CLEMSON UNIVERSITY
CLEMSON ARCHITECTURE CENTER IN CHARLESTON

WORKSHOP
USER HANDBOOK
CAC.C WORKSHOP OVERVIEW

As part of the Academic Resources in Charleston, the CAC.C Workshop provides equipment facilities, staff and instruction to registered CAC.C students for the enrichment of their educational experience. Other roles of the Workshop and its staff include: support of faculty and staff in the design and construction of furnishings and support of CAC.C staff in University functions. The Workshop provides a full complement of power and hand tools for the manipulation of wood, and related media. A limited selection of equipment for the working of metals and other materials is also available. The Workshop staff provides facility maintenance, user assistance, training and supervision while offering users an extensive knowledge of materials, tools, processes and safety. A library of shop related reference materials is available in the CAC.C library. Through user education we aim to minimize the risks inherent in the use of tools and equipment. Students must attend an orientation session to obtain Shop privileges. User orientations include an introduction to the facility and staff as well as an outline of safe shop practices and equipment usage. Unsafe use of Workshop facilities and equipment may result in revocation of access to the facility.

GENERAL OPERATING HOURS

MONDAY - SUNDAY
9:00 am - 10:00 pm

CONTACT INFORMATION
David Pastre - Shop Manager

MOBILE PHONE
843.696.3343

E-MAIL
pastre@clemson.edu

ADDRESS
CAC.C Workshop
1 Simons Street
Charleston, SC 29403
POLICIES AND PROCEDURES

SHOP ACCESS PRIVILEGES
Shop users MUST be registered CAC.C students who have paid the Technology Access Fee for the current semester or a CAC.C Faculty or Staff and must attend Shop Orientation prior to using the facility.

· Shop Access Privileges can be revoked at any time at the Shop Manager’s discretion.

SHOP HOURS
· Shop hours are established each semester.
· Any extension of scheduled operating hours MUST be approved by shop management.
· Extension of shop hours must be requested by instructors at least 48 hours prior to the hours in question.

TOOL CHECK-OUT
· You are responsible for any tools you check out. If CAC.C Workshop equipment is lost, stolen or damaged while checked out to you, you are responsible for replacement.
· Obtain approval from Shop Manager before removing ANY tool from the shop.
· Obtain special permission for periods longer than 2 hours.
· Tools should be returned to the shop promptly upon completion of use.
· Tools checked out overnight should be removed less than 1 hour before closing.
· Tools checked out overnight must be returned within one hour of opening the next day.
· Tool Check-Out privileges can be revoked at any time at the Shop Manager’s discretion.

DUST COLLECTION
· In order to maintain the air quality in the shop and neighboring areas, dust collection is provided and must be used when operating dust creating machinery.
· NEVER allow sparks or other incendiary material to enter the dust collection system.
· Please use finishes adhesives, resins and similar products outside ONLY!!

PERSONAL PROTECTIVE EQUIPMENT
· Safety glasses or goggles MUST be worn during the operation of any stationary or portable power equipment (non-tinted, plastic-lens prescription glasses are also acceptable).
· Ear muffs and ear plugs are available and should be worn during sustained use of noise generating equipment.
· Dust masks are available and should be worn when generating significant dust.

PERSONAL PROJECTS
· CAC.C faculty, staff and currently registered CAC.C students may use the CACC Workshop during regularly scheduled hours for non-course related projects under these conditions:
· All standing policies and procedures are followed
· Users are Clemson University students or employees
· Student users have paid the applicable CAC.C Technology Fees
· Users have attended a User Orientation Session and obtained Shop privileges.
· The use does not interfere with users undertaking course-related work in any way.
· Shop management approves the use.
· No consumable shop supplies are used (glue, abrasives, hardware, etc.)
· No commercial, professional or financial gain is made by any party.
· CAC.C Students not taking summer courses may use the CAC.C Woodshop with the Shop Manager’s permission over the summer.

