

# IOWA STATE UNIVERSITY

## **Computation & Construction Lab**

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Safety Protocol + Tool Specific Training

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# Safety Protocols

# Safety | Personal Protective Equipment



## Ear Protection

- Use earplugs/earmuffs in high noise work areas where chainsaws or heavy equipment are used; clean or replace earplugs regularly.



## Work Gloves

- Gloves should fit snugly.
- Workers should wear the right gloves for the job (examples: heavy-duty rubber gloves for concrete work; welding gloves for welding; insulated gloves and sleeves when exposed to electrical hazards).



## Safety Glasses

- Safety glasses or face shields are worn any time work operations can cause foreign objects to get in the eye. For example, during welding, cutting, grinding, nailing (or when working with concrete and/or harmful chemicals or when exposed to flying particles). Wear when exposed to any electrical hazards, including working on energized electrical systems.
- Eye and face protectors – select based on anticipated hazards.



## Masks

- Masks are worn to prevent airborne dangers and allergens
- Masks – select based on anticipated hazards. N95 recommended for anything with Silica.
- Do not wear a respirator unless it is properly fitted.



## Vests

- High visibility garments can be defined as clothing designed to make the wearer more visible



## Foot Protection

- Construction workers should wear work shoes or boots with slip-resistant and puncture-resistant soles.
- Safety-toed footwear is worn to prevent crushed toes when working around heavy equipment or falling objects.

# Safety | Required Environmental Health + Safety Training

1. <https://training.ehs.iastate.edu/iowaSU/site/>
2. Login Net-ID and Password
3. You will need to search for the following videos by name and complete the training.
4. Save the completed certificate in the Canvas assignment name the file with your LastName\_FirstName

## Emergency Response Guide Video

The ISU Emergency Response Guide video was developed to increase emergency situational awareness within the ISU community based on significant incidents on university and college campuses around the country. The video provides simple emergency response procedures for the campus community to follow in the event of an emergency situation and augments the information on the Emergency Response Guide, emergency action plans and emergency maps.

## Shop Safety Fundamentals

Covers Basic Procedures and Policies for academic shop settings.

## Fire Safety and Fire Extinguisher Training

The online Fire Safety and Extinguisher Training course may be taken to fulfill the training requirement for those who do not have a fire extinguisher required as part of their work environment. This course reviews safety and emergency procedures for preventing and responding to a fire emergency; common ignition sources of fires and good practices for the storage of flammable and combustible materials with the goal of preventing fires; and reviews what to know and do ahead of time in order to be prepared for a fire emergency; the proper steps to take in the event of a fire; and when to use a fire extinguisher and how to handle the extinguisher by putting out a simulated fire.

Learners who want to practice using a fire extinguisher can attend the final 20 minutes of the classroom course to receive hands-on use of a fire extinguisher. Check the calendar schedule or call (515) 294-5359. (The practice time is not a recorded training.)

# Safety | Reporting Accidents

## Shop/Tool Use Agreement:

### Iowa State University Shop/Tool Use Safety Agreement

All shop users must complete and sign this form. Shop Supervisors are to keep this form on file. See reverse for records of tool authorizations and course completions.

Name (print)		ISU #	Date
Email Address			
Faculty/Shop Supervisor		Department	
<input type="checkbox"/> Undergraduate	Class	College	Major
<input type="checkbox"/> Graduate Student	Year entered ISU Graduate School	<input type="checkbox"/> Postdoc <input type="checkbox"/> Faculty or Staff Member	

I have read the shop safety rules and understand them as they apply to my work in the Shop/Lab areas. Specifically:

1. I agree to abide by the published and posted safety rules and accept personal responsibility for my work in shops and laboratories. I will abide by any and all additional local shop rules. I understand that my failure to do so can result in my loss of privileges in the shop/lab areas.
2. I understand the shop access rules, monitor/supervision requirements, and shop hours and understand that shop may be subject to video monitoring.
3. I will wear safety glasses at all times while in the shop, unless otherwise designated.
4. I understand what attire is required to work in the shop and will not enter the shop unless so attired.
5. After use, I will clean and maintain all equipment, floors and benches I use.
6. I will not attempt to use any machine, tool or equipment that I do not have written permission to use. I will ask for instruction and/or training before using any machine, tool or equipment with which I am not familiar.
7. I will check in with the supervisor or monitor upon entering or leaving the shop, and prior to operating any machinery.
8. Any equipment or tooling I find in need of repair or that I damage, I will promptly notify the monitor or supervisor and I will leave the prominent cautionary tag on the machine listing my name, research group or class, and a phone number or email address where I can be reached.

**Certification:** I understand that it is a privilege and learning opportunity to use the shop/lab areas and agree to abide by all University regulations and stipulations placed upon me as conditions for working in these areas.

Signed	Date
Shop Supervisor	Date

### Tool Authorizations and Course Completions

Unless explicitly stated otherwise in writing, your authorization for a particular tool is a "learner's permit," not a "driver's license." You must still check in with the monitor or supervisor and s/he may still require you to have direct supervision while using particular tools.

Tool	Restriction(s)	
Shop Supervisor Signature		Date
Tool	Restriction(s)	
Shop Supervisor Signature		Date
Tool	Restriction(s)	
Shop Supervisor Signature		Date
Tool	Restriction(s)	
Shop Supervisor Signature		Date
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Tool	Restriction(s)	
Shop Supervisor Signature		Date

<http://www.ehs.iastate.edu/occupational/accidents-injuries>

All accidents and injuries sustained by Iowa State University students while in academic classes or events sponsored by the university must be reported to Risk Management by the student and a university representative using the ISU Uniform Incident Report.

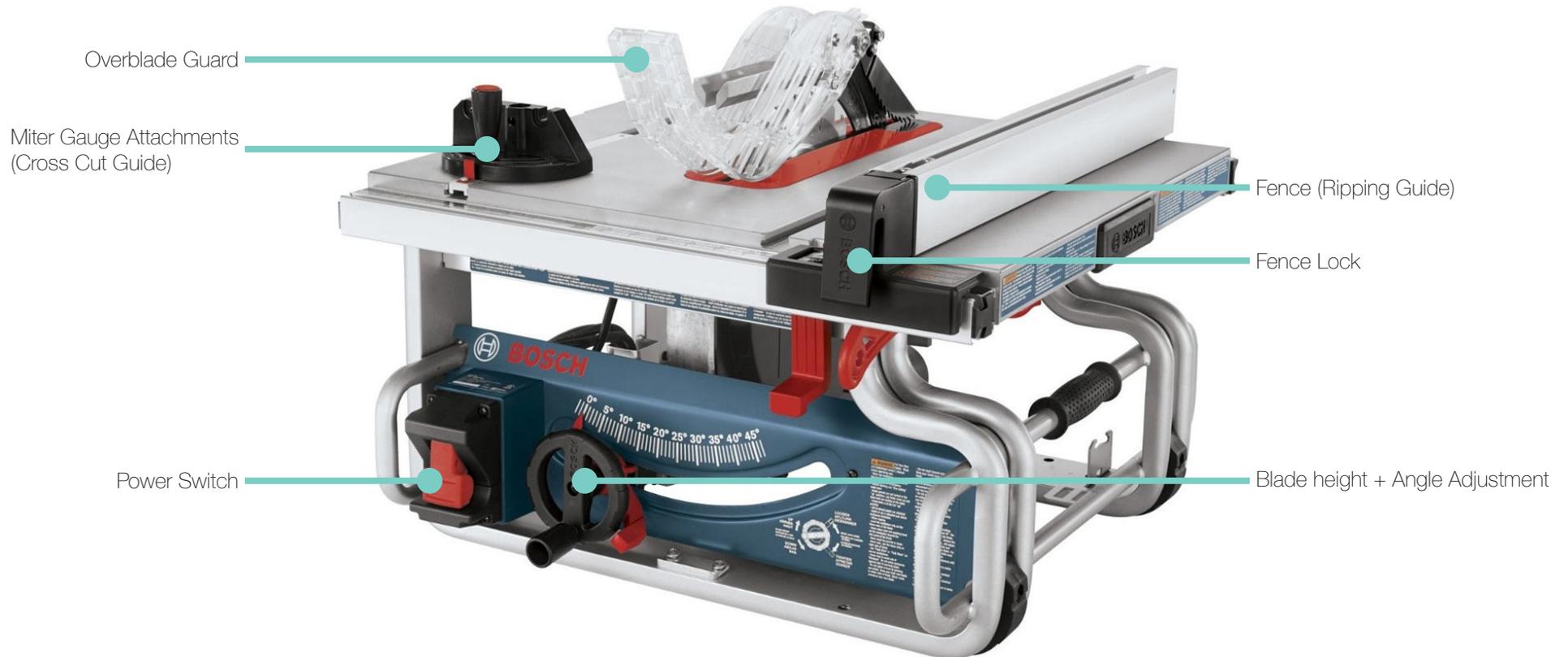
For further direction, see "Accidents and Injuries, Student" in the University Policy Library.



