**WEEK 10 YEAR 12 APPLIED TECHNOLOGY**

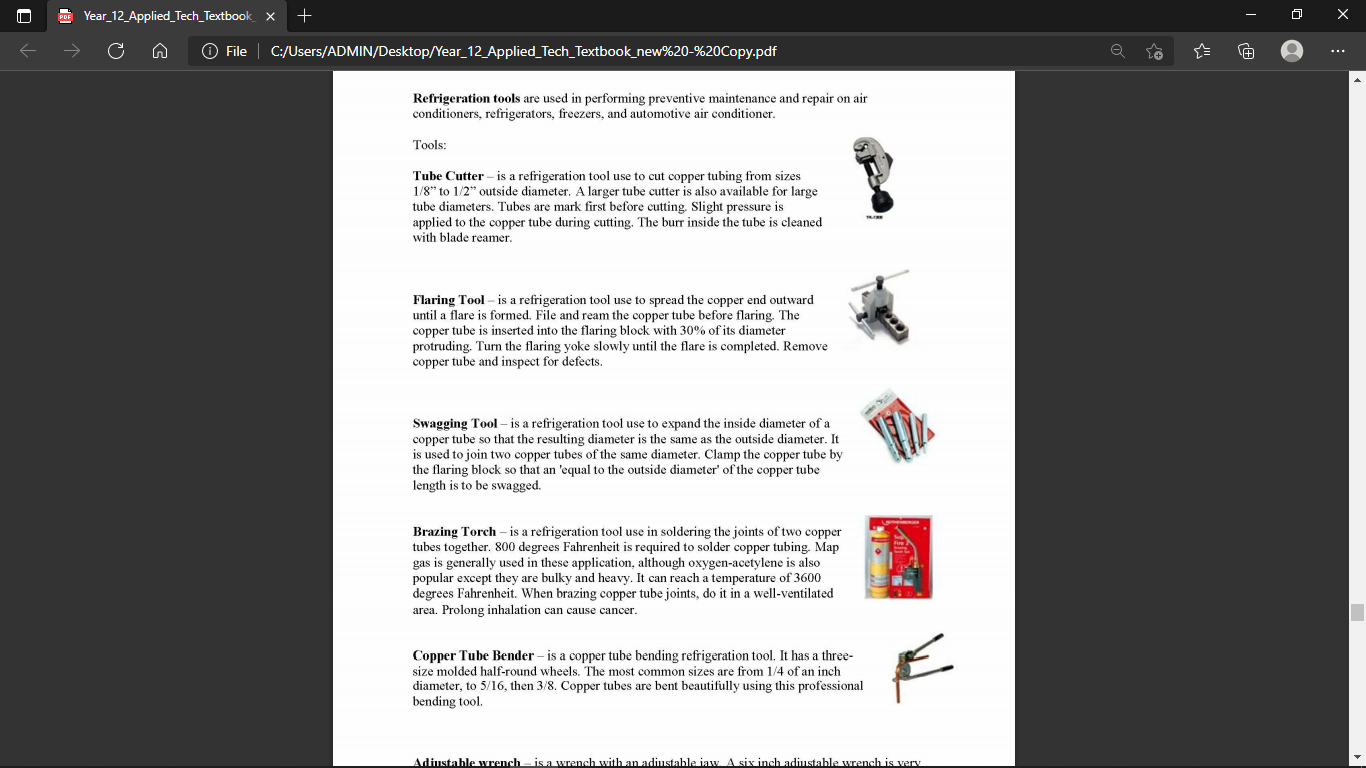
**STRAND: REFRIGERATION & AIR CONDITIONING**

**LESSON 56: REFRIGERATION TOOLS**

**LEARNING OUTCOME: IDENTIFY THE TYPES OF REFRIGERATION TOOLS**

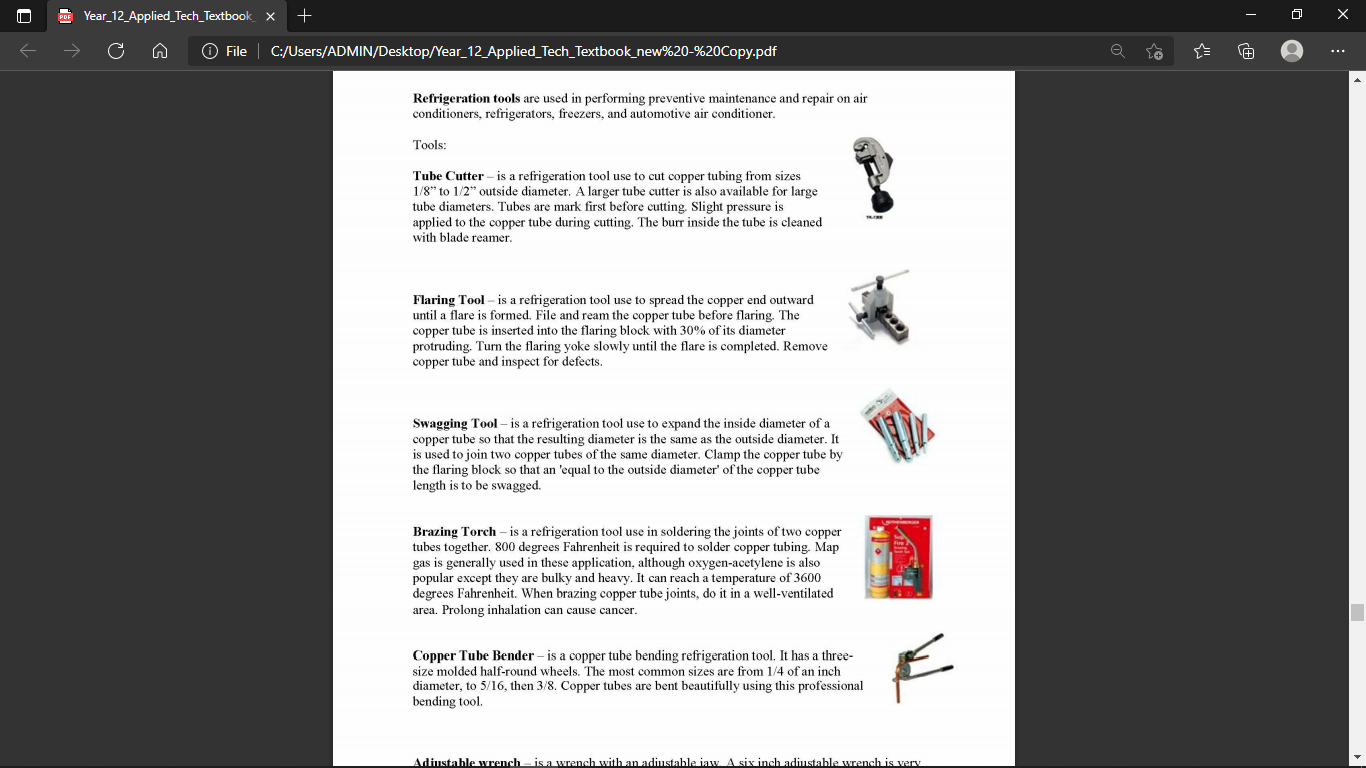
1. **TUBE CUTTER-**

* A tool use to cut copper tubing from sizes 1/8 ‘’ to 1/2 ‘’
* The burr inside the tube is cleaned with blade reamer

****

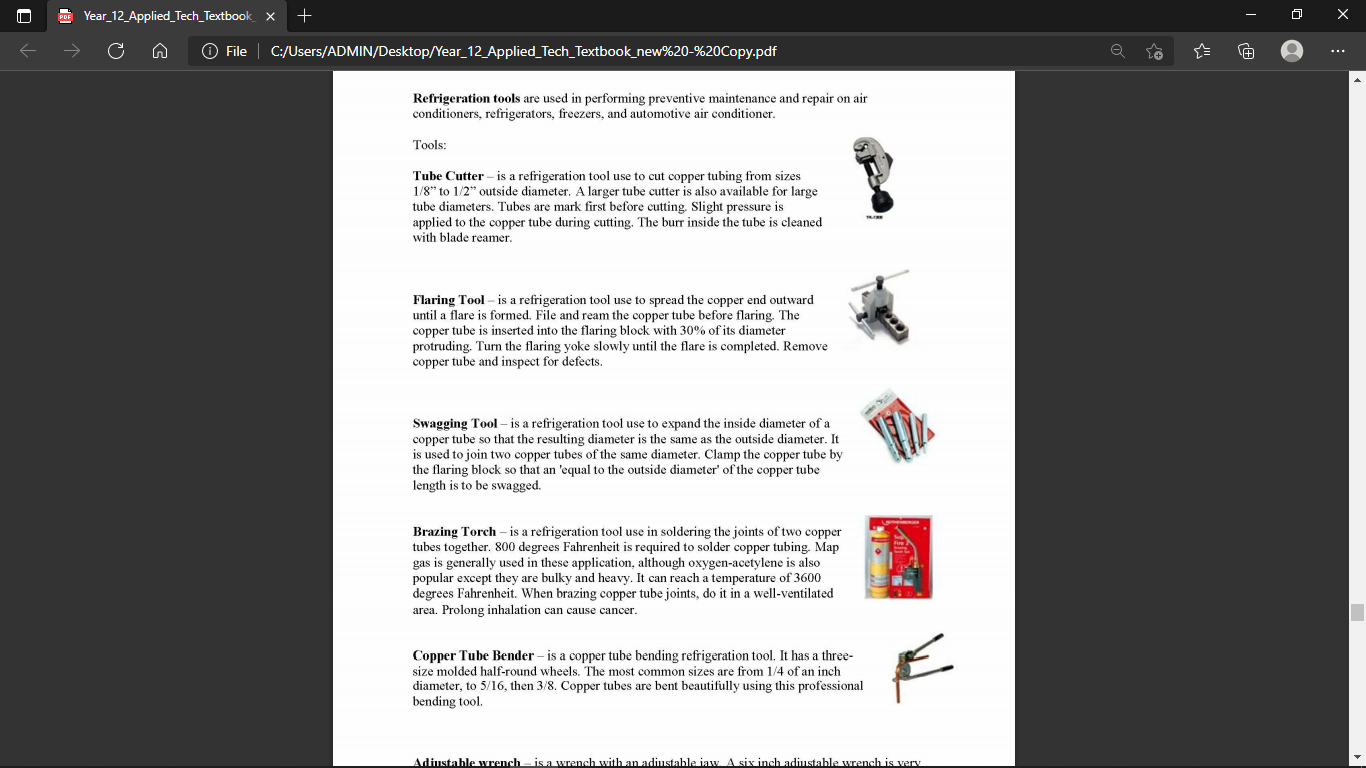
1. **FLARING TOOL**

* A tool used to spread the copper end outward until a flare is formed. File and ream the copper tube before flaring



