Mechanics Level I

Based on March, 2022 Curriculum Version 1

Module Title: Perform Bench Work

Module code: IND MCS1 M05 0322

Nominal duration: 95 Hour

Prepared by: Ministry of Labor and Skill

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

PPE	Personal Protective Equipment
TTLM	Teaching Training Learning Materials
LAP	Learning, Activity Performance
UC	Unit of competency

Introduction to the Module

In the field of manufacturing, the term '**bench work**' refers to the production of components by hand on the **bench**, where as fitting deals which the assembly of mating **parts**, through removal of **metal**, to obtain the required fit. Both the **bench work** and fitting requires the use of number of simple hand tools and considerable manual efforts.

Bench work and fitting have important roles to play to complete the production of our articles by hand on the bench. Fitting if the assembling to gather of parts and remove metal to secure the necessary fits and may or may not be carry out at the bench .The working of metals is made possible by the manipulation of tools and machines. Hand tools are the basic tools normally used in the school and college workshop to realize designed artifacts. The first part of this chapter covers bench work tools such as files, saws and chisels; the second part deals with tools for marking out, measurement and inspection.

This module covers the units:

- Occupational health and safety
- Plan Task and Prepare Work Piece
- Hand Tool Operations
- Drill, Ream and Hone Operations
- Hand Grind Cutting Tools
- Workplace Relationship

Learning Objective of the Module

- Identify Personnel Protective Equipment (PPE)
- Apply Plan task and prepare work piece
- Apply Select and use hand tools
- Peeper Drill, Boring, Reaming and Honing Bore holes
- Perform Cutting Tool On Grinding
- Apply Duties and Responsibilities In Positive Manner

Module Instruction

For effective use this modules trainees are expected to follow the following module instruction:

1. Read the information written in each unit
2. Accomplish the Self-checks at the end of each unit
3. Perform Operation Sheets which were provided at the end of units
4. Do the “LAP test” giver at the end of each unit and
5. Read the identified reference book to more knowledge and to do examples and exercise.

Unit One: Occupational Health and Safety

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

- Personnel Protective Equipment (PPE)
- Preventative OHS Procedures
- Risk And Hazards in The Work Place

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

- Identify Personnel Protective Equipment (PPE)
- Demonstrate Preventative OHS Procedures
- Identify and Reporting Risk And Hazards

1.1 Personal Protective Equipment

Employers have duties concerning the provision and use of personal protective equipment (PPE) at work. PPE is equipment that will protect the user against health or safety risks at work. It can include items such as safety helmets, gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses. It also includes respiratory protective equipment (RPE).

i. Use of PPE

Making the workplace safe includes providing instructions, procedures, training and supervision to encourage people to work safely and responsibly**.** Even where engineering controls and safe systems of work have been applied, some hazards might remain.

These include injuries to:

- The lungs, from breathing in contaminated air
- The head and feet, from falling materials
- The eyes, from flying particles or splashes of corrosive liquids
- The skin, from contact with corrosive materials
- THE body, from extremes of heat or cold

PPE is needed in these cases to reduce the risk.

ii. What do I have to do?

- Only use PPE as a last resort
- If PPE is still needed after implementing other controls (and there will be circumstances when it is, head protection on most construction sites), you must provide this for your employees free of charge.
- You must choose the equipment carefully (see selection details below) and ensure employees are trained to use it properly, and know how to detect and report any faults
    - PPE therefore (for the purposes of this policy) includes items such as the following when they are worn for purposes of health and safety:-
    - aprons;
    - gloves;

- protective equipment for adverse weather conditions;
- safety footwear;
- hard hats;
- high visibility waistcoats;
- Eye and face protection;
- Lab coats; face masks; and ear defenders
- You should ask yourself the following questions:
- Who is exposed and to what?
- How long are they exposed for?
- How much are they exposed to?

iii. **Selection and use**

When selecting and using PPE: Choose products which are CE marked in accordance with the Personal Protective Equipment Regulations 2002 – suppliers can advise you Choose equipment that suits the user – consider the size, fit and weight of the PPE. If the users help choose it, they will be more likely to use it If more than one item of PPE is worn at the same time, make sure they can be used together.

Example: wearing safety glasses may disturb the seal of a respirator, causing air leaks. Instruct and train people how to use it. Train people to remove gloves without contaminating their skin. Tell them why it is needed, when to use it and what its limitations.

iv. Where PPE is used, it must:

- be selected taking into account the nature of the hazard and the task;
- be provided free of charge to employees;
- carry a European Conformity (EC) or British Standard (BS) mark;
- be maintained in an efficient working order and in good repair;
- be compatible with other PPE;
- be stored in an assigned and suitable area with easy access;
- be provided in conjunction with appropriate instruction and training to the wearer;

Never allow exemptions from wearing PPE for those jobs that ‘only take a few minutes', Check with your supplier on what PPE is appropriate – explain the job to them, in doubt, seek further advice from a specialist adviser.

v. Maintenance and Replacement of PPE

PPE must be maintained and replaced in accordance with the manufacturer’s advice where appropriate, and a record maintained by the manager. Departments must devise written procedures for any necessary maintenance of PPE including cleaning, disinfecting, examination, repair, replacement, and testing. These procedures must detail the extent and frequency of maintenance, and the names of responsible individuals. The use of disposable or single use PPE avoids the need to devise and carry out such procedures, but the manufacturer’s information must be passed on to users so that they can recognize when to discard and replace equipment . PPE must be properly looked after and stored when not in use, e in a dry, clean cupboard. If it is reusable it must be cleaned and kept in good condition.

Think about:

- using the right replacement parts which match the original, respirator filters
- keeping replacement PPE available
- who is responsible for maintenance and how it is to be done
- having a supply of appropriate disposable suits which are useful for dirty jobs where laundry costs are high, e.g. for visitors who need protective clothing

Employees must make proper use of PPE and report its loss or destruction or any fault in it.

1.2. Preventive OHS Management

An occupational health and safety (**OHS**) **management** system encompasses more than just your health and safety program. Having an effective **management** system improves your ability to continuously identify hazards and **control** risks in your workplace.

How do you implement a safety management system?

- **Implementing and Operating a Health and Safety Management System**
- Implement a reporting system.
- Train workers how to identify and control hazards.

- Conduct inspections.
- Collect hazard control ideas.
- Implement hazard control ideas.
- Address/anticipate workplace emergencies. Seek input on workplace changes.
- What is OHS How will you implement OHS in your organization?

Establish occupational health and safety policies and **an OHS** program. Provide general direction to management, supervisors, and workers about **their** responsibilities and roles in providing a safe and healthy workplace. Provide specific direction and delegate authority to those responsible for health and safety. What are the key elements of a safety management system? Most successful occupational health and safety management systems contain the following key elements: A way to control and distribute up-to-date documents:

- Safety Inspection Checklists.
- Risk Assessments.
- Emergency Response Plan.
- Training Program and Documentation System.
- Internal Audit Policy and Schedule.

1.3 Report hazard

Accidents no matter how small and trivial they seem, to your supervisor, instructor or tutor Record your report and details of the incident on an accident form.

Receive first-aid treatment from a qualified person, or your company's medical centre, depending upon the size of your company and its policy.

It is important that you follow the procedures laid down by your company since the accident register has to be produced on request by any HSE inspector visiting your company.

Also if at some future date you had to seek compensation as a result of the accident, your report is important evidence

- Failure to log all accidents is an offence under the Health and Safety at Work etc. Act and can lead to prosecution in the courts
- Warning signs and labels

Let’s now consider some examples of the signs and labels you may come across in your place of work, commencing with warning signs .You must be aware of the warning signs and their meanings. You must also obey such signs. To disregard them is an offence under the Health and Safety at Work etc. Act. Warning signs are triangular in shape and all the sides are the same length. The background color is yellow and there is a black border. In addition to warning signs there are also warning labels

Self check-1

Part-I Matching

Instruction: select the correct answer for the give choice. You have given 1 Minute for each question. Each question holds 2 Points.

Match column A with column B

A	B
1/ Personal Protective Equipment?	**A /** Report hazard
2 / Elements of a safety management?	B/ Safety Inspection Checklists
3 / Glove lab coats; ear defenders face masks;	C/ to your supervisor
4/ Maintained in an efficient working order and in good repair	D/ Where PPE is used, it must be
5 Important of PPE?	E/ Making the workplace safe
	F /Report hazard

Part 2. Short answer

1. Write the advantages of wearing PPE.
2. Where is the right way of using PPE?
3. Write the possible hazards when trainees not wear PPE.

Unit Two: Task and Prepare Work Piece Preparation

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

- Safety Regulation
- Work Activities Sequentially
- Selecting Materials Specifications
- Dimensions/Features On Work Piece

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:

- Apply Safety Regulation
- Plan Work Activities Sequentially
- Select Materials Specifications
- Mark Dimensions/Features On Work Piece

2.1. Applying safety regulations

The term '**bench work**' refers to the production of components by hand on the **bench**, where as fitting deals which the assembly of mating **parts**, through removal of **metal**, to obtain the required fit. Both the **bench work** and fitting requires the use of number of simple hand tools and considerable manual efforts. Bench work and fitting have important roles to play to complete the production of our articles by hand on the bench. Fitting if the assembling to gather of parts and remove metal to secure the necessary fits and may or may not be carry out at the bench .The working of metals is made possible by the manipulation of tools and machines. Hand tools are the basic tools normally used in the school and college workshop to realize designed artifacts. The first part of this chapter covers bench work tools such as files, saws and chisels; the second part deals with tools for marking out, measurement and inspection.

2.1.1. Metal work shop Safety

A/ General safety

Safety means the right way of doing things. The safety in Workshops has been written not only to provide appropriate safety procedures but also to assist trained workshop personnel with the provision of a reference document outlining the general principles of safe working practices relevant to the mechanical engineering aspects. It relates to specific areas where definite safety measures are required for workshop operations.

General safety rules are established for three good reasons:-

- To protect you and your colleagues from badly harm.
- To minimize damage to facilities, machinery and tools with which you work.
- To enable you experience a positive safety attitude not only in the work shop but also in your entire professional career. Safety is not only the responsibility of a single fellow. It is the responsibility of every one.

. B/ **Classification of Safety**

Personal safety:

- Wear approved safety glasses or goggles at all times.
- Wear approved foot wears at all times.
- Remove all rings, Watches, or bracelets.

- Long hair must be protected by a hair net or an approved protective shop cap.
- Avoid horse play at all times, since an accidental slip or fall can cause a serious cut or body injury.
- Never handle sharp tools or cutters by hand.
- Use proper lifting techniques whenever lifting tools or machines.
- Do not carry sharp tools on pockets.
- Remove all rings, Watches, or bracelets.
- Don't wear loose clothes.
- Do not use a file without handle.

C/ Bench work and assembling shop safety:

- Keep hands and tools wiped clean and free of dirt, oil and grease.
- Always keep the work shop clean.
- Do no keep working tools at the edge of the table.
- Keep the floor free of oil and grease
- While sawing, keep the blade straight; otherwise it will break
- Clean the vice after use.
- Keep the floor around a machine or bench free of tools or stock.
- Sweep up the metal chips on the floor frequently.

D/ Machine and tool safety

- Do no keep working tools at the edge of the table.
- Never place tools or materials on machine tools.
- Always keep the machine clean.
- Always stop a machine before attempting to clean it.
- Do not use vice as an anvil.

E/ Cause of accidents

1.improper dressing

2.poor house keeping

3.insensible behavior

4.incorrect procedure

F/ preventing accidents

1 good house keeping

2 correct procedure

3 sensible behavior

2.1.2 Planning work activities sequentially

Definition of Planning

Planning:- is the process of deciding in detail how to do something before you actually start to do it. It is the process of setting goals, developing strategies, and outlining tasks and schedules to accomplish the goals.

B/ 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. This doesn't necessarily mean that everything will go according to plan. It probably won't. But if you have planned properly, your ability to adjust, without compromising your overall purpose, will be that much greater.

C/ Reasoning for doing Plan

Four reasons for planning:-

- Provides direction
- Reduces uncertainty
- Minimizes waste and redundancy
- Sets the standards for controlling

D/ Engineering:-

- Engineering is a professional art of applying science and technology to optimize the conversion of natural resources to the benefit of mankind. (Natural resources available in the universe are Iron ore, Air, Sun, Water, Space, Human etc.)
- Human resource is a supreme strength to develop Engineering to contribute the welfare and progress of the society or to this nation.

E/ Engineer:-

- Engineer is a person having creative thoughts and ideas to develop technology for the noble cause of the society or to nation.

- All objects begins an idea, Conceived and visualized by the Engineer. He makes an internal representation of the object in his mind and communicates it to others through media of expression.

2.2. Professional activities of an engineer

1. Planning: Proposal of doing something

- It means a set of preparation is to do in order to achieve something or any kind of task/work. (Preparation means programmers, drawings, Materials requirement and their sources, time schedule, cost estimate, scheme and design and method of preparation etc.)
- It is a management function of defining goal of an individual / organizations.
- It determines the task/work and resources necessary to achieve set goals.
- It helps to save materials, labor, time, money efforts and process etc. so that any kind of work/task can be performed successfully without having any difficulty with full confidence.

2. Visualization (related to vision / creating picture in mind)

- It is a behavioral technique of improving performance of his individual.
- It encourage for creating metal picture for successful execution of any work.

3. Hard work and practice (doing something repeatedly)

There is no substitute for hard work. A spiritual person says that “Work is Worship”, “Practice makes the man perfect”. Practice makes a person to acquire skill to use their knowledge for gaining self-assurance and confidence to handle any kind of work without any difficulty.

4. Punctuality (being in time):

Punctuality is a moral goodness, which is to be practiced very well punctuality is nothing but courtesy to others. By being punctual you respect the value of time of others. This is more than anything else. It helps you to plan your activities and schedule with precision and efficiency.

5. Work place Environment:

Workplace environment is to be maintained neat and clean, and spread happiness, cheerful, love & affection around your work place, at home and also to the community.

6. Efficiency: It is the ability to do whatever we expected of us as promptly accurately and economically as possible. These activities are to be performed by an engineer to maintain quality and integrity for successful execution of any task & to face the challenge of globalization.

Workshop It is a place of work for preparing variety of jobs/products by using different kinds of Instruments, hand tools and Machines.

In order to prepare the products in workshop, the workshop needs having many branches according to nature of work including:

1. Fitting shop
2. Welding shop
3. Sheet metal shop
4. Machine shop
5. Foundry & Forging shop etc.

Required information to prepare the product

It is a common experience that when we want to prepare any product, the following Information's are required:-

1. Actual Shape
2. Accurate Size
3. Manufacturing Method

Before taking up the construction of a product, the person who prepares it must have a clear picture of the shape and size of the object in his mind and to know the method of manufacturing process for successful execution of the work

2.3 Selecting materials

Concepts of engineering materials

The knowledge of materials and their properties is significant for a design engineer. The machine elements should be made of such a material which has properties suitable for the conditions of operation.

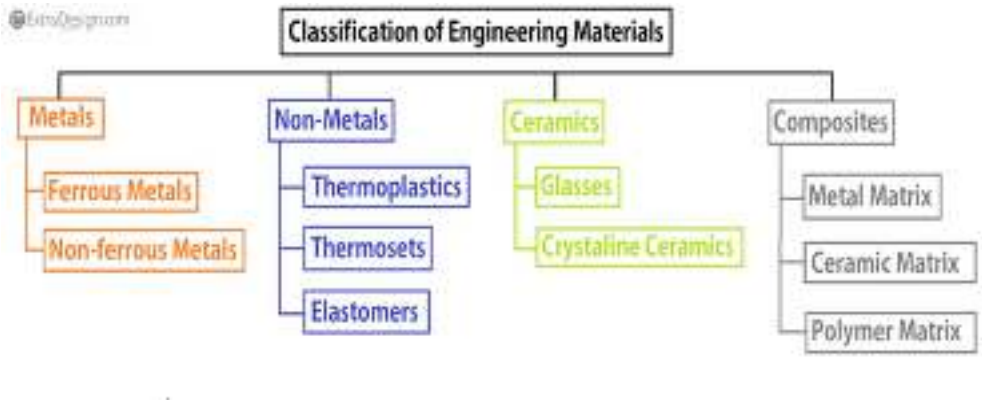


Figure 2.1 Classifications of Engineering Materials.

Identifying properties of ferrous and nonferrous metals

Metals are an element that can conducts heat & electricity. Metals have the following properties:

- Solid at room temperature
- Reflective when polished
- Expand up on heating &contract on cooling
- Good conductor of heat & electricity

Metals can be classified in to two groups:-

1. **Ferrous metals**: - are those which contain iron as the main content.
   Pig iron, wrought iron, cast iron, steel, alloy steel etc.
2. **Nonferrous metals**: - are those which don't contain an iron.
   Copper, zinc, tin, lead, brass, bronze, etc…

The basic source of iron is iron ore. The separation of iron from iron ore is by smelting in blast furnace.

- **Pig iron**: all iron and steel products are derived from pig iron. The principal raw materials of used to produce pig iron are iron ore, coke; lime stone, coal, fluxes etc. Pig iron produce in a blast furnace is the first product in the process of converting by melting iron ore in to useful metals.
- **Steel**: is an alloy of iron and carbon. It has high compressive strength & corrosion resistance compare to other elements. It is used for cutting tools, hand tools, building frame structure etc.

The main difference b/n pig iron & steel is the carbon content. Pig iron contains 3%-4%carbon. To make steel the carbon has to be reduced & other additional impurity to be burnt out , the carbon content varies from 0.1%- 1.5% .

Classification of Steels on their carbon content is:-

- Low carbon steel:-have less than 0.25% carbon content.
  It is used for making wires, rivets, nails etc.
- Medium carbon steel:-have b/n 0.15%-0.25% c- content.
  It is used for garden hoes, cranes, bolts, dies etc.
- High carbon steel: - have b/n 0.5% & 1.5% c- content. It is used for making hammers, springs, chisels, punches, hand files, reamers, screw drivers etc.