## Tool Specific Training

# Training | Tablesaw

Uses: precision cut wood, plywood, plastic panels to size.



# Training | Tablesaw

## Personal Protective Equipment (PPE)

- Ear Protection
- Safety Glasses
- No loose clothing, gloves or jewelry
- If you have long hair, tie it back

## Before Cutting

- Put on the PPE listed above.
- Inspect tool for damage or obstructions to operation.
- Ensure work area is clean and free of obstacles.
- Guarantee all guards are present and function properly
- Make necessary adjustments for safe operation - blade height and angle, fence or miter
- Check that the saw blade is approximately 1/4" above the material.
- Adjust the fence location and make sure it is locked in place.
- Ensure the Start/Stop paddle is in the "OFF" position (pushed in), flip the Main Power Switch to the "On" position (up)
- Pull the Start/Stop paddle out to start the motor/blade

## While Cutting

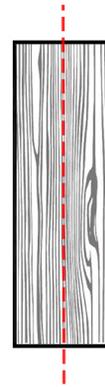
- When approaching someone using a table saw ALWAYS wait until they have turned off the machine and the blade has stopped turning, then you may speak to them.
- Always stand to the side of the blade when cutting. Standing to the side keeps you out of harms way in the event of a kickback.
- Do not let your hands get closer than 6 inches to the blade. A wooden push stick should be used to push material less than 6 inches wide through the saw.
- Move the fence out of the cutting area, or cut off of the tablesaw altogether
- Push the material all the way through the blade and do not reach over the blade for any reason.

## When Finished Cutting

- Turn off the saw and wait until the blade has completely stopped turning
- Clear the work zone of all debris
- Put the table saw away

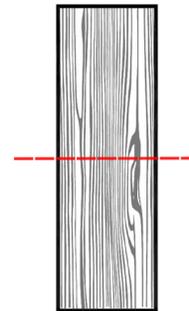
## Rip cuts (cutting with the grain of wood)

1. Use the rip fence to position and guide the work piece through the saw blade
2. Do not stand in the line of the saw cut when ripping
3. When ripping boards longer than 4 feet, use out-feed supports at rear of saw table
4. table
5. Use a push stick when ripping work less than 4 inches wide
6. Use an auxiliary wood facing on rip fence when ripping work 2 inches or narrower
7. narrower
8. Place workpiece on the table next to the blade, and adjust the blade so that it is only 1/8" above the workpiece
9. is only 1/8" above the workpiece
10. Turn on saw
11. Holding the workpiece firmly, move the workpiece slowly and smoothly past the blade
12. Once cut is complete, power off the saw
13. Do not touch the cut off piece until the saw blade is stopped



## Cross-cut (across the grain of wood)

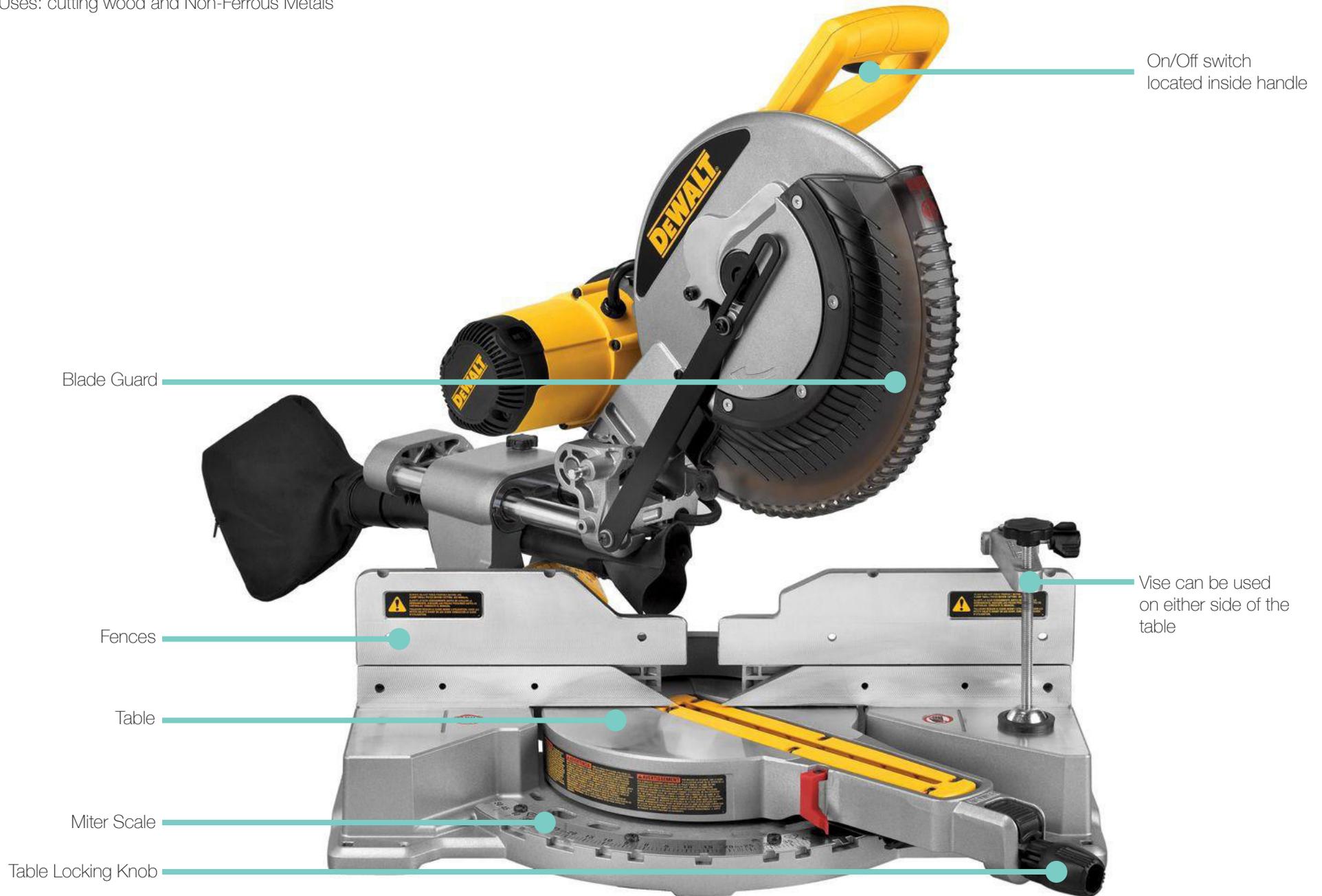
1. Only use miter gauge when performing cuts across the grain.
2. Do not use the rip fence with the miter gauge
3. Place the miter gauge in the right miter slot for bevel cuts, or either the right or left miter slots for non-bevel cuts
4. Adjust the miter gauge to the desired miter angle
5. Turn on saw
6. Holding the workpiece and miter gauge firmly, move the miter gauge and workpiece slowly and smoothly past the blade



Never use a combination of the fence and mitor gauge to perform cuts. This is a kickback hazard.