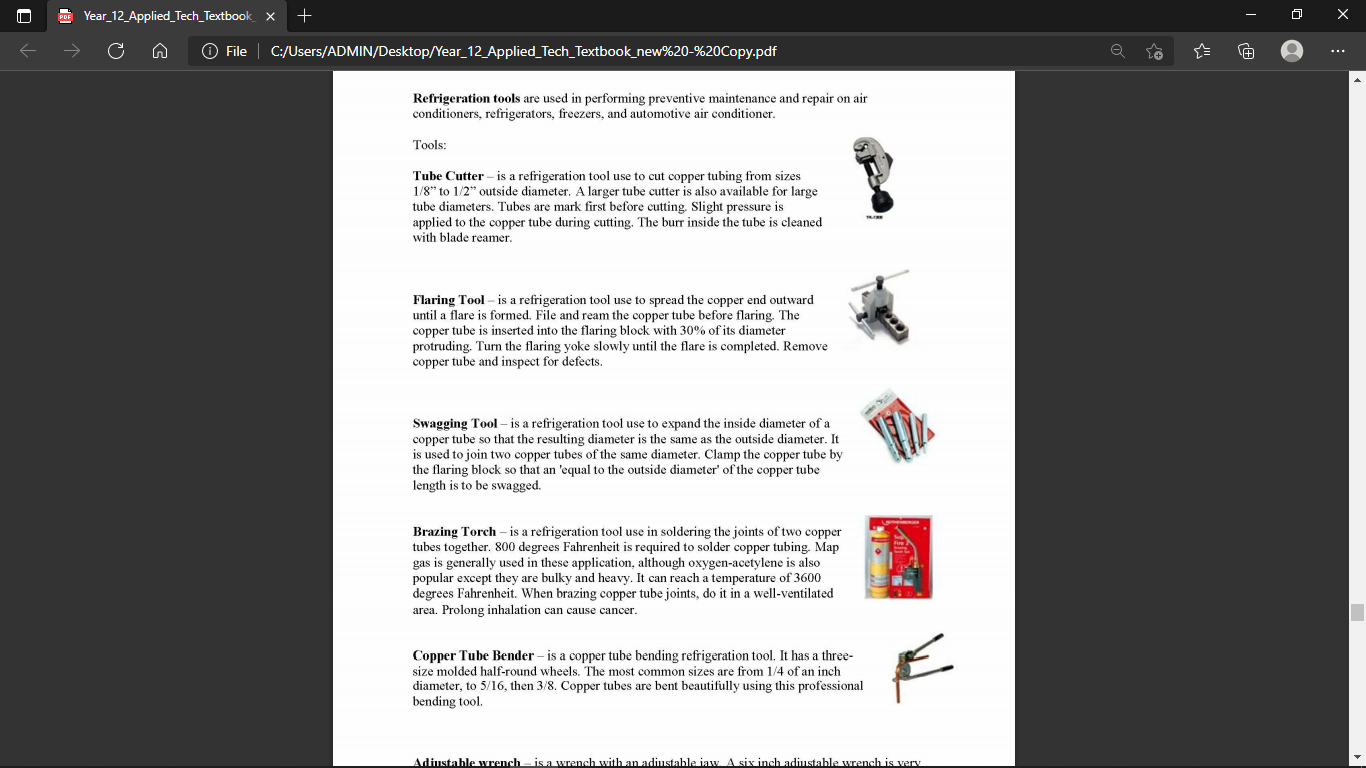
1. **SWAGGING TOOL**

* A tool use to expand the inside diameter of a copper tube so that the resulting diameter is the same as the outside diameter.
* It is used to join two copper tubes of the same diameter
* Clamp the copper tube by the flaring block so that an equal to the outside diameter of the copper tube length is to be swagged



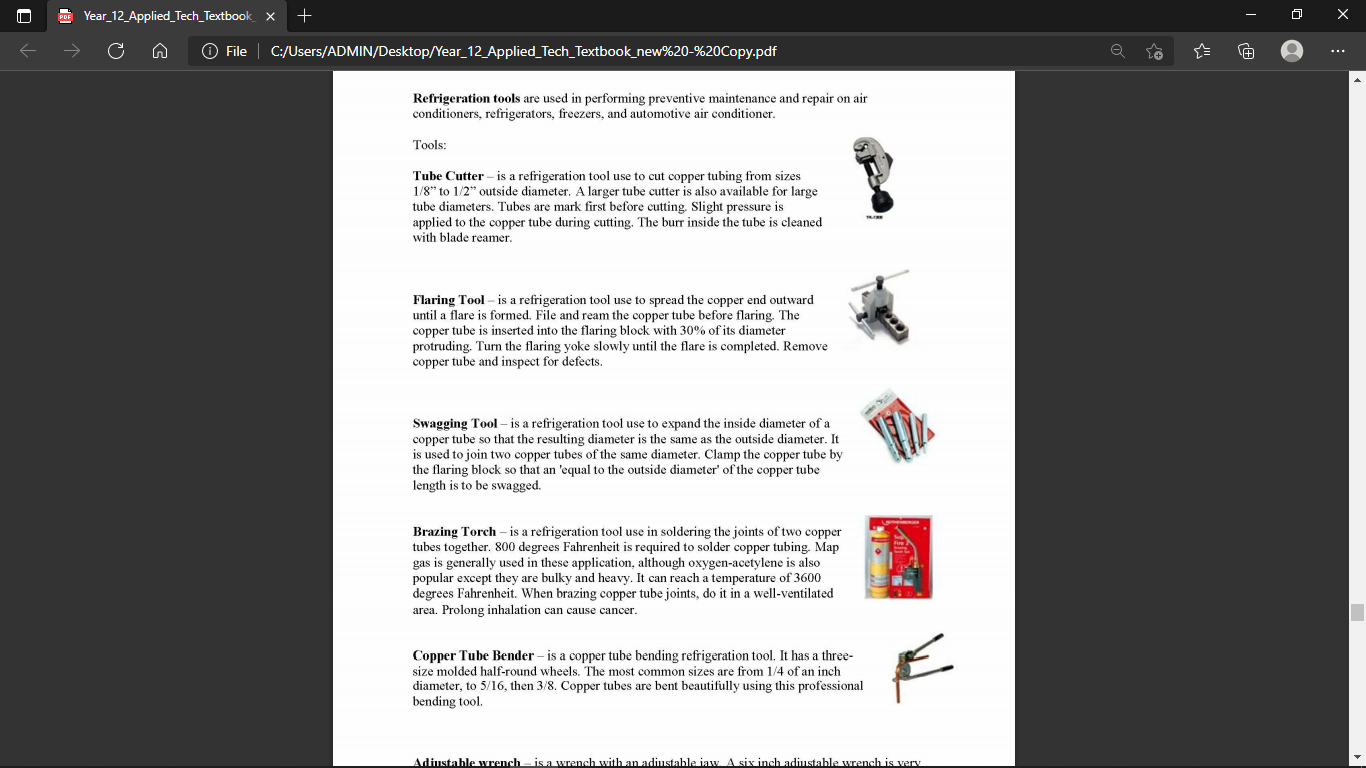
1. **BRAZING TORCH**

* A tool use in soldering the joints of two copper tubes together
* 800 degrees Fahrenheit is required to solder copper tubing
* Map gas is used, oxygen-acetylene is also used but are bulky & heavy
* When brazing copper tube joint, do it in a well-ventilated area



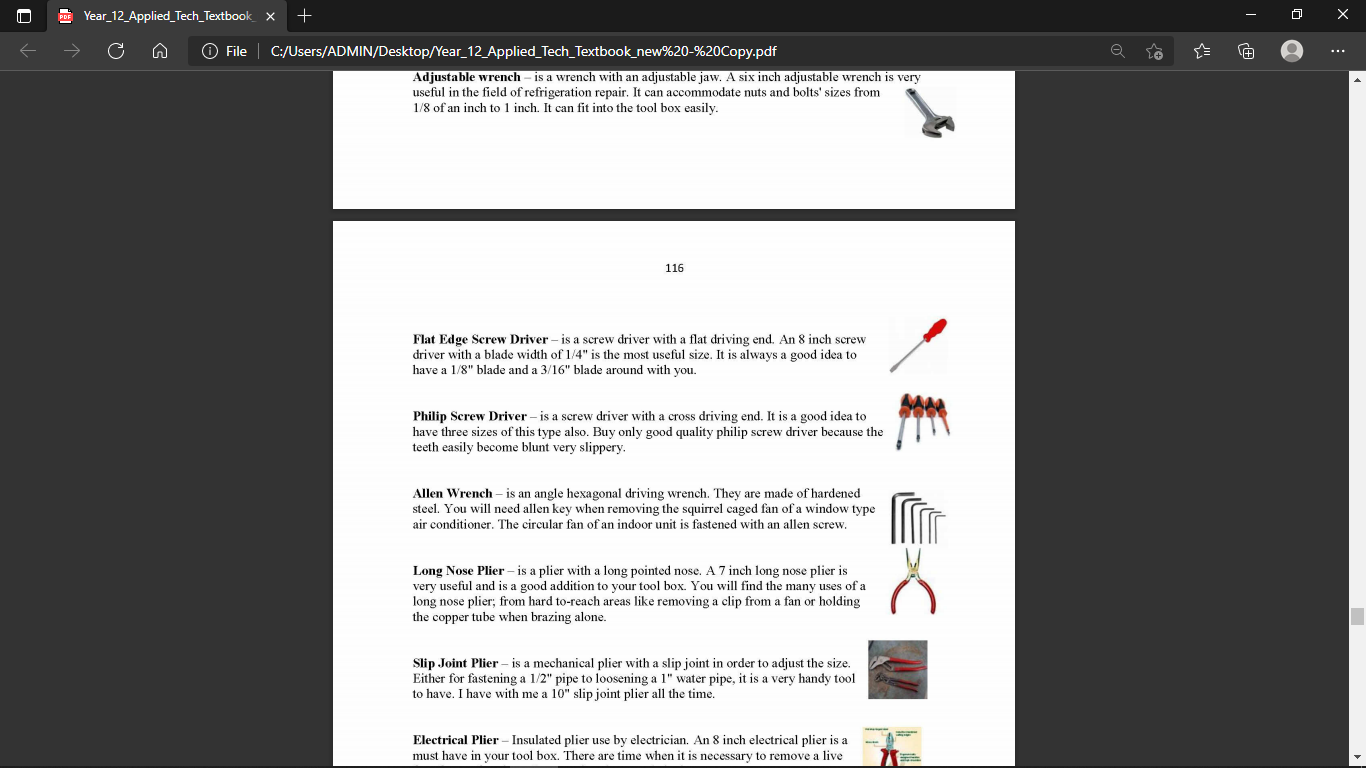
1. **COPPER TUBE BENDER**

* A copper tube bending refrigeration tool
* It has a three size molded half-round wheels

****

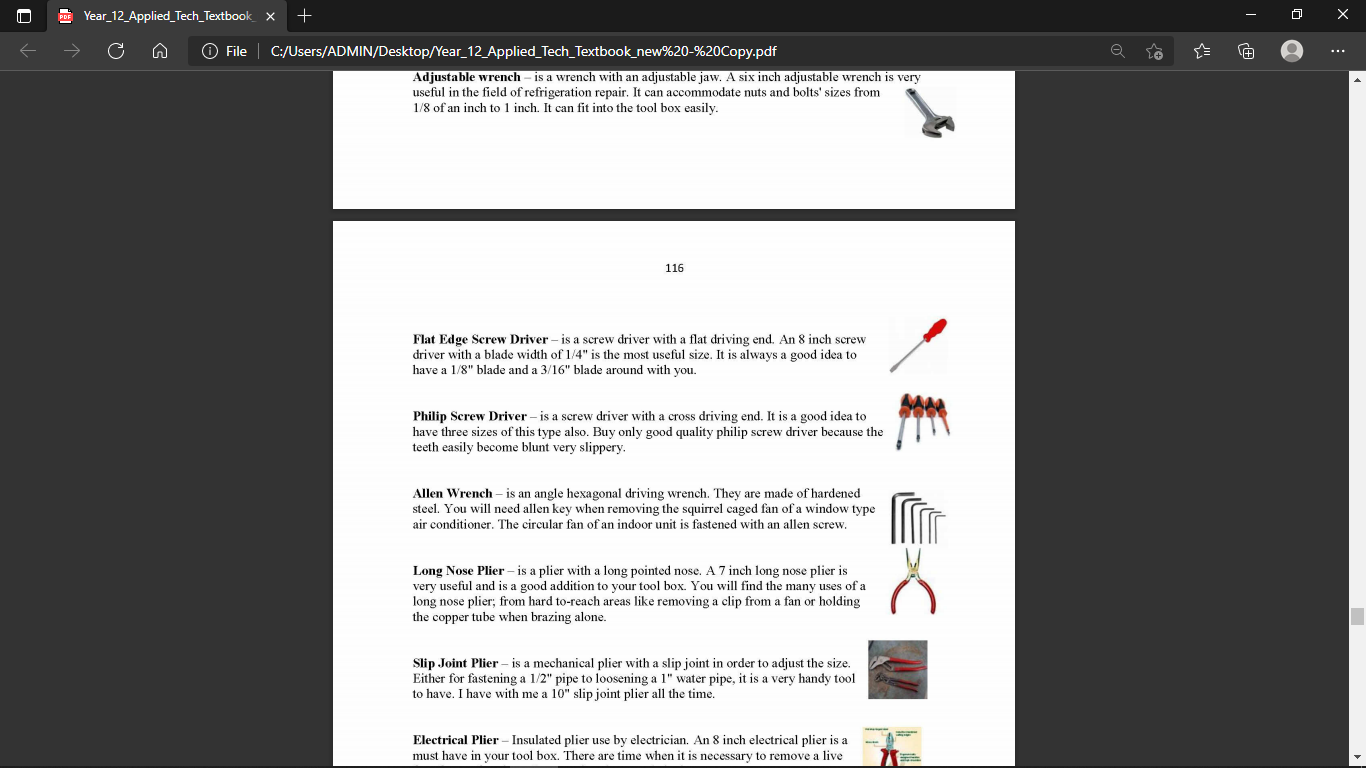
1. **ADJUSTABLE WRENCH**

* A wrench with adjustable jaw
* A six inch adjustable wrench is very useful in the field of refrigeration repair
* It can be used with nuts & bolts sizes from 1/8’’ to 1’’