Section of steels: - steel ingots are worked in to their final shapes by rolling to produce various shapes. For example Sheet, plate, rod, square, hexagonal angle, channel

Cast iron: - is an easily broken iron which contains some carbon & other impurities. It contains small amount of silicon, phosphorous, sulfur, manganese, etc. it has carbon content between 2%-4%.

2.4 Marking dimensions/features on work pieces

2.4.1 Concepts of Marking and Measuring Tools

Marking out and measuring is a critical part of manufacturing and is usually subject to a number of quality control checks. If components are marked out and measured wrongly before being cut out, there is no chance of them fitting together when they are assembled. Always take marking out measurements from a datum as indicated in Figure 4.1. A datum edge is a flat face or straight edge from which all measurements are taken. This prevents cumulative errors being made. If you are using timber, choose the face side carefully, before marking it with a small symbol for identification purposes, as shown in Figure 2.1. Then select a face edge that is at right angles to the face side. Take all your measurements from this side and/or edge.

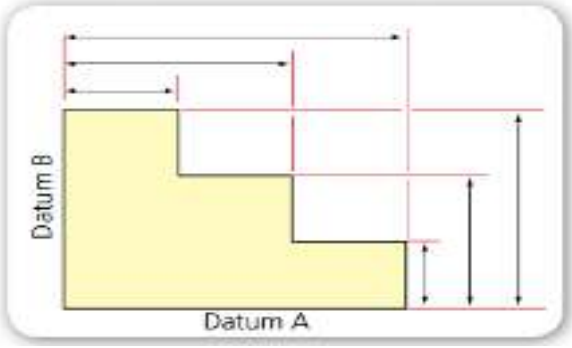


Figure 2.1: Datum edges

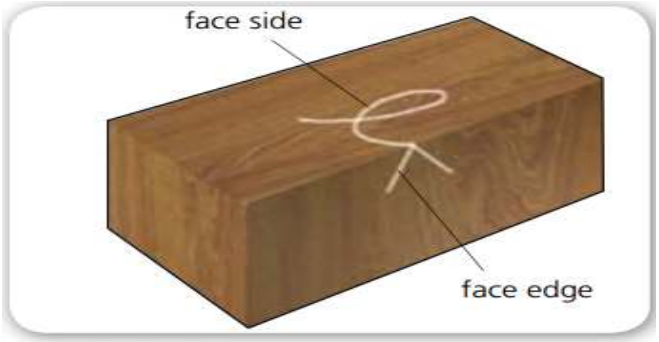


Figure 1.2 Face edges

These are tools used for marking out and measuring that you need to know about:

- rules
- punches
- squares
- templates
- gauges
- micrometers
- Scribers

4.1.1. Measuring Tools

- **Rules:**

There are two basic types of rule: steel rule and steel tape. Both start at zero and have millimeter graduations.

Table 2.1: The uses of rules

Item	Name	Use	Advantages	Disadvantages
	steel rule	for measuring up to 300mm in length	rigid form which means it will not bend and flex	ends can get worn, so the measurements are not accurate
	measuring tape	for making longer measurements up to 5 m	longer, so more versatile	can become twisted and break ends can break off, making them useless

These are made up of stainless steel and are available in many sizes ranging from 1/2 ft. to 2 ft. These are marked in inches or millimeters. All the faces are machined true. The edges of steel rule should be protected from rough handling**.** .

Figure 2.3 stile rue

Micrometers:

A micrometer is a specialized instrument used to take very accurate measurements. The thimble, which rotates as the micrometer is tightened, has 50 equal divisions around its diameter, giving an accuracy of 0.01mm.A reading is taken by adding all the visible whole numbers to the nearest 0.5 mm. The reading from the thimble, which will be between 0 and 0.49 mm, is added to the main reading to get the exact measurement.

Although the micrometer provides a very accurate measurement, it can be difficult to learn how to read it. A micrometer is a very useful instrument. It enables you to take measurements to within one hundredth of a millimeter (0.01mm).The metric micrometer is able to measure ranges of 25 mm (that is, for 0-25 mm, 25-50 mm, and so on).A common type is shown in Figure. The micrometer has a thread with pitch 0.5 mm. This means that the spindle advances by 0.5 mm for each turn. However, there are 50 graduations on the thimble. So the movement advanced for each graduation of the thimble is 0.5/50 = 0.01 mm. Micrometers are one of the precision measuring tools, used to measure to one-hundredth of a mm (0.01mm). On micrometers, the pitch of a screw

thread is used to determine lengths or diameters. Each complete turn of the measuring screw changes the distance between the measuring surfaces by the pitch of its thread (e.g. 0.5mm).

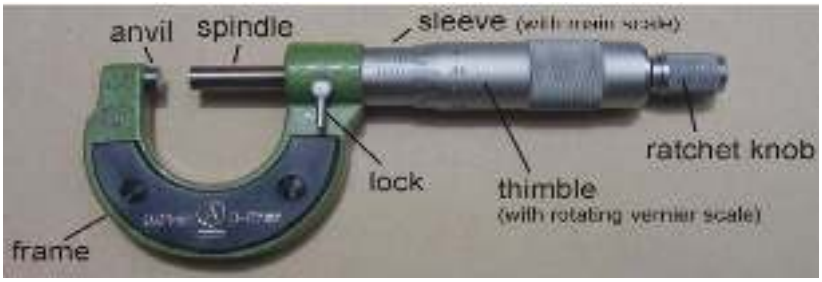


Figure 2.4 *outside micrometer*

Types of Micrometers:

1) Outside Micrometer:

An outside micrometer is used for measuring outside diameter of cylindrical objects, parallel surfaces or other outside dimension. The work to be measured is placed between the anvil and the tip of the spindle.

Reading to micrometer

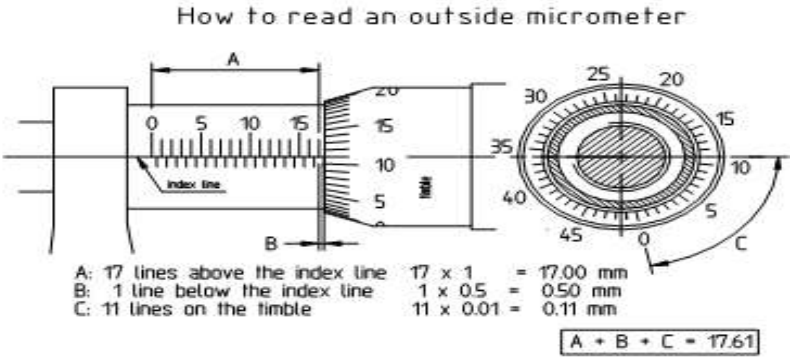


Figure 2.5 outside micrometer reading

For example

1. Upper main scale (sleeve) 12.00 mm
2. Lower main scale (no half mm) 0.00 mm
3. Circular thimble scale 0.13 mm
4. 13 X 0.01 mm = 0.13mm
5. Total reading <u>12.13 mm</u>

Inside Micrometer:

To read micrometer, we multiply the number of vertical position visible on the sleeve by 25 and add the number of divisions on the bevel of the thimble from 0 to the line that coincides with the horizontal line of the sleeve

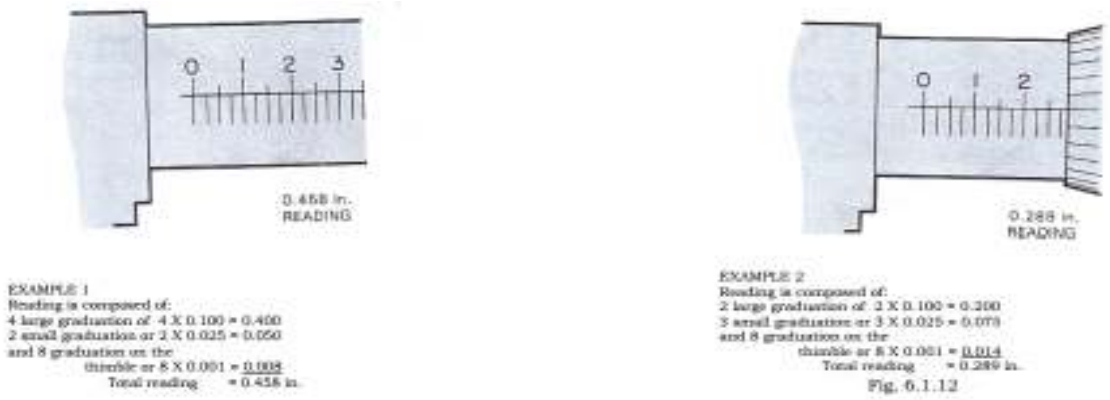


Figure 2.6 Reading micrometer

The structure of this micrometer is as similar as that of an outside micrometer. It is used for measuring internal dimensions.

Figure 3.7 Inside Micrometer

- ✓ **Depth Micrometer:**

Depth micrometers are used for measuring the depth of holes, slots, grooves, Keyway and shoulders etc. Note that the scales are graduated in reverse as compared with external or internal micrometers.

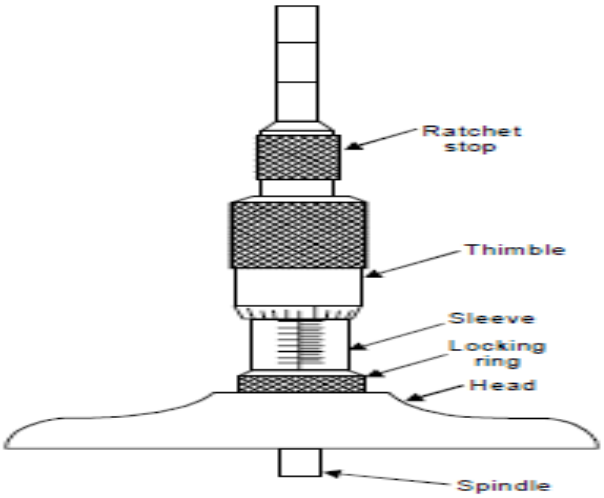


Figure 4.8 Depth micrometer reading

- **Venire Calipers:**

These are used for measuring outside as well as inside dimensions accurately. It may also be used as a depth gauge. It has two jaws. One jaw is formed at one end of its main scale and the other jaw is made part of a Venire scale.

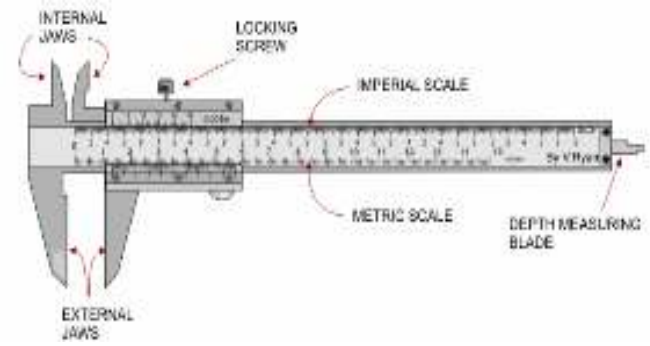


Figure 5.9 Venire caliper

To read (for example) 25.44 mm from the caliper, look for the number of the millimeter division below the venire zero: for example, it is 25. Next find the line on the venire scale that coincides with a line on the main scale: in this case 22. To calculate the total measurement, multiply 20 by 0.02 and add to 25:

That is:

Main scale reading = 25.00 mm
Venire scale reading = 22 X 0.02 (0.44 mm) Final reading = 25.44 mm

The venire caliper is a useful tool for taking external and internal measurements. Add the widths of the jaws (which are always stated on the caliper when taking internal measurements.

Principle of Venire Caliper

- Rule consists of the slide that fits over the rule. A distance on the slide of six-hundred thousandths (0.600) of an inch is graduated into 25 equal parts so that each division measures twenty four thousandths (0.024) of an in. Fig. 2.10. The graduations on the rule itself are twenty-five thousandth (0.025) of an inch, so in a distance of 600 there are 24 divisions on the rule. The difference in the size of the division on the rule and those on the venire scale is one thousandth (.001) of an inch.

How to read Venire Caliper?

- The zero mark on the venire scale indicates the measurement to be read on the rule in. This is seen to be 1.425 in. and a little more. The exact amount over 1.425 is found by examining the division lines of the venire scale to see which one exactly coincides with one of the lines on the rules. In this case it is line 11, so the full measurement is 10425 plus 0.011 which equals 1.436.

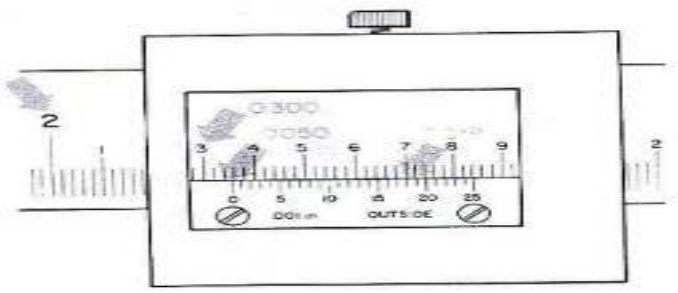


Figure 2.10 **Venire Caliper**

Example the reading is composed of: The “0” line on the Venire plate is between 2 and 3 on the beam = 2,000 Plus two 0.100 (1/10) Graduations = 0.200 Plus one 0.050 (1/20) Graduations = 0.050 Plus fifteen 0.001 (1/1000) Graduations = 0.015 Total reading = 2.368 in Reading a 1/50th Venire Caliper

.Vernier caliper reading

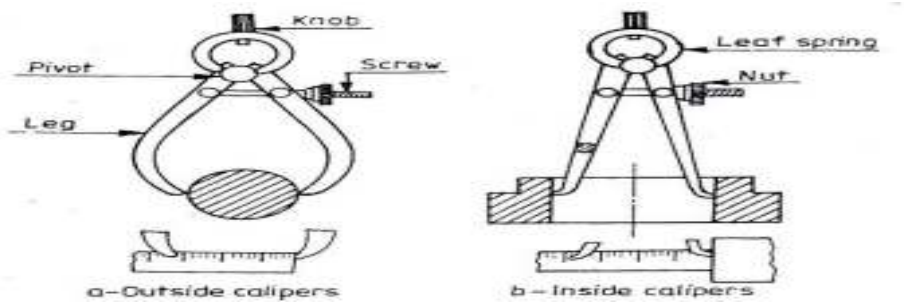
- **Calipers:**

They are indirect measuring tools used to measure or transfer linear dimensions. These are used with the help of a steel Rule to check inside and outside measurements. These are made of Case hardened mild steel or hardened and tempered low carbon steel. While using, but the legs of the calipers are set against the surface of the work, whether inside or outside and the distance between the legs is measured with the help of a scale and the same can be transferred to another desired place. These are specified by the length of the leg. In the case of outside caliper, the legs are bent inwards. Calipers are used for transferring measurements.

The three common types are:

- Outside
- inside and
- odd-leg Hermaphrodite

You can use inside calipers as outside calipers by merely turning the legs about the hinge. and in the case of inside caliper, the legs bent outwards.



. Figure 6. 11 Outside caliper and inside caliper

.

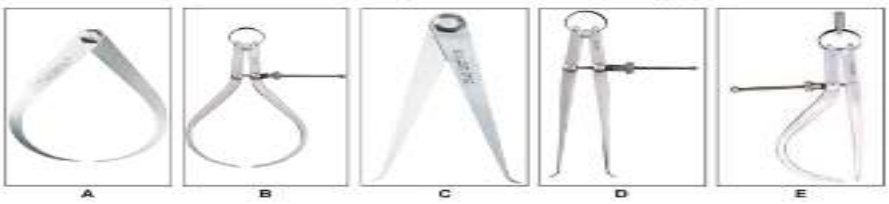


Figure 2.12 Calipers: A-firm joint outside caliper. B-Bow spring outside caliper. C-Firm joint

inside caliper. D- Bow spring in side caliper. E-Hermaphrodite caliper

- **Protractor:**

Engineer's Protractor

An engineer's protractor, as shown is a general purpose tool used for the measuring / checking angles, e.g. the angle of drill head, angle of cutting tool, and even for the marking out of angles on a component part.

. Figure 7.13 Engineer's Protractor

- **Venire Protractor**:

This is a precision measuring tool that the accuracy of measurement can reach ±5 minutes of an angle through the venire scale.

Dial Indicator:

A dial indicator (dial gauge) can measure dimensions up to an accuracy of 0.01mm or even less. The principle of it is that the linear mechanical movement of the stylus is magnified and transferred to the rotation of pointer as shown in Fig. 12. It is usually used as a comparator for calibration or alignment of machine.

. **Figure 8.14** ***Dial Indicators***

Laying out and laying out tools

I. **Laying out**

Layout is the process of making lines, circles, and other marks with a variety of hand tools to represent the features on the blueprint. These marks act as a reference for the operator during machining. They indicate features such as hole locations, dimensions, and other specific areas to be machined. The work piece is coated with a special layout dye, which helps the lines appear more clearly. Layout lines guide the operator to ensure the part fits within the acceptable tolerances. By preventing errors, layout reduces costs.

II. **Laying out tools**

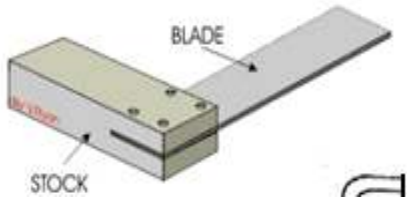
- **Squares:**

There are a number of squares:

- ✓ Try square
- ✓ Miter square
- ✓ Engineer's square.

