# Power Tools

## Module Two
### Introduction To Manufacturing

# What is Covered?

- Goals of this presentation
- Power Tools
  - Drills
  - Saws
  - Sanders
  - Nail Guns
  - Misc. Tools
- Safe Practices
- Deliverable
- Hands On Activity
- References

# Powered Drills

# Hand Held Drills

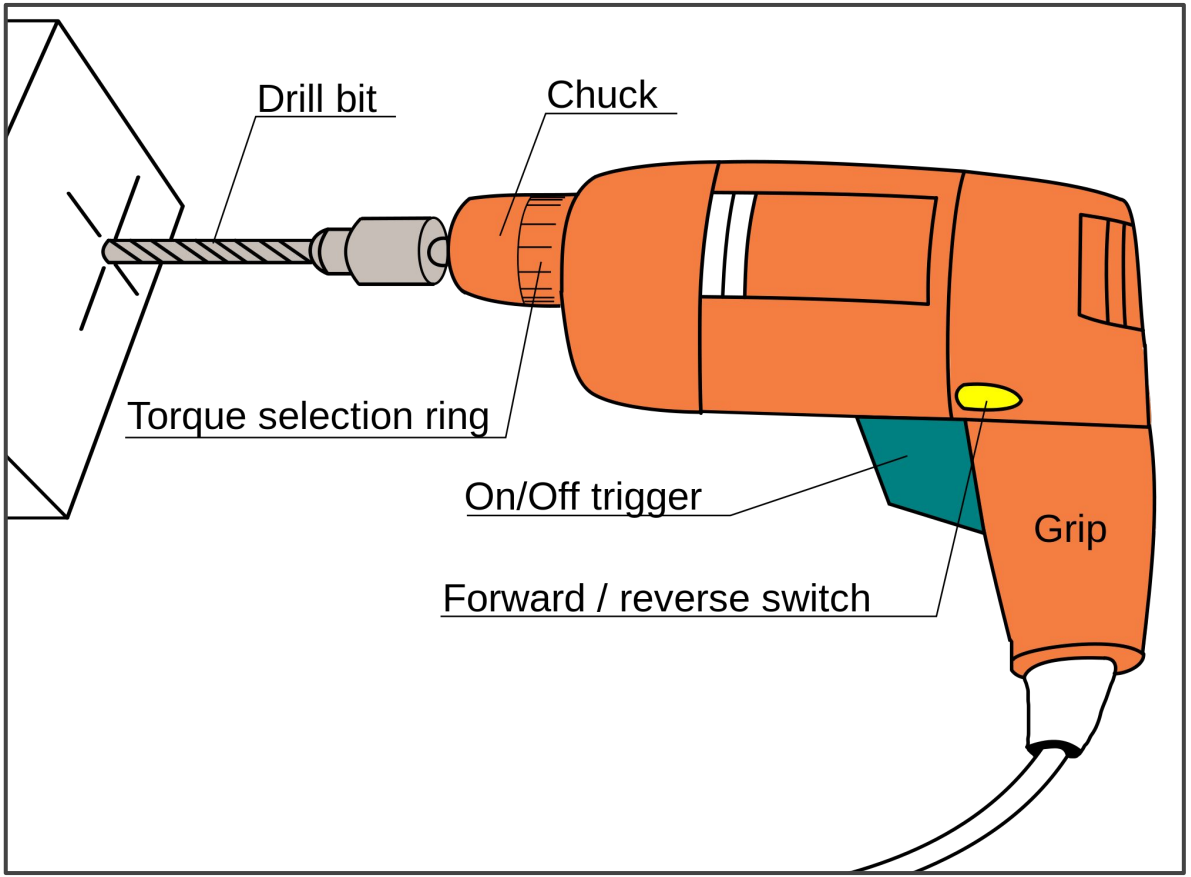
Pistol Grip Corded Drills, Hammer Drills, Impact Drills, Cordless Drills

# General Handheld Drills

Handheld Drills are comprised of the same basic parts including:

- Trigger: For starting and stopping drilling
- Chuck: For holding the various drill bits
- Bit: Interchangeable, is used for cutting or fastening
- Direction Switch: Decides which direction the bit is spinning