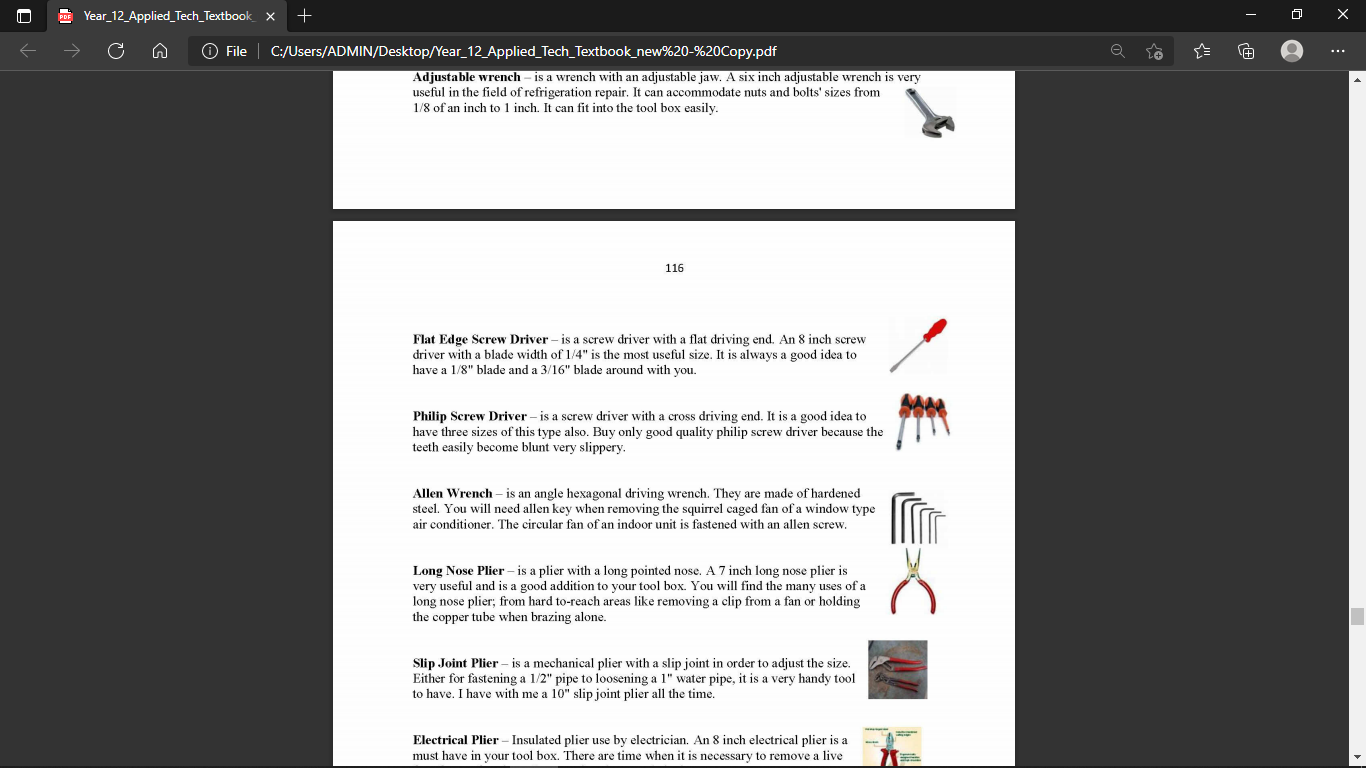
1. **FLAT EDGE SCREW DRIVER**

* A screw driver with a flat driving end
* An 8’’ screw driver with a blade width of 1/4 ‘’ is the most useful size



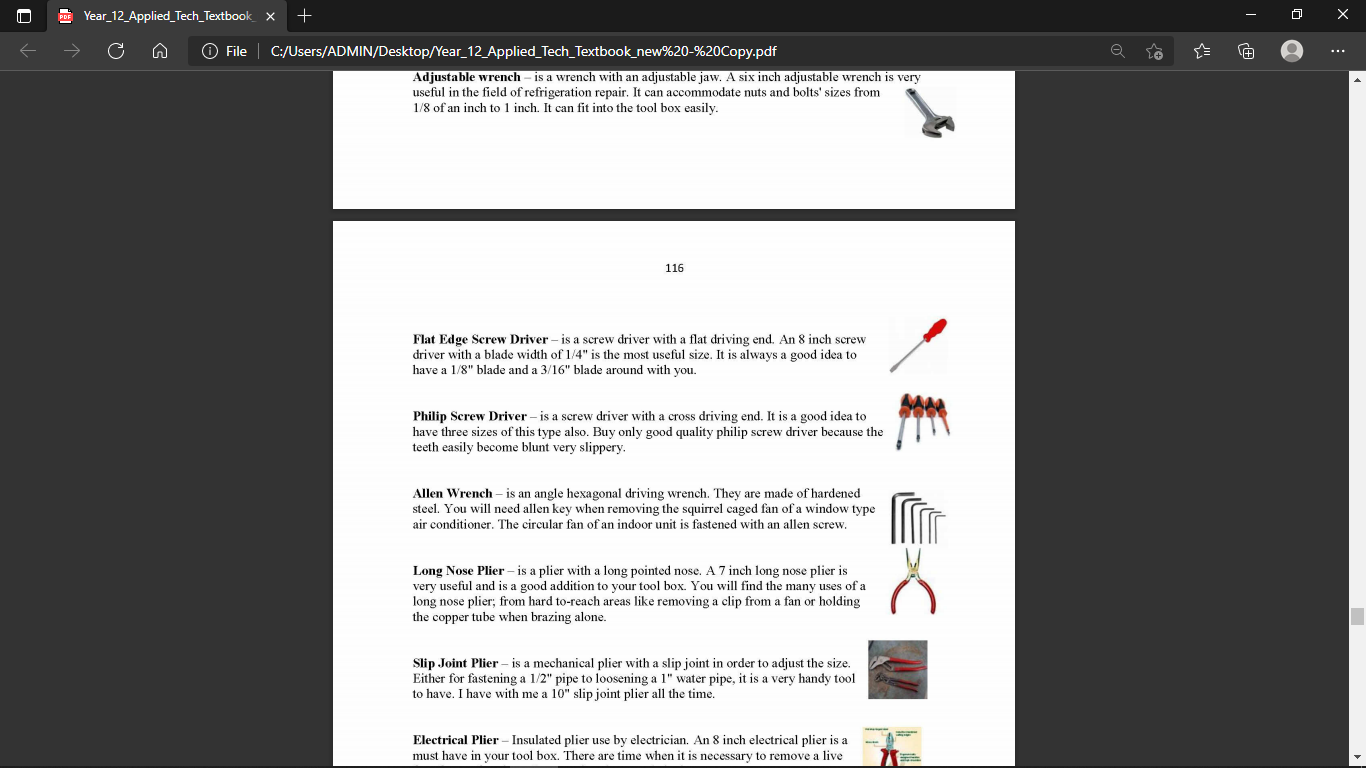
1. **PHILLIP SCREW DRIVER**

* A crew driver with a cross driving end
* It is good idea to have three sizes of this type