Both the try square and engineers square are used to mark lines at 90° to an edge. A try square is used on timber and an engineer's square is used on metals. Both can be used for marking out plastics. You can also use try squares and engineer's squares to check that a cut or an edge has been made at right angles to another. Hold the stock part of the square tightly against the edge that you have just cut. If you can see light between the two edges then the cut is not square. A miter square is used for marking out 45° or 135° angles on wood and plastic. Take great care when using any form of square for marking out or checking, and ensure that it is being held firmly and tightly against the surfaces or edges of the material.

In practice, try is used for checking the squareness of many types of small works when extreme accuracy is not required .The blade of the try square is made of hardened steel and the stock of cast Iron or steel. The size of the try square is specified by the length of the blade.



. Figure 2.15. The uses of squares.

Gauges:

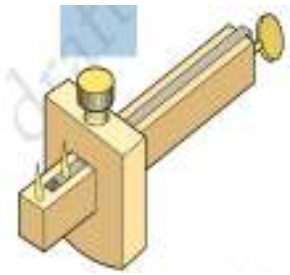
There are three basic types of gauge:

- ✓ marking gauge,
- ✓ mortise gauge
- ✓ Cutting gauge.

A marking gauge is used for marking lines parallel to the face edge and side on wood. It consists of a stock that slides up and down the stem, allowing various measurements to be set. The gauge should be set using a steel rule that has a zero end. The spur (sharp point) is pushed into the wood as the gauge is pushed or pulled along the length of the timber. It is important to hold the stock tightly against the edge of the timber to ensure that you mark a parallel line.

A venire height gauge is used for measuring height of an object or marking lines onto an object of given distance from a datum base.

A cutting gauge is used for cutting across the grain. It is used in the same way as a marking gauge, but has a blade instead of a spur. The blade cuts the fibers across the grain, making it easier and neater to cut with a saw. A mortise gauge has two pins; one pin is fixed and the other is adjustable. It is used for marking two parallel lines where a mortise and tenon joint is to be cut. The process of marking out is exactly the same tise gauge as with the two other gauges.



. Figure 9.16 ***Mortise gauge***

Figure 10.17 ***Venire Height Gauge***

- **Scribers:**

A scriber is used to scratch on the surface of metal and plastic lightly. If you are using a scriber on metal, it is a good idea to apply a coat of engineer's blue. This is a spirit-based liquid that is applied to a metal surface. When the scriber is dragged across the engineer's blue it leaves a clean line, which can be easily seen.

Figure 11.18 *Scribers*

Punches:

Centre punches are used to make an indent in the surface where holes are to be drilled in metal, as shown in Figure 2.19. They provide a starting point for the drill and stop it skidding over the surface. Dot punches are used for marking the centers where dividers are to be used. They are similar to a center punch, except that the tips are ground to a 60° rather than a 90° point.

Center Punch Procedure

1. Make sure that the point of the punch is sharp before starting.
2. Hold the punch at a 45 degree angle and place the point carefully on the layout line.
3. Tilt the punch to a vertical position and strike it gently with a light hammer.
4. If the punch mark is not in the proper position, correct it as necessary.

Figure 2.19. Center punch, and the punch in use.

- **Hammer:**

Hammer is a common work shop hand tools used for striking purpose. There are different types of hammers based on their function.

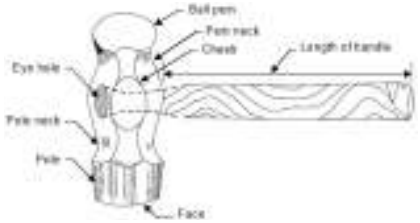


Figure 2.20 Common types of ball peen hammer and its parts.

- **Divider:**

It is basically similar to the calipers except that its legs are kept straight and pointed at the measuring edge. This is used for marking circles, arcs laying out perpendicular lines, by setting lines. It is made of case hardened mild steel or hardened and tempered low carbon steel. Its size is specified by the length of the leg**.**

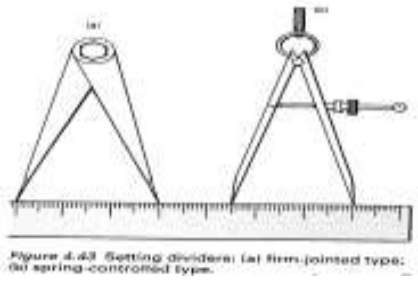


Figure 12.20 Divider: A-place and swing the compass on the center point of the circle or arc.
B-Use the Divider to Step off Measurement

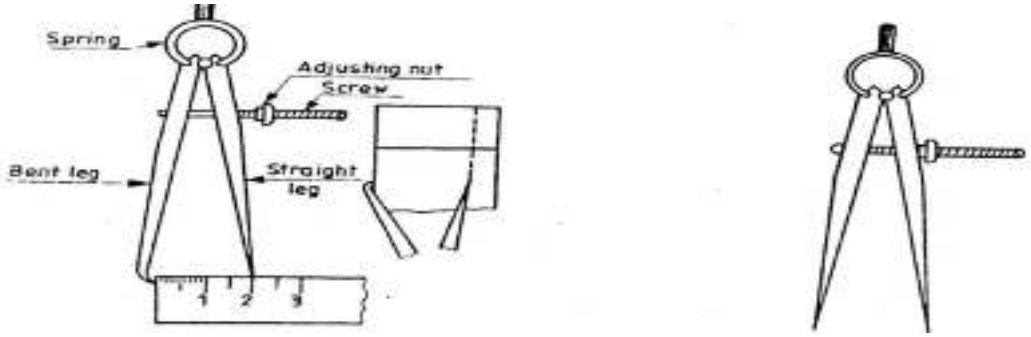


Figure 2.21 Odd leg caliper and divider.

- Trammel Points:

Trammel points are used to mark large circles or make arcs that have large radii. They are used similarly to dividers. The beam is usually made of metal.

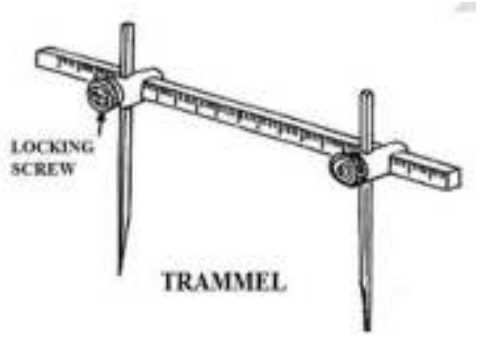


Figure 2.22 ***Trammel Points***

Surface plate

The surface plate provides a 'plane of reference' for checking other surfaces. The plate is made from an iron casting. Its top surface is perfectly flat, and the underside is ribbed to prevent distortion of the plate Figure 2.23 It is used generally for setting up work for marking out and testing. The surface table allows larger work to be checked for flatness.

. Figure 2.23. Surface plate

Surface gauge:

You use the surface gauge for marking parallel lines and finding centers. Shows the procedure:

1. Set the scriber at the height you want, using the rule Figure 2.24.
2. Hold the work against an angle plate or on a vee block.
3. Move the block until the scriber touches the work.

Angle Plate:

The angle plate is made from a good-quality casting. It consists of two faces machined at 90° to each other (Figure 2.24). You can fix work to the plate using bolts, which can pass through the

slots provided. You can also use the angle plate to support work when you are using the surface gauge for marking out.

Vee Blocks:

You use vee blocks to support cylindrical work when you are testing it or marking it out. The blocks, which are supplied in pairs, are made from cast iron. There are grooves along the sides, which allow the clamp to be used. If the work is long, you will need a 'matching pair'. (a) Set the scriber; (b) Hold the work against the angle plate and move the block against the work.

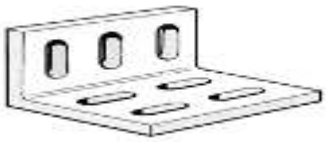


Figure 2.24. Angle plate

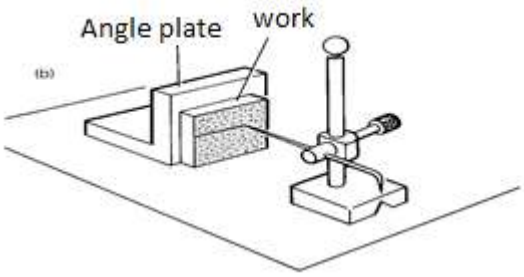


Figure 2.25. Surface gauge

Combination Set:

The combination set (Figure 2.26) is an important tool in the workshop, because you can use it as a center square, a try square, a protractor for marking out, measuring and testing. There are three heads (protractor, square and center), which slide onto a rule, which can be fixed at any position using the nut provided. The main parts of the combination set are used as follows.

1. The try square has angles of 45° and 90°, which you can use to mark out, or to check that a surface is vertical. You can also use it as a square.
2. You can use the center square to find the center of circular pieces.
3. You use the protractor with the rule to mark out or measure angular surfaces (Figure 2. 26 (c)).

Measuring and inspection tools

You can obtain detailed dimensions of work pieces using measuring tools such as the rule, or the combination set. You can also test existing features (such as holes) for accuracy using inspection tools such as plugs and gauges.

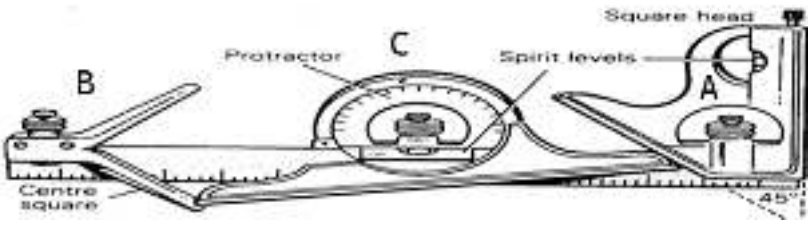


Figure 2.26 Combination set: combination set: (a) try square;
(b) Center square; (c) protractor

Basic arithmetic operations

Fractions and decimals

Converting ratios from fractions to decimals**:**

Although ratios are often given as fractions, they can also be expressed as decimals. You need to deal with a mixture of fractions and decimals, and to compare ratios given in either form, so you need to be able to convert between the two forms. The ratio of the circumference of a circle to its diameter is a constant denoted by π(the Greek letter *p*) pronounced pi, it has been approximated by a number of different fractions. One such fraction is $\frac{22}{7}$, another is 355/113. How do these compare with the decimal value from a calculator of 3.141592 654?

If you have a calculator handy then you could key in 22 ÷ 7 to convert to a decimal. However, if not, you might use long division or an informal method of division. Either way you should get 3.1428 …. So $\frac{22}{7}$ agrees to 3 significant figures. You will probably find it easier to use a calculator for dividing 355 by 113. The result is 3.14159292, which agrees to 7 significant figures.

Percentages and ratios

Ratios

A ratio is used to make comparisons between two similar terms. The items within a ratio are typically of the same units and the resulting comparison is dimensionless (i.e., no units). Ratios are typically expressed in one of three ways, the first being the most common:

- A fraction (division): $\underline{5=6}$

- In words, using “to”: 5 to 6
- With a colon: 5:6

For instance, RU has 409 biology majors and 76 math majors. As a ratio the number of biology majors to math majors is

$$\frac{\#\text{ biology majors}}{\#\text{ math majors}} = \frac{409\text{ students}}{76\text{ students}} = 5.38.$$

The number of biology majors: math majors are approximately 5:1.

Percentage Calculations

A percentage is a ratio expressed as part of 100 or per hundred. "Percent" means "per 100." To calculate a percentage use:

$$Percentage = \frac{subgroup}{total} \times 100$$

Ex.) A class has 52 female and 38 male students. What is percentage of female students?

What is ratio of female to male students?

The total number of students is 52+38 =90 students. The subgroup being examined is the number of female students (52).

The percentage of female students is then

$$\frac{52}{90} \times 100 \approx 57.78$$

Therefore, approximately 57.78% of the students are female.

The ratio of female to male students is 52:38, or $\frac{52}{38} = \frac{26}{19}$

Ordinarily,100 percent of any quantity is represented by the number 1.00,mean-ing the total quantity. Thus, if we take 50 percent of any quantity, or any multiple of 100 percent, it must be expressed as a decimal:

1% = 0.01

10% = 0.10

65.5% = 0.655

145% = 1.45

- **Conversion of units (English to metric)**
  - ✓ **English to Metric Conversions**

There are two different conversions to relate the foot and the meter. In 1893, the United States officially defined a meter as 39.37 inches. Under this standard, the foot was equal to 12/39.37 m (approximately 0.3048 m). In 1959, a new standard was adopted that defined an inch equal to 2.54 cm. Under this standard, the foot was equal to exactly 0.3048 m. The older standard is now referred to as the U.S. survey foot, while the new standard is referred to as the international foot.

$$1\ meter = 39.37\ inches$$

$$1\ meter * \frac{39.37}{12} \cong 3.2808\ feet$$

$$1\ foot * \frac{12}{39.37} \cong 0.3048\ meters$$

$$1\ mile \cong 1609.4\ meters \cong 1.6094\ kilometers$$

Self-check-2

part-I Choose the best answer

Instruction: select the correct answer for the give choice. You have given 1 Minute for each question. Each question holds 2 Points.

Choose the best answer for the following questions.

1. Which one of the following is not a bench work and fitting shop safety?

a/. Do not carry sharp tools in your pockets c/. keep your-self from car accident

b/. Clean the vice after use d/. do not use a file without handle

2. What is the reason that general safety rules are established for?

a./ To protect you and your colleagues from badly harm

b/. To decrease accidents in the work shop

c/. To minimize damage of facilities, machinery and tools d/. All

3. Which one of the following is the cause of accident?

a/. Improper dressing c/. Sensible behavior

b/. Good housekeeping d/. Correct procedure

4. Safety is only the responsibility of a single fellow.

a. True b. False

5 Which one of the following is a personal safety?

a. /Remove all rings, watches, bracelets c. /Wear approved safety glasses or goggles

b. /Wear approved foot wears at all times d. / All

Operation Sheet 2.1

Operation title: Perform tapping and threading

Purpose: To practice and demonstrate the knowledge and skill required in **threading**

Instruction: perform the required tapping and threading in the given dimension

Procedures:

1- Use bench work tools and equipment.
2- Use measuring instruments.
3- Prepare work piece to be measured.
4- Select the appropriate measuring instruments.
5- Measure the work piece.
6- Record the results.

Lap Test-2

Task 1: You will be given a V- Block similar to the one shown in Fig.1.1, use the steel rule to measure the dimensions shown in Fig. 1.2. Record your measurements in the table below

Lap Test-1

Task 1: preper the work piece to produce a thread according to the dimensions given

Task 2 perform the threading operation by the proper hand tools

Task-3: measure threads pitch by using thread *gauge.*

*All dimensions are in mm

Unit Three: Hand Tool Operations

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

- Clamping work pieces
- using hand tools for bench work
- Cutting, chipping, filing and scraping work pieces
- Cutting Threads
- bench work operations
- Applying safety procedures and using personal protective equipment's

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:

- Perform Clamp the work pieces
- Select and using hand tools
- Cut , chipping, filing and scraping work pieces with in tolerances
- **Cut** Threads properly
- Perform bench work operations
- Apply safety procedures in the work shop

3.1 Clamping work pieces

Concepts of clamping

Once work piece is located, it is necessary to press it against locating surfaces and hold it there against the force acting upon it. The tool designer refers to this action as clamping and the mechanisms used for this action are known as clamps. It is necessary that the work should be properly and securely held on for machining operations, a VISE is an effective work holding device.

Vises: Vises are the most common appliances for holding work on table due to its quick loading and unloading arrangement.

a/ Types of work holding devices

- **Bench vice**

A **bench vise** is like an extra hand and is a common tool found in any shop or garage. It is attached to a **workbench** and its purpose is to hold material steady, allowing you to use both hands to work on the material with other tools. They are ideal for sawing, sanding, planing, drilling, screwing, soldering and more.

Bench Vises with Swivel Base

There are mainly three types of vises commonly used:

- Plain vise
- Swivel vise
- Tool makers universal vise

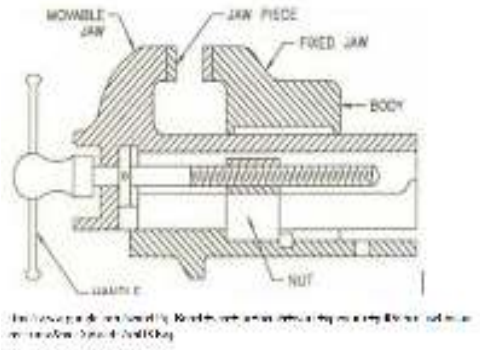


Figure 3.1. Bench vice

- **V-block**

V-block is rectangular or square block with a V-groove on one or both sides opposite to each other. The angle of the 'V' is usually 90^0. V-block with a clamp is used to hold cylindrical work securely, during layout of measurement, for measuring operations or for drilling for this the bar is faced longitudinally in the V-Groove and the screw of V-clamp is tightened. This grip the rod is firm with its axis parallel to the axis of the v-groove

- **C-Clamp**

This is used to hold work against an angle plate or v-block or any other surface, when gripping is required. Its fixed jaw is shaped like English alphabet 'C' and the movable jaw is round in shape and directly fitted to the threaded screw at the end .The working principle of this clamp is the same as that of the bench vice.