# Training | Miter Saw

Uses: cutting wood and Non-Ferrous Metals



# Training | Miter Saw

## Personal Protective Equipment (PPE)

- Ear Protection
- Safety Glasses
- No loose clothing, gloves or jewelry
- If you have long hair, tie it back

## Before Cutting

- Put on PPE listed above.
- Make sure working area is clean and free of obstacles.
- Ensure all guards are present and function properly
- Make necessary adjustments for safe operation.
- Inspect tool for damage or obstructions to operation.
- Use a tape measure or ruler to mark the length of your desired piece. Use a protractor to mark the desired angle.

## While Cutting

- When approaching someone using a miter saw ALWAYS wait until they have turned off the machine and the blade has stopped turning, then you may speak to them.
- Do not let your hands get closer than 6 inches to the blade.
- NEVER release the trigger before the blade has passed all the way through the material that could result in kickback or injury.
- NEVER use this saw to cut materials less than 12 inches long.
- NEVER turn on the saw while the blade is touching the stock this can result in injury.
- NEVER cut more than one piece of stock at a time.
- Avoid cutting through stock too quickly this could result in kickback or injury.
- Always stand to the side of the blade when cutting. Standing to the side keeps you out of harms way in the event of a kickback.



- Align the gap that the saw blade sinks into with the markings on your piece. When cutting, be sure to keep the wood in place. Always hold the piece flush against the fence with one hand while you lower the blade with the other. Pull the saw blade down and verify that it lines up. Then pull the blade down and press the trigger to activate the blade.

## When Finished Cutting

- Turn "OFF" the saw
- Wait until the blade has completely stopped turning
- Clear the work zone of all debris
- Put the miter saw away

# Training | Miter Saw

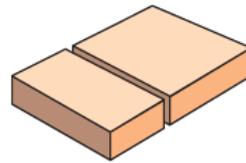
## Miter Angle Cuts

1. Loosen the miter clamp knob and squeeze the miter latch (located under the knob)
2. Slide the table to your desired angle, use the miter scale as a reference
3. Once desired angle is met, release the miter latch and tighten the miter clamp knob

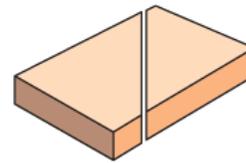
## Bevel Cut

1. Loosen the bevel clamp knob and move the saw to the desired angle
2. It is necessary to move the left side of the fence to allow for clearance
3. Once the desired bevel angle has been set, tighten the bevel clamp knob firmly

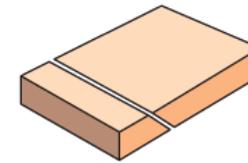
Note: Bevel angles can be set from 3 degrees right to 48 degrees left and can be cut with the miter arm set between 0 and 48 degrees right or left



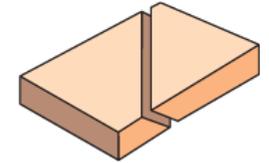
0 degree Miter Cut  
0 degree Bevel Cut



45 degree Miter Cut  
0 degree Bevel Cut



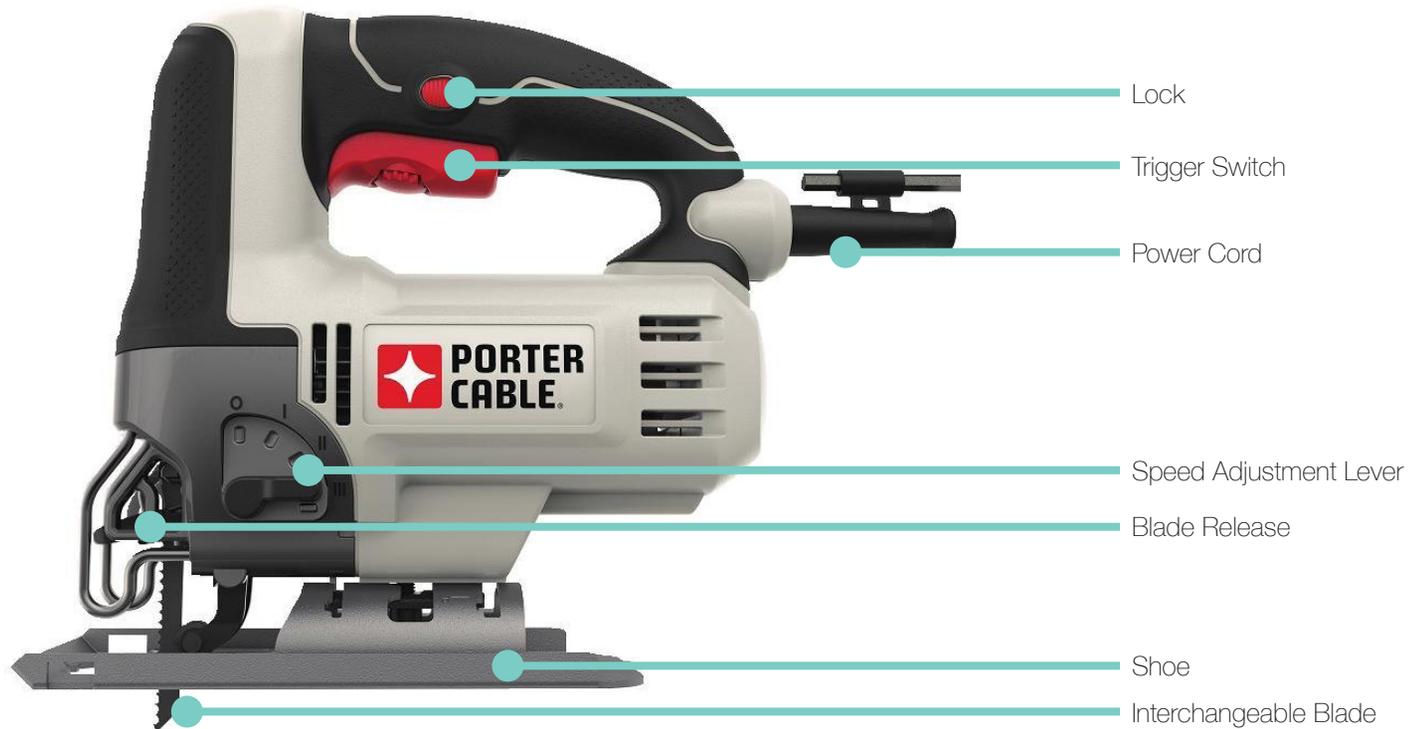
0 degree Miter Cut  
45 degree Bevel Cut



45 degree Miter Cut  
45 degree Bevel Cut

# Training | Jig Saw

Uses: Cutting wood, metal, plastics and foam of various sizes at various angles.



# Training | Jig Saw

## Personal Protective Equipment (PPE)

- Safety Glasses
- No loose clothing, gloves or jewelry
- If you have long hair, tie it back

## Before Cutting

- Put on PPE listed above
- Inspect the tool for damages or obstructions to operation.
- Ensure work area is clean and free of obstacles.
- Make necessary adjustments for safe operation. Clamp materials down. This is important so the material does not move vertically up and down while cutting. It also will allow you to have both hands free while operating the Jigsaw.
- Jigsaws are excellent for cutting curved cuts.
- Measure and mark your cut line.
- CAUTION Jigsaws can bind and produce kickback
- Choose the proper blade. Jigsaws can be used to cut plywood, medium density fiber board (MDF), plastics and metals.
- Place blade close to the edge of where you are going to cut the material. Drill a hole into the material to fit the blade through the material if not cutting from the edge.

## While Cutting

- When approaching someone using a jig saw ALWAYS wait until they have turned off the machine and the blade has stopped moving, then you may speak to them.
- CAUTION! Avoid cutting the power cord. It could result in electrical shock.
- Attempting to cut too quickly will cause the jigsaw to overheat and will create a splintered cut.
- Turn "ON" the saw by squeezing the trigger switch.
- Slowly feed the blade into the material, avoid putting excessive force on the blade.
- Keep hands clear of the saw blade.
- If debris accumulated while cutting material, turn off machine before blowing debris off surface. This will allow you to have a clearer path to visually see.