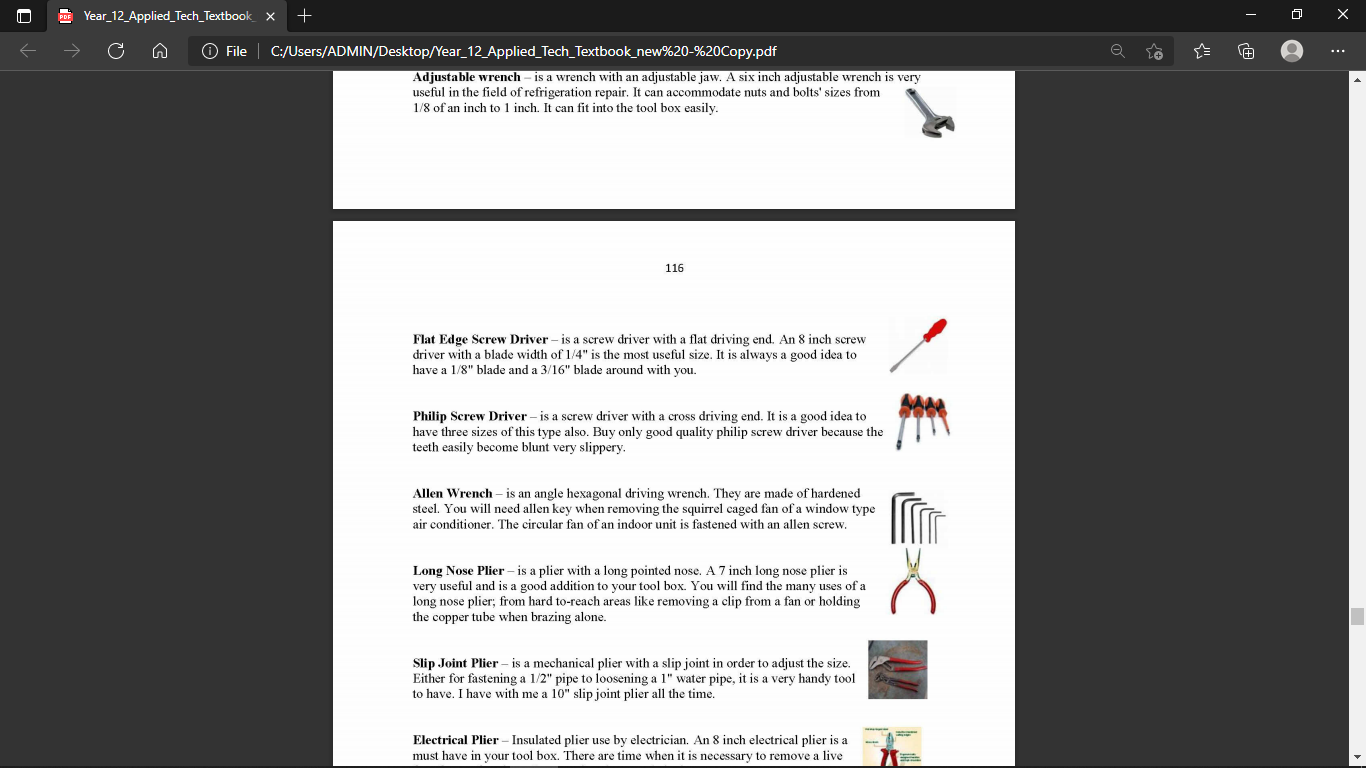
1. **ALLEN WRENCH**

* An angle hexagonal driving wrench
* They are made of hardened steel



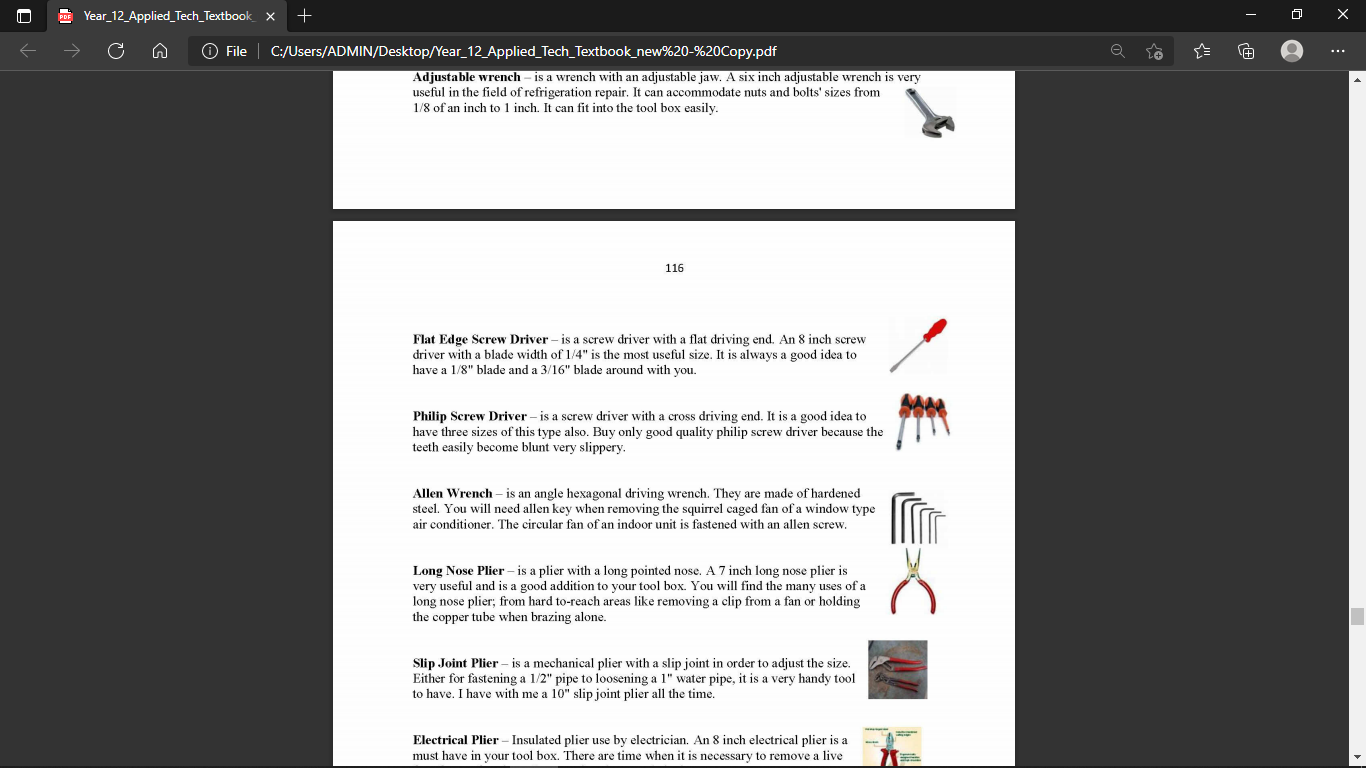
1. **LONG NOSE PLIER**

* A plier with a long pointed nose



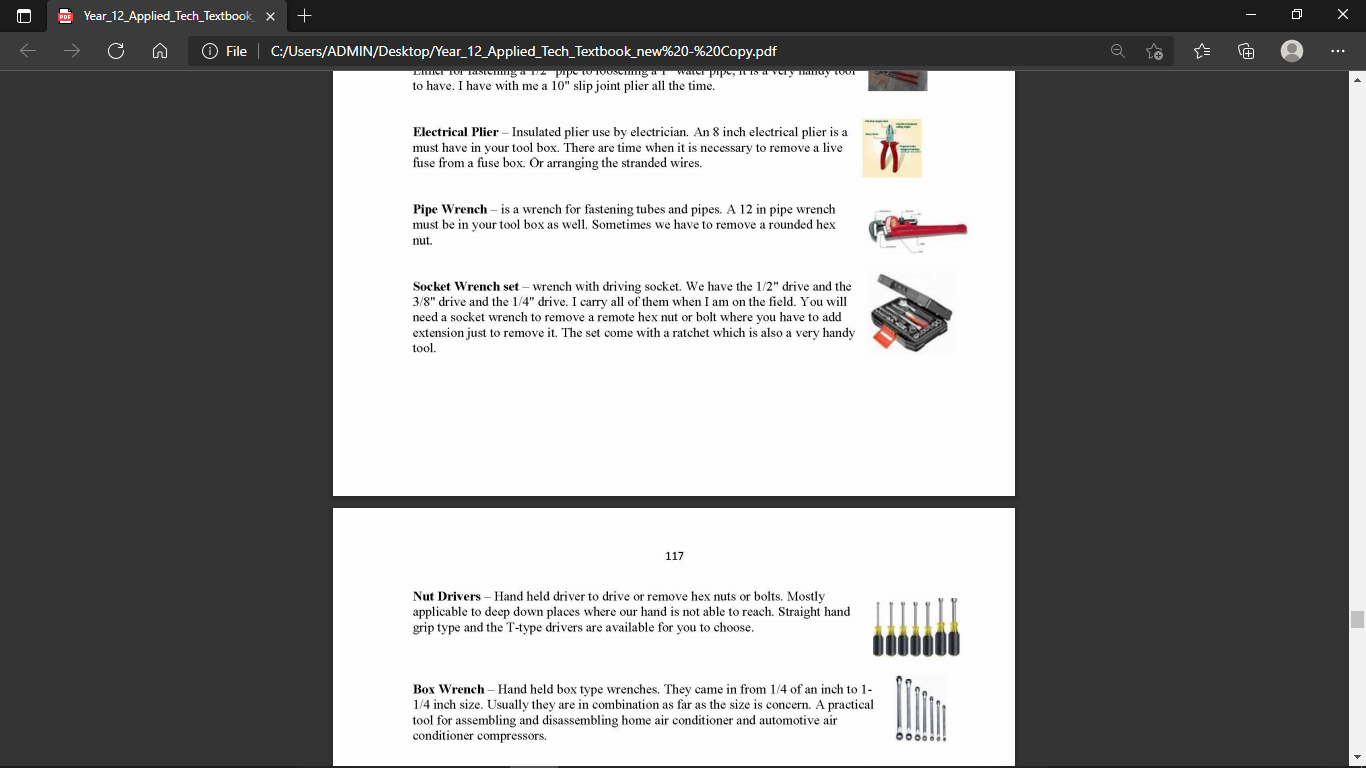
1. **SLIP JOINT PLIER**

* A mechanical plier with a slip joint in order to adjust the size



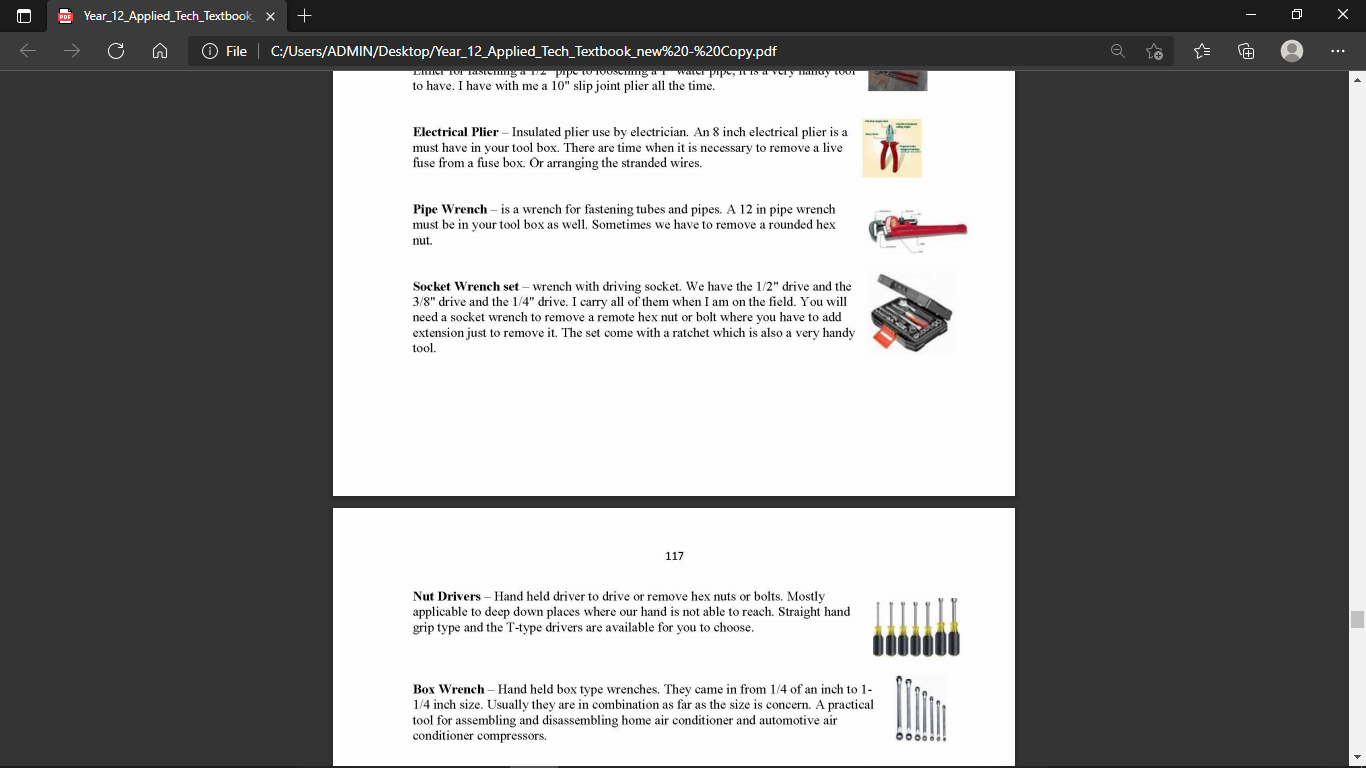
1. **ELECTRICAL PLIER**

* Insulated plier use by electrician
* To remove a live fuse from a fuse box



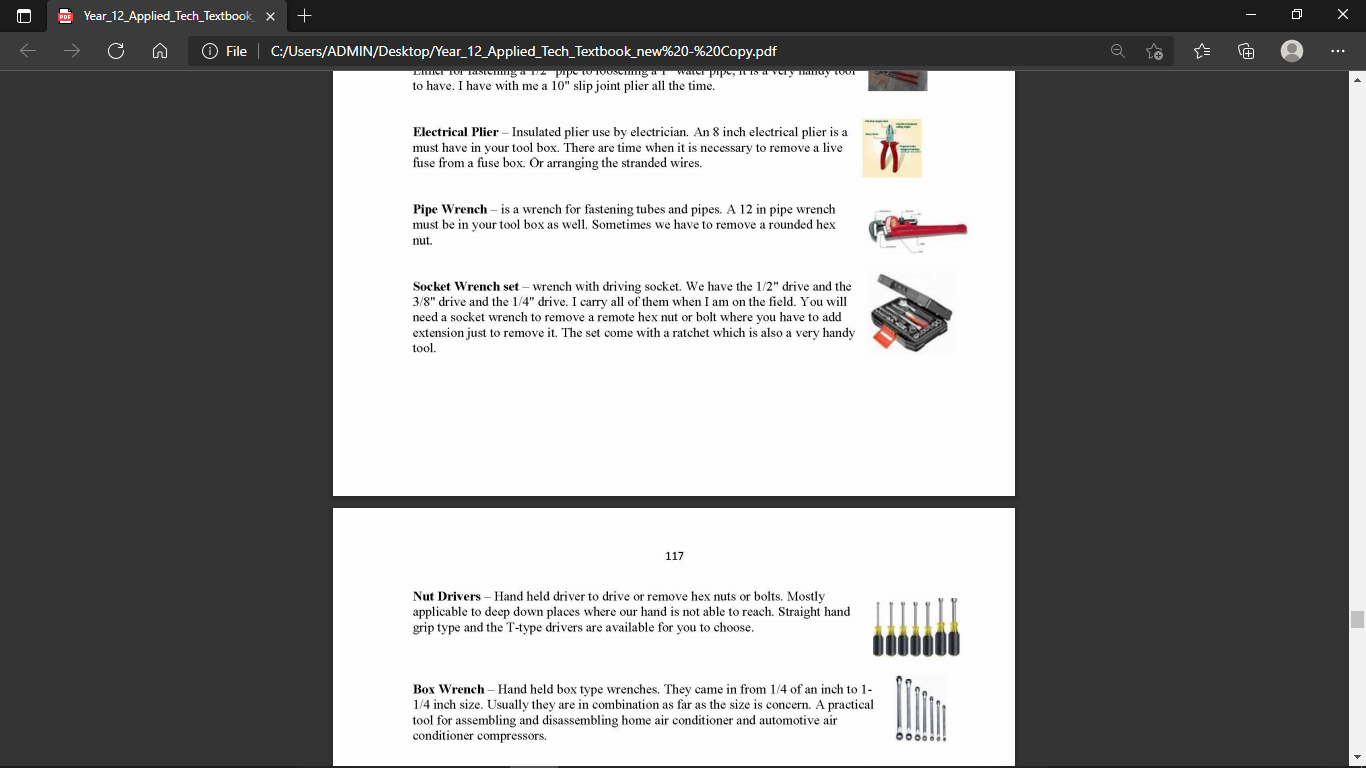
1. **PIPE WRENCH**

* A wrench for fastening tubes & pipes



1. **SOCKET WRENCH SET**

* Wrench with driving socket
* Socket wrench is needed in hard to reach area where extension is used to remove any nut
* The set comes with a ratchet which is also a very useful tool

