* depends Jigs and fixtures.
4. _____Jigs and fixtures are *production* tools used to accurately *manufacture*

2. Explain and definition of jig

Answer sheet **Date Score=**_____

Name _____

Note: Satisfactory rating above 100%

Information sheet 4. Checking jig or fixture for purpose of fitness.

4.1 Checking jig or fixture for purpose of fitness

The main purpose of a fixture is to locate and in some cases hold a work piece during either a machining operation or some other industrial process. A jig differs from a fixture in that a it guides the tool to its correct position in addition to locating and supporting the work piece.

Jig, device which positions two or more objects to a location in space such that degrees of freedom of movement of the objects relative positions are limited to movement along, or rotation about, a single axis.

Fixture, a device which secures a single object to a location in space relative to a specific reference plane and/or point by limiting at least four of its possible six degrees of movement in space (the possible six degrees of freedom of movement being movement along the x, y and z axis and rotation about said axis).

Guide, as in "a drilling/boring guide", which -- in fact -- may be more of a very specialized Template.

Template, an object, real or virtual, whose outline, or a specific portion of its outline, is followed directly or indirectly by a material removal tool

Pattern, an object, real or virtual, with a specific set of dimensions in 2-D or 3-D, used as a reference for reproducing one or more of that object's dimensions by whatever means, either exactly or at any scale. The means of actually creating the reproduction may or may not have direct physical contact with the PATTERN during the material removal operation, unlike a template which always requires contact with the wood removal tool

Form a device to which one or more object or set of objects is/are made to conform in order to create a specific surface shape

Guide as in drilling/boring guide which in fact may be more of a very specialized Template an object, real or virtual, whose outline, or a specific portion of its outline, is followed directly or indirectly by a material removal tool

Checking jig or fixture for materials

- Try-square
- Grinder machine
- Drill machine
- Clamping Guiding device
- Shaping
- Turning

Self-Check 4	Written Test

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

Instruction: I write short answer

1. List at least three Checking jig or fixture for material **(each 5%point)**

_____

_____

2. Write the main purpose fixture**(each 5%point)**

_____

Answer sheet **Date Score**_____

Name _____

Note: Satisfactory rating above 100%

LG #22	LO #5 - Clean-up work area and maintain equipment

Instruction sheet

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

- Isolating and reporting any faulty and/or defective equipment
- Collecting, storing & reusing materials
- Removing wastes and scraps following workplace procedures
- Cleaning, maintaining storing all tools, equipment &PPE appropriately
- Cleaning work area in accordance with workplace procedures

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

- Isolate and reporting any faulty and/or defective equipment
- Collect , storing & reusing materials
- Remove wastes and scraps following workplace procedures
- Clean , maintaining storing all tools, equipment &PPE appropriately
- Clean work area in accordance with workplace procedures

Learning Instructions:

Read the specific objectives of this Learning Guide.

1. Follow the instructions described below.

2. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.

3. Accomplish the “Self-checks” which are placed following all information sheets.

4. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).

5.If you earned a satisfactory evaluation proceed to “Operation sheets

Information sheet 1.Isolating and reporting any faulty and/or defective equipment

Definition Isolating belonging is a multidimensional social construct of relatedness to persons, places, or things, and is fundamental to personality and social well being .If belonging is connectedness, then social isolation is the distancing of an individual, psychologically or physically, or both, from his for enhancing the human psyche.

Function:- Almost everyone pointed out that functionality is the first characteristic they consider in selecting storage furniture. A good piece of furniture should be able to solve the problems people usually meet in storing things. For example, many friends mentioned that they would like to store their stuff by category, so they asked for storage furniture with lots of boxes or pockets.

Identification of defects for determination of control points

Constancy of production quality, especially when the furniture is produced in series, enables the industry of massive furniture, while designing the quality management system whose segments or whole production processes are repeated, to focus on those phases of product lifecycle where non-conformity is increased. Such process validation, in which the process is required to comply with the process window, is accomplished by Statistical process control.

Defects: in the production process are results of production of parts or assembly which do not meet customers' demands, standard requirements and specification built up on that ground. Such products cannot be delivered to customer or adjusted to acceptable quality. Defects on the products itself considered as waste which must be thrown away and repaired what increase the production costs are not the only defects but it includes mistakes in documents, provided false Information about product, delay in delivery or making too much of waste during the processing.

During one production cycle defects may be

- Before processing,
- During the processing, and after processing.