## When Finished Cutting

- Turn "OFF" the saw by releasing the trigger switch
- Wait until the blade has completely stopped moving
- Clear the work zone of all debris
- Put the jigsaw away

# Training | Jigsaw

## Speed Control

1. Speed can be controlled in two ways: speed control dial and the trigger.
2. Rotate the speed control dial to increase or decrease the maximum speed or strokes-per-minute (SPM) at which the blade will cut. Speed range is 500 SPM on speed setting 1 to 3, 100 SPM on speed setting 6.
3. As the trigger switch is pressed in, the strokes-per-minute continue to increase, but do not exceed the setting that the speed control dial is set at. As the trigger is released, the blade strokes-per-minute reduce.

## Changing the Blade (Figure A)

1. Disconnect the tool from power.
2. To remove a blade, lift the keyless blade lever (D), with a slight shake the blade will drop out.
3. To install a blade, lift the keyless blade lever (D).
4. Insert the blade into the clamp mechanism (F) while guiding the back of the blade into the groove of the guide rollers (G).
5. The shank should be completely inside the clamp mechanism.
6. Release the keyless blade lever.

Figure A

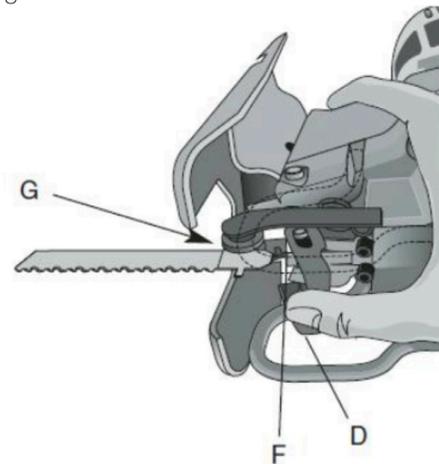
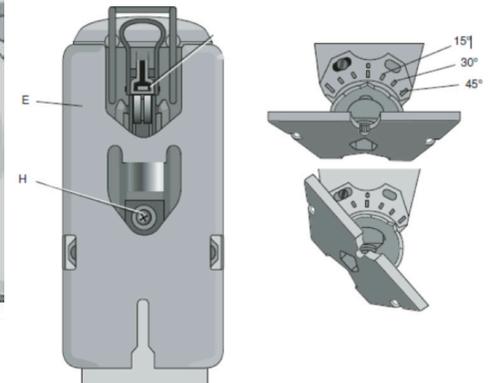


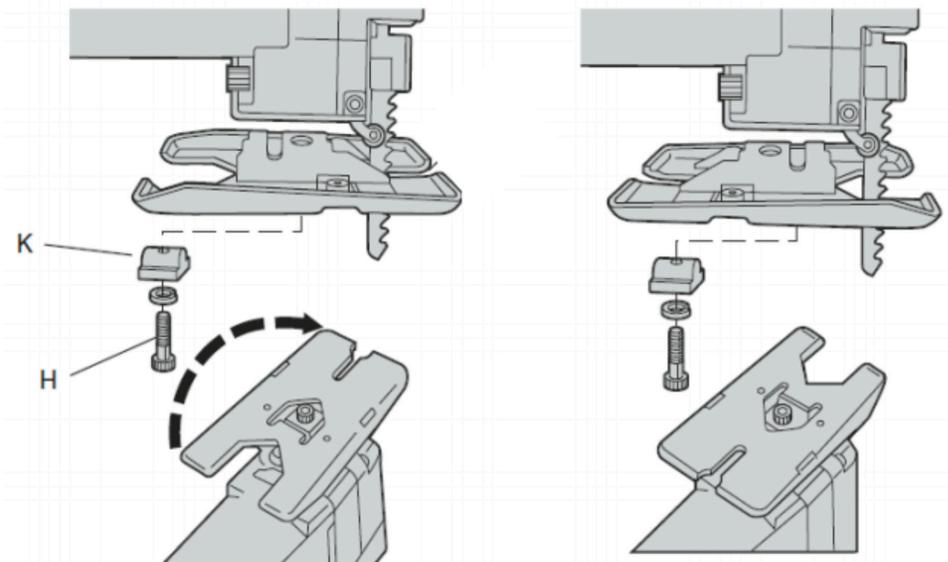
Figure B



## Bevel Cutting Adjustment (Figure B)

1. Disconnect the tool from power.
2. Bevel cuts may be made at any angle between 0 and 45 degrees in both directions.
3. Adjust the shoe (E) by loosening screw (H) on the bottom of the saw.
4. Rotate the shoe to the desired angle.
5. Tighten the screw firmly before using the saw.

Figure C



## Reversing Shoe Position (Figure C)

1. Disconnect the tool from power.
2. Remove screw (H) from the bottom of the saw
3. Remove the shoe from the jig saw; be careful to note the position of the clamp (K). The clamp must be re-installed in the same way or the shoe will not fit properly.
4. Rotate the shoe 180° and re-install noting carefully that, when the slot is forward, the screw (H) goes through the hole in the shoe and when the wide opening is forward, the screw passes through the slot in the shoe

# Training | Bandsaw (College of Design Shop Room 20)

Uses: Cutting wood, metal, and other material of this type



# Training | Bandsaw (College of Design Shop Room 20)

## Personal Protective Equipment (PPE)

- Safety Glasses
- No loose clothing, gloves or jewelry
- If you have long hair, tie it back

## Before Cutting

- Put on PPE listed above
- Inspect the tool for damages or obstructions to operation.
- Ensure work area is clean and free of obstacles
- Ensure that the top guide is within 3/16" of the work piece
- Make necessary adjustments for safe operation
- Inspect the tool for damage or obstructions to operation
- Turn on the saw using the START button located on the left side of the tool
- Begin work
- Slowly feed work piece towards the saw blade, avoid feeding material too quickly
- Keep hands clear of saw blade, use push sticks when needed

## While Cutting

- Turn off the saw using the STOP button located on the left side of the tool
- Allow the blade to come to a complete stop on its own
- Remove work piece from table top

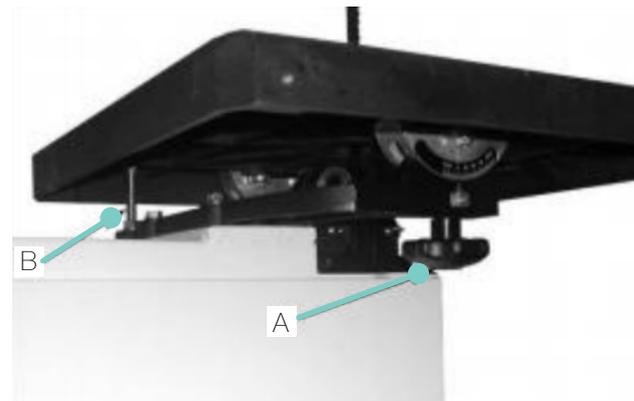
## When Finished Cutting

- Turn "OFF" the saw by releasing the trigger switch
- Wait until the blade has completely stopped moving
- Clear the work zone of all debris

## Table Tilt

1. Disconnect the machine from the power source
2. Loosen the lock knob (A)
3. Tilt table up to 45° to the right, or up to 10° to the left
4. Tighten the lock knob when desired angle is indicated on the scale

Note: Table stop bolt (B) must be removed to tilt table to the left



# Training | Reciprocating Saw

Uses: Cuts through almost anything. It is the go-to tool for remodeling and demolition.



# Training | Reciprocating Saw

## Personal Protective Equipment (PPE)

- Safety Glasses
- Dust Mask
- No loose clothing, gloves or jewelry
- If you have long hair, tie it back

## Before Cutting

- Put on PPE listed above.
- Make sure all parts are working in order before you begin.
- Reciprocating saws are well suited for demolition and making rough cuts in ceramic, metal, wood, and other materials. It is important to use the correct blade for the material you are cutting.