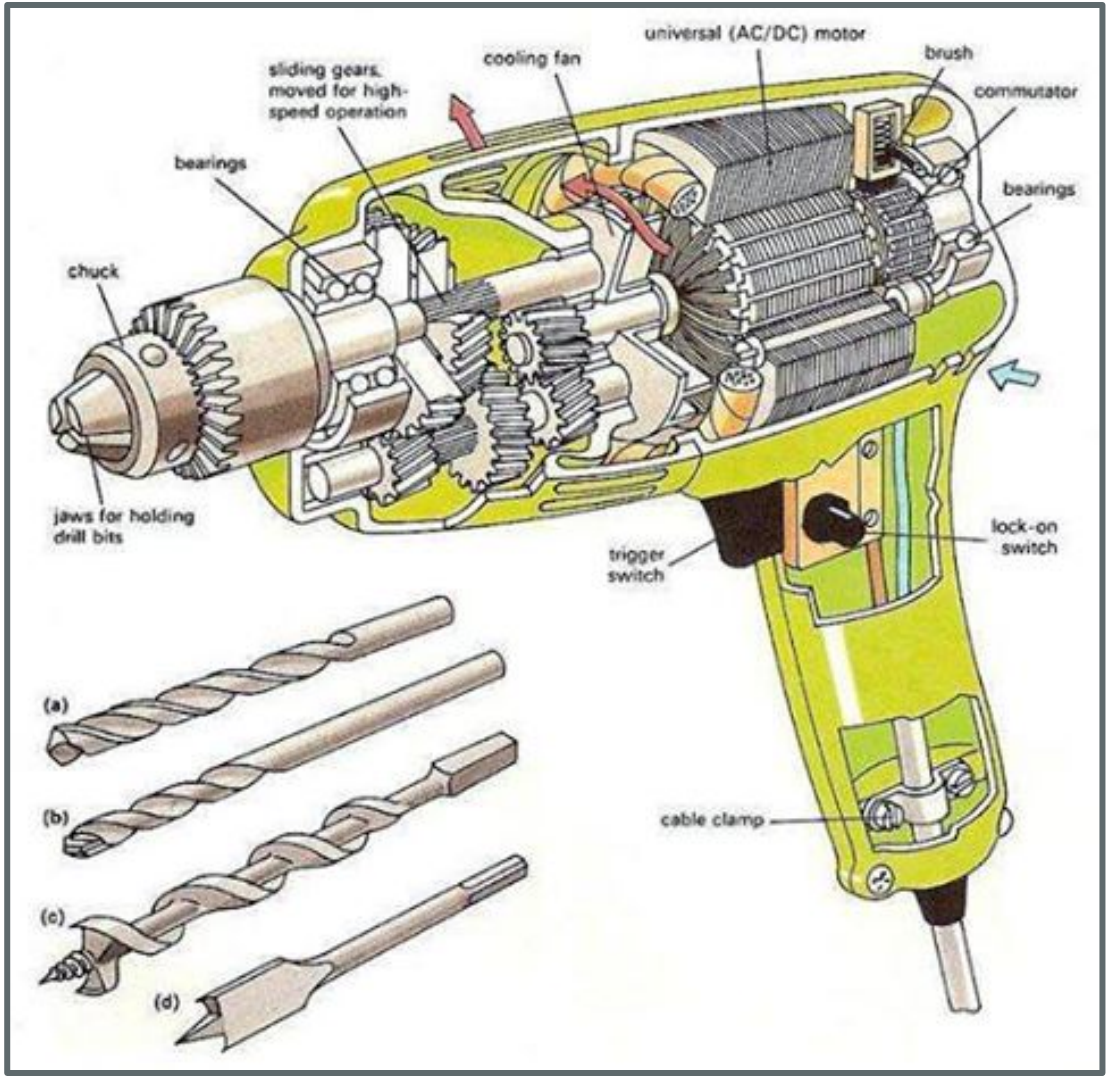
There are numerous types of drills for different activities, but the main task of drill is to bore holes or driving fasteners (Screws, etc).

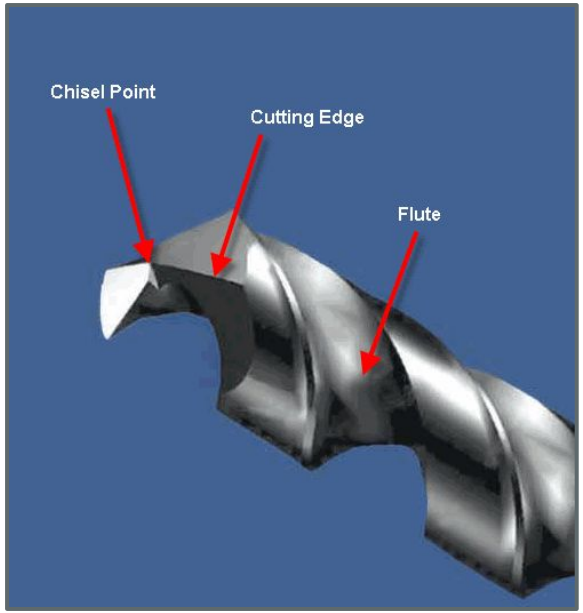


# Drill Mechanism

Basic drills run with an electric motor which rotates the chuck of the drill to engage the bit. Depending on the drill, various gear systems are employed to up the torque the drill can produce.

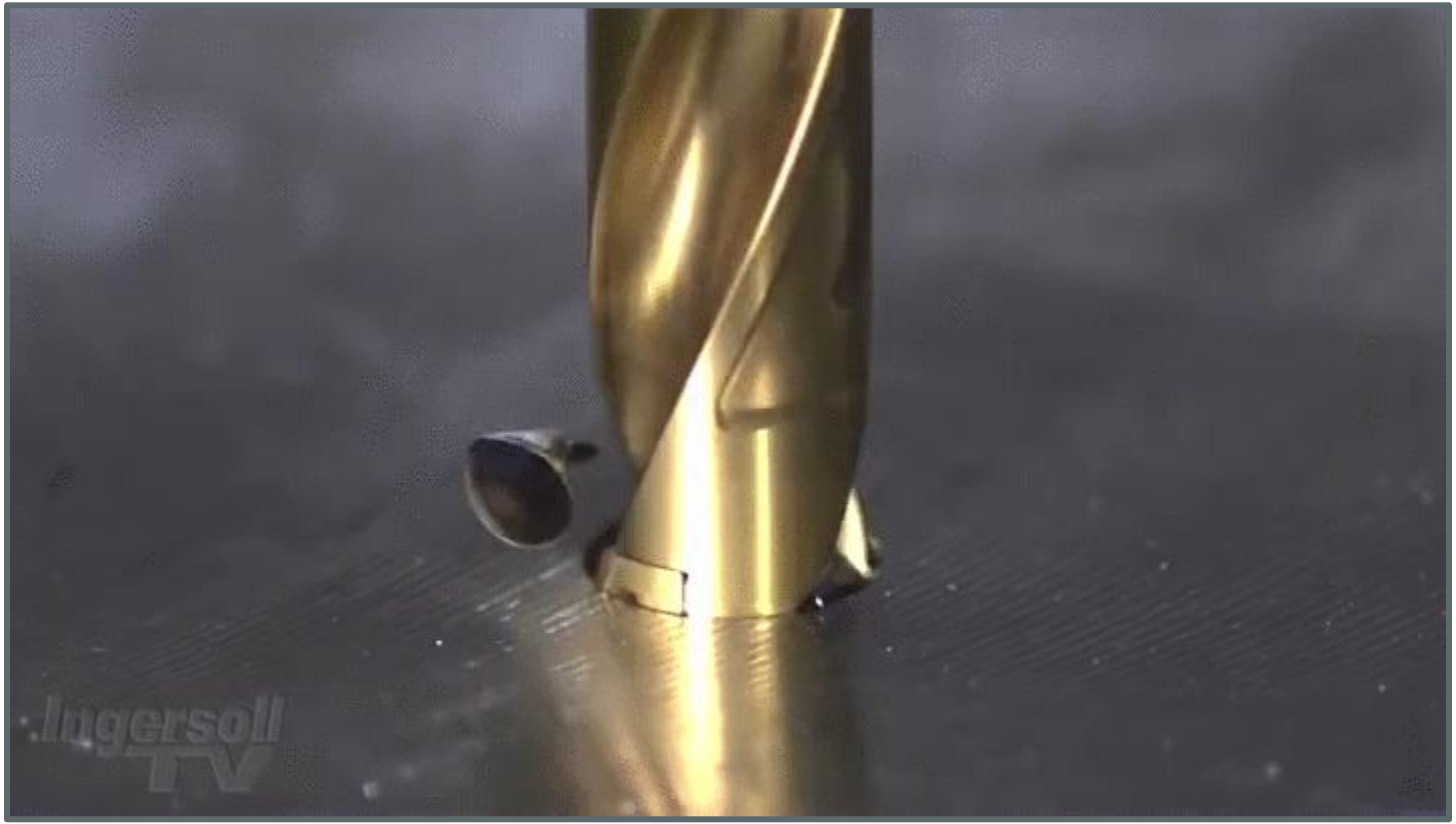
Some drills are run via electric wire, while some are battery powered and rechargeable. Other still used in oil drilling or construction run with pneumatics.