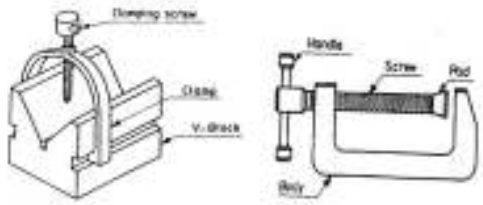


Figure 3.2 Work holding device: *V- Block* and C- *Clamp*

Pliers

There is a vast range of pliers used in the vehicle body building industry, with the most common being combination pliers, slip joint pliers, side cutters, circle pliers, long-nosed pliers and multi grips. The correct pliers to use depend on the type of vehicles being built. For example, long-nosed pliers are used to hold and grip small work in awkward places so these may be used extensively with hydraulic or electrical work. However, they may not be much use when building a semitrailer. Name these pliers:

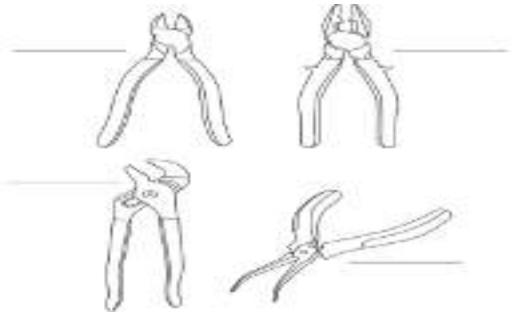


Figure 3.3 Pliers

Figure 3.4 Parallel clamps

- **Parallel Clamps**

Jaws are made of hardened and tempered steel. Clamps are equipped with spring clips

3.2 Selecting and using hand tools

3.2.1 Introduction to selecting and using hand tools

Vehicle body building is a very diverse trade and therefore requires the tradesperson possess many and varied skills. This person must be able to use and operate a wide range of tools and equipment, possibly a wider range than in any other trade. This learning resource covers a selection of hand tools and equipment used in the vehicle body building trade.

Tools

Tools can be divided into two main groups: hand tools and power tools. Hand tools are operated by the physical strength of the user. Power tools require an external source of power such as electricity or compressed air to operate. Each of these groups can also be divided into sub groups.

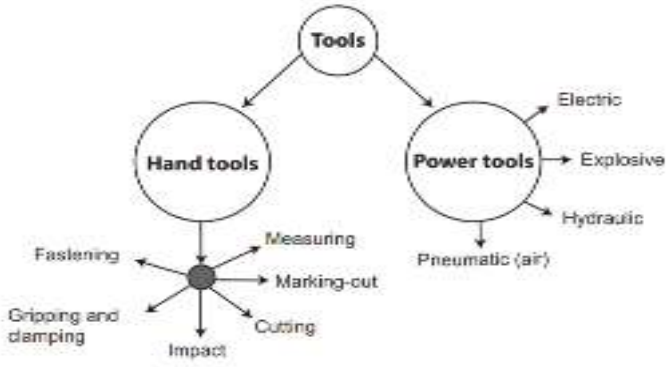


Figure 3.5 Types of tools

Types of tools

A/ **Hand tools**

Hand tools have been devised to enable trades people to carry out a job more efficiently, quickly and safely than would otherwise be possible. Some tools are quite simple, such as a screwdriver, which is almost indispensable for undoing a countersunk screw located in a recess.

Others are more complicated, such as a micrometer; these are indispensable are when measuring fine tolerances.

Hand tools can be classified into several groups:

- fastening tools
- gripping and clamping tools
- impact tools
- cutting tools
- marking-out tools
- Measuring tools.

Fastening tools

Spanners

There are several types of spanners, each suitable for a specific job. The most commonly used spanners in a vehicle body building workshop are:

- ✓ open-ended spanners
- ✓ ring spanners
- ✓ combination spanners
- ✓ sockets and their accessories
- ✓ hook spanners
- ✓ pin spanners
- ✓ adjustable spanners
- ✓ ratchet spanners

Flare nut spanners.

Types of spanners **Figure 3.6**

Wrenches

Wrenches are tools used for holding and turning. A variety of wrenches are used in the vehicle body building industry. Adjustable pipe wrenches are sometime called still son wrenches. Typically, they are used on cylindrical objects such as pipes and rails where there are no flats on which to use a spanner. Another type of wrench is the hexagon wrench, which would typically be used for undoing hexagonal recessed drain plugs. Smaller hexagon wrenches are called Allen keys. Torque wrenches are used to tighten nuts or bolts to a specific tension and are sometimes called tension wrenches.

They are used to correctly tension down the bolts holding engineering components such as power take-off units or bolts on kingpins. Never use a torque wrench to undo nuts or bolts, as this may damage or alter the accuracy of the wrench.

Torque wrench

Figure 3.7 Torque wrench

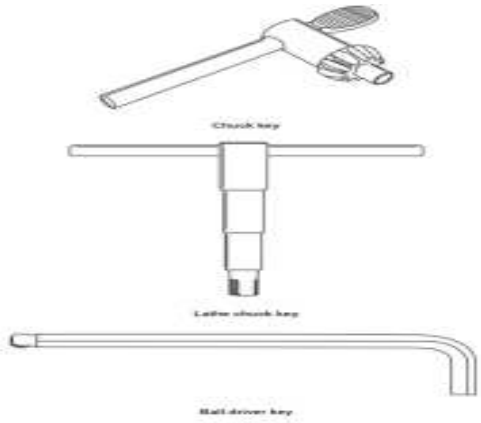
Screwdrivers

Screwdrivers are accurate precision tools and are not designed to be used as punches or cold chisels. The most common types of screwdrivers are the standard (straight blade or flat) type and the Phillips screwdriver, and they are available in many different sizes and lengths. There are also special screwdrivers designed for hard-to-get screws, for example right-angle screwdrivers.

Figure 3.8 Flat screw drivers

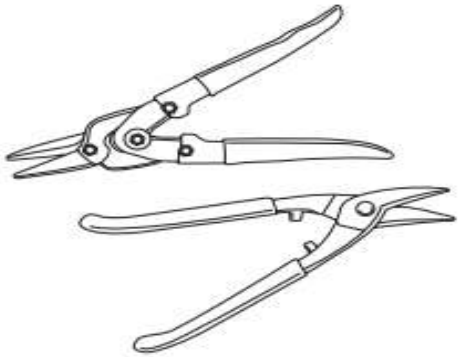
Keys

Keys used in the trade include drill chuck keys, lathe chuck keys and hexagon keys. Hexagon keys are also called Allen keys and include ball driver keys which can be used at an angle, unlike straight hexagon keys, which must be inserted squarely into the hexagonal recess.



. Figure 3.9 Keys: (a) Ch**uck** key, (b) Lathe Chuck key,(c)Ball driver key

Hand snips. Hand snips are used for cutting sheet metals.



. Figure 3.10 Hand snips

Taps and wrenches

Taps are used to cut internal threads in holes which are usually drilled for the purpose of attaching an item with bolts or metal threads. Taps come in all sizes and threads to match the wide variety of bolts and metal threads available in the trade.

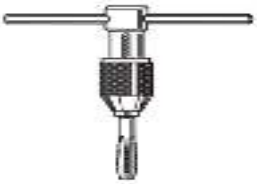


Figure 3.11 Stock and dies

Dies are used to cut external threads on rods, studs, shafts or bolts. They can also be used to clean up or repair damaged external threads.

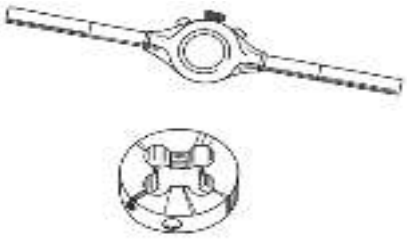


Figure 3.12 Die and die- stock

3.3 Cutting, chipping, filing and scraping work pieces

- **Concepts of Cutting metals**

Sawing is the process of cutting metal stock that is impractical to use a file, a chisel or a machine with a multi-point cutting tool called a hand hack saw. A hand hack saw can also be used for cutting off a jammed bolt, pipes, tubing and rods for special or custom fittings on the job (on the field work).

Some of the most common tools used to cut metals are **hacksaws**, **band saws**, **cold chisels**, **bolt cutters, tin snips, and abrasive saws**. Large stock is sawed, while bar stock is either sawed or cut with a cold chisel. Sheet metal is usually cut with metal snips. In fabrication facilities, large amounts of metal are cut with horizontal band saws or metal shears, commonly called “ironworkers. Layout tools are used to measure and mark metal stock before cutting, shaping, and doing other types of work with cold metal.

A/ Saws

Saws are used to cut material that is not needed away from material which is. Saw blades have alternate teeth bent out or ‘set’ in opposite directions. This is so that when they cut, they make a gap, called the kerfs. The kerfs must be wider than the saw blade so that the blade cannot get stuck. When using a saw, you should always cut to the waste side of the marked line so that you leave a small amount for finishing by either sanding or filing. Whatever you are cutting, it is important to keep as many teeth in contact with the piece being cut as possible. You should choose the correct saw for the type of material you are using. Table 2.3 on the next page shows the most common types of saws used in school workshops.

B/Cutting process

The saw is moved from the right to left and shows how the chip is formed. The cutting process is the result of the horizontal cutting direction and the pressure on the work piece. The angle of the teeth enables the saw to cut the material effectively. The teeth are set (bent out) that they do not get jammed in the cut.

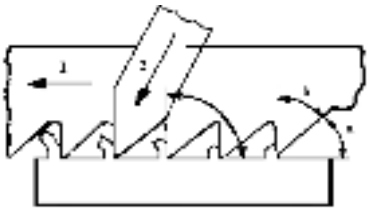


Figure 3.13 Hacksaw tooth setting

Teeth setting:

Forces on a saw blade:

1 is indicates the cutting direction

2 is indicates the pressure on the work piece

a is clearance and b is showing cutting angle

C/Steps to Follow in Making the Cut with a Hacksaw

Place the metal to be cut in a vise and mark it. The mark should be placed near the jaws, especially if the metal is thin. It may be necessary to use boards between the vise jaws to prevent scarring the work. Mark over the original mark with a file.

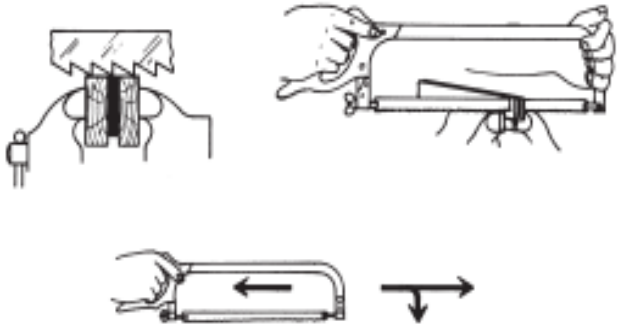


Figure 3.14 Using a hack saw

Depending upon the direction of cut, blades are classified as:

- Forward cut
- Backward cut.

Depending upon the pitch of the teeth (Distance between the two consecutive teeth) blades is classified as:

- Coarse (8-14 teeth per Inch)
- Medium (16-20 teeth per inch)
- Fine (24-32 teeth per inch)

D/ Parts of a hacksaw

1. Saw frame
2. Handle protector
3. Handle
4. Tang
5. Blade holder
6. Blade
7. Pins

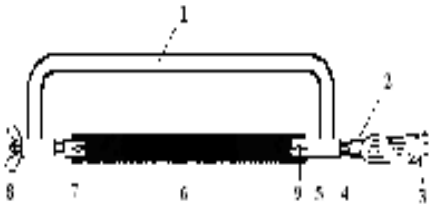


Fig.3.15. Parts of hack saw

8. Wing-Nut
9. Pins

E/ Types of blades for hacksaws

Fig.3.16 *Types of hack saw blades:* a) **One side toothed** **b) Both sides toothed**

. **How to handle a hacksaw?**

1 and 3 indicate the forward stroke with pressure

2 and 4 are the backward stroke without pressure the circle shows the direction of teeth (facing the front of the hacksaw) all strokes should be in a straight line and along the whole length of the blade.

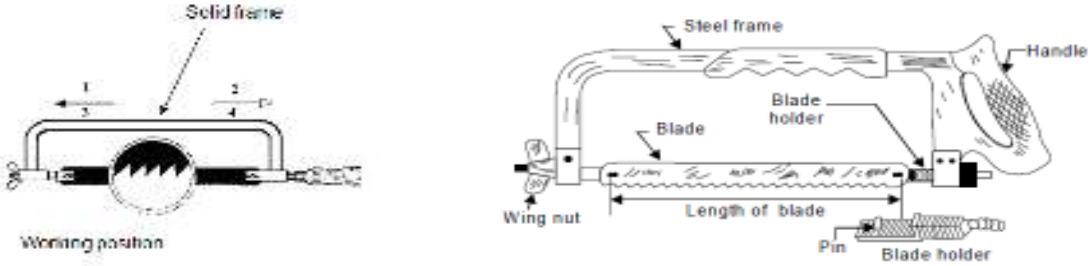
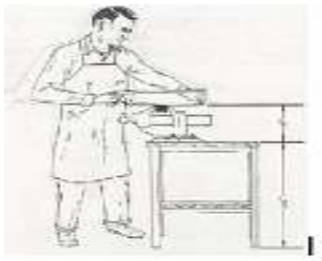


Fig.3.17 Hacksaw frames: *Non- adjustable frame (fixed frame)* . *Aadjustable frame*

The work piece must be clamped to allow free movement when sawing. Left-handed people clamp their work to the right of the vice and right-hander people to the left.



Working Position

Body position when sawing

. Fig.3.18. Working position

F/ Saw teeth for different materials

No of teeth /inch	Functions
14	For solid sections of soft materials
18	Suitable for general use. Solid sections of soft materials and large sections of hard materials (e.g. alloy steel)
24	Small solid sections, between 3 and 6 mm(e.g. heavy tubing and sheets)
32	For sections less than 3 mm thick

Note: At least three consecutive teeth should be in contact with the material. If the material is soft and has a large section, use a blade with few teeth per 25 mm (14 or 18 teeth per 25 mm) Use a fine-tooth blade when cutting a fairly thin section.

H/ Hacksaw blades are made of high-speed steel.

There are two types: all-hard and flexible. The difference between the two is that the all-hard snaps easily, and it is therefore not recommended for school work. The blades come in the following lengths: 200, 250 and 300 mm. They are also available with 14, 18, 24 and 32 teeth per 25 mm for cutting different materials

3.3.1 Chipping

Removing the metal with a chisel is called chipping and is normally used where machining is not possible. While chipping, safety goggles must be put on to protect eyes from the flying chips. To ensure safety of others, a chip guard is placed in position. Care should be taken to see that the chisel is free from mushroom head.

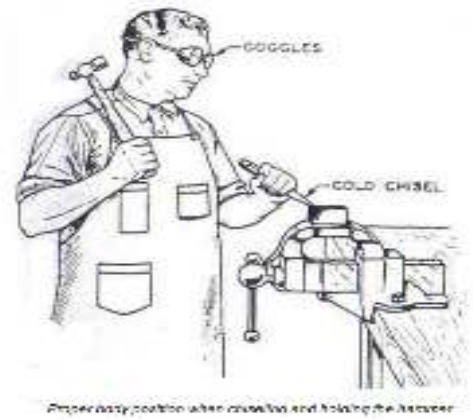


Fig.3.19 Proper body position when chipping

I/ Types of chisels:

These are sometimes referred to as cold chisels because they are used to cut cold metals. They are made of cast steel or alloy steel, with a hardened and tempered cutting edge.

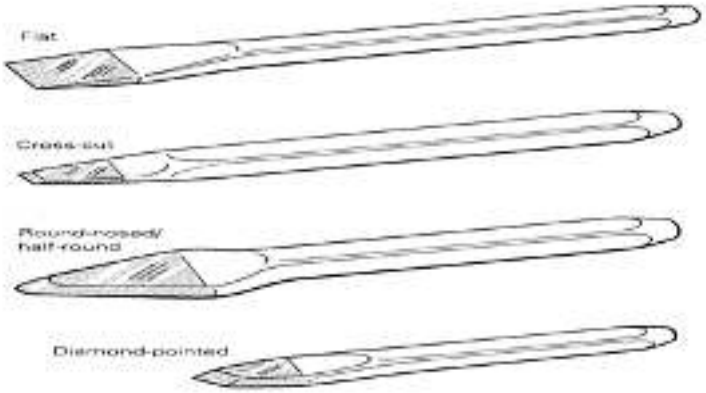
The common types of chisel (Figure 3.8) include:

1. **The flat chisel**: used for general-purpose chiseling;

2. **The cross-cut chisel**: used for cutting grooves such as keyways, and for chipping;

3. **The half-round-nosed chisel**: used for cutting grooves (which are either curved or half-round);

4. **The diamond-pointed chisel**: used for working into corners and cutting small grooves.



. Fig.3.20. *Common types of chisel*

Filing

Filing is a method of removing metal, and the file (Figure 3.9), which is the most widely used hand tool in the school workshop, is used for this cutting operation. It is made of carbon tool steel containing about 1.3 per cent carbon.

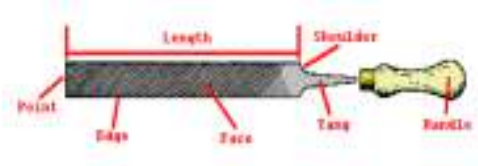


Fig.3.21. The main Parts of file

A file is a hand cutting tool made of high-carbon steel, having a series of teeth cut on the body by parallel chisel cuts. The parts of a file are shown in figure. 3.9. Files are used to remove surplus metal and to produce finished surfaces.

3.4 Cutting Threads

Threads may be cut internally using a tap externally using a die. The proper selection and use of these threading tools is an important phase of machine shop work.

3.4.1 Cut threads using tap and stock and die

A/ Dies

Dies are made either of high-carbon steel or of high-speed steel. Unlike taps, dies are used for cutting external (male) threads. There are three types (Figure blow). The circular split die is a circular piece with a split across one of the flutes. The split is provided to enable small adjustments to be made, using three set screws in the stock. The half die comprises two loose pieces, which are held in the stock. There is a small screw on the stock for adjustment. The die nut has a hexagonal body. This type, strictly speaking, does not cut new threads but is used to 'clean up' threads that are damaged.

B/ Taps and dies

Screwing is a temporary method of fastening parts together. Methods for cutting screw threads include the use of the centre lathe. For bench work, however, taps and dies are used.

C/ Taps

These are the tools used for cutting internal (female) threads. They are made of high-carbon steel or high-speed steel. The tap has a shank with a square end to take the tap wrench or holder. The shank is smaller than the threaded portion. The tap has four rows of threads, cutting edges or teeth, which suit a particular thread form. They perform the cutting action. The grooves between the cutting edges are called flutes. They allow waste material (chippings) to escape. They also allow cutting oil into the work.