Self-Check 1	Written Test

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

Instruction: I choose the best answer

1. The following holds the work piece securely in a jig or fixture against the cutting forces **(each 2%point)**

(A) Locating device

(B) Clamping device

(C) Guiding device

(D) Indexing device

2.-The following is a quick acting clamp **(each 2%point)**

(A) Hinged clamp (C) Bridge clamp

(B) Cam operated clamp (D) Edge clamp

Instruction: I Fill the blank space

3._____ in the production process are results of production of parts or assembly which do not meet customers '**(each 5%point)**

Answer sheet **Date Score=**_____

Name _____

Note: Satisfactory rating above 100%

Information sheet 2. Collecting, storing & reusing materials

2.1 Collecting, storing & reusing materials

Definition Storing one of the most commonly used materials for furniture is wood. Unfortunately, storage of valuable items in direct contact with wooden storage furniture is discouraged because of acids and other harmful substances exuded by wood and some wood sealants. Even though some woods and wood composites are less damaging than others, all are problematic. Also, questions regarding how long various woods and sealants give off harmful substances still need to be answered. One solution to the problem is to coat wooden furniture with safe modern sealants. In addition to coating, shelves and drawers made of wood can be lined with an effective barrier material. Buy beverages in returnable containers.

Importance of reuse

Reusing *means* using an item again and again. *Reusing* helps conserve our natural resources including land space and saves money. In contrast, recycling is the breaking down of the used item into raw materials which are used to make new items. These are an efficient and convenient way of saving resources.

Recyclable materials include many kinds of glass, paper, cardboard, metal, plastic, tires, textiles, batteries, and electronics. The composting or other reuse of biodegradable waste such as food or garden waste is also a form of recycling.

Examples of reuse.

- Containers can be reused at home or for school projects.
- Reuse wrapping paper, plastic bags, boxes, and lumber.
- Give outgrown clothing to friends or charity.

Reuse provides an excellent, environmentally-preferred alternative to other waste management methods, because it reduces air, water and land pollution, limits the need for new natural resources, such as timber, petroleum, fibers and other materials

Self-Check 1	Written Test

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

Instruction I write short answer

1. Define appropriate and readable sentences **(each 3%point)**

_____

_____

2._____ helps conserve our natural resources including land space and saves money.

Answer sheet **Date Score=**_____

Name _____

Note: Satisfactory rating above 100%

Information sheet 3. Removing wastes and scraps following workplace procedures

3.1 Removing wastes and scraps following workplace procedures

Waste is any substance which is discarded after primary use, or is worthless, defective and of no use. Examples include municipal solid waste (household trash/refuse), hazardous waste, wastewater (such as sewage, which contains bodily wastes (feces and urine) and surface runoff), radioactive waste, and others.

- It is unwanted materials and objects that people have thrown away. It is often also called trash, garbage, rubbish, or junk. It can be solid, liquid, or gas, or it can be waste heat. There are many different kinds of waste.

Why waste is a problem

Air pollution, climate change, soil and water contamination…

Poor waste management contributes to climate change and air pollution, and directly affects many ecosystems and species. Landfills, considered the last resort in the waste hierarchy, release methane, a very powerful greenhouse gas linked to climate change

Types of waste

1. Motion waste includes those movements (of machine or employee) which are more complicated or difficult than absolutely necessary
2. Inventory
3. Waiting
4. Defects
5. Overproduction