# Bits

Cutting bits are for boring holes in material. The type of drill bit depends on the material you are cutting. The far left picture shows a normal twist bit, which includes a chisel point, cutting edge and fluke. The chisel point starts the cut, while the cutting edge pulls the bit down into the material. The fluke allows chips (wasted material) to pass out of the cutting space. In the right picture, from left to right is pictured a twist drill bit, spur bit and forstner bit. They are used for cutting various sized holes.



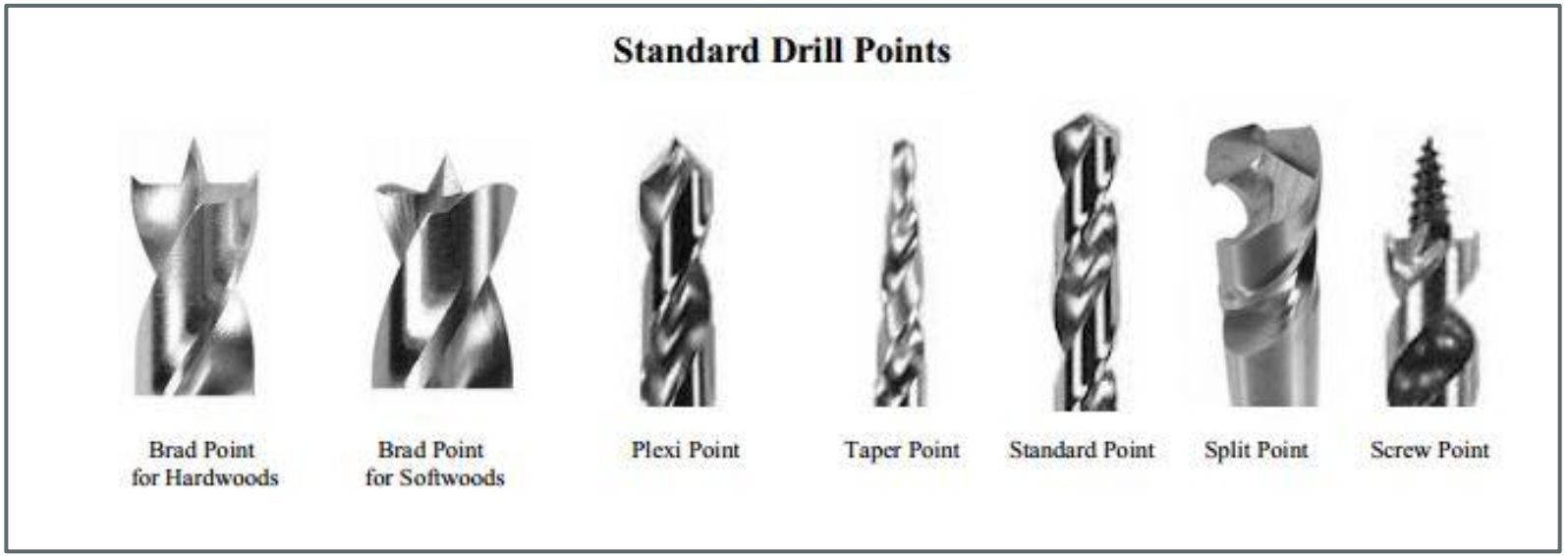

Drill Bit in Motion

# Bits continued...

Driving drill bits are used to drive fasteners into material.  Different drill bits are used for different types of fasteners.

Changing drill bit can be done a few different ways.  Some drills come with a chuck key that can be used to loosen and tighten the chuck.  Some chucks come with a quick release and others involve tightening and loosening the chuck by twisting.

Videos to Watch:
Changing Drill Bit
Quick Release Drill Bit No need to watch the whole thing)




# Changing Drill Bits


# Safe Usage

With any tool, safety is of the utmost importance. Follow these tips for drill usage.

- Avoid baggy clothes or jewelry and tie back long hair.
- Depending on the project, put the drill straight against the screw or piece being worked on, not at an angle.  Push with your arm straight down or against the work.
- Avoid slipping.  Don't point the drill towards you or anyone else while working.
- Secure your workpiece, to avoid slipping.
- Avoid touching the drill bit after usage, it can be hot.

