

# AGE 321

Workshop Practice and Farm shop

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## WORKSHOP & SAFETY

- Workshop place run with danger and risks
- Where equipments and tools are placed and operated to form machines or its components
- Tools are classified as hand tools, power tools and machine tools
- Hand ...light taken to the job
- Power ....motorized hand tools made portable by hand while working
- Machine tools ....heavy duty powered tools fixed to the workshop floor or table where job to be prosecuted are brought to it.
- Safety First ....when planned measures are taken to control situations and acts in an endeavour to prevent accidents to personnel, visitors and equipment

## Safe working conditions & techniques

- Provision of protective clothing
- Un-congested working area
- Proper machine guard for revolving parts
- Safe tool storage area
- Provision of First aid and fire fighting equipment
  
- The Correct use of tools
- Correct way to prosecute job
- Correct way to care and maintain tools

## Workshop Personnel & Safety Guide

- Personnel and visitors must be cautioned about dangers in the workshop
- Human failings
  - Untidiness, over-confidence, nosiness, foolishness, etc
- Personal safety rules
- Hand tool safety rules
- Power and Machine tools safety guide
- Electrical Tool safety guide.... Necessary since electricity is the major energy source in the workshop
- Electric shock
  - Current flows thro the body causing mild sensation, electrocution ....vigorous and violet muscular spasm
  - Extreme cases involves internal heating & partial blockage of blood thro blood vessel

## Workshop Safety Aids

- Are safety colors and signs developed to act as quick reference in giving safety information.
- Required to draw attention, not to replace appropriate safety precautions
- Colours
  - Used in recognition of contents of gas cylinders, pipes, etc.
  - Typical color representation would be brought and shown in class
  - Electrical wires and cables used in the workshop are also colour coded

## Fire in the workshop

- A phenomenon where combustible material react with oxygen to produce Heat
- Class A,
  - Ordinary combustible material ...wood, paper etc
- Class B inflammable liquids, petrol , paraffin, etc
- Class C Gases, electrical fire
- A fire fighting equipment must be provided in the workshop .....fire extinguisher
- A fire extinguisher is a portable fire fighting equipment containing an extinguishing medium in a pressurized container
- Must be placed conspicuously in the workshop with the cylinder painted in appropriate colour

### Types of Extinguisher

- Classified according to medium contained in cylinder
- Water
- Chemical
- Carbon Dioxide
- Dry Powder

### Fire precautions

- Know position of fire alarm Extinguisher
- Correct Appliances to use
- Do not block fire exits
- Never smoke unless permitted
- Avoid use of flammable liquids and spillage
- Report all defective electrical equipments

### MARKING OUT & MEASURATION

- Benchwork is the process of using hand tools to produce machine or its components on the workbench
- Production of machine involves the use of marking tools and measuration
- Marking out is the scratching of lines on surface of a work piece to indicate the outline, position of holes, slots etc..
- Tools for Marking out
  - Workbench
  - Surface table and surface plate.....Datum
  - Scriber
  - Engineers square
  - Precision steel rule
  - Divider / trammel
  - Calipers
  - Centre punch
  - Marking Dye etc

## Measurement

- When components are fabricated it is necessary and required to have some form of precise measurement if parts are to fit together as intended, notwithstanding where or whoever is making the component
- Standard of measurement is the metre
- Measuring instrument
  - Indicating and Non-indicating

### Tools

- **Vernier Instruments**
  - Vernier caliper, Micro-meter screw gauge,
  - Dial gauge or Indicator, Slip gauge, feeler gauge etc

## Assembly Tools

- Used on the bench on marked and measured components or components that had gone thro other workshop processes
- **Spanners and Wrenches**
  - Set, Ring, Tubular, Socket, Adjustable
  - Wrenches are for tackling heavier works on cylindrical objects
    - Types...Stilton, Chain or pipe, Strap
- **Screw Driver ..... Driving tool**
  - Flat, star, Phillip head
- **Hammer.... Impelling tool**
  - Ball, cross , straight
  - Special made of rubber, fibre, wood.....Mallet
- **Pliers**
- **Clamps**
- **Hand Vice**