A/ The procedure for cutting external threads is as follows:

1. Square the end of the work and chamfer it (using a file, grinding machine or centre lathe) for an easy start.
2. Grip the die, held in the stock, firmly and squarely on the work.
3. Turn clockwise, about a quarter-turn, and ease back to remove chippings.
4. Apply a good supply of oil (lubricant).
5. Make adjustments of the screws after making a full cut until the depth required is achieved.

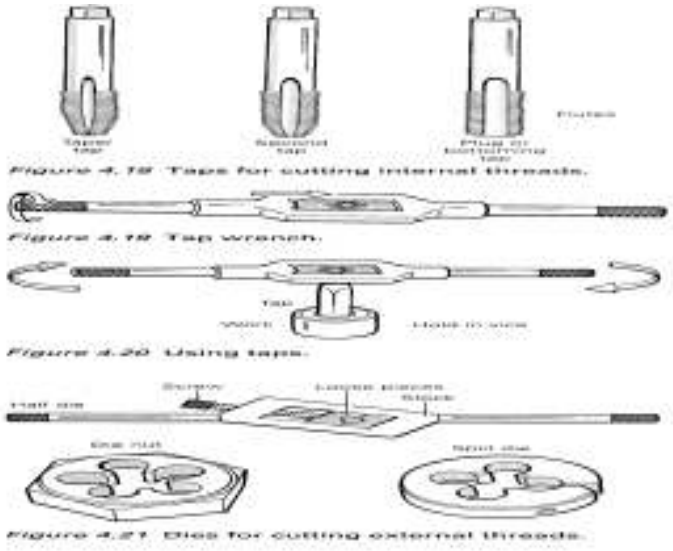


Fig.3.22. Taps and dies

B/ Care and maintenance is important:

1. Do not use either the stock or the die as a hammer; the threads may be broken.
2. Remove the die from the stock after every thread cutting, clean them and pack them into their boxes.
3. Use plenty of oil during cutting to reduce friction.

C/ Tap Drill Size

Before a tap is used, the hole must be drilled to the correct tap drill size. This is the drill size that would leave the proper amount of material in the hole for a tap to cut a thread. When a chart is not available, the tap drill size for the ISO (International Standards Organization) thread can be found easily by applying this simple formula:

$$TDS = M - P$$

TDS = tap drill size
M = metric diameter of the tap
P = pitch of the thread in millimeters

D/ Hand Tap

A tap is a cutting tool used to cut internal threads. Normally it's made of high-speed steel (HSS). Hand taps are usually made in sets of three, because it is better to distribute all the cutting work during the thread–process to three taps.

No. 1 (taper) tap: 1 ring on shank

No. 2 (plug) tap: 2 rings on shank

No. 3 (bottoming) tap: without ring

The most common taps have two or three flutes in order to form the cutting edges, transport the chips out of the hole and give way for the lubricant. The end of the tap is square so that a tap wrench can be used to turn it into a hole.

E/ Tapping a Hole

Before a tap is used, a hole must be **drilled** in the work piece to the correct tap drill size. The tap drill size (T.D.S.) is the size of the drill that should be used to leave the proper amount of material in the hole for a tap to cut threads. Then **countersink** both sides of the hole.

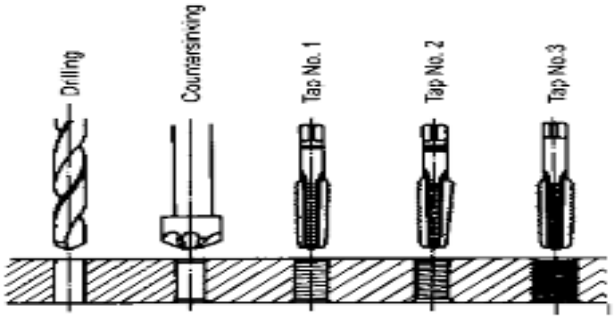


Fig.3.23. Drill, Countersink and tapping a hole

Working Steps for Hand Tapping

1. Select the correct size and type of tap for the job (blind hole or through hole).
2. Select the correct tap wrench for the size being used.
3. Use a suitable cutting fluid (No cutting fluid for brass or cast iron).
4. Place the tap in the hole as near to **vertical** as possible.
5. Apply equal down pressure on both handles, and turn the tap clockwise (for right-hand thread) for about two turns.
6. Remove the tap wrench and check the tap for square knees. Check at two positions 90 degree to each other.
7. If the tap has not entered squarely, remove it from the hole and restart it by applying slight pressure in the direction from which the tap leans. Be careful not to exert too much pressure in the straightening process, otherwise the tap may be broken.
8. Turn the tap clockwise one−half turn and then turn it backward about one−quarter of a turn to break the chip. This must be done with a steady motion to avoid breaking the tap.

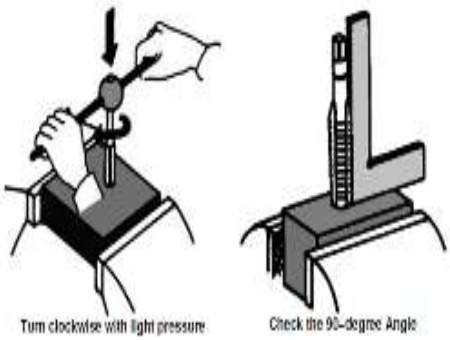


Fig.3.24. Tapping operation

Table 3.1.Drill size

Metric	Pitch mm	Drill Ø mm		UNC	TPI	Drill Ø mm		UNF	TPI	Drill Ø mm
M 3	0.50	2.5		1/4"	20	5.1		1/4"	28	5.5
M 4	0.70	3.3		5/16"	18	6.6		5/16"	24	6.9
M 5	0.80	4.2		3/8"	16	8.0		3/8"	24	8.5
M 6	1.00	5.0		7/16"	14	9.4		7/16"	20	9.9
M 8	1.25	6.8		1/2"	13	10.8		1/2"	20	11.5
M 10	1.50	8.5		9/16"	12	12.2		9/16"	18	12.9
M 12	1.75	10.2		5/8"	11	13.5		5/8"	18	14.5
M 16	2.00	14.0		3/4"	10	16.5		3/4"	16	17.5
M 20	2.50	17.5		7/8"	9	19.5		7/8"	14	20.4
M 24	3.00	21.0		1"	8	22.25		1"	12	23.25

Tread calculation

Example

External	**Internal**
D-P/5	**D-P**

M10	M10
10-1.5/5=9.7	10-1.5=8.5

Threading Dies

A threading die is used to cut external threads on round work pieces. The most common threading dies are the adjustable and solid types. The round adjustable die is split on one side and can be adjusted to cut slightly over or undersized threads. It is mounted in a die stock, which has two handles for turning the dies onto the work. The solid die, cannot be adjusted and generally used for re-cutting damaged or oversized threads. Solid dies are turned onto the thread with a **special** diestock, or adjustable wrench.

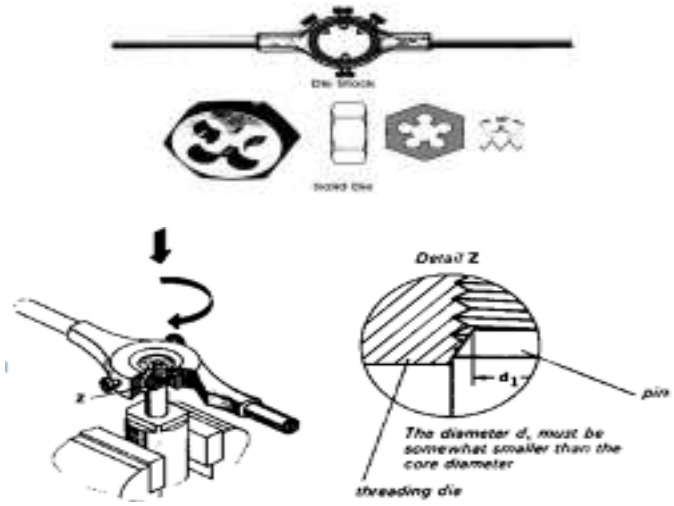


Fig.3.25. Die and its operation

Thread with a Hand Die Working Steps

The threading process requires the machinist to work carefully to produce usable parts and avoid damage. The following describes the procedure to be used.

1. Chamfer the end of the work piece with a file or on the grinder. Consider that a 3/4” thread requires a bolt with an outside diameter of 3/4”.
2. Fasten the work piece securely in a vise. Hold small diameter work short to prevent it from bending.
3. Select the proper die and die stock.
4. Lubricate the tapered end of the die with a suitable cutting lubricant.
5. Place the tapered end of the die squarely on the work piece.

6. Apply down pressure on both die stock handles and turn clockwise several turns. Check the die to see if it has started squarely with the work.
7. If it is not square, remove the die from the work piece and restart it squarely, applying slight pressure while the die is being turned.
8. Turn the die forward one turn, and then reverse it approximately one half of a turn to break the chip.
9. Apply cutting fluid frequently during the threading process.

Metric Threads

These threads are identified by the letter „M“, the nominal diameter, and the pitch. For example, a metric thread with an outside diameter of 5mm and a pitch of 0.8mm would be identified as follows: M5x0.80

Table1.2. Pitch of metric thread

nom. dia.	pitch	nom. dia.	pitch
M3	0.50	M9	1.50
M4	0.70	M10	1.75
M5	0.80	M11	2.00
M6	1.00	M12	2.50
M8	1.25	M13	3.00

3.5 Performing bench work operations

- **Concepts of bench work operations**

Bench work operations for the manual mill often occur before and after the machining of the part. These operations are commonly performed on a standard workbench with the part secured in a **vise**, or secured to the worktable depending on the operation. Bench work operations involve processes that allow the work piece to achieve the accuracies specified by the blueprint. These operations require operator skill and attention to detail.

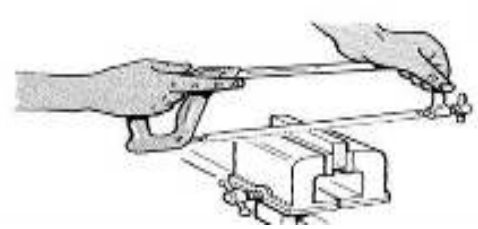
- ✓ Follow safety and correct working procedures to perform bench work operations.

- Bench work operations performed prior to machining include the following: Layout

- Cutting: in the metal work shop materials (especially metals) are cut to shape before filing.

There are numerous types of cutting operations.

- ✓ Points to watch when using the hack saw:
    1. Hold the work securely in the vice.
    2. Grip the hack saw firmly, using both hands.
    3. Use the same stance as filing.
    4. Use the full length of the blade.
    5.



. *Figure 3.26 Sawing operation*

- Chipping:
    - ✓ chipping metal (chiseling)

Chiseling is one of the methods of cutting materials.

-you can chip the metal to produce grooves or to reduce the width or thickness.

Procedures to chip metal:

1. hold the metal in the vice
2. Hold the chisel at an angle of about 45^0 to the work.
3. Hammer to remove the chip.

- Filing: is a method of removing metal.
- Filing: is a skill that is difficult to learn. It is not easy to explain how to use a file.

Self-check-3

Part-I Matching

Instruction: select the correct answer for the give choice. You have given 1 Minute for each question. Each question holds 2 Points.

Part II choose the best answer

1. Which one of the following is not clamping tools?

   a/Vice b/ V- block c/ hacksaw d/ C- clamp

2. One of the following is not the parts of bench vice.

   a/Jaw face b/ Thimble c/ Fixed jaw d/ Movable jaw

3. _____is used for clamping work piece.

   a/ Bench vice b/ C-clamp c/ V-block d/ All

4. _____is used to cut internal threads in holes which are usually drilled for the purpose of attaching an item with bolts or metal threads.

   a. Tap Die c. snips d. all

5. Some of the most common tools used to cut metals are_____

   a/Hacksaws b/ tin snips c/ cold chisels d/ all

Operation Sheet 3.1

Operation title: Cut the work piece to produce a drill and file to make a T-fitting

Purpose: To practice and demonstrate the knowledge and skill required in cut the work piece to produce a drill

Instruction: perform the required tapping and threading in the given dimension

Procedures:

1. Wear the safety clothes required.
2. Measure the stock to the required dimension.
3. Mount the work piece firmly on the vice.
4. Choose the correct blade according to the type of material and thickness being cut.
5. Install the hacksaw blade.
6. Use the blade check list to ensure proper installation.
7. Use the hacksaw to cut the work piece. Use the marked sawing lines to guide the cutting process.

2. To make a T-fitting from the given two pieces, follow procedures:

1. Filing
2. Checking flatness and squareness
3. Marking and measuring
4. Punching
5. Sawing
6. Chipping
7. Finishing

Lap Test-3

Task-1 Install the hacksaw blade properly.

Task-2 Measure the stock to the required dimensions.

Task-3 Measure a hole diameter by using caliper to the given dimension.

Task-4: Perform the required tapping and threading. using standard procedure.

UNIT FOUR: Drill, Ream and Hone Operations

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

- Drilling, boring, reaming and honing Bore holes
- operate safety 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:

- prepare Drill, boring, reaming and honing Bore holes
- Perform all operations using safety procedures

4.1 Drilling, boring, reaming and honing holes

1. Introduction to drilling

Drilling: It is a process of producing round holes in a solid material or enlarging existing holes with the use of multi tooth cutting tools called drills or drill bits. In other words it is the process of making holes of cylindrical shape on metals and other materials using drill bits and drilling machines.

Drilling machine: are driven either manual or by electrical power.

4 1.2. Classification of drilling machines

Drilling machines: are classified into hand and breast drill, portable electrical drill, bench drill, pillar dills and others.

4.1.3 The hand and breast drill: are driven by hand and are commonly used where electricity is unavailable and are used for light work.

4.1.4 Portable electrical drill: are most suitable to work which cannot be done with bench drill.

1. **Bench drill:** is one of the most common used machines in the work shop. This machine has the following parts. The base, the column, the head, the spindle, the pulleys, the motor, the belt, the safety swatch, the feed handle, the depth gauge, the head locking handle, the gear lever, the collar, the chuck and the main switch.
2. **Pillar dills:** is similar in design to the bench drill. But it is floor mounted and usually much large.

Various cutting tools are available for drilling, but the most common is the *twist drill*.

- **Standard Operations**

Drilling machines may be used for performing a variety of operations besides drilling a round hole. A few of the more standard operations, cutting tools and work set-ups will be briefly discussed.

A. **Drilling** – may be defined as the operation of producing a hole by removing a metal from a solid mass using a cutting tool called a twist drill.

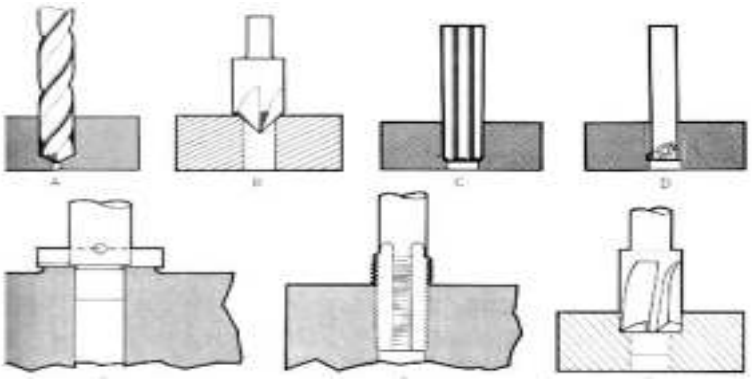


Fig. 4.1. Variety of operations of drilling machine.

B. Countersinking – is the operation of producing a tapered or cone shaped enlargement to the end of the hole.

C. Reaming – is the operation of sizing and producing a smooth round hole from a previously drilled or bored hole with the use of a cutting tool having several cutting edges.

D. Boring – is the operation of enlarging and truing a hole by means of a single-point cutting tool which is usually held in a boring bar.

E. Spot-facing – is the operation of smoothing and squaring the surface around a hole to provide a seat for the head of a cap screw or a nut. For the spot facing operation, the work being machined should be securely clamped and the machine set approximately ¼ of the drilling speed.

Spot facing is a process of machining a flat surface around the mouth of a hole in order to provide a flat seat for the head of a bolt or a nut.

F. Tapping – is the operation of cutting internal threads in a hole with a cutting tool called a tap. Special machine or gun taps are used with a tapping attachment when this operation is performed by power in a machine.

G/ Counter boring – is the operation of enlarging the top of a previously drilled hole to a given depth to provide a square shoulder for the head of a bolt or a cap screw. Counter boring is used to form a flat, recessed seating for a cheese head bolt or cap screw.

Drill Presses

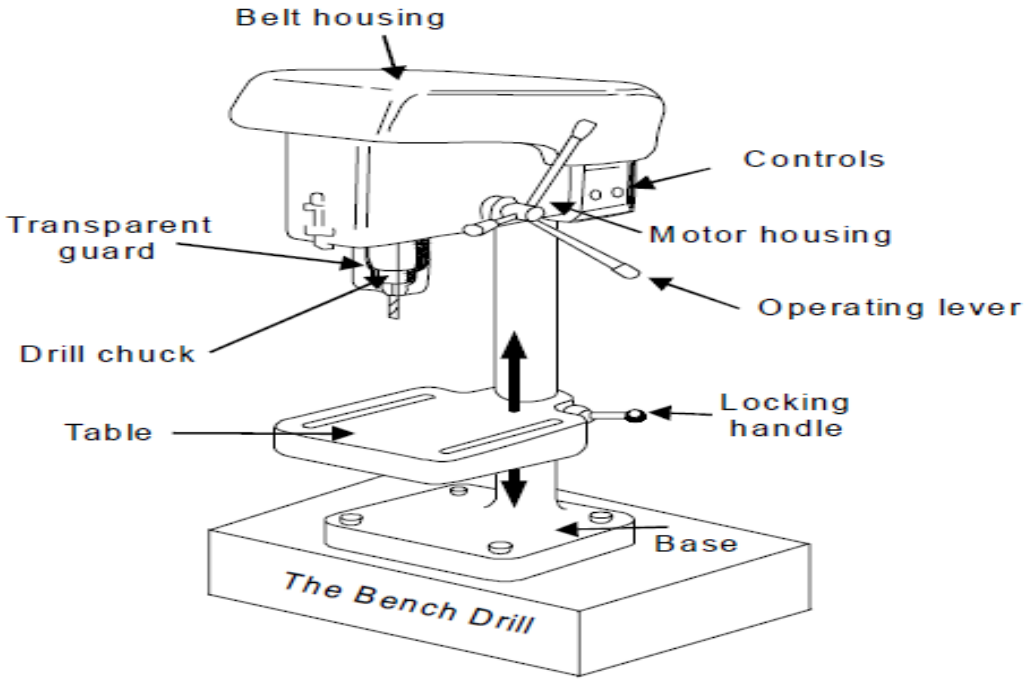


Fig 4.2. Parts of drill Presses.