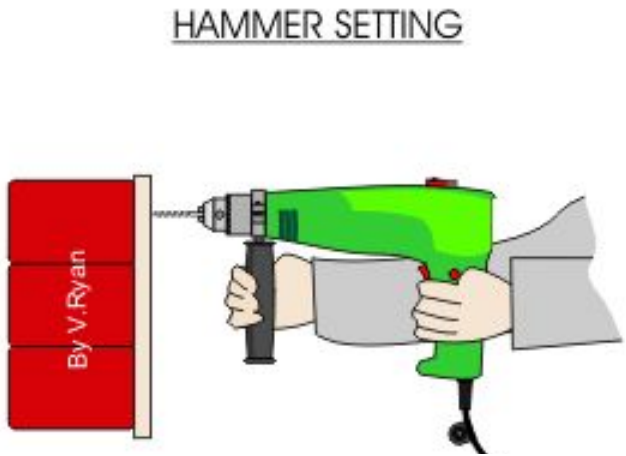
# Variations of Hand Held Drills

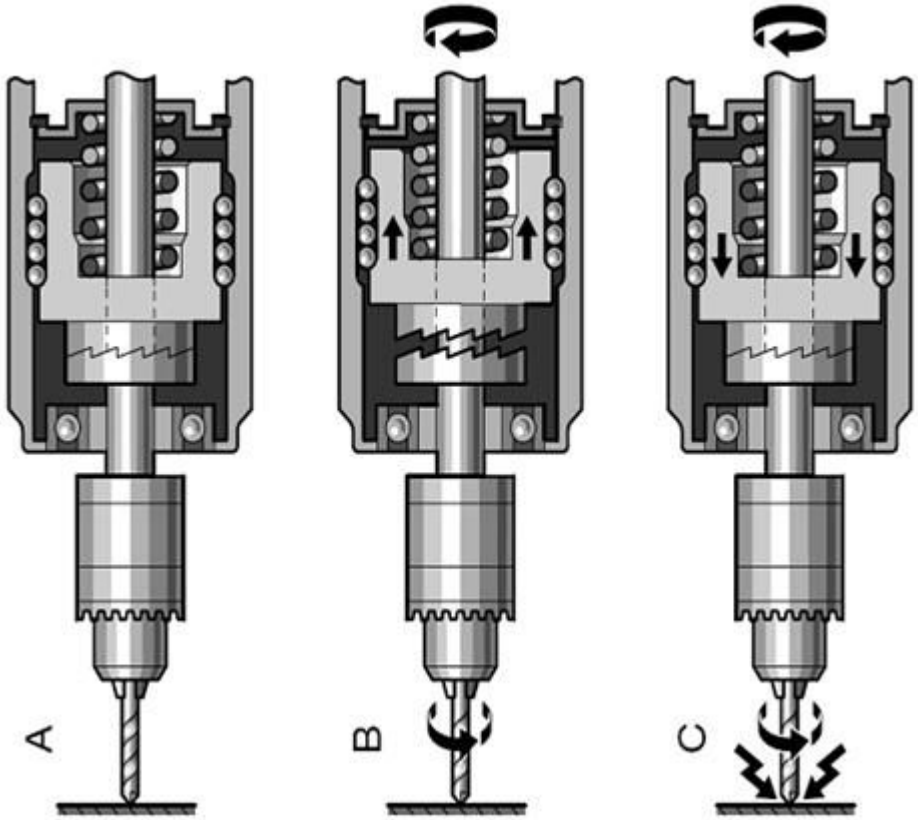
There many types of interchangeable bits, but also different types of drills for all projects.  A few are covered in the next slides.

- Hammer Drill
- Impact Drill

# Hammer Drill

Sometimes called rotary drill. As it spins, the bit also moves back and forth in quick hammering motion. These drills are used to breaking up concrete and brick, while the spinning bit can whisk away bits of the concrete and debris. These pulses are short and very rapid.

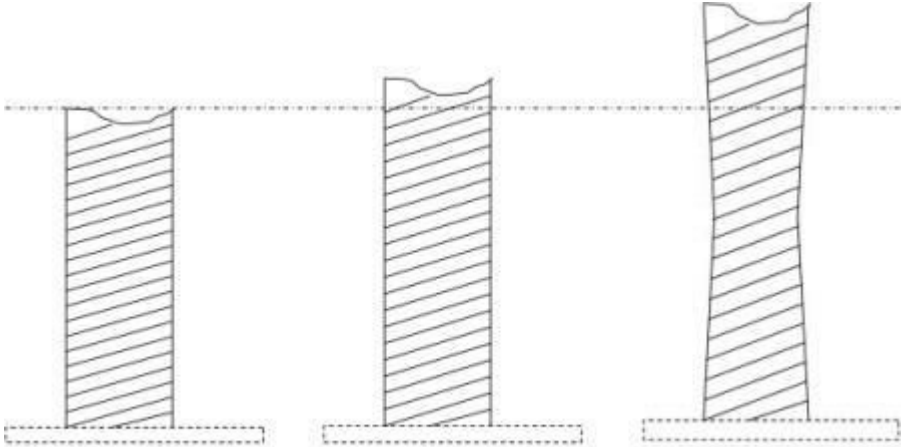



Hammer Action


# Impact Drill

Impact drills have very few tasks, and are used in driving screws, usually large ones, or removing them, especially in cases where screws are over torqued. The impact drill uses a large amount of torque simply for removing or driving screws.