## Cutting Tools

- Hacksaw cutting off metals in the workshop before other finishing processes
  - Fixed or adjustable frames
  - Flexible blade, hard and spring back
- Cold Chisel ... cutting cold metal made from treated hexagonal or octagonal shaped high carbon steel (hardened & Tempered)
  - Flat, half-round, diamond, side-cut or Cross cut
- File to reduce metal accurately to a required size after sawing or chipping
  - Classified according to section and shapes, Grade (teeth spacing) and type of cut  
Single cut or double cut  
Rough, bastard, second cut, smooth & dead smooth  
Hand , Flat, round, half-round, square, three-square, knife. Special warding file
- Methods of Filing
  - Cross filing
  - Draw filing
  - Straight filing
- Pinning
  - Use of chalk
  - File card pieces OF brass

## Assembly Tools

Scrapers – correcting errors

scraping is removal of small amount of excess material from work pieces after filing or chiseling

types: flat, curved, half round, triangular

Grinder - finishing surface of work after been previously rough shaped by other tools

grinding is removal of metals by wheels made of abrasive grits

Drills - high carbon steel that rotates under pressure to produce accurately sized hole by cutting fine shavings.

Types: flat, twist, countersink, counterbore

Hand or Wheel braces

Reamers

Taps

Stock and Dies

Snips

## General Equipment

- Lifting appliances
  - Chain-drive, lever hoist and jack
- Grease gun
- Oil can

## Power Tools

- Motorized or Power driven
  - portable by hand, powered through electrical motor or pneumatic motor
- Electric Drill
  - Uses attachments such as screw driver, hammer, file, saw, etc

## Machine Tools

- Heavy duty powered tools fixed to floor or table
- Jobs taken to them
- Driven by separate motors for its operations or by combining several operations driven by a single motor (universal machine)
  - Power Drill, Bench drill or Pillar drill
  - The Lathe ....heavy duty machine for generating cylindrical, circular and moulded forms by rotating against a cutting or forming tools

## Fastening of Materials

- Joining or fastening of mat. Depends upon strength required, design, size and type of mat to be joined
- Methods
  - Mechanical
    - Bolts & nuts, stud, Rivets
  - Metallurgical
    - Soldering
      - Soft soldering, Hard soldering
      - Soldering Iron
    - Brazing
      - Blowpipe
    - Electric Arc Welding
      - Passage of electric current thro electrode
      - Types ... Arc welding, tungsten inert gas (TIG), metal inert gas (MIG)

## Fastening of Materials

- Gas Welding
- Obtaining heat to melt by burning a mixture of combustible gas and oxygen to provide an intense heat (FLAME)
- Common gas mixture is oxygen and acetylene
- Oxy Acetylene welding
- Wide temp range
- Cheap, portable and invaluable in workshops
- Adhesives
- To establish permanent bond between to surfaces that might be of the same of different materials
- Glues .classified according to ability to resist moisture and their composition
- Types: Natural or Synthetic
- Natural ..... Animal, vegetable or natural origin (mineral)
  - Use in woodworking, paper industry
- Artificial ... synthetic mat.... Chemicals, plastic, rubber
  - Thermoplastic rubber, Thermoplastic resin and thermosetting resin

- Starch glue
- Protein or synthetic
- Waterproof
- Water resistant ..... low or high
- Epoxy... thermosetting resin
  - Reaction of a resin and a basic curing agent ....hardener.
  - Contact glues

## Wood Working Tools

- Differences between hand tools in wood workshop and metal workshop
- A fitter machinist and a wood workshop operator
- Wood workshop table
- Wood scraper
- Wood chisel as opposed to cold chisel
- Wood Twist drill
- Basic requirements for a mechanical/ wood workshop

## Farm Tools

- A tool
  - Component or element that does not have a frame attachment and no external or internal prime mover
- Farm tools..... Rudimental machine tools usually powered by human efforts
  - Varieties of farm tools to be shown to students in the class lab practical