- Caution! The blade may bind in the material causing kickback.
- Caution! Objects being cut can fall unexpectedly injuring the user or others.
- Avoid the blade making contact with electrical wiring. This could shock the user.
- Make sure all parts are working in order before you begin.

## While Cutting

- When approaching someone using a reciprocating saw ALWAYS wait until they have turned off the machine and the blade has stopped moving, then you may speak to them.
- If the saw requires a lot of force to cut, the operator should replace the blade.
- CAUTION! Avoid cutting the power cord could result in electrical shock.
- Attempting to cut too quickly will cause reciprocating saw to overheat and will create a splintered cut.
- If debris accumulated while cutting material, turn off machine before blowing debris off surface. This will allow you to have a clearer path to visually see.

## When Finished Cutting

- Turn off the saw
- Wait until the blade has completely stopped moving
- Clear the work zone of all debris
- Put the reciprocating saw away

# Training | Circular Saw



# Training | Circular Saw

## Personal Protective Equipment (PPE)

- Ear Protection
- Safety Glasses
- No loose clothing, gloves or jewelry
- If you have long hair, tie it back
- Wear an approved respirator or dust mask when exposed to harmful or nuisance dusts.

## Before Cutting

- Put on PPE listed above.
- Make sure all parts are working in order before you begin.
- Corded circular saw are typically larger and have more cutting power than cordless saws. For some materials such as hardwoods, this added power can mean fewer mishaps.
- Wet or pressure treated lumber may require special attention during cutting to prevent kickback.
- When setting up a circular saw to make a cut, the saw blade depth should be adjusted to about 1/4" below the material.
- The best and safest way to make long, straight cuts with a circular saw is to clamp a straight edge to the material and run the saw along it.
- Check the saw blade for proper rotation.
- Ensure that the blade you have selected is sharp enough to do the job. Sharp blades work better and are safer.
- Check the retracting lower blade guard to make certain it works.
- Keep all cord clear from work area.
- Circular saws are designed for right-hand operation. Left-hand operation will demand more care to operate safely.

## While Cutting

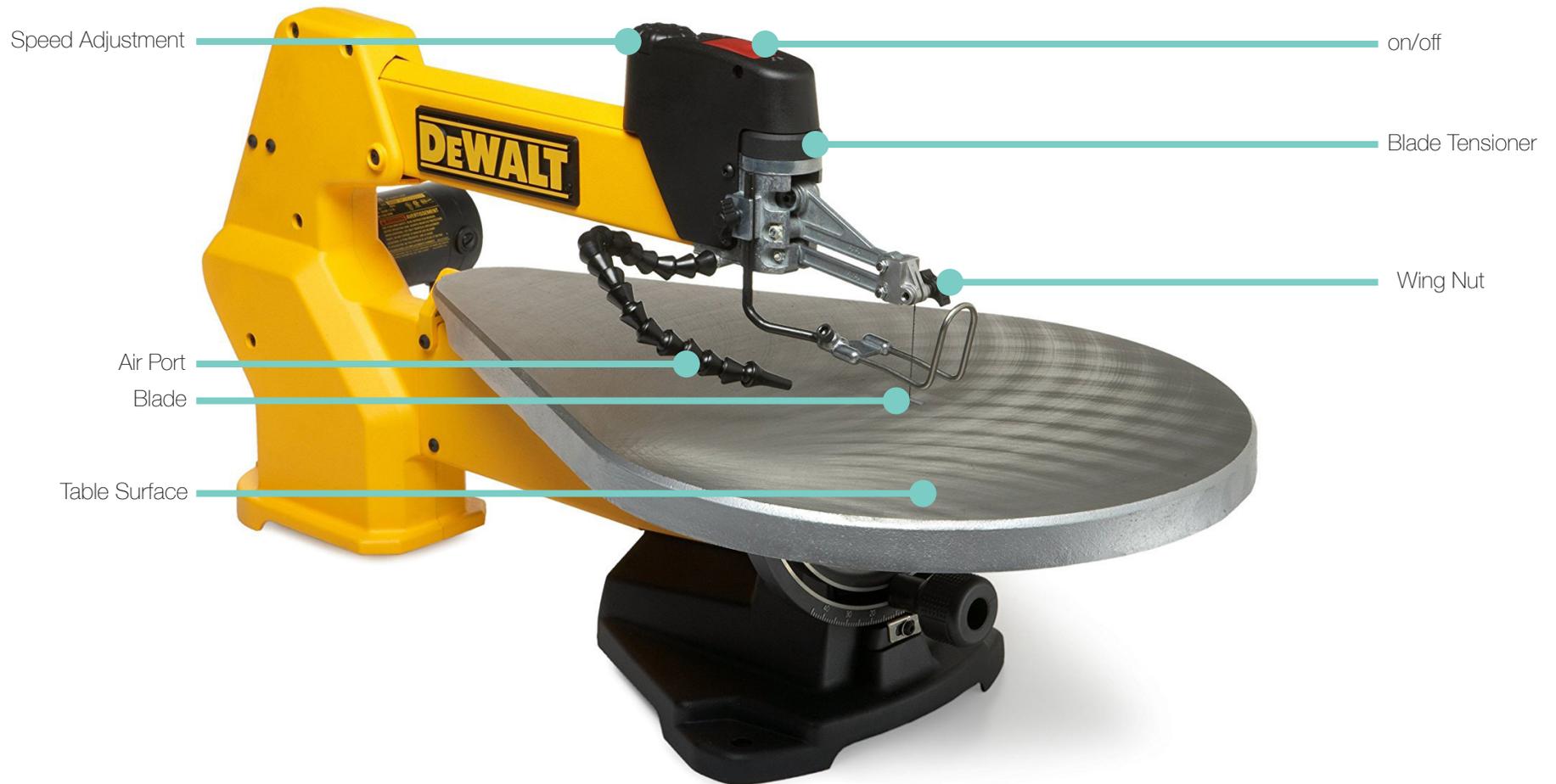
- When approaching someone using a circular saw ALWAYS wait until they have turned off the machine and the blade has stopped turning, then you may speak to them.
- If the saw requires a lot of force to cut, the operator should replace the blade.
- CAUTION! Avoid cutting the power cord could result in electrical shock.
- Attempting to cut too quickly will cause reciprocating saw to overheat and will create a splintered cut.
- If debris accumulated while cutting material, turn off machine before blowing debris off surface. This will allow you to have a clearer path to visually see.

## When Finished Cutting

- Turn off the saw
- Wait until the blade has completely stopped moving
- Clear the work zone of all debris
- Put the reciprocating saw away

# Training | Scroll Saw (College of Design Shop Room 20)

Uses: Cutting wood, metal, plastics and foam of various sizes at various angles



# Training | Scroll Saw (College of Design Shop Room 20)

## Personal Protective Equipment (PPE)

- Safety Glasses
- No loose clothing, gloves or jewelry
- If you have long hair, tie it back

## Before Cutting

- Put on PPE listed above
- Inspect the tool for damage or obstructions to operation.
- Ensure working area is clean and free of obstacles.
- Adjust the material hold-down so that it rests just slightly (1/8") above the material
- Make necessary adjustments for safe operation
- Be sure the blade rings like a high pitched guitar string. If the blade is not tensioned properly the tool won't cut well.
- Scroll saws are used for making curved cuts in thin stock and can be used for cutting large holes and shapes out of sheet stock.
- Extra caution should be taken since this saw has an exposed blade.
- The scroll saw can be used to cut very tight curves.

## While Cutting

- When approaching someone using a scroll saw ALWAYS wait until they have turned off the machine and the blade has stopped, then you may speak to them.
- Keep the material firmly pressed down on the table, letting it do its work. Pushing too hard can disorient your settings and cause poor cut quality.
- Use the attached air nozzle if you need to clear dust and small scraps of material away from the blade while you are cutting.
- Turn on the saw by pressing the front of the switch located on the top of the saw
- Allow the blade to reach full speed before beginning cut.
- Slowly feed material into blade, avoid putting excessive force on the blade.
- Keep hands clear of saw blade.