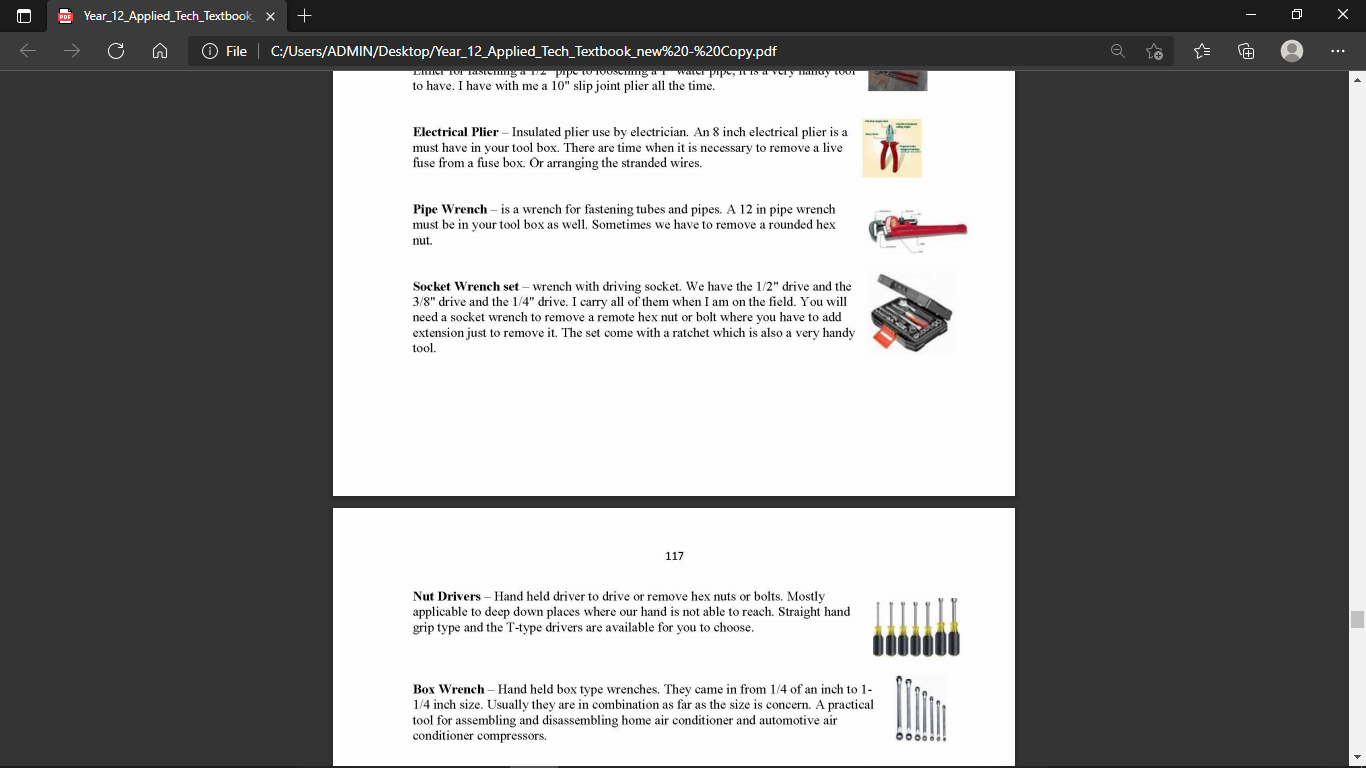


**LESSON 57: REFRIGERATION TOOLS**

**LEARNING OUTCOME: IDENTIFY THE TYPES OF REFRIGERATION TOOLS**

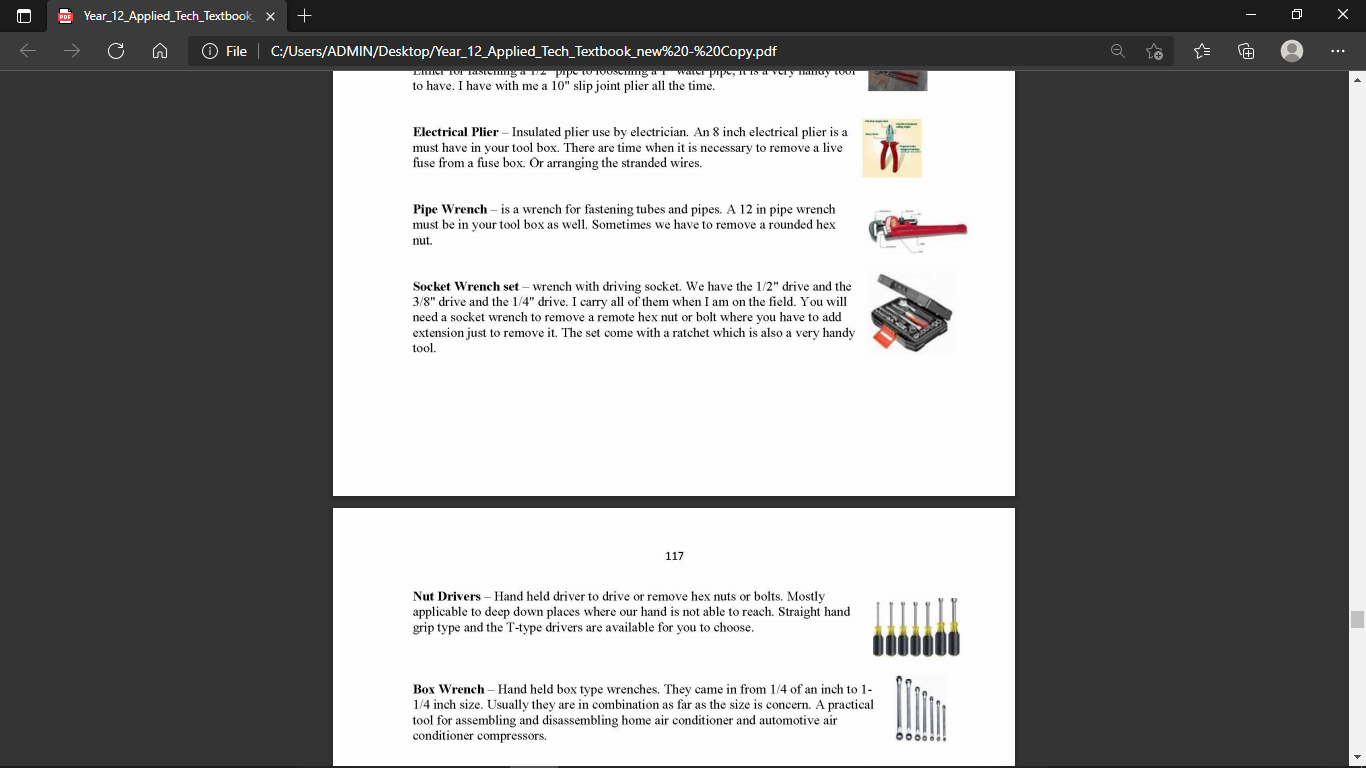
1. **NUT DRIVERS**

* Hand held driver to drive or remove hex nuts or bolts
* Mostly used in deep down places where our hand cannot reach



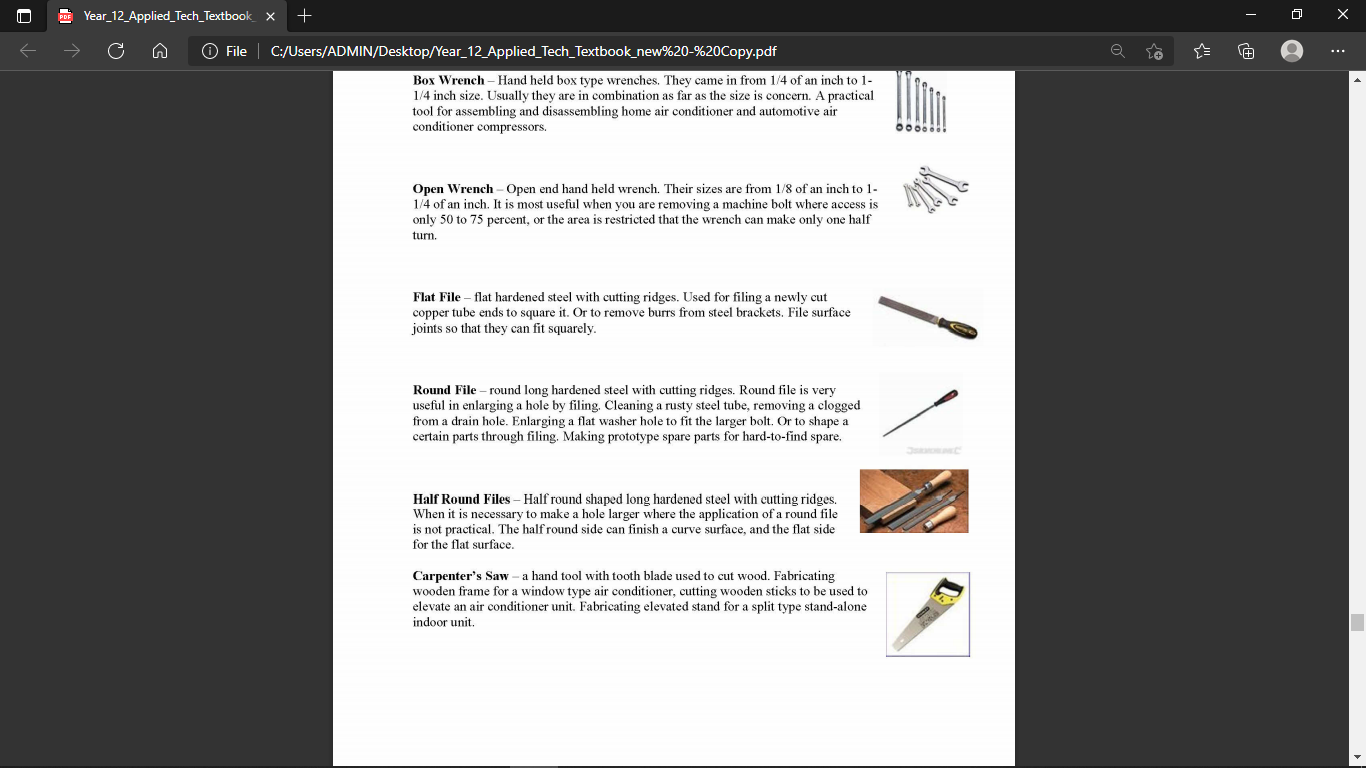
1. **BOX WRENCH**

* Hand held tool box type wrenches
* They range from ¼ of an inch to 1 ¼ inch



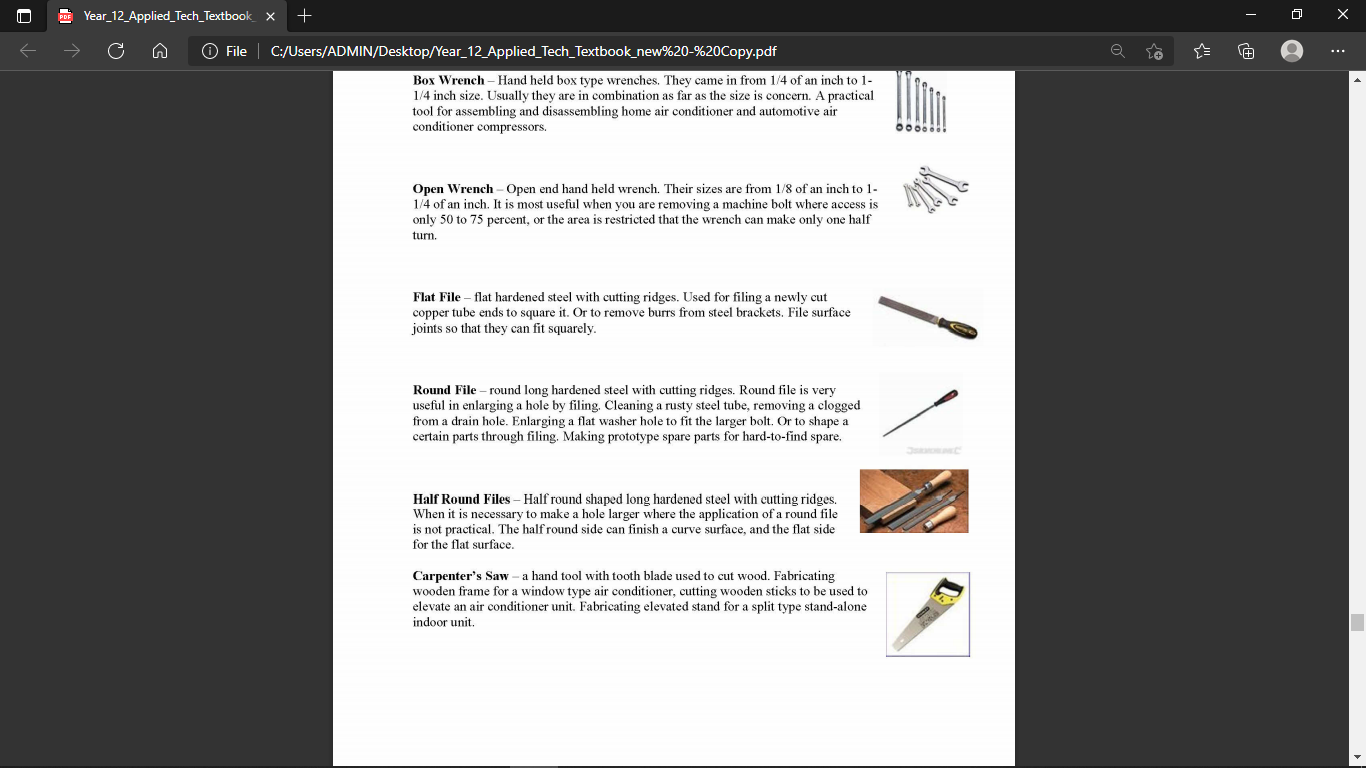
1. **OPEN WRENCH**

* Open end hand held wrench
* Their sizes from 1/8 of an inch to 1 ¼ inch
* For removing a machine bolt where access is only 50 to 70 %