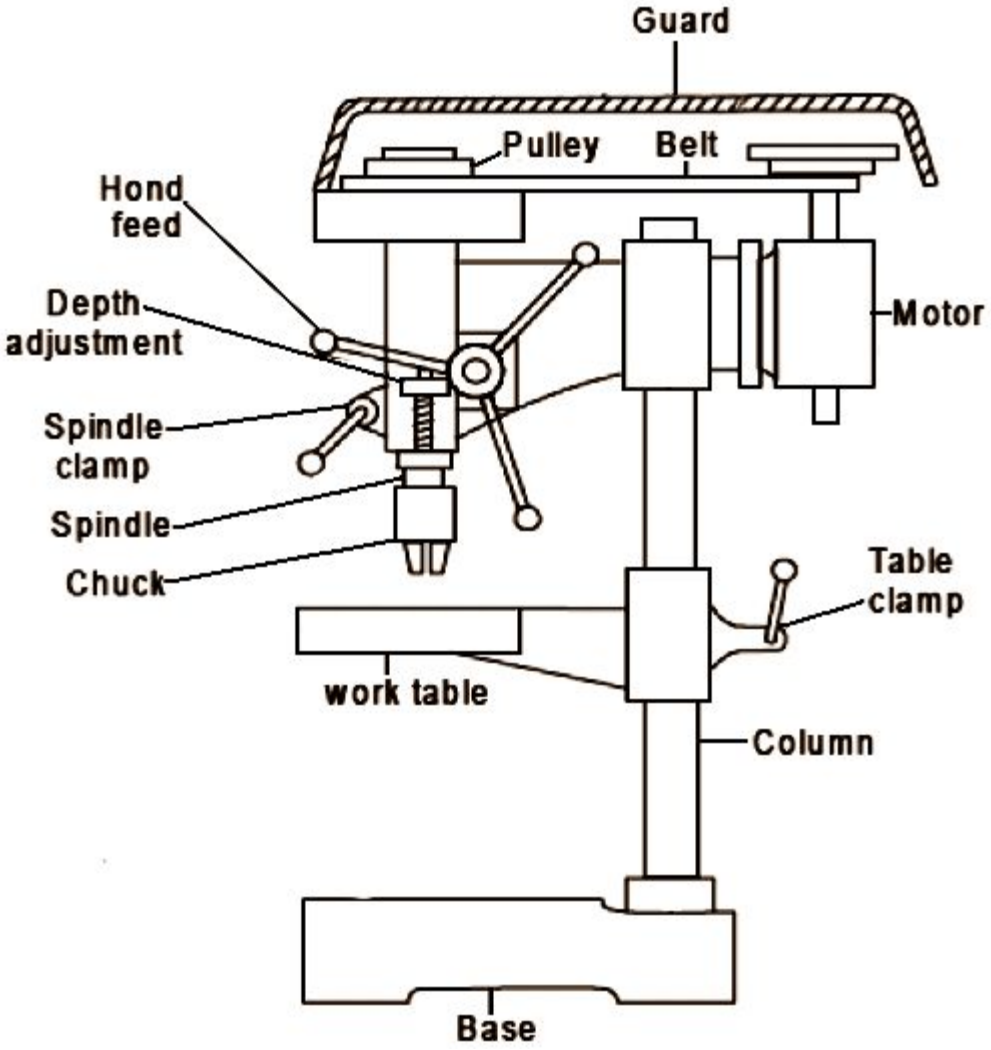


# Drill Press

Pedestal Drill, Bench Drill, Pillar Drill

# Drill Press Parts

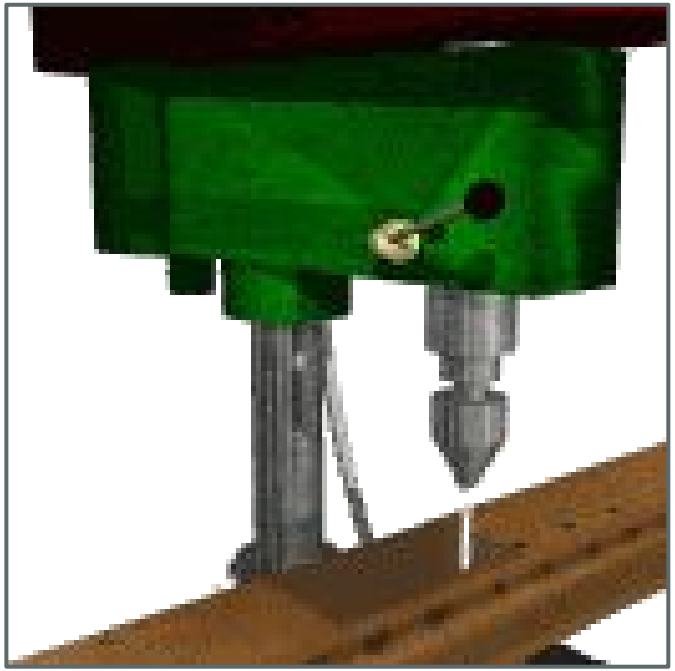
- Chuck: Where different bits can be fit for various drilling purposes.
- Feed handle: Pulling the handle towards the operator lowers the spindle and chuck for drilling.
- Work Table: Where you place work, often times this includes a clamp.
- Depth Adjustment: can be set to predetermine cut depths instead of guessing.
- Table clamp: Table can be lowered or raised depending on work.
- The pulley, belt, and motor are generally enclosed in a casing guard.



# Usage

A drill press is used for drilling holes. The drill press requires less effort for drilling large holes through different types of materials.

The drill press can get bound up or stopped if too much waste material collects in the hole being drilled.  To prevent this on deeper cuts, lower the drill press partially and then remove and blow out or swipe away waste, then continue to lower.