MATERIALS STORAGE
· Store any materials neatly and out of the way of other shop users.
· Obtain permission from the Shop Manager before leaving any materials unattended in the shop.
· Clearly mark any materials with name, date and contact information.
· Unidentified materials may be disposed of at the Shop Manager’s discretion.
· Identified materials may be disposed of if left in the shop for over one week.
OCCUPANCY POLICY

In order to maintain an acceptable level of user safety, the CAC.C Workshop has adopted the following occupancy limits. This policy takes into account space, equipment and staff limitations of the Workshop.

OCCUPANCY OF THE WORKSHOP IS LIMITED TO 20 USERS.

IF OCCUPANCY LIMITS ARE EXCEEDED:
· The most recent arrivals will be asked to return at a later time.
· The Workshop door will be locked.
· If a safe environment cannot be established through the application of the procedure above, the Workshop may be CLOSED to establish order at the discretion of the Shop Manager.

Resolution of any disputes regarding the application of this policy shall be the responsibility of the Workshop Manager in conjunction with the Director of the CAC.C.

Please consider these occupancy limits when assigning projects and deadlines.

Notify Workshop management of expected heavy shop use so that adequate staff can be scheduled.
GENERAL WORKSHOP SAFETY

Consult with the Shop Manager before performing any procedure you are unfamiliar with. He or she is the one to decide if the work can and should be done, and will be able to suggest the safest most efficient way to do it.

Use the Workshop as an Applied Physics Lab. For every action, there is an equal and opposite reaction. Be prepared for all of the possible reactions to your action.

CLOTHING: Dress properly for your work. Remove coats and jackets, roll up loose sleeves, remove loose jewelry and tie back long hair. Wear shoes, NO SANDLES ALLOWED!

EYE PROTECTION: Wear safety glasses, goggles or a face shield when operating any power tools. Be sure you have enough good light to see what you are doing.

HEADPHONES: The use of headphones is prohibited in the Workshop.

Be thoughtful and helpful toward other shop users. Be sure the work your doing doesn’t endanger yourself or anybody else. Caution other students if they are not following safe operating procedures.

Select the proper size and type of tool for your work. Never use a tool unless it is sharp and in good condition. Inform the Shop Manager if tools are damaged, dull or in need of adjustment.

CARRYING TOOLS: Keep sharp-edged and pointed tools turned down. Do not swing or raise your arms over your head while carrying tools. Do not carry sharp tools in the pockets of your clothes.

CLAMPING STOCK: Whenever possible, mount the work in a vise, clamp or special holder. This is especially important when using chisels, gouges, portable electric tools, or drill press.

WORKING SPEED: Give yourself enough time to complete your work. Rushing can lead to accidents and seldom produces quality work.

FLOOR SAFETY: The floor should be clear of scrap blocks and excessive litter. Keep projects, saw horses and other equipment and materials you are using out of traffic lanes. Immediately wipe up any liquids spilled on the floor.

INJURIES: Report any injury, however minor, to the Shop Manager.
PORTABLE POWER TOOL SAFETY

Wear appropriate personal protective equipment. (safety glasses, ear plugs, dust masks, etc.) Use the Workshop as an Applied Physics Lab. For every action, there is an equal and opposite reaction. Be prepared for all of the possible reactions to your action.

Never attempt to use a tool that you are unfamiliar with and haven’t received approval to use. Seek the assistance of the Shop Manager if you have any questions about the safe operation of any tool.

Think through an operation before performing it. Know what you are going to do and what the machine will do in response.

Make all the necessary adjustments before turning a tool on.

Never remove or adjust a safety guard on any machine or tool without permission.

You must be wide awake and alert. Never operate a power tool when you are tired.

Allow the tool to reach its full operating speed before feeding it into your stock.

Work the tool carefully and only as fast as the material will be cut easily.

Most cutting tools should work without the use of excessive force. If a tool does not cut cleanly and easily, it is probably dull or damaged. Please bring it to the Shop Manager’s attention.