Cutting Speed	$Vc = \frac{\pi \times D \times n}{1{,}000}$	Vc = Cutting Speed (m/min) π = 3.14 [The Circular Constant] D = Diameter (mm) n = Spindle Speed (min^{-1}) Vf = Feed (mm/min) fz = Feed per Tooth (mm/tooth) Z = Number of Flutes
Spindle Speed	$n = Vc \div \pi \div D \times 1{,}000$	
Feed	$Vf = n \times fz \times Z$	
Feed per Tooth	$fz = \frac{Vf}{n \times Z}$	

4.1.5. Drill Bits

Introduction

Twist drills are end-cutting tools used to produce holes in most types of material. On standard drills, two helical grooves, or flutes, are cut lengthwise around the body of the drill. They provide cutting edges and space for the cuttings to escape in the drilling process. Since drills are one of the most efficient tools, it is necessary to know the main parts, how to sharpen the cutting edges, and the correct speeds and feeds for drilling various metals in order to use them most efficiently and prolong their life.

Parts of Twist drills

Shank

Most twist drills used in machine shop work today are made of high-speed steel. High-speed drills have replaced carbon-steel drills since they can be operated at double the cutting speed and the cutting edge lasts longer. A drill may be divided into three main parts: the shank, the body and the point.

Generally drills up to 13mm in diameter have straight drill shanks, while those over this diameter usually have tapered shanks. Straight-shank drills (fig. 08/02) are held in a drill chuck; tapered-shank drills (fig. 08/01) fit into the internal taper of the drill press spindle.

- A tang (fig. 08/01) is provided on the end of tapered-shank drills to prevent the drill from slipping while it is cutting and to allow the drill to be removed from the spindle or socket without the shank being damaged by using a drill drift.

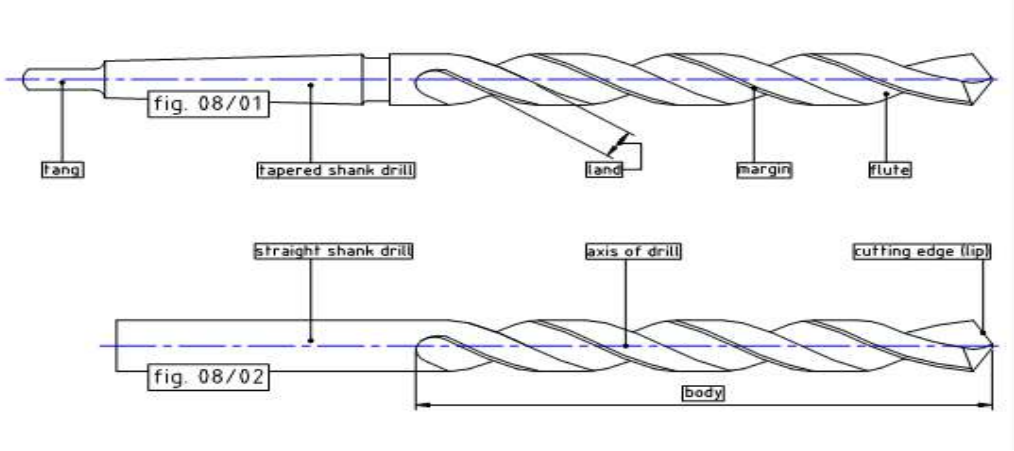


Fig. 4.3. Twist drills bit.

Body

The body is the portion of the drill between the shank and the point. It consists of a number of parts important to the efficiency of the cutting action.

The flutes are two or more helical grooves cut around the body the body of the drill. They form the cutting edges, admit cutting fluid, and allow the chips to escape from the hole.

- The margin is the narrow, raised section on the body of the drill. It is immediately next to the flutes and extends along the entire length of the flutes. Its purpose is to provide a full size to the drill body and cutting edges.
- The lip clearance is the undercut portion of the body between the margins and the flutes. It is made smaller to reduce friction between the drill and the hole during the drilling operation.
- The web is the thin partition in the center of the drill which extends the full length of the flutes. This part forms the chisel edge at the cutting end of the drill. The web gradually increases in thickness toward the shank to give the drill strength.

- Point The point of a twist drill consists of the chisel edge, the lips, the lip clearance angle and the heel.

  The chisel edge (web) is the chisel-shaped portion of the drill point.
- The lip (cutting edge) a formed by the intersection of the flutes. The lips must be equal length and have the same angle so that the drill will run true and will not cut a hole larger than the size of the drill.

4.2. Performing all operations using safety procedures

Perform basic drilling, reaming and honing operations applying safety procedures and using personal protective devices.

When performing drilling, reaming and honing operation safety precaution and personal protective equipment (PPE) is necessary to protect ourselves, machines, tools and equipment.

Following the right safety procedures and personal protective device perform the operations listed below:

Drilling

Drilling operations

To practice drilling, counter boring, counter sinking and reaming there are some procedure as follows

- Prior to drilling a hole, locate the hole position and put a punch mark to aid the drill in starting the hole.
- Select the proper drill bit according to the size need.

  Select cutting fluid.
- Select the correct rpm.

  Use an interrupted feed, called peck drilling, to break up the chips being produced.
- Counter sinking and counter boring operations are performed with the same procedure by changing the tools.
- Select the reamer.
- Drill a pilot hole that is a bit smaller to a reamer.
- Drive the reamer at a slow, constant speed. The cutting speed for reaming should be 1/3 of drilling.

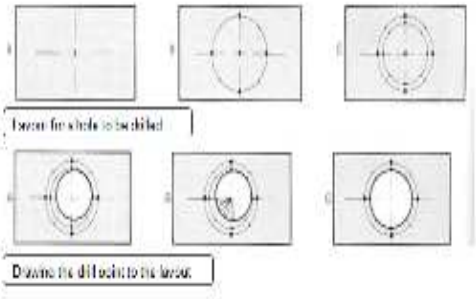


Fig. 4.4 Layout for a hole to be drilled.

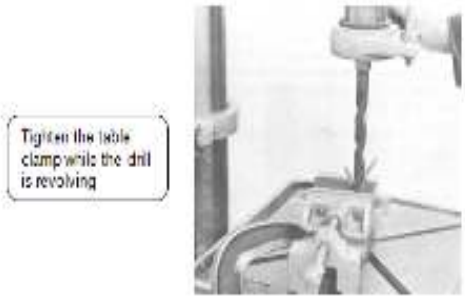


Fig. 4.5 Tighten the table clamp.

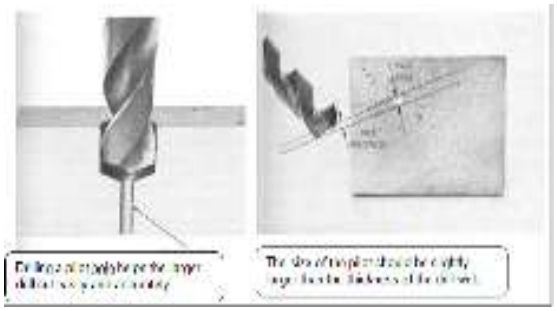


Fig. 4.6 Drilling a pilot hole.

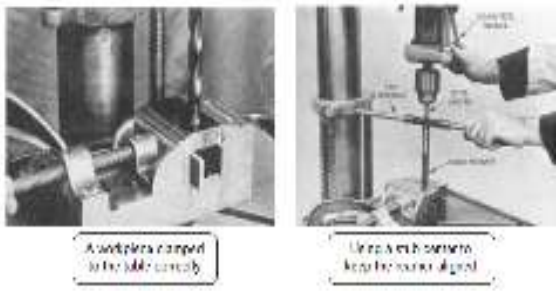


*Fig. 4.7.*Clamping a work piece to the table and drilling

Self-check 4

Part-I Choose

Instruction: select the correct answer for the give choice. You have given 1 Minute for each question. Each question holds 2 Points.

Directions: Answer all the questions listed below:

1____is the process of producing round hole in a solid material or enlarging existing holes.

a. Reaming b. Drilling c. Honing d. Filling

2Which one of the following is a finishing process of drilled holes?

a. Honing b. filling c. Sawing d. Drilling

3____is the process of enlarging a hole that has already been drilled.

a. Drilling b. Honing c. Boring d. None

1/ What mean by PPE? (**2 points**)

2/ Write the steps to provide drilling operation. (**2 points**)

3/ Write the importance of PPE in the work shop. (**2 points**)

4/ List out the types honing tools. (**2 points**)

5/Write the function of honing operation. (**2 points**

Operation Sheet 4

Operation title: drilling, tapping and reaming

Purpose: To practice and demonstrate the knowledge and skill required in drilling, tapping and reaming to produce a drill.

Instruction: perform filing, checking, marking, punching, cutting, drilling, tapping, reaming, and finishing in the given work piece

Procedure:

1. Hold the mild steel flat piece of 50 x 50 x 6mm between the jaws of the bench vice.
2. Start filing on first flat surface after removing the rust with the tip of flat file.
3. Straight filing is continued till the surface is formed perfectly flat.
4. Check the straightness by using straight edge.
5. Turn to the adjacent side which is narrow and make it straight, flat and 90° with flat surface prepared.
6. File the next adjacent side and make it flat and perpendicular to both flat surface and first narrow side which is already prepared.
7. Apply chalk on the finished flat surface and mark dimensions
8. Use surface plate V-block and venire height gauge for marking.
9. Marked lines are punched by using dot punch and ball peen hammer.
10. File to correct dimensions in length and width and check the dimensions using an outside caliper and steel rule.
11. Mark two curve on the edge of M.S flat using divider.
12. Make curve using round file.

Operations: title to make a square cutting

Purpose: To practice and demonstrate the knowledge and skill required

. **Instruction:** perform the required material

Procedure:

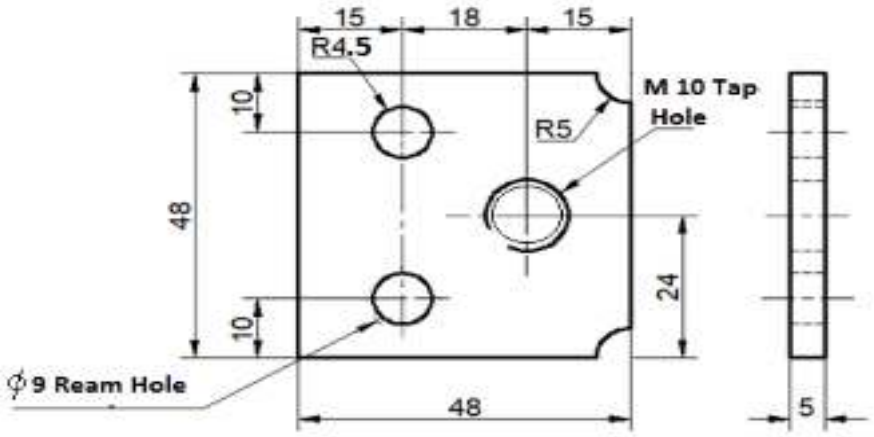
1. The given mild steel flat piece is checked for given dimensions.
2. One edge of given is filled to straightness with rough and smooth files and checked with try square.
3. An adjacent is also filled such that is square to first edge and checked with try square.
4. Wet chalk is applied on one side of the flat and dried for making.
5. Lines are marked according to given figure, using odd leg caliper and steel rule.

6. using the dot punch are made along the marked lines.
7. The excess materials removed from the remaining two edges with try square level up to half of the marked dots.
8. Finally buts are removed by the filling on the surface of the fitted job

Lap test 4

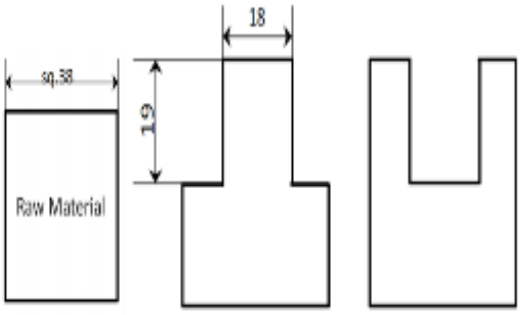
Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **2-5** hours.

Task 1: Cut the work piece to produce a drill gauge according to the dimensions given.



All dimensions are in mm.

Task 2: Make a Square fit from the given mid steel pieces.



* All dimensions are in mm.

Materials required: mild steel flat (40*40*3mm).

UNIT FIVE : -Hand Grind Cutting Tools

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

- Honing cut edges
- Sharpening Cutters
- appropriate cooling agent to grinding Cutters
- cutting tool grinding
- Applying safety procedures and using personal protective equipment's

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:

- Perform Hon cut edges
- Make Sharpe Cutters
- Use appropriate cooling agent to grinding Cutters
- Perform cutting tool on grinding

5.1 Perform off-hand grind cutting tools

5.1.1 Honing cut edges

Concepts of off-hand grinding

Off – hand grinding is the term used in engineering to describe the process where the work is held by hand material is removed using an abrasive wheel.

This type of grinding is carried out in the workshop for such work as:

a. Removing excess materials

b. Smoothening surfaces

c. Preparing plates for welding

d. Sharpening cutting tools (drills, chisels, punches, shaper and lathe tools)

Off – hand grinding must be performed with great regard of safety. The principle of operation requires an exposed portion of the abrasive wheel to be in close proximity to the operator.

Hazard may be created by having relatively heavy abrasive wheels rotating a high speed. The wheels on all types of machines must be heavily guarded.

The guard exposes enough of the wheel surface to enable the operator to perform the work required.

Girding machines.

NOTE: Wear safety goggles when performing any grinding operation.

Figure 5.1 Portable grinder

Figure 5.2 Bench grinder

Figure 5.3Pedestal grinder

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5.2 Sharpening Cutters

Concepts of Sharpening Cutters

The word sharpening is usually used for the final finishing of edge tools. Like all edge tools, a drill bit needs to have the right shape before you can start to sharpen it. Creating the initial shape often means that quite a lot of steel needs to be re-moved when for example, you change the point angle of a drill or you shape a broken or heavily worn drill. Once the geometry of the point is established, you maintain the sharpness by sharpening. With the T or make system you can exactly replicate an existing shape and therefore you just need to touch up the edges. Shaping and Sharpening

Edge tools need to be sharp to work efficiently. The bevels of a sharp edge tool end in a uniform tip. After a period of use the tip becomes rounded and the edge is no longer sharp.

You can sharpen tools with a bench stone or, in the case of knives, with sharpening steel.

This means that you work on the very tip of the bevel and the tool is sharp again. When sharpening with steel or a bench stone, a very limited amount of steel is removed. After several sharpening or honing, the edge angle becomes too wide and the tool must be re-shaped. Sooner or later all edge tools need to be re-shaped and this is done by grind-ing on a grindstone or a grinding wheel. When only a limited amount of steel is removed this operation is also called sharpening. Grinding means that so much steel is removed from the tool that the edge is restored to the original angle or altered on purpose to a new angle. The shape of the tool can also be changed according to your requirements.

Tool Sharpening

For some tools it is very important to keep them sharp at all times. Common tools, such as scribers, center punch, chisels, drill bits, tool bits for lathe machine needs to be sharpened every time you feel that they do not cut well.

- **Sharpening Scriber and Center Punch**

1. Scriber and center punch should be ground in the position as shown beside.
2. Use the tool rest to rest your hands while bringing the tool in the right position.

3. Rotate the tool while grinding.
4. Cool the tool down from time to time.
5. Do not overheat the metal.

Sharpening Chisel

- Use the tool rest to rest your hands while bringing the tool in the right position.
- Use the whole grinding wheel while grinding. Move with the tool regularly from the left to the right side and back.
- Cool the tool down from time to time.
- Do not overheat the metal.
- Grind the chisel−point parallel and straight. See also the pictures below.

Grinding twist drills

Twist drills may be ground in a drill holder fixture or free hand. Use fixture if available.

Grind drill lips or cutting edges at an angle of 59 degrees, as illustrated below (50 to 60degrees for drilling brass or bronze, 68 degrees for extremely hard material). Both cutting edges must make same angle with drill angle with angle drill axis, and both cutting edges must be same length.