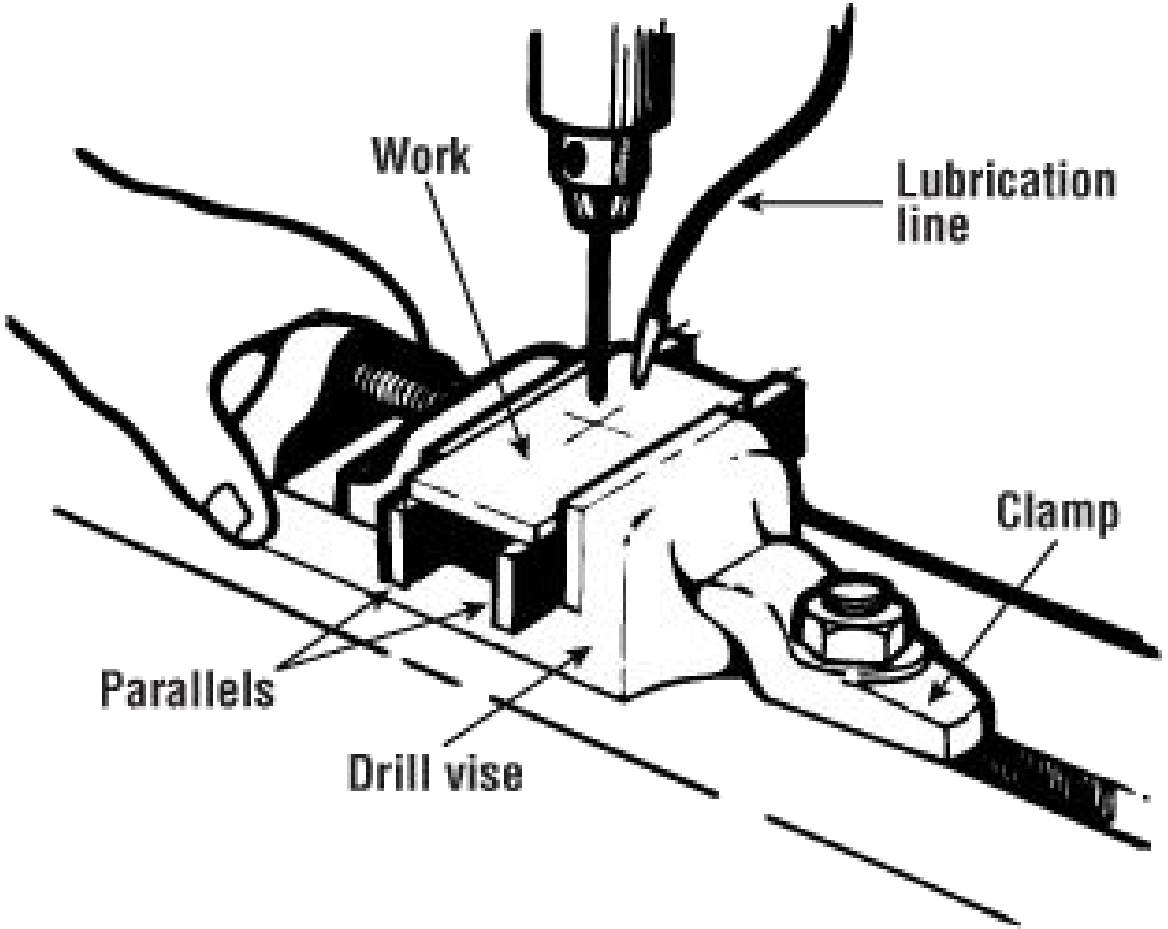
How to use

# Safety

Make sure to clamp work in place when using a drill press.

Pull back hair and long clothing. Any spinning component should be taken seriously.  Hair and clothes can be grabbed and pulled quickly into a machine.

Make sure your bit is securely tightened in the chuck.



# Powered Saws

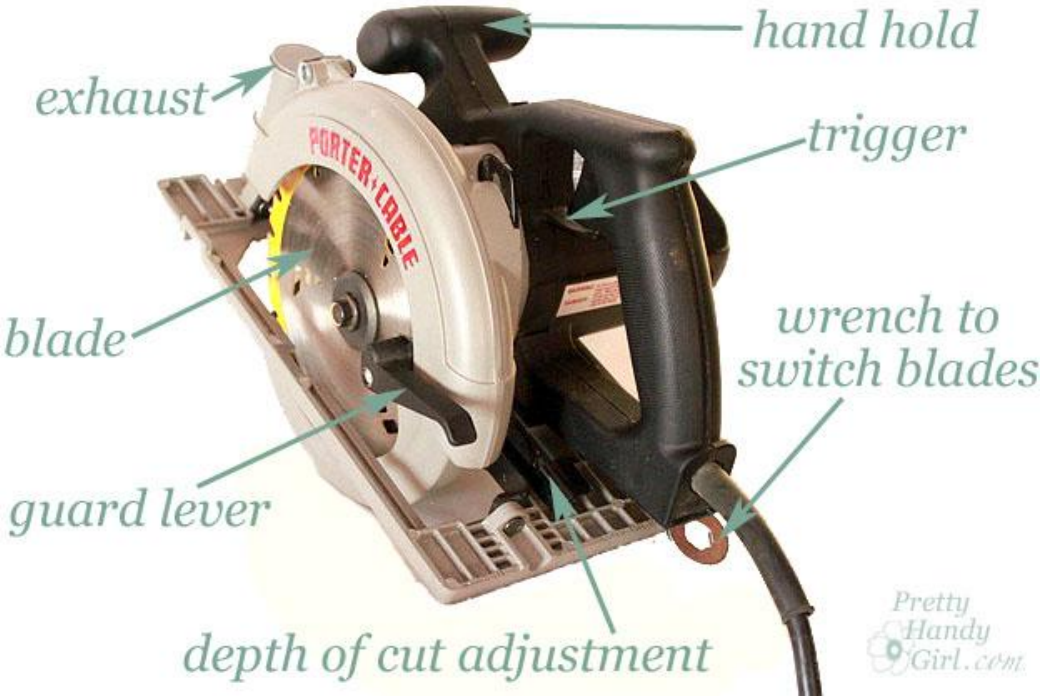
# Powered Saws

Circular, Table, Reciprocating, Band, Etc.

# Saw Basics

There are a huge amount of saws available for different processes.  Saws are used to cut pieces of work.  These cuts can be intricate and small or used for huge cuts in large projects or even chopping down trees or cutting simple lumber for home projects.

Saws all involve a moving saw blade, whether that be in a rotary motion or a back and forth motion, all include a sharp edged blade with teeth to slice work.


# Circular Saws

Circular Saws are a powered tool that uses a disc or blade to cut material using a rotary motion. The blade spins around an arbor and comes in numerous variations, but often times the term “Circular Saw” refers to the handheld version of this powered saw. Often times the saw involves a guide or base plate which is where the saw is place on the work. Then, the saw is started with a trigger button. The blade often times can be lowered and raised for different cutting depths. Depending on the material, the blades can be interchanged. Also, the blades can be turned for angled cuts.

# Circular Saw Usage

Safety is of utmost importance. When working with any piece, make sure to have the piece clamped or secured. Make sure not to cut toward any person, including yourself. Circular saws, like any saw, can sometimes grab material and fling it in unpredictable directions.

Pay attention to cutting, and do not over work the blade. If it seems to be stalling, stop and begin again after it has time to cool. When stopping a saw, make sure to wait for it to come to a complete stop before touching the blade.

NO

YES

# Band Saw

A band saw uses a continuous blade in a loop which is used to cut various material. Band saws come in a few orientations; Upright or vertical, horizontal and portable They can be used for cutting many types of material, depending on the blade type, speed and how large or small a piece is.