If a tool is not working properly, shut off the power immediately and inform the Shop Manager.

Do not allow your attention to be distracted while using a tool. Do not distract other shop users while they are using power tools.

When your done using the shop, put away all tools, clean up your workspace.
STATIONARY POWER TOOL SAFETY

Never operate a machine or power tool without the approval and/or instruction of the Shop Manager.

Tell us what you want to do and we will suggest the safest, most efficient way to get it done.

Use the Workshop as an Applied Physics Lab. For every action, there is an equal and opposite reaction. Be prepared for all of the possible reactions to your action.

Think through an operation before performing it. Know what you are going to do and what the machine will do in response.

Make all the necessary adjustments before turning on the machine. Adjustments on certain machines will require approval.

Never remove or adjust a safety guard on any machine or tool without permission.

Use approved push sticks, feather boards and safety devices. Some operations require the use of a special jig or fixture.

You must be wide awake and alert. Never operate a machine when you are tired or impaired.

Keep the machine tables and working surfaces clear of tools, stock and project materials. Also keep the floor free of scraps and excessive litter.

Allow the machine to reach its full operating speed before feeding in the work.

Feed the work carefully and only as fast as the machine will easily cut it.

Most cutting tools should work without the use of excessive force. If a tool does not cut cleanly and easily, it is probably dull or damaged. Please bring it to the Shop Manager’s attention.

If a machine is not working properly, shut off the power immediately and inform a Shop Manager.

When you are operating the machine, you are the only one to control it. If someone is helping you, be sure they understand what you are doing and what they will be doing.

Do not allow your attention to be distracted while operating a machine. Do not distract other shop users while they are operating equipment.

When you have completed an operation on a machine, shut off the power. Wait until it stops before leaving the machine or setting up another cut.

When your done using the shop, put away all tools, clean up your workspace and sign out.
WOODWORKING EQUIPMENT

BANDSAW

YOUR STOCK MUST SIT FLAT ON THE TABLE OR BE SECURELY CLAMPED TO SOMETHING SITTING FLAT ON THE TABLE!

Wheel guard doors must be closed and the blade properly adjusted before turning on the machine.

Adjust the upper guide assembly so it is ¼ inch above the work.

Check blade guides for proper set-up.

Allow the saw to reach full speed before feeding the work.

Use appropriate fence and/or guide. The stock MUST be held flat on the table.

Feed your stock only as fast as the teeth will easily remove the wood.

Whenever possible plan saw cuts to avoid backing out of curves.

Make turns carefully and do not cut radii so small that the blade is twisted.

STOP the machine before backing out of a long curved cut.

Round stock should be mounted securely in a jig or hand screw.

If a blade breaks: step away from the saw, shut off the machine and wait for the machine to come to a complete stop. Have the Shop Manager install a new blade.

Turn off the machine as soon as you have finished your work. Do not leave the machine until it has stopped running.
BELT/DISC SANDER
YOUR STOCK MUST SIT FLAT ON THE TABLE OR BE SECURELY CLAMPED TO SOMETHING SITTING FLAT ON THE TABLE!

Be certain the belt or disk is correctly mounted. The belt must track in the center of the drums and platen. Do not operate the disk sander if the abrasive paper is loose.

Check the guards and table adjustments to see that they are in the correct position and securely locked in place.

Whenever possible, use the table, fence and other guides to control the position of the work.

Small and irregularly shaped pieces should be held in a hand clamp, special jig, or fixture.

Sand only on the side of the disk sander that is moving down toward the table.

Move your work-piece as you sand so that it doesn’t burn or clog the abrasive.

Always use a backing block or other technique when sanding thin pieces on the belt sander.

Do not use power sanders to form and shape parts if the operations could be better performed on other machines.

Sand only clean, new wood.

Do not sand work that has excess glue or finish on the surface. These materials will load and foul the abrasive.
OSCILLATING SPINDLE SANDER
Select desired drum diameter and abrasive grit. Remove drum retaining bolt by turning CLOCKWISE.