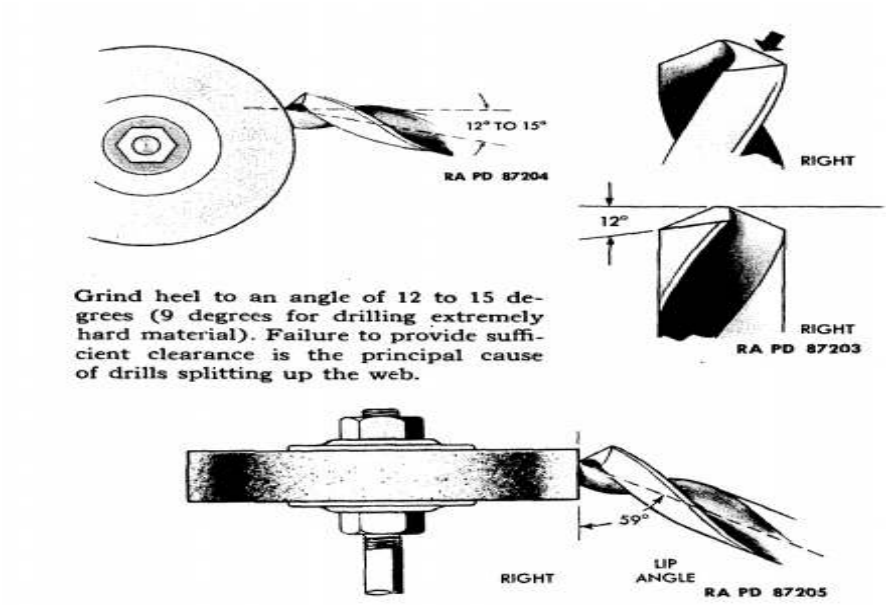

Figure 5.3 Grinding of twist drills

5.3 Grind Cutters using appropriate cooling agents

5.3.1 Properties of Cutting Fluids

- **Functions of cutting fluids**

Cutting fluids are used in metal machining for a variety of reasons such as improving tool life, reducing work piece thermal deformation, improving surface finish and flushing away chips from the cutting zone.

Cutting fluids consist of those liquids and gases that are applied to the tool and the material being machined to facilitate the cutting operation. Vast quantities are used annually to accomplish a number of objectives. (Boston, 1952)

1) To prevent the tool from overheating, i.e. so that no temperature is reached where the tool's hardness and resistance to abrasion are reduced, thus decreasing the tool life.
2) To keep the work cool, preventing machining those results in inaccurate final dimensions.
3) To reduce power consumption, wear on the tool , and the generation of heat, by affecting the cutting process. This investigation wishes to establish a relationship between the surface chemistry of the lubricants involved and how they can accomplish reducing the contact length on the rake face of the tool where most of the heat during cutting is produced

4) To provide a good surface finish on the work.

5) To aid in providing a satisfactory chip formation (related to contact length)

6) To wash away the chips/clear the swarf from the cutting area.

7) To prevent corrosion of the work, the tool and the machine.

The desirable properties of cutting fluids in general are (Boston, 1952)

1) High thermal conductivity for cooling
2) Good lubricating qualities
3) High flash point, should not entail a fire hazard
4) Must not produce a gummy or solid precipitate at ordinary working temperatures
5) Be stable against oxidation.
6) Must not promote corrosion or discoloration of the work material.
7) Must afford some corrosion protection to newly formed surfaces.
8) The components of the lubricant must not become rancid easily
9) No unpleasant odour must develop from continued use
10) Must not cause skin irritation or contamination
11) A viscosity that will permit free flow from the work and dripping from the chips.

5.3.2 Types of cutting fluids

Cutting fluids may be divided into four main categories (FVTC, 2000):

i- straight or neat cutting oils
ii- water miscible or water-based liquids
iii- gases
IV- paste or solid lubricants

Straight Cutting Oils

Straight cutting oils are not mixed with water. Cutting oils are generally mixtures of mineral oil and animal, vegetable or marine oils to improve the wetting and lubricating properties. Super, chlorine, and phosphorous compounds are sometimes added to improve the lubrication qualities of the fluid for extreme pressure applications. There are two

main types of straight oils: active and inactive.

i. Water miscible or water-based fluids

The water-based fluids act mainly as coolants and the neat cutting oils act mainly as lubricants. There are many variants of both types. Fatty acids are often incorporated in the neat oils. Until recently both the emulsions or soluble oils as they are also called and the neat oils, contained chlorine and sulphur additives that improved lubrication under extremely difficult conditions. Chlorine affects the skin detrimentally and its degradation products are often carcinogenic and sulphur is environmentally unacceptable.

Consequently other lubrication improvers under difficult conditions are searched for. Ester technology is used successfully for softer materials where high rates of metal working are needed, and where heat generation is not a major problem. (du Plisses, 2001)

These can operate at higher temperatures as they have better resistance to thermal degradation than mineral oils. (Mortimer & Or szulik, 1993) They are biodegradable and do not cause dermatitis and are therefore more environmentally acceptable. In many cases phosphor and sulphur do however still form part of the cutting fluid. (FYTC, 2000)

For the water miscible fluids water quality has a large effect on the coolant. Hard water (high mineral content) can cause stains and corrosion of machines and work pieces.

Water can be demonized to remove the impurities and minerals. Water is the best fluid for cooling. It has the best ability to carry heat away. Water, however, is a very poor lubricant and causes corrosion.

Oil is excellent for lubrication but very poor for cooling, and it is also flammable. It is clear that, from a lubrication point of view water and oil have strengths but also some weaknesses. If water and oil are combined and an attempt is made to minimise the weaknesses the best properties of both may be balanced to obtain desirable end properties for the cutting fluid. Water-soluble fluids have been developed which have good lubrication, cooling ability, low-flammability and corrosion resistance. These fluids are usually mixed on site. It is crucial that the mixing directions and concentrations are followed very closely to get the maximum benefit from the coolant. (FYTC, 2000)

Emulsions

An emulsion is a dispersion of oil droplets in water. Soluble oils are mineral oils that contain emulsifiers. Emulsifiers are soaps or soap-like agents that allow the oil to mix with water and stay in suspension. Emulsions (soluble oils) when mixed with water produce a milky white product.

Lean concentrations (more water, less oil) provide better cooling but less lubrication. Rich concentrations (less water, more oil) have better lubrication qualities but poorer cooling properties.

There are different types of soluble cutting fluids available including extreme pressure soluble oils. These are used for extreme machining conditions like broaching and gear hobbling for example. (FYTC, 2000)

Chemical Fluids

Chemical coolants are also miscible cutting fluids. Chemical cutting fluids are pre-concentrated emulsions that contain very little oil. Chemical fluids mix very easily with water to form an emulsion. The chemical components in the fluid are used to enhance the lubrication, bacterial control, and rust and corrosion characteristics. There are several types of chemical coolants available including coolants for extreme cutting conditions.

Inactive chemical cutting fluids are usually clear fluids with high corrosion inhibition, high cooling, and low lubrication qualities. Active chemical fluids include wetting agents.

They have excellent rust inhibition and moderate lubrication and cooling properties.

chlorine- and phosphorous- containing compounds are sometimes added to improve the extreme pressure characteristics. These are usually in an organic form, i.e. the chlorine or phosphorus IS grafted onto a hydro-carbon backbone. (FVTC, 2000).

ii. Gases and vapors

Cutting oils and water miscible types of cutting fluids are the most widely used.

Compressed air, ineIe gases like carbon dioxide, Freon, and Nitrogen are sometimes used. A vortex tube may be used to apply gaseous lubricants or coolants (ARTX, 2002). Using this tube, it is possible to apply the gases at a very low temperature and under medium pressure thereby facilitating a higher gas density and cooling and lubrication capability. Cutting using sub-zero cold gas is known as cryogenic cutting. The gas stream also helps to blow away chips from the cutting area. (FVTC, 2000)

Paste and Solid Lubricants

Waxes, pastes, soaps, graphite and molybdenum disulphide are examples falling into this category. These are generally applied directly to the work piece or tool or in some cases impregnated directly into the tool, for example the grinding wheel of a grinder. One example of a paste lubricant is lard. Many experienced journeymen recommend lard for tapping.

5.4 Performing cutting tool grinding

1.1. Introduction

Grinding is a metal cutting operation like any other process of machining removing metal in comparatively smaller volume. The cutting tool used is an abrasive wheel having many numbers of cutting edges. The machine on which grinding the operation is performed is called a grinding machine.

Grinding is done to obtain very high dimensional accuracy and better appearance. The accuracy of grinding process is 0.000025mm. The amount of material removed from the work is very less. Grinding machines are made in a variety of types and sizes, depending upon the class of work for which they are to be used. Pedestal grinders are used to sharpen high-speed steel cutting tools used on the lathes and milling machines, debar, or used to remove surface imperfections and to work extremely hard materials.

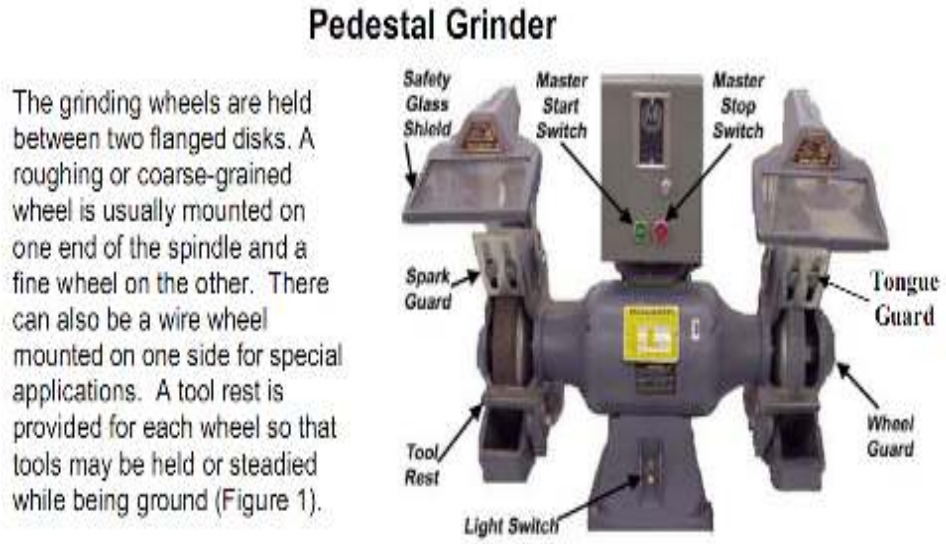

Fig 5.1. Main Parts of a Pedestal Grinder

The operator is protected against flying abrasive particles and ground material by the wheel guards, which are an integral part of a machine. Safety glass shields are also provided for additional protection. These grinders are used for all kinds of general off-hand grinding and for the sharpening of drills, chisels, tool bits, and other small tools.

Procedure for Grinding:

1. Examine the grinder to see that the tool rest is set at the required height, is within 1/8 if an inch to the face of the wheel, and is securely fastened in this position.
   Tongue guard is to be set at ¼" from the wheel (figure 1).
2. Adjust safety glass shields on the grinder to permit clear vision of the part to be ground and still protect the oprator from flying particles.
   CAUTION: Always wear safety glasses and/or face shield when using

1. Start the grinder.

   CAUTION: Stand to one side of the wheel when operating the grinder.

2. Hold the work in one hand, and steady it with the other. Place the work on the tool rest; then guide it against the face of the revolving wheel and apply enough pressure togrind, depending upon the hardness of the material and the wheel itself.

   Note: Support the work on the tool rest to steady it when grinding, except in the case of the small tool bits which can be guided better by supporting them with the fingers or with a hand resting on the tool rest.

3. Cool work in a water pot as it becomes heated from grinding, especially the small hardened tools that would lose their temper if overheated. **Twist drills should not** be cooled by dipping in water, as it may cause cracking.

Grind the job to the required shape or size by moving the work back and forth across the face of the wheel. This will prevent wearing a groove into the wheel and will result in a flatter surface on the work.

CAUTION: Keep fingers away from the revolving wheel, especially when grinding small pieces. Also make sure that the tool rest is close enough to the wheel to prevent the work from slipping into the space between the two.

Note: Remove as much metal by rough grinding as is possible; then use the finer wheel for finishing.

Do not grind on the side of the wheel except when absolutely necessary, and then with only light pressure.

6. Check work with a gage or other measuring tool.
7. Stop grinder.

Sharpening the twist drill bit

To get a good performance from a drill bit the sharpening must be done correctly, this means that all the angles and the lengths of the edges must be exactly as established and will not occur during the grinding edge of the material structural modifications.

Drill bits are cutting tools used to create cylindrical holes, almost always of circular cross-section. Bits are held in a tool called a drill, which rotates them and provides torque and axial force to create the hole. There are several types of drill bits are used currently such as Spade, lip and spur (brad point), masonry bit and twist drill bits. Our focused will be on standard

size Twist Drill Bits. Twist drills become dull and must be sharpened. The preferred method of sharpening a twist drill is with the drill grinding machine which is done manually by holding and feeding the blunt drill bit on to the rotating grindstone, but this machine is not always available in field and maintenance units, so the offhand method of drill sharpening must be usedThe offhand method requires that the operator have knowledge of the drilling geometry (Fig4.4)

To execute the correct sharpening are therefore required special equipment and dedicated grinding machines.

The geometric elements to consider are:

- Point angle
- Lip relief angle
- Length of cutting edges

The control of the angle φ and of the length of the cutting edges is done with a small and simple gauge or with precision optical equipment.

- **Operational procedures:**

1. Dress grinding wheel with dressing tool.
2. Hold drill bit against face of wheel at 59^0 angle on cutting lip.
3. Carry drill bit up the wheel face by dropping end and rotating very slightly in a clockwise direction.
4. Make slow deliberate strokes, the full width of the cutting lip.
5. Do not lower cutting lip below the horizontal position as this will round the cutting edge.
6. When one lip is ground, rotate the drill one half turn and grind the other lip.
7. Use tool gauge to check equal lengths of lips, 590 angle cutting lip and 12-150 lip clearance.
8. Test bit by boring hole in mild steel plate.
9. Stop while drilling, turn drill press in reverse direction to release drill bit from hole.
10. Make grinding corrections on drill bit as indicated by hole.
11. Submit drill bit and metal for evaluation.

UNIT SIX : - Workplace Relationship

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

- duties and responsibilities in positive manner
- Seek assistance from Workgroup
- Encourage , acknowledging and acting work place relationship
- Respect and acknowledging personal values and beliefs

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:

- Apply Do duties and responsibilities in positive manner
- Correctly Seek assistance from Workgroup
- Apply , acknowledging and acting upon Feedback on performance
- Respect and acknowledging personal values

6.1 Develop effective workplace relationship

6.1 Doing duties and responsibilities

Introduction

Working with Others refers to the ways workers interact with one another to get the job done. Sometimes, workers complete tasks on their own. Other times, they work with a partner or as part of a team. Some workers also have a supervisory or leadership role, which makes working with others more complex.

Working with other includes a combination of two or more person work with to complete a given task. The examples of real workplace task that depend on working with other:

Machinists work independently and with others. They work independently to interpret plan and produce or repair parts. They work with other machinists to carry out new or complex tasks or to solve problems. For example, they may work with partners or maintenance staff to troubleshoot equipment failures.

The majority of **welders'** tasks are completed independently, but they must work with other team members, including fitters, other welders and supervisors to plan work, confirm measurements and calculations assist coworkers with tasks and schedule sharing of equipment. They may also be partnered with workers from other trades, such as pipefitters, to coordinate their tasks on projects so that steps are completed in the right order.

Automotive painters may be required to coordinate activities with workers from body repair and vehicle preparation departments to ensure a smooth supply of vehicles to be painted. Automotive painters may also work directly with coworkers who assist them with vehicle preparation duties, such as sanding and masking.

Workplace culture

Workplace is a place where people work, such as an office or factory. **Culture** is the set of shared attitudes, values, goals and practices that characterize an institution or organization. Workplace culture is the set of shared attitudes, values, goals and practices that characterize an institution or organization such as a corporate culture focused on the bottom line. The culture of a workplace is critical to our ability to work successfully with others in that workplace. Positive workplace culture enhances and encourages teamwork, improves efficiency and productivity and significantly reduces employee turnover.

1.1. Positive workplace relationship

It is a human quality to seek the friendship and interaction of others, social interaction has the ability to influence the state of our mental health; therefore it is important to have positive relationships at home and in the workplace. It has been researched that the more content a person is in the workplace, the more productive they will be. Having positive and healthy relationships within the workplace also benefits us in many other ways. Our work becomes more enjoyable when we get along with our co-workers, we become more innovative and resourceful, and we are more likely to engage with changes that may be implemented.

Employees spend a lot of time in the presence of their co-workers, especially in a team environment. Building effective workplace relationships is beneficial to the employees, as well as to the organization.

Team cohesiveness improves the overall effectiveness of the team. Effective workplace relationships can enrich the employee experiences at work by satisfying psychological needs for affiliation., likewise poor workplace relationships often leads to conflict and division within teams. Constant conflict and negativity has a direct impact on the productivity and culture of the organization.

Duties and responsibilities

Job Duties

The Job Duties section is the foundation of the Job Description. It conveys the complexity, scope, and level of responsibility of a job. It is important to accurately, concisely, and completely describe the duties and responsibilities of a job.

Job Description

Summarizes the main points of the job description which may include key responsibilities, functions, and duties; education and experience requirements; and any other relevant information (i.e. scheduling requirements, travel, etc)

A job description identifies essential and non-essential tasks that are assigned to a specific position. It also identifies reporting relationships and may also describe required qualifications, minimum requirements, working conditions, and desirable qualifications.

Job description is a written statement, found in policy manuals that describe the duties and functions of the various jobs within the organization. It outlines the scope of authority, responsibility, and accountability involved in each position.

It should provide the broad general guidelines under which the individual will function and the basis for performance evaluation of the person working in that role

The Uses of a Job Description

- Identifies duties of positions
- Organizes work efficiently enabling supervisors to better control workload
- Assists in identifying employee training needs
- Assists in evaluating and defining employee performance and expectations
- Serves as recruitment tool
- Avoids potential out-of- class situations
- Provides a defensible tool when documenting employee performance issues
- Provides a reliable foundation for position evaluation when faced with issues such as reasonable accommodation, limited duty, workers compensation, fitness for duty and disability retirement.

Note: When writing generic duties for more than one position in a classification, extra care must be taken to describe the duties. This is because the descriptions are inherently more general in nature, Extra care is needed in order to fully capture the work of multiple positions and not omit any essential functions.