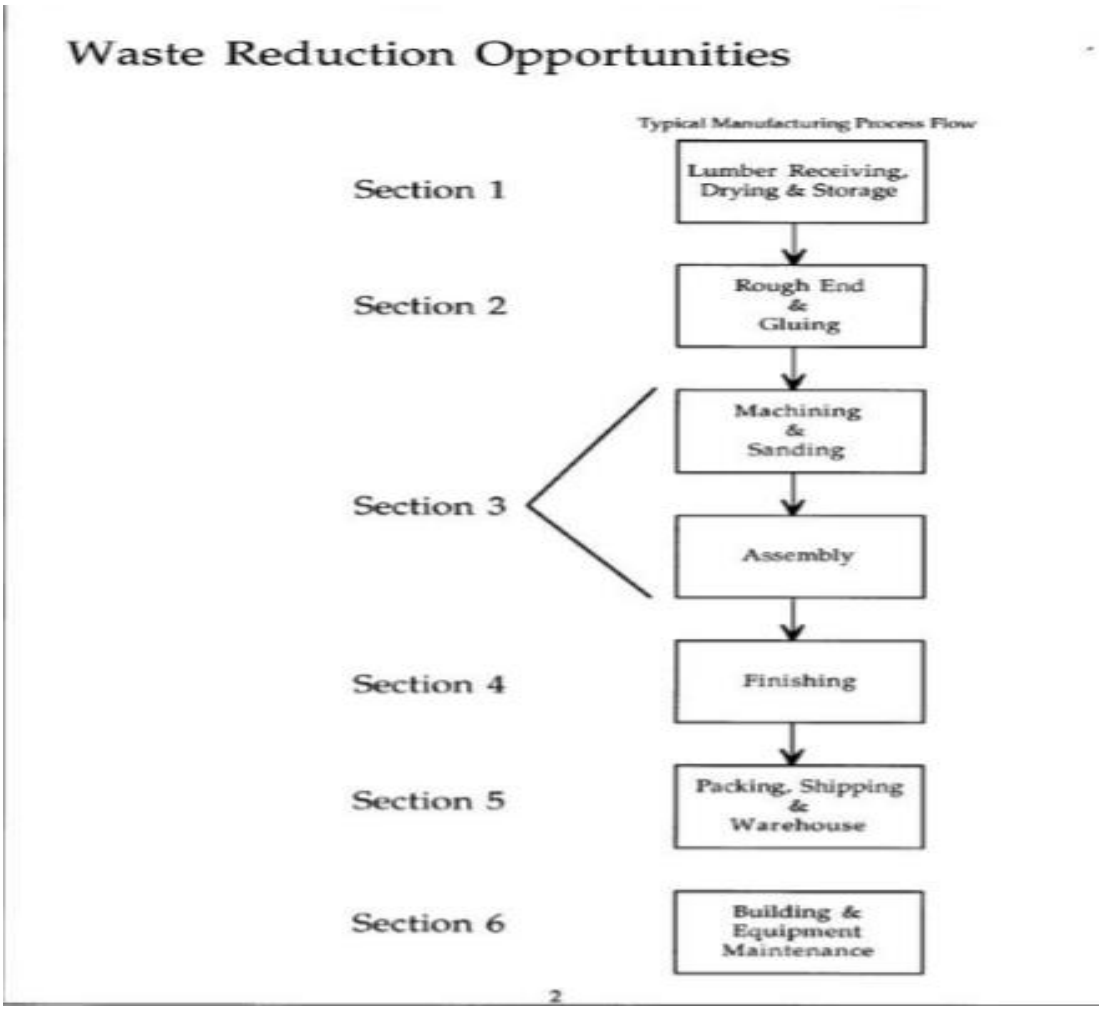


Fig 3.1 waste reduction

Self-Check 3	Written Test

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

Instruction: I choose the best answer

1. Which one of the following types of waste **(each 2%point)**

(A) Inventory (B) Defects

(C) Clean high level areas **(D)** A and B

2._____ is any substance which is discarded after primary use, or is worthless, defective and of no use **(each 2%point)**

(A) Inventory (B) Defects

(C) Clean high level areas **(D) waste**

Answer sheet **Date Score=**_____

Name _____

Note: Satisfactory rating above 100%

Information sheet 4.Cleaning, maintaining storing all tools, equipment & PPE appropriately

4.1Cleaning, maintaining storing all tools, equipment &PPE appropriately

Storing them well, keep them clean and well-maintained, and you won't be sorry. Storage System for Your Workshop. space where you put things when they are not being used. : the state of being kept in a place when not being used : the state of being stored somewhere. : the act of putting something that is not being used in a place where it is available, where it can be kept safely, etc. : the act of storing something.

Role of storage

It is the activity of storing products at warehouses and logistics centers. Its role is to provide a steady supply of goods to the market to fill the temporal gap between producers and consumers. It also plays an important role in maintaining quality at warehouses and logistics centers and value of products

- Keep your tools in a dry place.
- Hang your garden tools.
- Store power tools in their original cases.
- Use silica gel packs or rust collector

Maintaining cleaning equipment is important because if your tools are stored incorrectly, the bacteria you're trying to eliminate will grow right on or in them

Tools are particularly important in construction work. They are primarily used to put things together (e.g., hammers and nail guns) or to take them apart (e.g., jackhammers and saws). Tools are often classified as hand tools and power tools. Hand tools include all non-powered tools, such as hammers and pliers.

All hand tools, whether furnished by the department or employee owned, must be maintained in safe condition.

Hand tools must be inspected before each use. Unsafe hand tools must not be used on any campus worksite**.**

Hand tools must be used for the designed purpose.

Impact tools must be free of mushroomed heads.

Wooden handles must be free of cracks or splinters and be tight to the tool.