Confirm that there are washers on both ends of the sanding drum.

Install new drum/abrasive and tighten retaining bolt by turning COUNTER-CLOCKWISE.

Insert throat plat with appropriate opening. Hold workpiece FIRMLY while pressing against rotating spindle.

SCROLL SAW
De-tension blade before changing.
Pass blade through hole drilled in stock for blind cuts
Install blade in a vertical position with the teeth pointing down.
Clamp blade into holder the blade clamping bolt must be AS TIGHT IS YOU CAN MAKE IT.
Apply sufficient tension to blade AFTER clamping.
Maximum cutting thickness is 1- 1/2” excessive thickness will cause the blade to break.
Rotate material to track cutting,
DO NOT push stock into the side of the blade.
DRILL PRESS
Use the right bit and drill speed for the job. Holes over 1/2 inch and in harder materials should be bored at the lower speeds. Check with the Shop Manager if you’re unsure of proper speed.

UNLOCK table before adjusting height.

Mount the bit securely in the drill chuck.

Position the table and adjust the feed stroke so there is no possibility of the bit striking the table.

Use a backing board to protect the table and to drill cleaner holes.

Use a punch to locate holes in hard materials to prevent drill bit from skating.

Small or irregularly shaped pieces must be clamped to the table or held firmly by some means.

Feed the bit smoothly into the work.

When the hole is deep, withdraw it frequently to clear the shavings and cool the bit.

Hold stock with vice or other fixture to prevent injury caused by spinning stock.

Use only an approved bit. Bits with feed screws or those that have excessive length generally should not be used in a drill press.
HOLLOW CHISEL MORTISER
See Shop Manager for assistance with installation of chisel/bit set.

Select and install desired chisel/bit set.

Set fence, hold down and depth stop to desired positions.

Place scrap backing board beneath stock if through cutting.

Make cut with steady even pressure and speed

Retract chisel from cut.

If machine clogs with chips, shut off immediately and see Shop Manager for assistance in clearing the machine.

Remove all scraps and clean up area when completed.
MITER SAW
Hold stock firmly against back fence of saw.

Keep hands clear of cutting area.

Set desired cutting angles and lock adjustment mechanism.

DO NOT cut any workpiece that is not firmly anchored against back fence.

Use appropriately sized stock.

NEVER interfere with the operation of retractable blade guard.

NEVER force the tool. If the saw doesn’t cut properly ask a Shop Manager for help.

Use the appropriate blade. If you are cutting non-wood materials, make sure the blade is appropriate for the job.

Beware of flying off-cuts. This saw tends to fling small off-cuts. Use supplemental back fence, clamp workpiece or construct a holder to save small off-cuts.

When using the sliding feature on the sliding compound miter saw, pull the saw toward before lowering the blade into the stock.
SURFACE PLANER
NEVER run used wood through this machine: only NEW SOLID WOOD can be used.
Get approval of Shop Manager before operating.
Allow machine to feed stock.
NEVER push or pull material through machine.
If stock binds or stops, adjust depth to allow completion of the cutting pass.
Shut off the machine if stock fails to feed all the way through.
NEVER look or reach into the mouth of the machine while it’s running.
Plane only with the grain of the wood.
The maximum depth of cut per pass should not exceed 1/16th inch.
The stock MUST be at least 12 inches long.
Keep hands away from the cutterhead.
ROUTER TABLE
Have the Shop Manager check your set-up before using machine.

Select router bit and install in appropriate router collet. DO NOT “bottom out” the router bit: install bit with ≥ 90% of shaft in collet.

Cut only new stock that is straight and true, and free of splits, checks and knots.

Consider the direction of cut. Stock is almost always moved from right to left.

Use caution to avoid “self-feeding” cuts. Such cuts can rapidly throw stock from the operator.

Make numerous shallow passes rather than one deep pass. Excessive depth of cut is dangerous, and damages tooling and equipment.