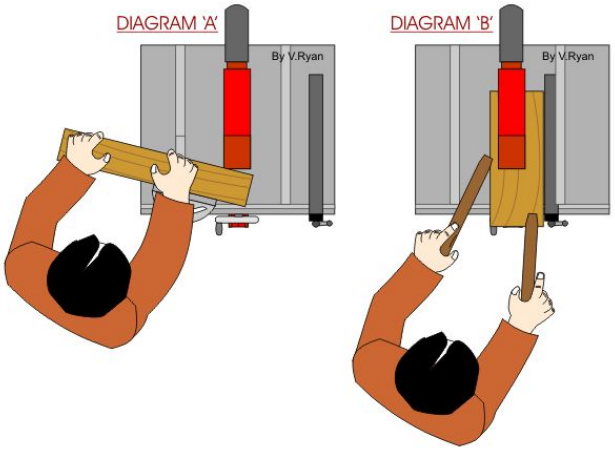
The next few slides cover the different types of band saws.

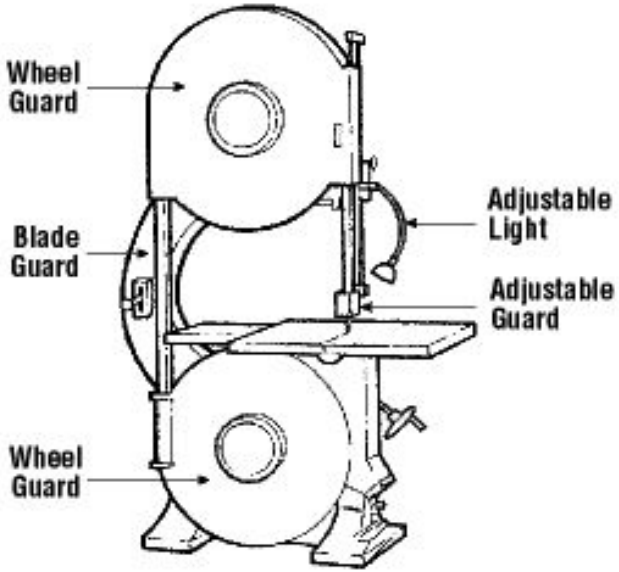


# Upright bandsaw

The upright band saw is used for cutting material as it is slid along a workplace.  In the diagram to the top right you see two techniques for cutting work.

If you parts are small, it is sometimes a good idea to use a guide or a stick to push a piece through.



# Horizontal bandsaw

A horizontal band saw cuts a part using either gravity feed or hydraulic or electronic feed.  The part is slid below the blade, and the blade slowly is lowered through the part.

In the gif to the right, you see the liquid lubrication.  This keeps the part and blade cool and moving.

# Portable BandSaw

The portable version of the band saw, this little machine is used similar to any portable saw, like a circular saw.

Watch the short video to explore how a portable band saw can be used.
Portable Band Saw Video

These saws use the same continuous band of blades as the larger band saws shown to the right.  These can be changed fairly easily when they wear out.  Make sure to set them evenly and straight within the machine.



# Table Saw

A table saw is a general term for a very wide range of saws, all of which are embedded in tables or are in general stationery.  some are very large for cutting huge workpieces and lumber, while others are smaller for construction or hobby.  The table to the left can be adjusted to accommodate different material cutting depths, and includes a guide shown on the right of the table which can be used for setting exact cut sizes.


For safety, it is a good idea to lower to blade until it is out of sight when not in use.

# Reciprocating Saw

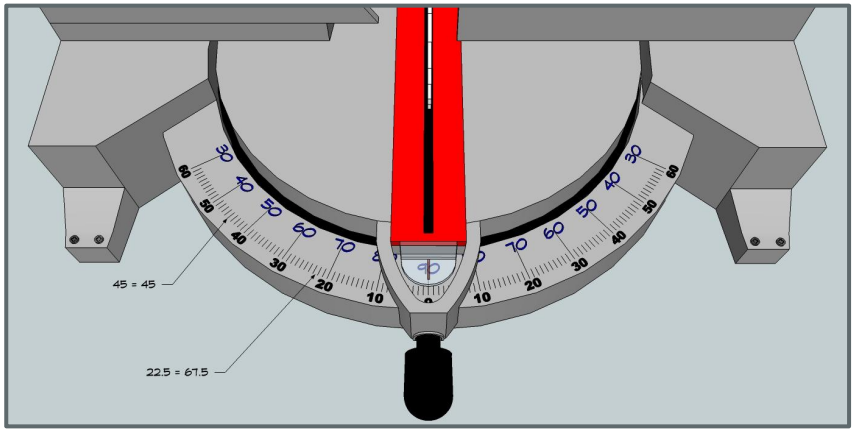

A reciprocating saw uses a quick back and forth motion to cut and remove material. These are very versatile saws that have easily interchangeable blades for use with various materials. These are handheld and can be used to make quick cuts in small hard to reach areas.


# Miter Saw

A miter saw is very similar to a circular saw, but it is not portable. The miter saw can easily be adjusted to make cuts in many angles.  These are very common in workshops as they are smaller than table saws, but can easily cut lumber.