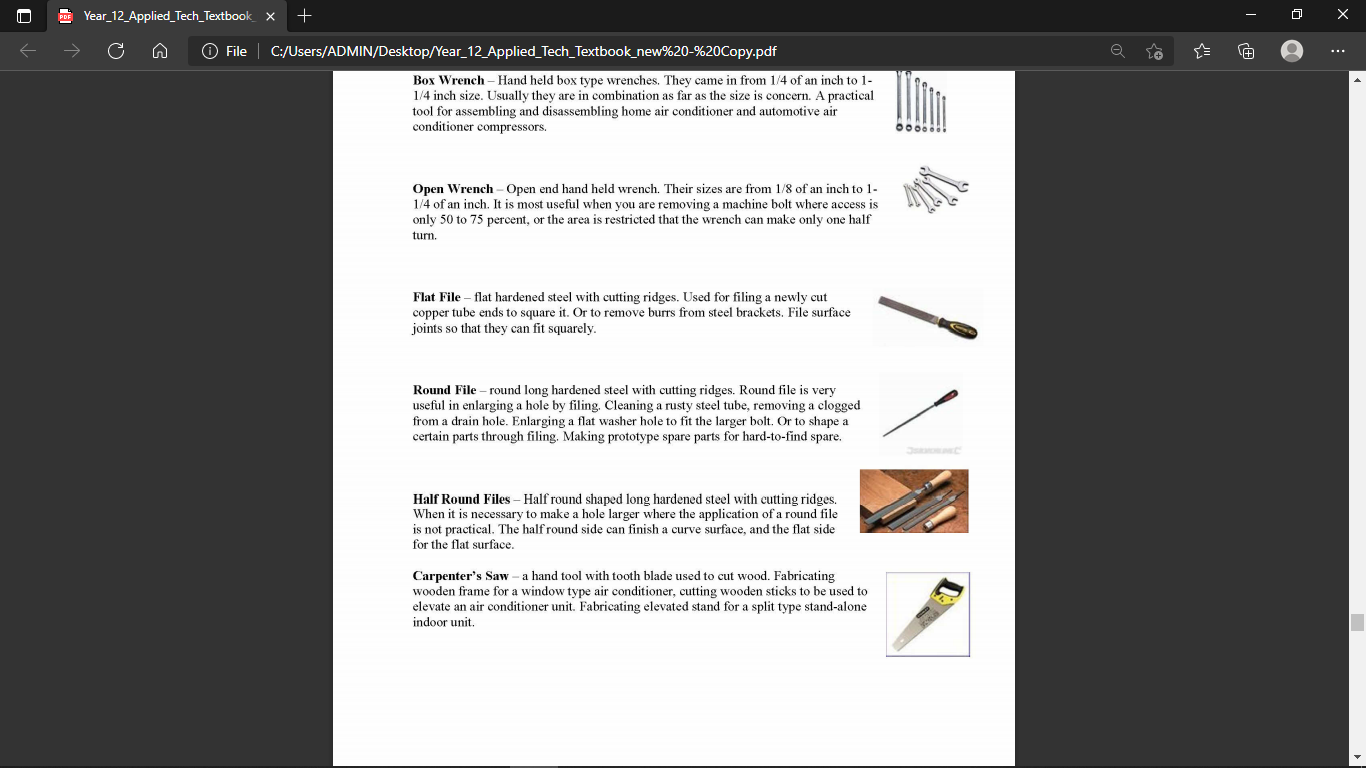
1. **FLAT FILE**

* Flat hardened steel with cutting ridges
* Used for filing a newly cut copper tube ends to square it or to remove burrs from steel brackets



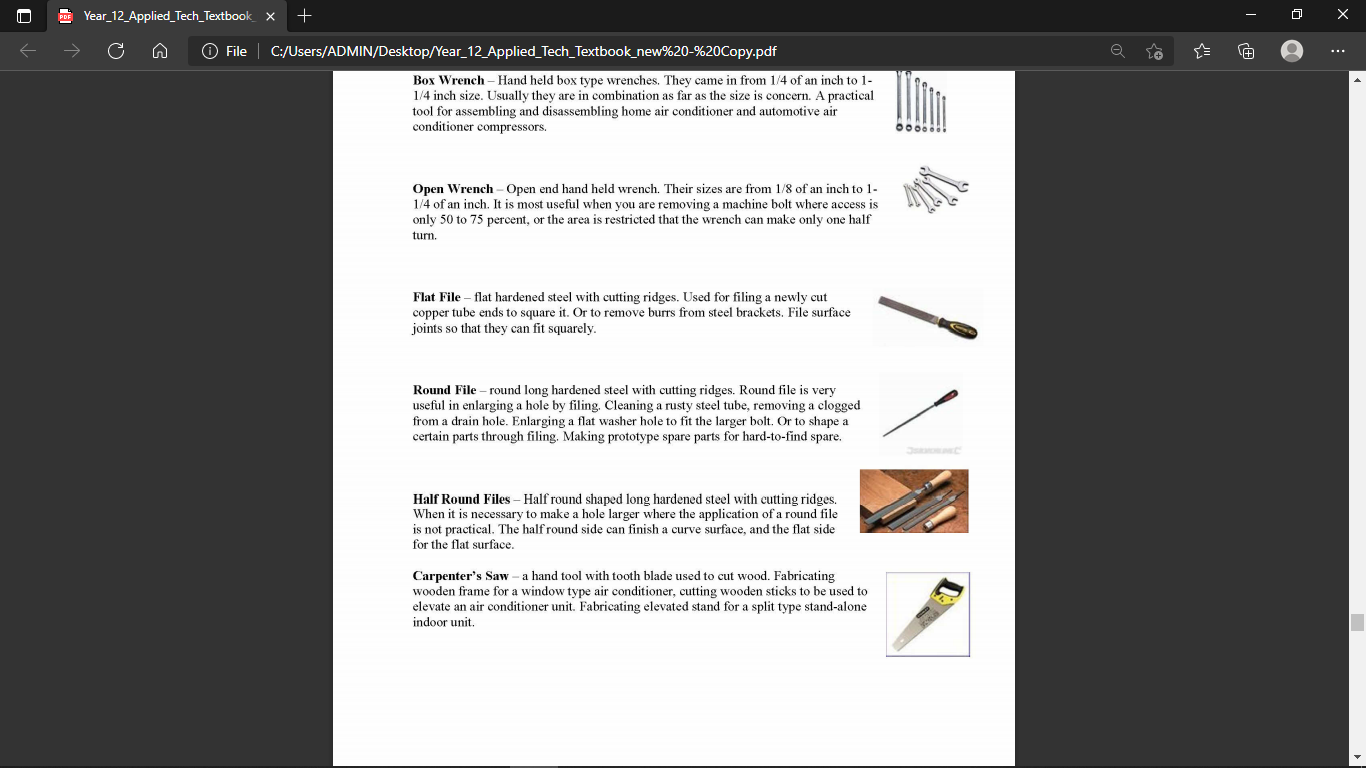
1. **ROUND FILE**

* Round long hardened steel with cutting ridges
* Very useful in enlarging a hole by filing
* Cleaning a rusty steel tube or removing a clogged drain hole
* Enlarging a flat washer hole to fit the larger bolt



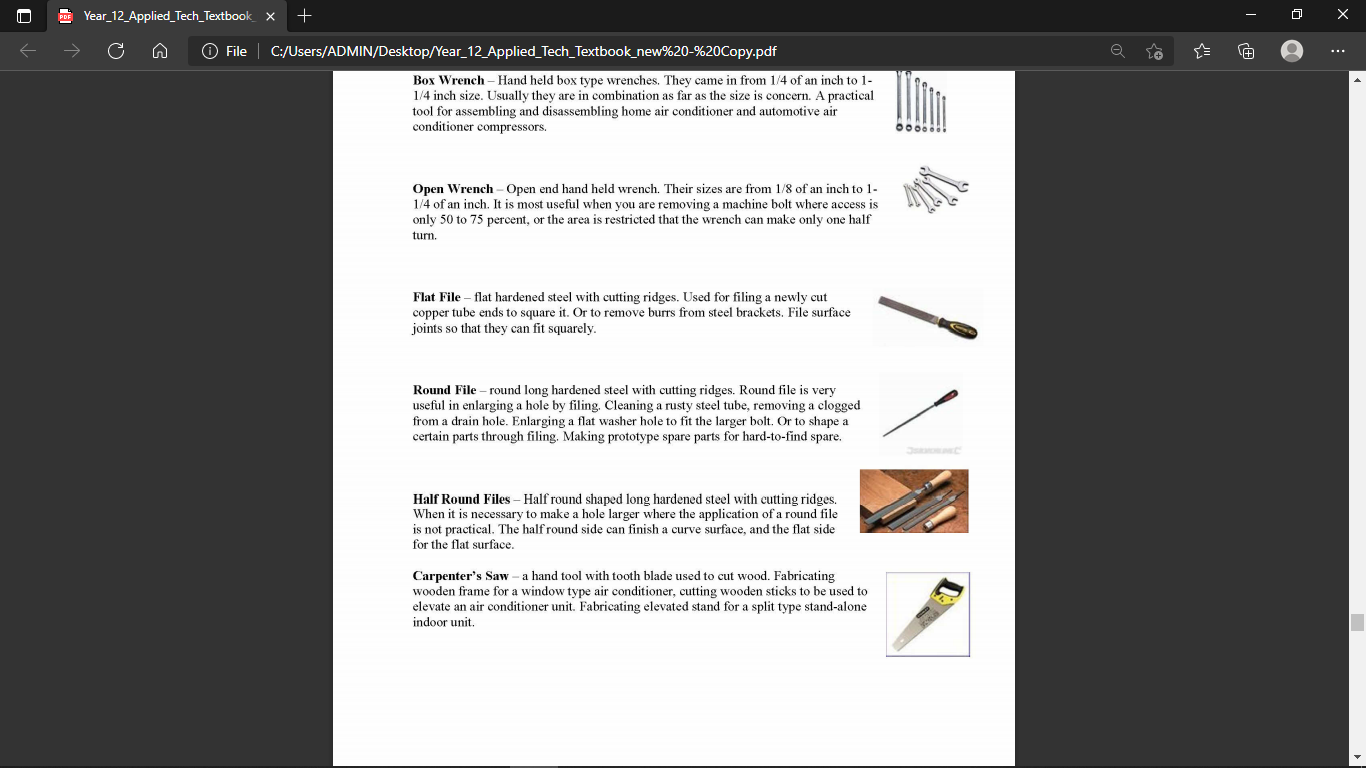
1. **HALF ROUND FILES**

* Half round shaped long hardened steel with cutting ridges
* The half curve can finish a curve surface & the flat side for the flat surface