## When Finished Cutting

- Turn off the saw
- Wait until the blade has completely stopped moving
- Clear the work zone of all debris
- Put the reciprocating saw away

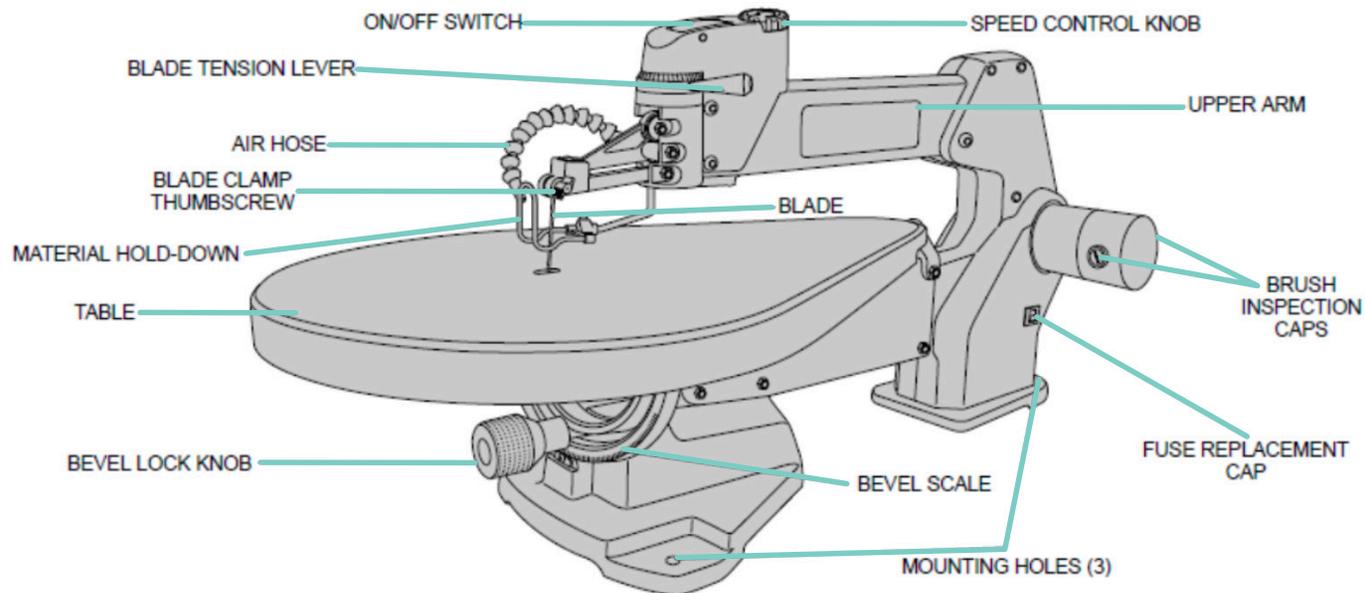
# Training | Scroll Saw (College of Design Shop Room 20)

## Speed Control

1. **WARNING:** Only operate the speed control knob when the saw is running
2. To increase the speed, turn the knob clockwise
3. To decrease the speed, turn the knob counterclockwise

## Changing Blade

1. Disconnect tool from power supply
2. Move the blade tension lever all the way to the right
3. Loosen, but do not unscrew, the top and bottom blade clamp thumbscrew
4. Remove the old/broken blade
5. Thread the new blade through the hole in the table, with the teeth facing down and toward the front of the saw
6. Insert the blade into the bottom blade clamp and securely tighten the thumb screw
7. Insert the top of the blade into the top blade clam and securely tighten the thumb screw
8. Properly adjust the blade tension lever to the correct tension
  - a. With tension on the blade, prick the front of the blade and listen to the tone emitted
  - b. A low or no tone requires additional tension, a high tone means that the tension is too high
  - c. Once the desired tension is met, test the tension on a piece of scrap
  - d. When cutting, if the blade bends, you need to add more tension
  - e. Inspect the cut, if the cut is square and the blade is not broken, the blade is properly set
9. Reconnect power supply to tool



# Training | Drill Press

Uses: drilling/boring holes into various (metal, wood, plexiglass, plastic)



# Training | Drill Press

## Personal Protective Equipment (PPE)

- Safety Glasses
- Hearing Protection
- No loose clothing, gloves or jewelry
- If you have long hair, tie it back

## Before Drilling

- Put on PPE listed above
- Ensure work area is clean and free of obstacles
- Make necessary adjustments for safe operation
- Inspect the tool for damage or obstructions to operation
- Place material so that it is resting against the left side of the column to prevent material from spinning or securely fasten material to the table
- Select correct bit type for materials being drilled.
- Make sure the drill chuck is tightened down on the drill bit and the chuck key has been removed
- Using your material, gauge where the height of the table should be and move it accordingly turning the table crank clockwise or counter clockwise.
- Clamp the drill press to a table.

## While Drilling

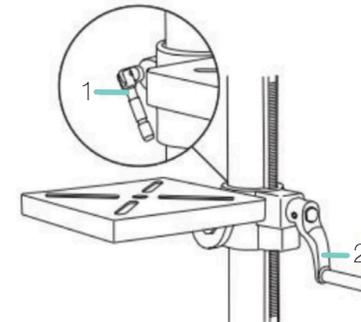
- When approaching someone using a drill press ALWAYS wait until they have turned off the machine and the blade has stopped turning, then you may speak to them.
- Turn on the drill press by flipping the switch to the ON position (Upward)
- Begin work
- Slowly feed drill bit towards material, avoid feeding material too quickly or too slowly
- Keep hands clear of drill bits

## When Finished Drilling

- Turn off the drill press by flipping the switch to the OFF position (downward). To lock the switch off, remove the key
- Wait until the chuck is completely stopped moving on its own
- Remove work piece from table top
- Clear the work zone of all debris
- Put the drill press away

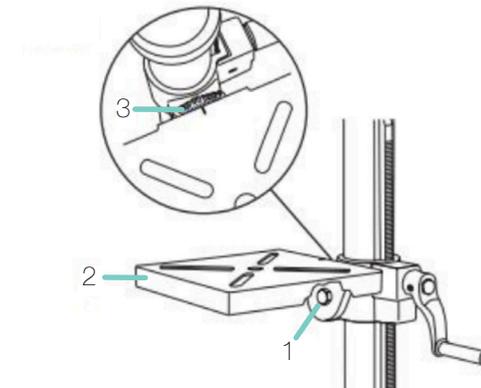
## Raise and Lower the Table

1. Loosen the column lock handle (1) and turn the crank handle (2) until
2. the table is at the desired height
3. If table needs rotated, rotate table to desired position
4. Tighten the table lock handle (1) to secure table



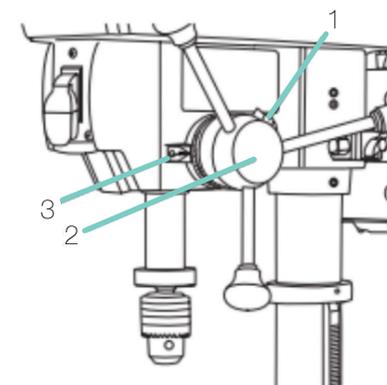
## Depth Stop Adjustment

1. To stop the drill at a specific depth for consistent and repetitive drill, loosen the depth scale lock (1) located on the depth scale hub (2)
2. Turn the hub until the pointer (3) is aligned to the desired depth on the scale
3. Tight the depth scale lock (1), the chuck will stop after traveling downward to the distance selected



## Tilt Table

1. Table can be tilted from 0° to 45° to the left and right
2. Loosen the bevel lock bolt (1) with a wrench
3. Tilt the table (2) to the desired angle, use the scale (3) as a guide
4. Re-tighten the bevel lock bolt (1)
5. To return the table to its original position, loosen the bevel lock bolt
6. and realign the bevel scale (3) to the 0° setting
7. Tighten the bevel lock bolt (1) with the wrench



# Training | Hand Router

Uses: Cutting edges on wood, laminate covered wood and some plastics



# Training | Hand Router

## Personal Protective Equipment (PPE)

- Safety Glasses
- Ear Protection
- No loose clothing, gloves or jewelry
- If you have long hair, tie it back

## Before Cutting

- Make sure all parts are working in order before you begin.
- Hand routers may be used for cutting grooves, mortises and other recesses in wood, plastic, and other soft materials. A hand router can also cut edge profiles such as chamfers, bullnoses and coves. Routers make curved or straight cuts in sheet materials.
- You should securely clamp material to a table before routing.
- If when operating the router, you hear an unfamiliar noise or vibration, turn off the router immediately and check to see if the bit has come loose.