Organizational Policy

Organizational Policy is a set of policies, principles, rules, and guidelines formulated or adopted by an organization to reach its long-term goals and typically published in a booklet or other form that is widely accessible.

6.2.1 Seeking assistance from Workgroup. Assistance is included according to the work volume and complexity.

6.2 Difficulties arises in workplace

When difficulties, such as conflict, arise in the workplace, it is important to seek assistance from workmates. Often colleagues can put an issue in perspective, provide a fresh point of view or suggest an alternative course of action. Sometimes when you start to talk about a conflict situation and how you are feeling, you start to work through it and the reasons why the situation is occurring starts to make more sense to you.

Everyone should always practice to seek the assistance of other group members who could provide you with sound advice on specific issues.

There are a number of **common problems** that arise during group work, such as:

- Miss-understanding about responsibilities
- Perceived of commitment in some group
- One person doing all the work
- Personality clashes

6.3 Misunderstandings about responsibilities

In most cases, miss-understandings about responsibilities can be avoided by following guidelines discussed in the 'model' of group work, for example:

- At a group meeting, identify all specific tasks and allocate them to team members
- Then, agree on a timeline for each task by arranging future meeting dates
- Finally and crucially keep notes during the meeting about everyone's tasks and circulate those notes to all members

This should help ensure that all tasks are covered and that all members will be held accountable if they forget or ignore their responsibilities.

Perceived lack of commitment in some group members

As mentioned earlier, each person's objectives may be very different from yours, so it's important to establish varying levels of motivation early in the group process. If there are some group members who are more committed to achieving high grades, for example, they may have to be prepared to do a greater share of the work. It's better to know this up-front than to have group conflict later on!

If conflict does arise, for whatever reason, rather than assuming that the other members are 'wrong', it's often helpful to adopt the following philosophy:

One person doing all the work

For a number of reasons, one group member will sometimes take on the responsibility of doing the bulk of the work. This is generally not a good idea, and it is unfair, both to that person and the other group members who stand to benefit from working on the project.

Again, take an assertive approach when working out a solution to the problem. Approach the person in a respectful manner, being ready to hear the other person's reasons for their behavior. Suggest the importance of group collaboration, with regard to:

- troubleshooting potential problem areas
- utilizing special skills
- respecting other's ideas
- including everyone in the process

Personality clashes

To avoid these problems occurring, you need to adopt **assertive**, not aggressive, behavior. Assertive behavior means looking for win-win outcomes in communication in which everyone ends up feeling good about things. It does NOT mean getting everyone else to behave in the way you would like them to behave - this is aggressive behavior. It does NOT mean allowing other people to let you do all the work and have all the worry - this is passive behavior.

Take a moment to consider the following chart. It should be noted that aggressive behavior can often be disguised be apparent politeness. In other words, just because someone is speaking softly and smiling, does not mean they are not using aggressive tactics.

Seeking assistance from Workgroup when difficulties arise

Effective group performance is very important to the organization if the goals of the company are to be achieved. If groups of people are not working well together, this is an indication of internal problems within the group and ultimately within the organization. Therefore, assistance should be sought from a supervisor or manager, Peers/work colleagues and other members of the organization to help solve the problems before production is affected

6.4. Encouraging, acknowledging and acting upon Feedback on performance

Feedback on Performance

Feedback is a part of how we work. It can be a simple comment on a piece of work or can be a more detailed and structured discussion about how we are going and what we could do even better.

It can happen in a ‘day to day’ way, for example:

- You just handled that enquiry really well. You gave the correct information and communicated it very clearly.
- I think you could improve the report by talking with X to find out more...

  Day to day’ feedback happens naturally and continuously as part of the way we interact with each other at work.

  More structured feedback discussions happen when you talk with your supervisor/manager about how you are going in your job. Structured feedback discussions can happen as part of the performance cycle (e.g. performance planning discussions and mid or end of cycle

review discussions) or at other times if there is a particular matter you wish to discuss, this example:

- I think the things you do really well are …
- I've arranged this time to talk with you about a couple of issues I've noticed with your work recently…
- Some areas I would like to see you develop in are …

Who can I give feedback?

We can all give feedback to people that we work with in the workplace.

- Our supervisors/managers
- The staff we supervise/manage (this is a responsibility of all supervisors/managers)
- Our peers and colleagues
- People in other teams/areas that we interact with or rely on to do our job.

It doesn't matter what level they are, or whether our job is at the same, higher or lower level. In general we don't give feedback to members of the public or our clients/customers. This may be different in some roles (e.g. teachers will give feedback to students and parents).

Formal/Informal performance appraisal

A performance appraisal compares each employee's actual performance with his or her duties and performance standards. Managers use job analysis to learn what these duties and standards are. Compensation (such as salary and bonus) usually depends on the jobs required skill and education level, safety hazards, degree of responsibility, and so on all factors you assess through job analysis.

Appraisals by the immediate supervisor are still the heart of most appraisal processes. Getting a supervisor s appraisal is relatively straightforward and makes sense. The supervisor is usually in the best position to observe and evaluate his or her subordinate performance. The supervisor is also responsible for that person's performance .The human resources department serves a policy-making and advisory role. Generally, human resource managers provide the advice and the appraisal tool to use, but leave final decisions on procedures to operating division heads. The human resource team should also be responsible for training supervisors to improve their appraisal skills, for monitoring the appraisal systems effectiveness. The following are different types of Formal or Informal performance appraisal

Peer Appraisal:- With more firms using self-managing teams, appraisal of an employee by his or her peer's appraisal is popular.

Rating Committee:- A rating committee is usually composed of the employee's immediate supervisor and three or four other supervisors.

Self-rating:- Some employers obtain employees self-ratings that usually in conjunction with supervisor ratings.

Appraisal by subordinates:- Many employers have subordinates rate their managers, usually for developmental rather than for pay purposes. Managers who receive feedback from subordinates who identify themselves view the upward feedback process more positively.

Alternation Ranking Method:- Ranking employees from best to worst on a trait or traits is another option. Since it is usually easier to distinguish between the worst and best employees, an **alternation ranking method** is most popular.

Paired Comparison Method:- The paired comparison method helps make the ranking method more precise. For every trait (quantity of work, quality of work, and so on), you pair and compare every subordinate with every other subordinate

Forced Distribution Method:- The forced distribution method is similar to grading on a curve. With this method, you place predetermined percentages of rates into several performance categories.

Critical Incident Method:- With the critical incident method, the supervisor keeps a log of positive and negative examples (critical incidents) of a subordinate s work-related behavior.

Obtaining feedback from supervisors and colleagues and clients

When we receive feedback we usually go through three stages we react, we reflect and we respond. For feedback to be useful it is important that we 'analyze' the feedback before responding. The following tips provide guidance on how to approach each of these stages:

React	**During this stage we:** • Need to be aware of and manage our emotional reaction to what we are hearing. Think about how what we say and do now will seem to us (and others) later on. • Should concentrate on listening to the feedback and ask questions to ensure that we understand the other person's views and expectations. • Must remember not to skip the next stage! Depending on what the

	feedback is, we might need to end the discussion at this point to give ourselves time to think properly about what we have heard.
Reflect	**During this stage we:** • Should be honest with ourselves about our own performance and be open minded about what the other person has said. • Should allow ourselves extra time for our emotions to calm down if necessary. • Ask for specific examples to help us to understand the feedback e.g. "What would you have preferred me to do"? • "How could I do it differently next time"?
Respond	**During this stage we:** • Accept the feedback by thanking the person giving it. • If we don't agree, we respectfully say so and support what we're saying with facts or our alternative views. • Should focus on the future and improvement - suggest options or solutions. We respectfully negotiate and agree to 'next steps' (to address issues raised in the feedback). • Need to ensure we understand the next steps and we are committed and able to implement what have agreed to do.

Personal, reflective behavior strategies

Reflective supervision is an opportunity to provide structured support for staff who wants to build skills and enhance their work with families. Positive Goal-Oriented Relationships: Reflective practice is, in its simplest form, thinking about or reflecting on what you do. It is closely linked to the concept of learning from experience, in that you think about what you did, and what happened, and decide from that what you would do differently next time.

Reflective practice is an active, dynamic action-based and ethical set of skills, placed in real time and dealing with real, complex and difficult situations.

Developing and Using Reflective Practice

Reflective practice is a tool for improving your team both as a group and in relation to your work and life experiences. Although it will take time to adopt the technique of reflective practice, it will ultimately save you time and energy.

- Read - around the topics you are learning about or want to learn about and develop
- Ask - others about the way they do things and why
- Watch - what is going on around you
- Feel - pay attention to your emotions, what prompts them, and how you deal with negative ones
- Talk - share your views and experiences with others in your organization
- Think - learn to value time spent thinking about your work.
- Routine organizational methods for monitoring service delivery

The organizational routine defined here as a coordinated, repetitive set of organizational activities is an important element of organizational learning and knowledge management. Some scholars even consider routines to be the only source of sustainable strategic advantage for firms. Yet we know little about the actual operation of routines, particularly what makes them work well. This study helps fill this gap in the literature by examining two knowledge-intensive routines one involving explicit knowledge; the other, tacit knowledge in four large companies.

Organizational routine is the type and level of interdependency in work teams, created by the interaction between work environment and individual, provides the basis for organizational routines and organizational routine change in the framework

6.4 Respecting and acknowledging personal values and beliefs

Personal values, belief and attitudes

As human beings, we all have our own values, beliefs and attitudes that we have developed throughout the course of our lives. Our family, friends, community and the experiences we have had all contribute to our sense of who we are and how we view the world. As community services workers, we are often working with people who are vulnerable and/or who may live a lifestyle that mainstream society views as being different or unacceptable. If, as community services workers, we are to provide a service that meets the needs of our target groups and helps them to feel empowered, we need to be aware of our own personal values, beliefs and attitudes and be prepared to adopt the professional values of our industry and not impose our own ideas on our clients.

Personal Values

Values are principles, standards or qualities that an individual or group of people hold in high regard. These values guide the way we live our lives and the decisions we make. A value may be defined as something that we hold dear, those things/qualities which we consider to be of worth.

Personal belief

Personal beliefs come from real experiences but often we forget that the original experience is not the same as what is happening in life now. Our values and beliefs affect the quality of our work and all our relationships because what you believe is what you experience. We tend to think that our beliefs are based on reality, but it is our beliefs that govern our experiences.

Personal attitude

The word 'attitude' can refer to a lasting group of feelings, beliefs and behavior tendencies directed towards specific people, groups, ideas or objects. An attitude is a belief about something. It usually describes what we think is the 'proper' way of doing something. The attitudes that we feel very strongly about are usually called values. Other attitudes are not so important and are more like opinions. Sometimes our own attitudes can make us blind to other people's values, opinions and needs. Attitudes will always have a positive and negative element and when you hold an attitude you will have a tendency to behave in a certain way toward that person or object.

The influence of attitudes

Our attitudes develop over time and not only reflect where we have come from i.e. the influence family, friends and experiences have had on our attitudes, but also how we will proceed with our life in the future. Attitudes are therefore a powerful element in our life, are long enduring and hard to change but not impossible!

The problem with attitudes

One of the problems with our attitudes is we often ignore any information which is not consistent with them we become selective in the way we perceive and respond to events and issues and lose our 'objectivity' about the world. By developing insights about our attitudes we

reduce the risk of making decisions at work based on our unconscious, pre-existing perceptions, allowing us work more professionally with clients.

Awareness of personal attitudes

It is good practice to think about your attitudes and beliefs: it helps you to understand yourself better. It is beneficial to reflect on your life, identify some of the significant events that have shaped you, consider what qualities you admire in yourself and others and be mindful of what values and are important to you.

Respecting the beliefs, attitudes and values of others

Everyone is entitled to their own values, attitudes and beliefs. It is important to accept and respect that other people may well have different attitudes, values and beliefs than you. We do not have the right to expect that others change their values, attitudes and beliefs just because they are different to ours.

It is quite possible that you may face situations at work that either challenge or compromise your own values, attitudes or beliefs when working to support people with a disability. It is not always easy to avoid communicating your beliefs and values to clients, but it is something you need to be very aware of. It can be very easy to influence clients in subtle ways. Simple things like body language, gestures, the way you say something, or even actions, can give a client the impression you agree or disagree with their values or beliefs.

The diagram below illustrates the influences on us that result in our behavior and whether that resulting behavior is ethical. The diagram first outlines the sources of our beliefs. It then shows the relationship between the beliefs and values to our attitudes and our resulting behavior.

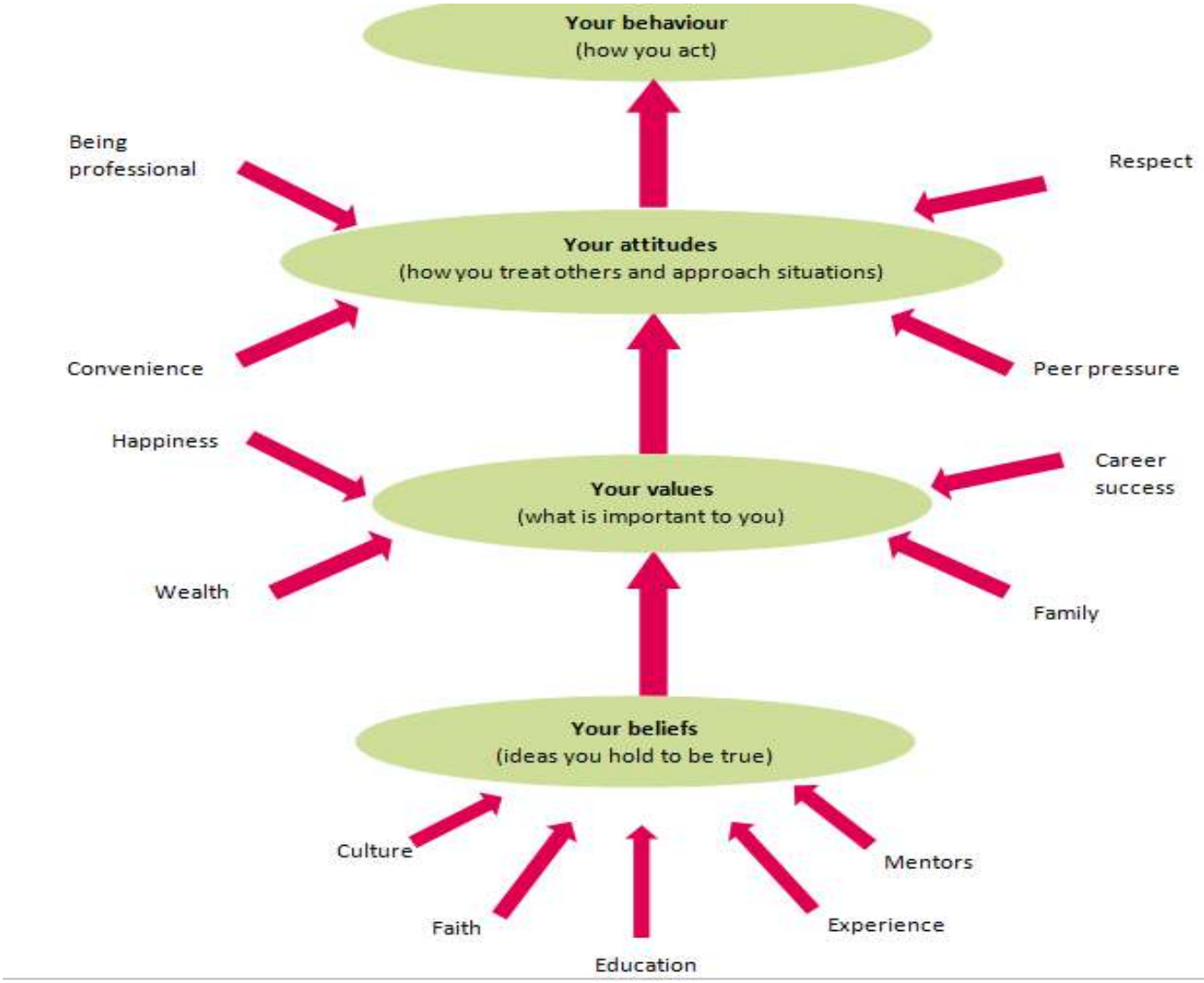

Figure 6.1 Attitudes of individual

Self-check 6

Test-I

Instruction: select the correct answer for the give choice. You have given 1 Minute for each question. Each question holds 2 Points.

Directions: Answer all the questions listed below.

Part I: - Choose the correct answer from the given alternatives

1. Working with other includes a combination of:
   A. Two or more person work with
   B. Carrying out new or complex tasks or solving problems in team
   C. Machinist, welders and supervisors to plan work
   D. All of the above
2. Which one is true about workplace culture?
   A. The set of shared attitudes, values, goals
   B. Practices that characterize an institution or organization
   C. Corporate culture focused on the bottom line
   D. All are answer
3. Job description summarizes the main points, except.
   A. The key responsibilities and functions
   B. Number of team/group
   C. The duties
   D. Level education and experience requirements;
4. If an organization is a limited amount of authority is delegated, which organizational structure preferred?
   A/Centralization B/ Departmentalization
   C/Decentralization: D/ Delegation
5. If there is a formal vertical and horizontal chain of command:
   A/Line structures B/ Flat design structure
   C/ Matrix Structure D/ All are answer

Part II: - Match Column B to Column A

Column A	Column B
_____1. Refers to the ways workers interact with one another to get the job done	A. Job Duties
_____2. A set of policies, principles, rules, and guidelines	B. Code of conduct
_____3. defines how a company's employees should act on a day-to-day basis	C. Centralized decision making
_____4. section is the foundation of the Job Description	D. Working with other
_____5. Few managers at the top level make the decision	E. Organizational Policy
	F. Decentralized decision making


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MINISTRY OF LABOR
AND SKILLS