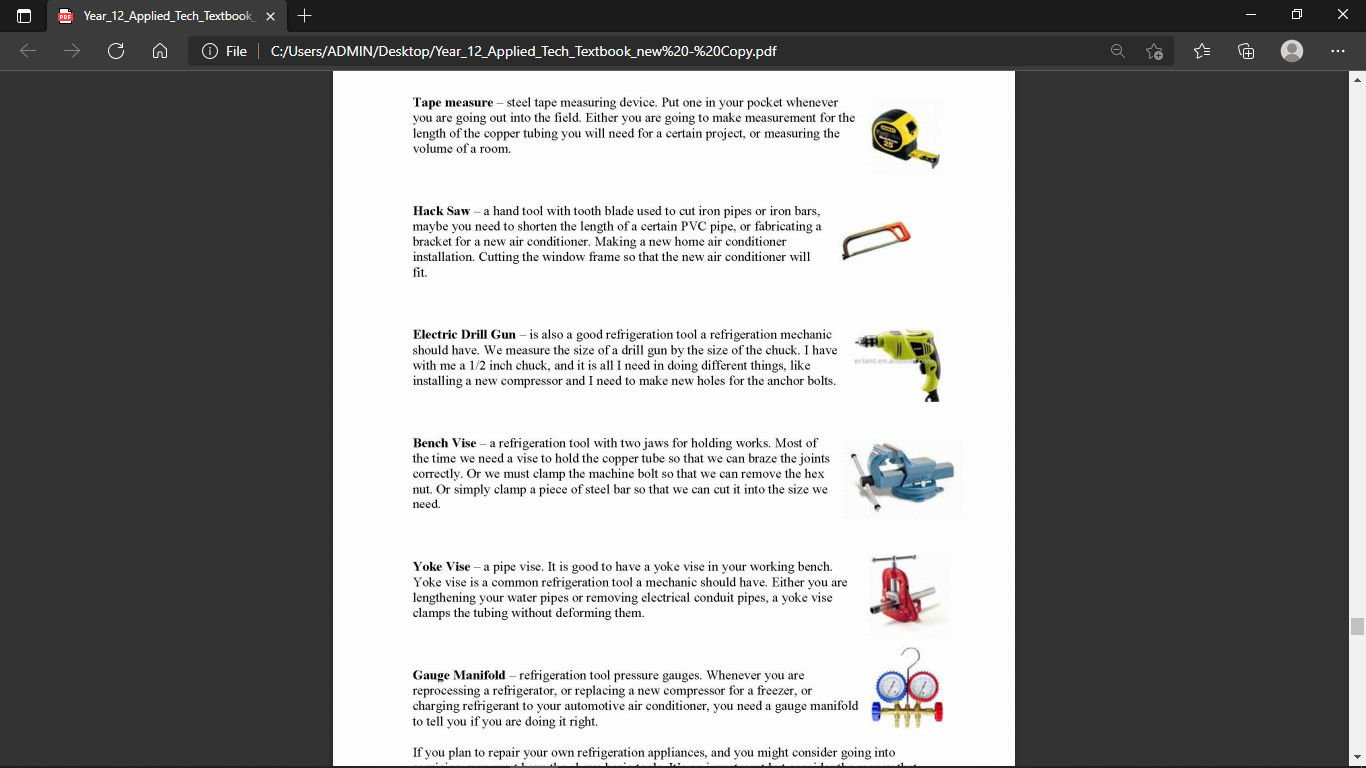
1. **CARPENTER’S SAW**

* A hand tool with tooth blade used to cut wood



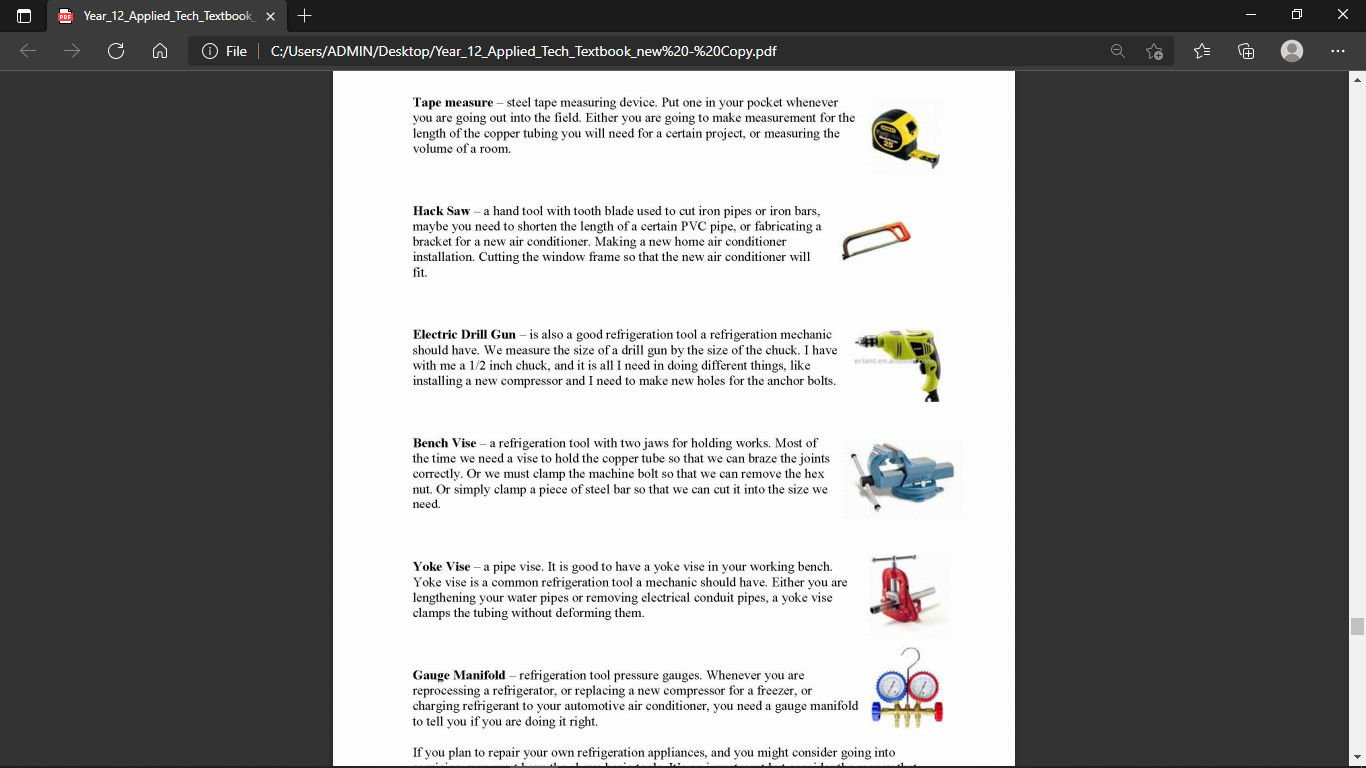
1. **TAPE MEASURE**

* Steel tape for measuring



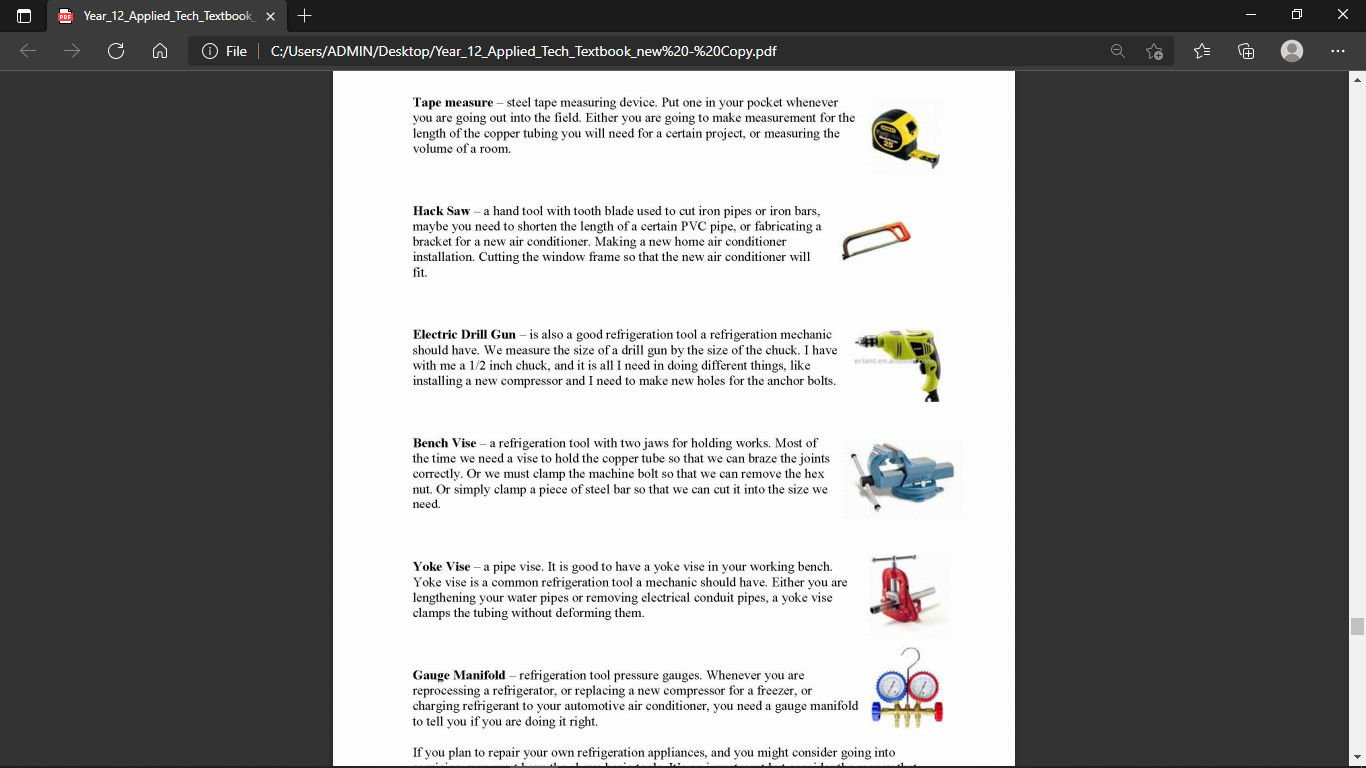
1. **HACK SAW**

* A hand tool with tooth blade used for cutting iron pipes or iron bars & PVC pipes