## While Cutting

- When approaching someone using a hand router ALWAYS wait until they have turned off the machine and the bit has stopped turning, then you may speak to them.
- The proper way to grip a hand router is firmly with two hands.
- Never use a router to bore holes.
- Always fasten stock with clamps.
- Always unplug the router when changing bits, adjusting the router, or mounting attachments.
- Immediately after use, a router bit is too hot to be touched with bare hands.

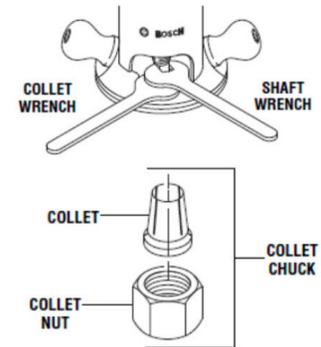
## When Finished Cutting

- Turn off the router
- Wait until the bit has completely stopped moving
- Clear the work zone of all debris
- Put the hand router away

# Training | Hand Router

## Installing / Removing Cutters

1. Disconnect router from power supply
2. Remove the chip shield
3. Hold the armature shaft in place with the shaft wrench
4. Use the collet wrench to loosen the collet chuck assembly in a counterclockwise direction
5. Remove router bit
6. Verify that the new bit's shank is of the proper diameter for the collet to be used, insert the shank of the router bit into the collet chuck assembly as far as it will go, then back the shank out until the cutters are approximately 1/8" to 1/4" away from the collet nut face
7. With the shaft wrench holding the armature shaft, use the collet wrench to firmly tighten the collet chuck assembly in a clockwise direction



## Variable Speed Control

1. To increase the speed and torque of your router, turn the variable speed control selector to a higher setting. Refer to the "Speed Selection Chart" for reference

Dial Setting	RPM	Application
1	8,000	Nonferrous metals larger diameter bits and cutters
2	13,500	
3	16,500	
4	20,000	Softwoods, plastics, counter tops, smaller diameter bits and cutters
5	21,500	
6	25,000	

## Set Depth of Cut

1. Disconnect router from power supply
2. Hold the router in a horizontal position with the base clamp lever facing you
3. Open the base clamp lever to release the motor
4. To make a large depth adjustment, depress the coarse adjustment release lever and raise or lower to desired depth. There are three notches in the motor housing which are spaced 1/2" apart to facilitate this adjustment
5. To make a fine depth adjustment, turn the fine adjustment knob clockwise to lower the router bit or counterclockwise to raise the bit.
6. Fasten the base clamp lever to secure adjustments.



# Training | Drill

## Personal Protective Equipment (PPE)

- Safety Glasses
- No loose clothing, gloves or jewelry
- If you have long hair, tie it back

## Before Drilling

- Put on PPE listed above
- Ensure work area is clean and free of obstacles
- Make necessary adjustments for safe operation
- Inspect the tool for damage or obstructions to operation
- Select correct bit type for materials being drilled.

## While Drilling

- When approaching someone using a drill ALWAYS wait until they have turned off the machine and the blade has stopped turning, then you may speak to them.
- Turn on the drill by pressing the trigger.
- Begin work
- Slowly feed drill bit towards material, avoid feeding material too quickly or too slowly
- Keep hands clear of drill bits

## When Finished Drilling

- Wait until the chuck has completely stopped moving on its own
- Remove work piece from table top
- Clear the work zone of all debris
- Put the drill away

## Some Common Drill Bits

Quick Release Drill  
Bit Holder



General  
Purpose  
Twist Bit



Masonry  
(Stone, Brick,  
Concrete)



Auger



Spade  
(Large holes  
in wood)



Hole Saw  
(wood or  
Plastic)



## Changing the Bit

Drill bits can be quickly changed by holding the Chuck in place, putting the drill in reverse, and holding down the trigger. This will loosen the grip on the bit, allowing it to be re-moved. After putting the new bit in the front end of the drill, switch the Drill to the forward position, hold the chuck, and hold the trigger and the drill's grip will tighten on the new bit. Drill bits can also be manually changed by rotating the Chuck by hand.

# Training | Nail Gun



Pressure Safety

Hose Coupler

Trigger

Magazine Release

# Training | Nail Gun

## Personal Protective Equipment (PPE)

- Safety Glasses
- Ear Protection
- No loose clothing, gloves or jewelry
- If you have long hair, tie it back

## Before Using the Nail Gun

- Put on PPE listed above
- Ensure work area is clean and free of obstacles
- Make necessary adjustments for safe operation
- Inspect the tool for damage or obstructions to operation
- Load nail gun. The pneumatic hose should always be disconnected while the nailer is reloaded.
- Connect nail gun to air compressor with the hose.
- OSHA estimates that nail gun accidents account for 37,000 emergency room visits each year. Be careful!

## While Using the Nail Gun

- When approaching someone using a nail gun ALWAYS wait until they have turned off the machine, then you may speak to them.
- Never point the nail gun at anything other than the surface you intend on nailing.
- Hold the air nailer firmly with one hand
- Unless about to shoot, DO NOT hold finger over the trigger.
- Push the air nailer down, compressing the pressure safety.
- Make sure the air nailer is at least a quarter of an inch away from the edge of the material.
- With the pressure safety still compressed on the surface, quickly pull and release the trigger.

## When Finished Using the Nail Gun

- Unplug the nail gun
- Put the nail gun, air compressor and hose away

# Training | Combo Sander (College of Design Shop Room 20)



# Training | Combo Sander (College of Design Shop Room 20)

## Personal Protective Equipment (PPE)

- Safety Glasses
- No loose clothing, gloves or jewelry
- If you have long hair, tie it back

## Before Using the Combo Sander

- Put on PPE listed above
- Ensure work area is clean and free of obstacles
- Ensure all guards are present and function properly
- Make necessary adjustments for safe operation
- Inspect machine for damage or obstructions to operation

## While Using the Combo Sander

- When approaching someone using a combo sander ALWAYS wait until they have turned off the machine and the blade has stopped turning, then you may speak to them.
- Turn on sander using power switch located at front center of the machine
- Begin work
- Slowly press work piece against belt/disc, avoid feeding material too quickly
- Keep hands clear of sanding surfaces

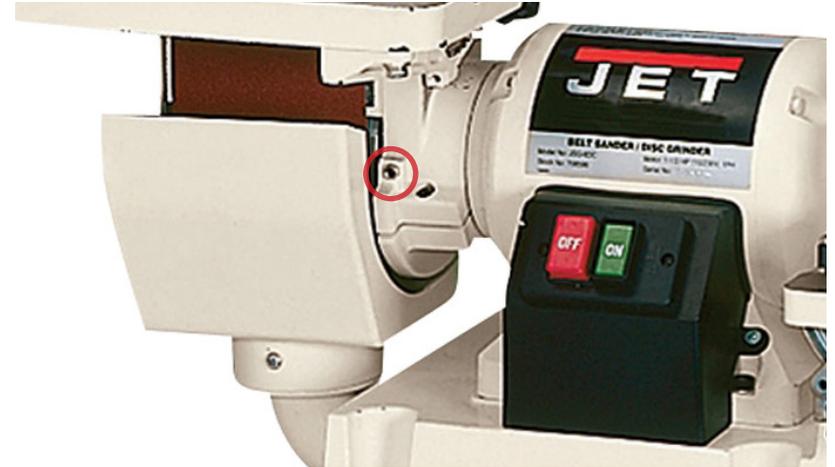
## When Finished Using the Combo Sander

- Remove work piece
- Turn off tool using power switch
- Allow sander to stop on its own