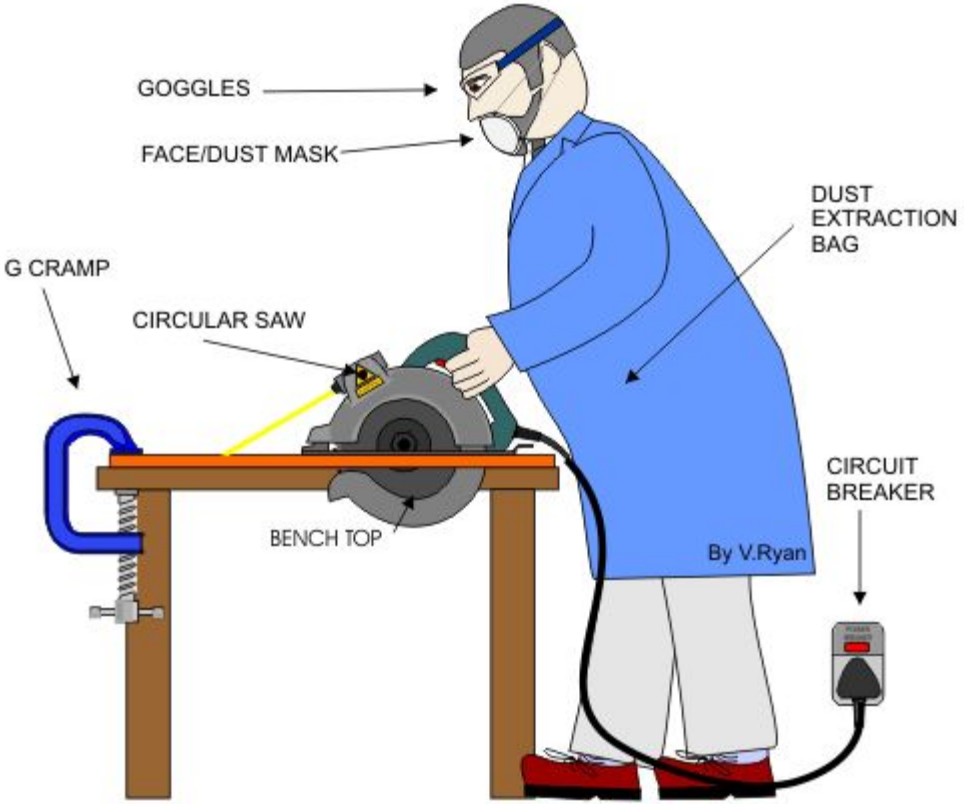
The lower image shows how the angle of the blade can be adjusted.

Video of usage

# Saw tips

- Don’t start a saw directly against a workpiece. Begin the blade first and then move the work into the blade.
- make sure to stop the blade if you smell burning or see the part stripping or shattering.
- If the blade stalls, release the trigger and slowly remove the piece.
- Use guides when you can to eliminate risk to fingers and hands.
- When applicable, use a clamp or secure a piece before cutting.
- Wear safety glasses and a respirator if necessary. ALWAYS wear earplugs or headphones to protect hearing.



# Other Powered Tools

# Power Sanders

Belt Sander, Orbital Sander

# Sander Basics

Powered sanders are used for quickly sanding and shaping materials. There are hand sanders and larger belt sanders.

Belt sanders work like a band saw, where a loop of abrasive material is wrapped around some motors. Then, when in motion, work is brought to the moving belt and is sanded down. These belt sanders come in tiny table top versions and large scale industrial options.

Hand sanders are used for shaping material or resurfacing materials.

If interested, check out a basic video

# Nail Gun

Electronic, Pneumatic

# Nail guns

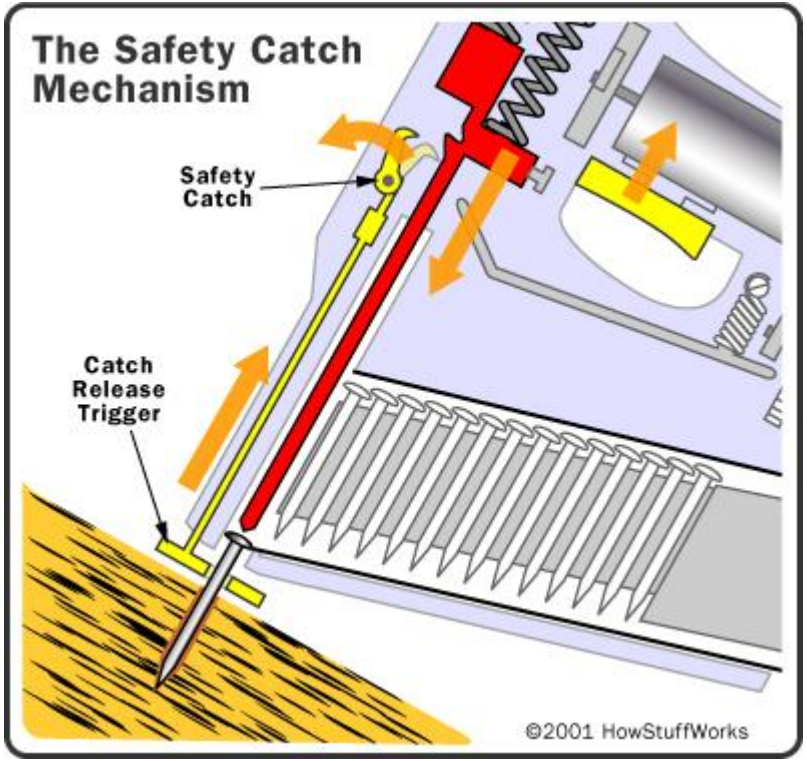

Nail guns are powered by either electro-magnetism or pneumatics.  Nai guns are loaded with nails similar to how a stapler is loaded.

Nail guns are highly powered and can be extremely dangerous!  They are used in general for basic tacking and constructions as seen to the right.

# Nail Gun Safety

The tip of the  gun where the nail is shot, there is a small guide that must be pushed down completely for the nail gun to fire.  This is an added safety and also makes sure you are nailing into an actual surface.

Nail guns have replaced hammers in many constructions situations due to ease and speed.



# Dremel

# Dremel Tools

Dremel tools can be used to do intricate hobby work or cut sheetrock.  A dremel or variation of one comes with numerous interchangeable bits used for sanding, cutting, etching and drilling.  These dremels are usually handheld.


# Heat Gun

# Heat Gun

Heat guns produce a huge amount of heat in a directed area, much like an incredibly hot hair dryer.  Heat guns can be used for a variety of reasons listed below:

- Removing paint from walls or doors
- Embossing
- Shrinking heat shrink
- Melting and forming plastics
- Desoldering
- Adhesive removal
- Loosening nuts and bolts
- Pipe bending
- Many more options

# Heat Gun Safety

HEAT GUNS ARE HOT.

On average they can get as hot as 1000F.  Some can get hotter.

Do not point at yourself or anyone else.  Do not run for too long or hold on a piece for too long.  If melting materials, make sure not to breathe in any toxins.

# Next Steps

# Quiz and Deliverable

You are required to complete a very short quiz and complete a hands on activity.

Both the quiz and the hands on activity can be found on the website.