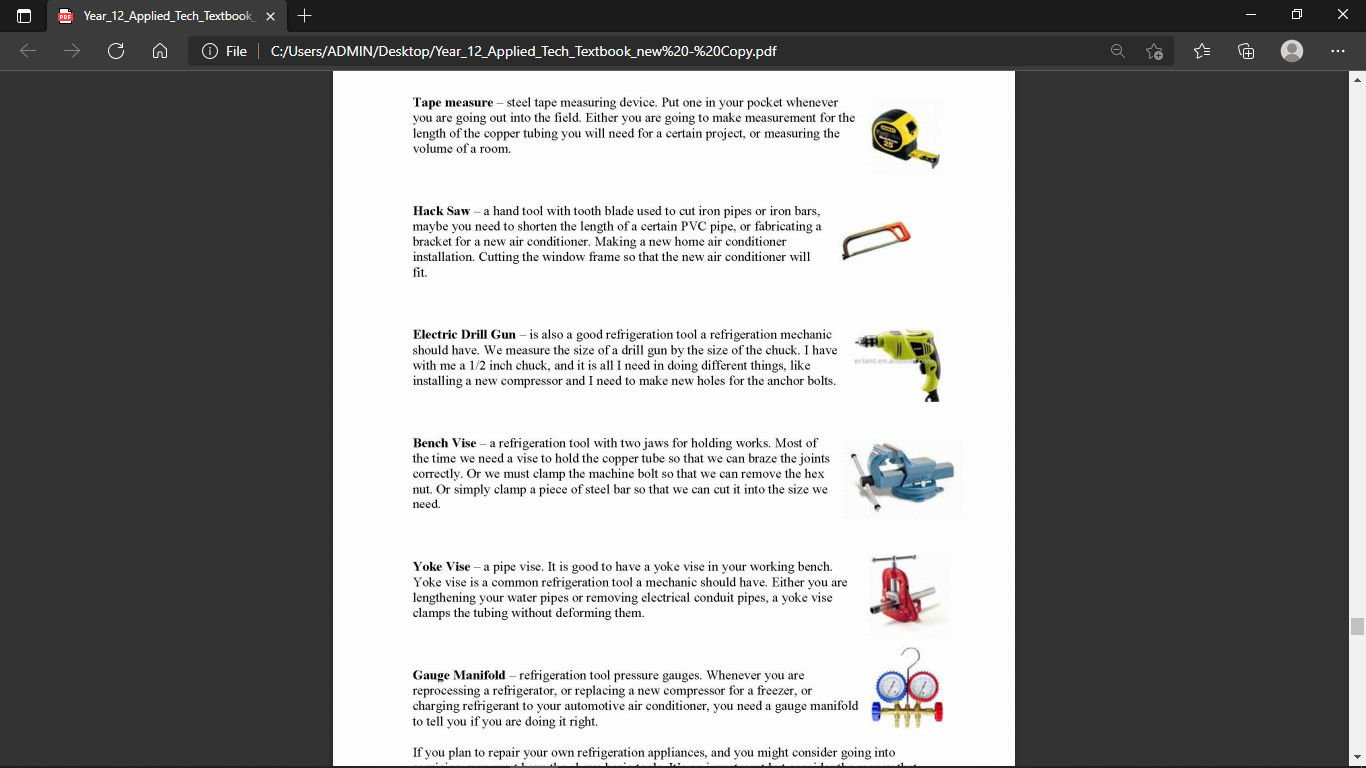
1. **ELECTRIC DRILL GUN**

* A tool used for making new holes for anchor bolts or screws



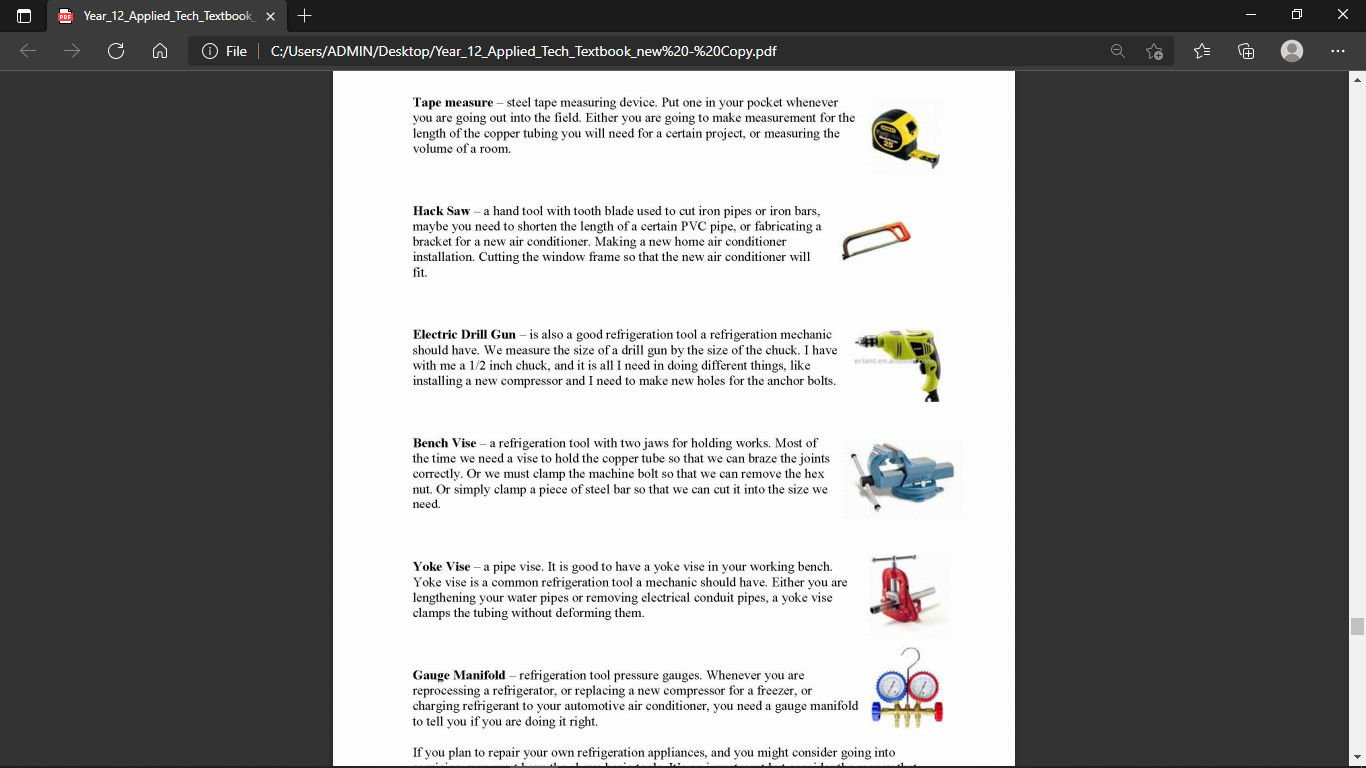
1. **BENCH VISE**

* A tool with two jaws for holding works



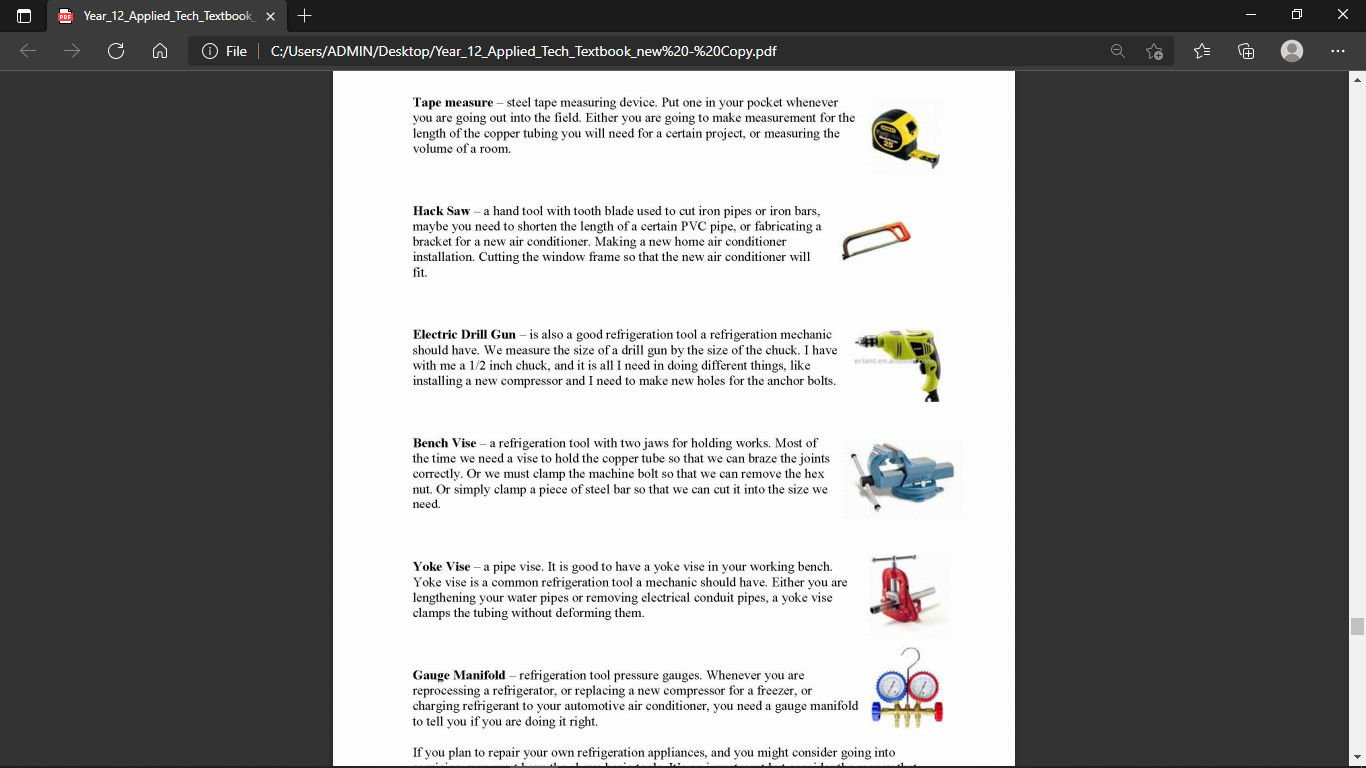
1. **YOKE VISE**

* A pipe vise
* It is used in lengthening pipes or removing electrical conduit pipes



1. **GAUGE MANIFOLD**

* A pressure gauge
* Very useful when reprocessing a refrigerator or replacing a new compressor or charging refrigerant



**LESSON 58: SAFETY IN REFRIGERATION & AIR CONDITION**

**LEARNING OUTCOME: IDENTIFY SAFETY IN REFRIGERATION**

1. **DISCONNECT ALL POWER SOURCES**

* Please be sure to disconnect all electrical power to the unit before you remove any of the access panels or attempt any maintenance procedures

1. BEWARE OF SHARP EDGES

* Be very careful when you handle parts or reach into units
* Many of the metal parts & housing have very sharp edges which can cause injury

1. FOLLOW ALL SAFETY PROCEDURES

* Follow all safety procedures suggested by the manufacture of the equipment

1. USE COMMON SENSE

* I f something seems dangerous don’t do it. Instead consult a professional

**SAFETY IN REFRIGERATION- HOUSEKEEPING**

* Use caution signs or cones to barricade slippery areas
* Do not store or leave items on stairways
* Return tools to their storage places after using them
* Do not block or obstruct stairwells, exist or accesses to safety & emergency equipment
* Do not place materials such as boxes in walkways
* Do not use gasoline for cleaning purposes
* Mop up water around drinking areas

**LESSON 59: LIFTING PROCEDURES**

**LEARNING OUTCOME: IDENTIFY THE PROCEDURES OF PROPER LIFTING TECHNIQUE**

1. **GENERAL**

* Test the weight of the load before lifting by pushing the load along its resting surfaces
* If the load is to heavy or bulky, use lifting & carrying aids such as forklift or get assistance from co-worker
* Never lift anything if your hands are greasy or wet
* Wear protective glove when lifting objects with sharp corners or jagged edges

1. **WHEN LIFTING**

* Face the load
* Position your feet 6’’- 12’’ apart with one foot slightly in front of the other
* Bend at the knees, not at the back
* Keep your back straight
* Get a firm grip on the object using your hands & fingers. Use handles when they are present
* Hold the object as close to your body as possible
* Perform lifting movement smoothly & gradually, do not jerk the load
* If you must change direction while lifting or carrying the load, turn your feet & turn your entire body. Do not twist at the waist
* Set down objects in the same manner as you picked them up
* Do not lift an object from the floor to a level above your waist in one motion. set the load down on a table or bench and then adjust your grip before lifting it higher

**LESSON 60: REFRIGERATION CONCEPTS & THE USES OF REFRIGERATION**

**LEARNING OUTCOME: IDENTIFY THE CONCEPTS & USES OF REFRIGERATION**

**The principle of refrigeration is based on the following concepts:**

1. Heat flow from a system at higher temperature to another at lower temperature
2. Fluids by absorbing the heat, change from liquid phase to vapour phase & subsequently condense by giving off the heat
3. The boiling and freezing temperatures of a fluid depend on its pressure. When a certain fluid at a very low pressure & temperature is compressed, even though its pressure increases, it may still be in the condensed state itself if its temperature is not increased to the saturation temperature corresponding to the increased pressure
4. Heat can flow from a system at low temperature to a system at higher temperature by the aid of external work down as per second law of thermodynamics

**USES OF REFRIGERATION**

* Ice making
* Preservation of food products & medicines
* Air conditioning
* Transportation of food stuffs, dairy products, flowers, etc
* Cooling of concrete for dams
* Treatment of air for blast furnace
* Special industrial processes such as chemicals, medicals, surgical aids, etc
* Processing of food products, beverages, textiles, printing work, etc

**ACTIVITY**

1. State the use of the following tools
2. Tube cutter
3. Flaring tool
4. Swagging tool
5. Pipe wrench
6. Nut drivers
7. Flat file
8. Tape measure
9. Bench vise
10. State the four main safety in refrigeration & air condition
11. State the first procedure when lifting a load
12. State three uses of refrigeration

**WORKSHEET**

|  |  |
| --- | --- |
| **1.Name the following refrigeration tools** | |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |