COURSE MODULE

COURSE CODE: IA 327 (ELECTRICAL INSTALLATION AND MAINTENANCE)

Module 2

2nd Semester, S.Y. 2020-2021

Introduction

Electrical tasked can be accomplished systematically to save time, effort, and resources. Most of the work cannot be done using bare hands. To do the task, electrical tools are needed to perform the job.

Intended Learning Outcomes:

Use appropriate hand tools and test equipment

Topic/s: Use of Hand Tools

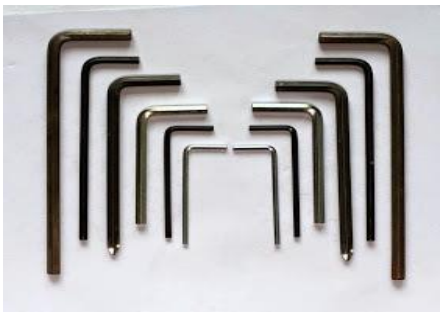
DIFFERENT TYPES OF HAND TOOLS AND THEIR USES

Driving Tools

Screwdriver is a device specifically designed to insert and tighten or to loosen and remove screws. A screwdriver comprises a head or tip which engages with a screw, a mechanism to apply torque by rotating the tip and some way to position and support the screwdriver. A typical hand screwdriver comprises an approximately cylindrical handle of a size and shape to be held by a human hand and an axial shaft fixed to the handle, the tip of which is shaped to fit a particular type of screw. The handle and shaft allow the screwdriver to be positioned and supported when rotated to apply torque.

- **Flat Screwdriver** is used to drive or fasten negative slotted screws.

- **Phillips Screwdriver** is used to drive or fasten positive slotted screws. It is a screwdriver that could take greater torque and can provide tighter fastenings.



- **Hex (Allen Wrench)** is used to drive or fasten hexagonal screws. The head has a hexagonal hole turned by an allen key. An Allen key is a hexagonal shaped wrench bent in letter-L. The Allen key was invented by an American, Gilbert F. Heublein.

- **Precision Screwdriver Set** is a set of small screw drivers composed of slotted and Philips screwdrivers.

Soldering Tools

- **Soldering Iron** is a device used for applying heat to melt solder in attaching two metal parts. A soldering iron is composed of a heated metal tip and an insulated handle. Heating is often achieved electrically, by passing a current, supplied through an electrical cord, through a heating element. For electrical work, wires are usually soldered to printed circuit boards, other wires, or small terminals. A low-power iron (15-30 Watts) is suitable for this work.

- **Soldering Tool Stand** is a place of the soldering iron to keep them away from flammable materials. The stand often also comes with a sponge and flux pot for cleaning the tip.

- **Desoldering tool** is used for the removal of solder and components from a circuit when troubleshooting, repair purposes and to save components. Electronic components are often mounted on a circuit board and it is usually desirable to avoid damaging the circuit board, surrounding components, and the component being removed.

Splicing Tools

Combination Pliers (Lineman's Pliers). This is used for gripping, holding, and cutting electrical wires and cables and even small nails. They are usually used by linemen in doing heavy tasks.

- **Long Nose** is used for holding, bending and stretching the lead of electronic component or connecting wire.

- **Side Cutter.** It is a wire-cutting plier, though they are not used to grab or turn anything, but are used to cut wire.

- **Wire Stripper.** It is a pair of opposing blades much like scissors or wire cutters. The addition of a center notch makes it easier to cut the insulation without cutting the wire. This type of wire stripper is used by rotating it around the insulation while applying pressure in order to make a cut around the insulation. Since the insulation is not bonded with the wire, it will be pulled easily at the end.

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BORING TOOLS

Volt Mini-Drill. It is used to bore or drill holes in the printed circuit board (pcb)

Portable Electric Drill. It is used for boring hole/s in the plastic chassis or metal chassis with the used of drill bits.

Metal File. It is a hand tool used to shape metals by grinding. A file series of sharp, parallel ridges or teeth. Most files have a narrow, pointed tang at one end to which a handle can be fitted.

Flat File. They are parallel in width and tapered in thickness. They are used for flat surfaces and edges.

Half Round Files. They are tapers in width and thickness, coming to a point, and are narrower than a standard half round which are used for filing inside of rings.

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Round Files. They are also called rat-tail files gradually tapered and are used for many tasks that require a round tool, such as enlarging round holes or cutting a scalloped edge.

Cutting Tool

Utility Knife. It is a common tool used in cutting various trades and crafts for a variety of purposes.

HAMMER

Are mostly used tools in the shop. They should be gripped at the end of the handle.

Ball-peen Hammer. It is a type of hammer used in metalworking. The ball-peen hammer remains useful for many tasks such as tapping punches and chisels. The original function of the hammer was to "peen" riveted or welded material so that it will exhibit the same elastic behavior as the surrounding material.

Magnifying Glass. It is a convex lens which is used to produce a magnified image of an object. The lens is usually mounted in a frame with a handle (see image). Roger Bacon is the original inventor of the magnifying glass. A magnifying glass works by creating a magnified virtual image of an object behind the lens. The distance between the lens and the object must be shorter than the focal length of the lens for this to occur. Otherwise, the image appears smaller and inverted, and can be used to

project images onto surfaces. The framed lens may be mounted on a stand, keeping the lens at the right distance from the table, and therefore at the right distance from the object on the table. The latter applies if the object is small and also if the height is adjustable. Some magnifying glasses are foldable with built-in light.

Paint Brush. It is made of bristles set in handle used for cleaning dirty parts of a circuit or an object.
Performing roughing-in, wiring and cabling works.

PULL-PUSH RULE

This familiar device is spring-loaded so that the tape retracts into its metal or plastic case when not in use.

HACKSAW

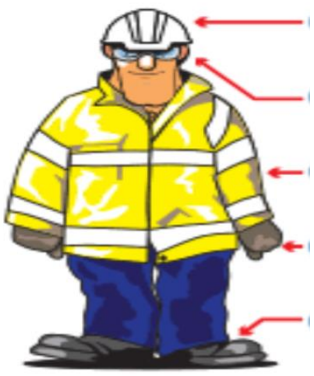
A saw with a narrow fine toothed blade set in a frame, used especially for cutting metals.

TOOL BOX

Is a box used to organize, carry, and protect the owner's tools.

PERSONAL PROTECTIVE EQUIPMENT

Commonly referred to as "PPE", is equipment worn to minimize exposures to hazards that cause serious workplace injuries and illness.



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PERSONAL PROTECTIVE EQUIPMENT

- Hand gloves
- Goggles
- Ear muffs/plugs
- Shoes
- Hard Hat
- Reflecting Jacket
- Safety belt and harness
- Mask
- Pants

Proper use of hand tools

- Ensure that employees are properly trained in the safe use of hand tools.
- Always provide training on how to choose the right tool for the job, how to correctly use each tool, and how to identify when tools need to repair.
- Select the right tool for the job. Substitutes increase the chance of having an accident.
- Use tools designed to allow wrist to stay straight. Avoid using hand tools with your wrist bent.
- Use good quality tools.
- Keep tools in good condition at all times.
- Inspect tools for defects before use. Replace or repair defective tools.
- Keep cutting tools sharp and cover sharp edges with a suitable covering to protect the tool and to prevent injuries form unintended contact.
- Replace cracked, splintered, or broken handles on files, hammers, screwdrivers, or sledges.
- Ensure that the handles of tools like hammers and axes fit tightly into the head of the tool.
- Replace worn jaws on wrenches, pipe tools and pliers.
- Redress burred or mushroomed heads of striking tools.

What to avoid when using hand tools

- Do not use tools for jobs they are not intended to do.
- Do not apply excessive force or pressure on tools.
- Do not cut towards yourself when using cutting tools.
- Do not wear bulky gloves to operate hand tools.
- Do not throw tools. Hand them, handle first, directly to the workers.
- Do not carry a sharp tool in your pocket.

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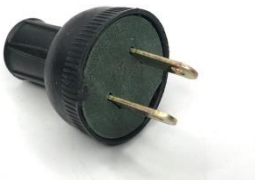
Electrical Supplies and Materials

Electrical materials *are* developed and constructed for a special purpose such as to:

1. control the flow of current in an electrical circuit;
2. carry electrical current from the source to the load or current consuming apparatus;
3. hold and secure wires to its fixtures inside and outside houses and buildings; and
4. protect the houses, buildings, appliances' and instruments from any destruction and damage.

The following are the most commonly used ***electrical materials*.**

MATERIALS AND DESCRIPTION	PICTURES
Convenience outlet- a device that acts as a convenient source of electrical energy for current consuming appliances. It is where the male plug of an appliance is inserted and usually fastened on the wall or connected in an extension cord. It maybe single, duplex, triplex or multiplex and could be surface type or flush type.	 Surface type (duplex)  Flush type (duplex)
Male plug- a device inserted to a convenience outlet to conduct electric current. A flat cord is attached to it on one end and the other end is connected to a current consuming instrument or appliance.	

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Lamp holders- devices that hold and protect the lamp and are also called as -Lamp Sockets/Receptacles. These come in many designs and sizes. They are classified as flush, hanging (weather proof/chain) and surface types.	  Flush type Hanging (chain)   Surface type Hanging (weather)
Switch - a device that connects and disconnects the flow of electric current in a circuit. There are many shapes, designs, and types and they are classified as hanging, flush, and surface types.	 Surface type  Flush type Hanging type
Fuse - a circuit protective device that automatically blows and cut the current when and over load or short circuit happens.	 Knife blade Cartridge Plug type

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Circuit Breaker - a protective device used to automatically blows and cuts the current when trouble in the circuit such as short circuit or overload occurs.	 Circuit breaker
Junction Box - an octagonal shaped electrical material where the connections or joints of wires are being done. It is also where the flush type lamp holder is attached. This could be made of metal or plastic (PVC) *Polyvinylchloride.*	 Plastic  Metal
Utility Box - a rectangular shaped metallic or plastic (PVC) material in which flush type convenience outlet and switch are attached.	 METAL  PLASTIC
Flat Cord- Is a duplex stranded wire used for temporary wiring installation and commonly used in extension cord assembly. It comes in a roll of 150 meters and with sizes of gauge # 18 and gauge # 16 awg (American wire gauge).	  Flat cord

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Electrical Wire/Conductor- electrical material that could be: **a. Stranded** wire which is made of multiple strands joined together to make a single wire. **b. Solid** wire is made of a single strand of copper or aluminum wire. These are used in wiring installation inside and outside the buildings.	 a. Stranded wire  b. Solid wire
Conduits/Pipes- electrical materials used as the passage of wires for protection and insulation. These could be rigid metallic, flexible metallic conduit (FMC), rigid non-metallic (PVC), and flexible non-metallic or corrugated plastic conduit (CPC)	 Metallic conduit  Flexible Non-metallic conduit or corrugated plastic conduit (CPC)  Rigid Non-metallic conduit (PVC)
Clamps- electrical materials used to hold and anchor electrical conduits in its proper position.	 Metal clamp  Plastic clamp
Connectors- used to attach metallic or non-metallic conduit to the junction or utility boxes.	 Metal connector  Flexible non metallic connector

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