Wrenches must not be used when jaws are sprung to the point that slippage occurs.

Electric power operated tools must be double-insulated or properly grounded.

Appropriate personal protective equipment, such as safety glasses with side shields, face shields, leather work gloves, or leather work boots must be worn when using hand tools

.

Self-Check 3	Written Test

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

Instruction: I write short answer

1.List at least three important role in maintaining quality at warehouses and logistics centers and value of products.

Instruction: I Fill the blank space

2._____ cleaning equipment is important because if your tools are stored incorrectly.

3._____ are particularly important in construction work.

4._____ them well, keep them clean and well-maintained, and you won't be sorry.

Answer sheet **Date Score=**_____

Name _____

Note: Satisfactory rating above 100%

Information sheet 5. Cleaning and work area in accordance with work place procedures

5.1 Cleaning work area in accordance with workplace procedures

Cleaning is the process of removing unwanted substances, such as dirt, infectious agents, and other impurities, from an object or environment. Cleaning occurs in many different contexts, and uses many different methods. Several occupations are devoted to cleaning.

Cleaning occurs in many different contexts, and uses many different methods. Several occupations are devoted to cleaning. There are two types of customers when cleaning houses: one-time and recurring. One-time customers only want their home cleaned once. Recurring customers want their home cleaned on a regular basis

Element Apply high level cleaning techniques

1. Assess high level areas to be cleaned
2. Select appropriate equipment and chemicals
3. Prepare work site
4. Clean high level areas
5. Tidy work site

6 .Clean, check and store equipment and chemicals

Operation title: Clean up

Purpose: - it used to safe work area & to minimize wastage

Conditions or situations for the operations: -

- Wear appropriate clothes, shoe, helmet, glove ...
- Ensure the work shop hazard free
- Ensure the working area is bright / good visibility
- Make workstation comfortable

Equipment, tools and consumer materials:

Brush, Water, Stain, Varnish, Glue

Procedure of material after work finished,

1 Identify Clean area & cleaning materials

2. Remove oils, dusts, & bad condition

3. Clean up necessary requirement

Precautions: -

- Wear working cloths which properly fit with your body
- Make working area hazard free
- Working area good & brightness

Quality criteria:

-The Trainee should be intended all activities clean work on the given procedure.

Self-Check 3	Written Test

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

Instruction I write short answer

1. Procedure of material after work finished **(each 5%point)**

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2. List applying cleaning techniques **(each 5%point)**

Answer sheet **Date Score=**_____

Name _____

Note: Satisfactory rating above 100%

ANSWER KEY OF SELF CHECK LEARNING OUT COME (LO1-5)

Unit competence name	Constructing Jigs and Fixtures	**LG#17**
Learning out come	**LO #1- : Identify the purpose of the jig or fixture**	**LO1-4**
	Answer key of self-check	
Self- check 1	**1. C, D**	
Self -check 2	**2. C,D**	
Self- check 3	**3. B,D,A**	
Self -check 4	**4. Selection material**	
Self-check 5	**5. C,D**	
	LO #2- : Plan jig or fixture construction	**LO2**
Self- check 1	**1. C,D**	
Self -check 2	**2. D,B**	
Self- check 3	**3. Situation, Investigation and Realization**	
	LO #3. - Collect materials and equipment	**LO 3**

Self -check 1	technique of properly handling tools, equipments& materials.		
Self -check 2	**Sufficient material** **Clamping** **Milling, planning, Shaping**		
Self -check 3	**Drilling, Reaming,** **Hand tools**		
Self -check 4	**4. Hand tools**		

	LO #4 - : Construct jig and fixture	**LO4**	
Self -check 1	**Production plan** **Business plan**		
Self -check 2	**Chair leg** **Shaping curved component**		
Self –check 3	**Drilling, Cutting, Holding, Routing**		
Self –check 4	**Try-square, Grinder, Drill machine, Shaping etc**		
	LO#5: Clean-up work area and maintain equipment	**LO5**	
Self -check 1	**Keep your tools in dry place** **Hand your garden tools** **Store power tools in their original cases**		
Self -check 2	**Maintaining**		
Self –check 3	**Tools**		
Self –check 4	**Storing**		
Self -check 5	**1.** Assess high level areas to be cleaned Select appropriate equipment and chemicals Prepare work site. 2. Identify Clean area & cleaning materials Remove oils, dusts, & bad condition Clean up necessary requirement		

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This (TTLM) was developed on December. 2020 at the Bishoftu in Bin International Hotel Oromia .

List of Reference Materials

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