# Training | Combo Sander (College of Design Shop Room 20)

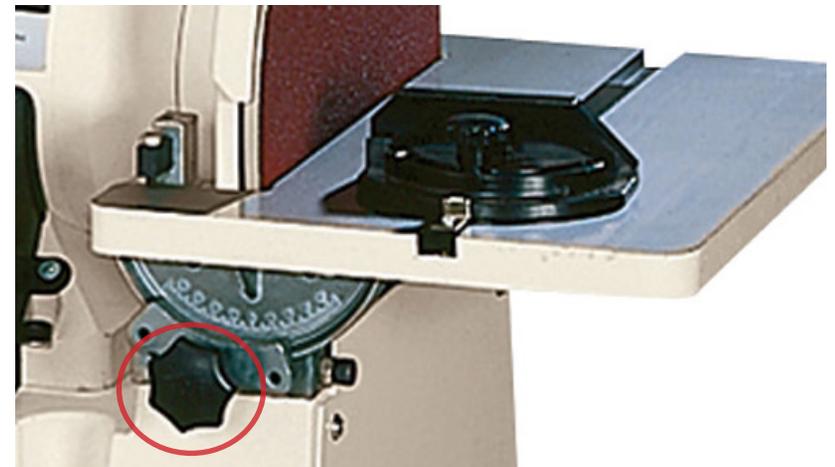
## Belt Arm Adjustment

1. Loosen the belt arm lock screw to tilt the belt arm
2. Belt arm can be tilted from  $0^{\circ}$  to  $90^{\circ}$  (Arm has preset positions at  $0^{\circ}$ ,  $45^{\circ}$ , and  $90^{\circ}$ )
3. Once desired angled is determined, tighten the lock screw before operation

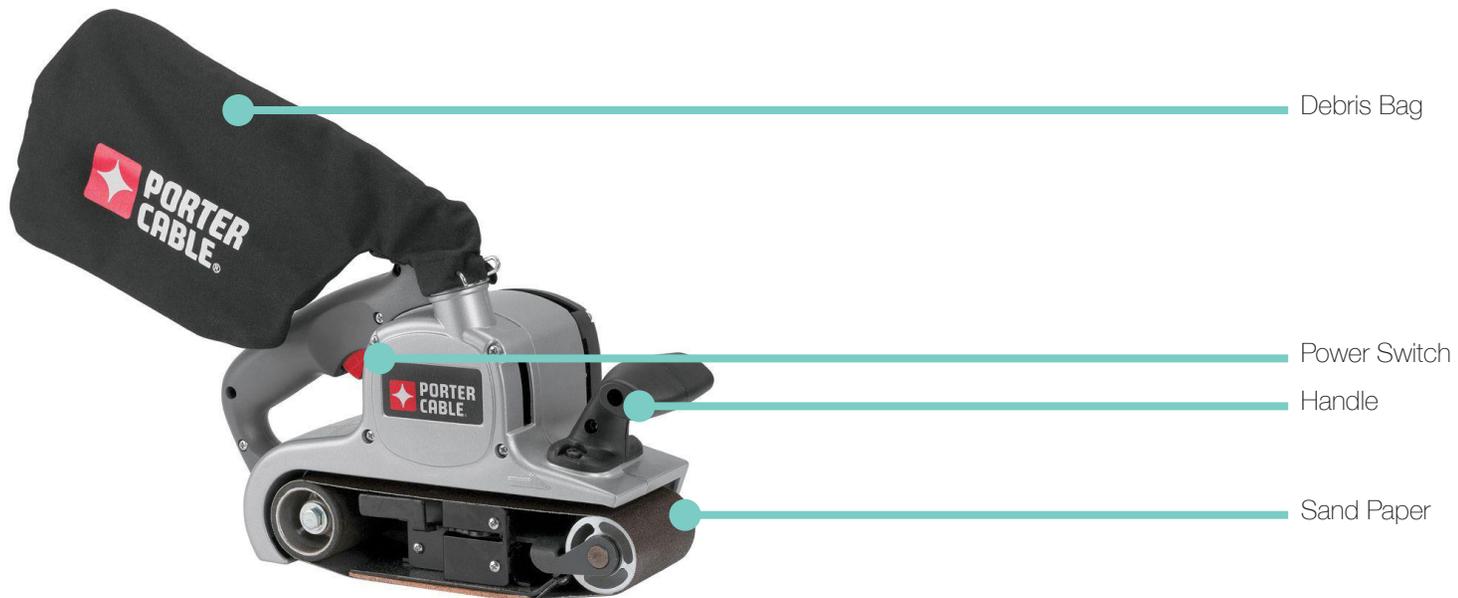
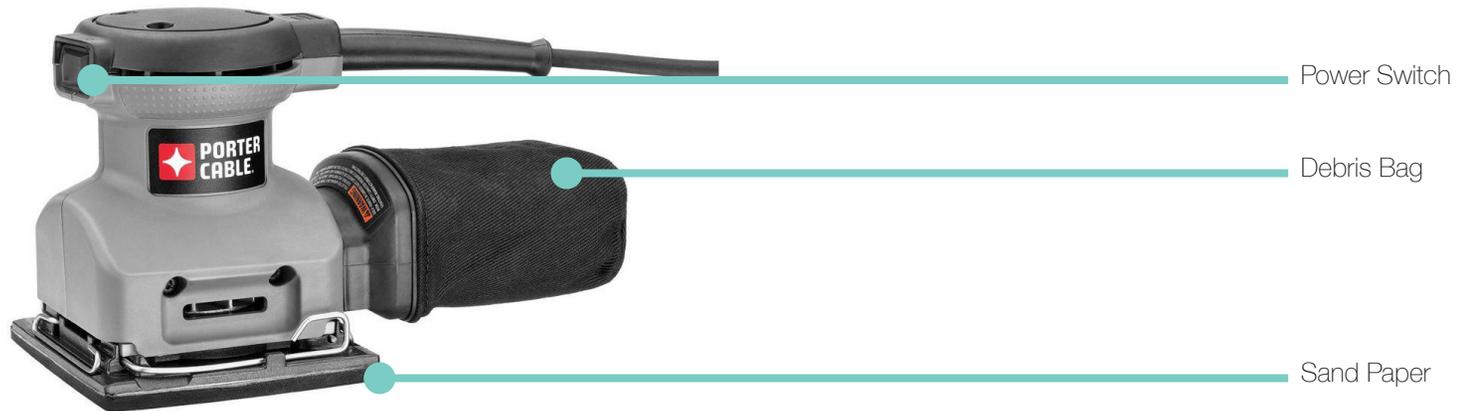


## Disc Table Adjustment

1. Loosen both lock knobs
2. Adjust table until desired angle is met, use the gauge on the side for proper angle
3. Tighten both lock knobs to secure table before use



# Training | Belt and Palm Sanders



# Training | Belt and Palm Sanders

## Personal Protective Equipment (PPE)

- Safety Glasses
- No loose clothing, gloves or jewelry
- If you have long hair, tie it back

## Before Using the Belt and Palm Sanders

- Put on PPE listed above
- Ensure work area is clean and free of obstacles
- Ensure all guards are present and function properly
- Inspect machine for damage or obstructions to operation

## While Using the Belt and Palm Sanders

- When approaching someone using a belt or palm sander ALWAYS wait until they have turned off the machine and it has stopped moving, then you may speak to them.
- Place sand paper onto the sander
- Turn on sander using power switch
- Begin work
- Slowly move the sander against the piece
- Keep hands clear of sanding surfaces

## When Finished Using the Belt and Palm Sanders

- Turn off the tool and wait for sander to stop moving.
- Unplug the sander
- Put sander away