Use the fence for all straight line cuts. Be certain it is properly adjusted and securely locked in place.

Use guards, feather boards and hold-down devices whenever possible.

Use appropriately sized stock. Small profiles should be milled out of lengths of stock. A jig or fixture may be necessary for milling small pieces.

Make a trial cut on an extra piece of stock that is the same thickness as your project work.
JOINTER
Get the Shop Manager’s approval before operating.

NEVER run used wood through this machine; only NEW, SOLID wood can be used.

Use push sticks or push blocks to handle the stock.

Inspect stock carefully for staples, nails etc. Any foreign matter will damage the knives.

Make adjustments for depth of cut and position of fence before turning on the machine.

The maximum depth of cut for joining an edge is 1/8 inch; for a flat surface, 1/16 inch.

Stock must be at least 12 inches long. Stock to be surfaced must be at least 3/8 inch thick.

Feed the work so the knives will cut with the grain.

Use only new stock that is free of knots, splits and checks.

Keep your hands away from the cutterhead even though the guard is in position. Maintain at least a 4 inch margin of safety.

The jointer knives must be sharp. Dull knives will vibrate the stock and may cause a kickback.
WOOD LATHE
Get the approval from the Shop Manager before using this machine.

Mount workpiece firmly between centers, on faceplate or in chuck before turning on machine.

Select appropriate speed before plugging in the machine.

Adjust tool rest to minimal distance from workpiece.

Rotate stock manually before applying power to guarantee proper mounting and toolrest clearance.

Select appropriate turning tool for the task at hand.

ALWAYS hold turning tool firmly with both hands.

ALWAYS tilt turning tool down onto rotating workpiece.

Consider the grain of the stock when removing material, work the cutting tool with the grain for the best results.
TABLE SAW

More shop related injuries occur on tablesaws than any other woodworking machines.

The KEY to tablesaw safety is moving the material past the blade in a STRAIGHT LINE and avoiding trapping cut off pieces between the blade and other parts of the saw.

ALWAYS HAVE THE LONGEST EDGE OF THE STOCK THAT YOU ARE CUTTING AGAINST THE GUIDE THAT YOU ARE USING TO MAKE IT GO IN A STRAIGHT LINE!!

RIPPING

When your workpiece is longer than it is wide, guide it along the rip fence.

Be certain to keep the edge flat against the rip fence for the entire length of the cut.

NEVER push on the "waste" side of your stock, or push the offcut "waste" piece into the blade.

CROSS CUTTING

When your workpiece is wider than it is long, use a miter gauge, sliding table, or other jig to guide your workpiece.

Push your workpiece all the way past the blade.

DO NOT push on or handle the "waste" or off-cut piece until the saw has come to a complete stop.

NEVER, NEVER, EVER, EVER attempt to cut stock freehand.

NEVER allow an off cut or "waste" piece to become pinched between the blade and the rip fence.

The SawStop mechanism is triggered when conductive materials are contacted by the saw blade. If you have any suspicion that the material you are cutting may conduct electricity, check with a Shop Manager to test the material before attempting to cut the material.
Be certain the blade is sharp and the right one for your work.

Use all appropriate guards, splitters and safety mechanisms.

Set the blade so it extends about 1/4 inch above the stock to be cut.

Stand to either side of the operating blade and the stock to be cut, not directly behind the workpiece.

Maintain a 4 inch margin of safety. Do not let your hands come closer than 4 inches to the spinning blade even when the guard is in position.

Stock must have at least one straight edge before being cut on the tablesaw.

The position of the stock must be controlled either by the fence or the miter gauge.

Use only new stock that is free of knots, splits and warp.

Stop the saw before making adjustments to the fence or blade.

Do not let small scrap cuttings accumulate around the saw blade. Shut off the machine, let blade stop and remove.

Resawing and other special setups MUST be inspected by a Shop Manager before power is turned on.

The dado or any special blades should be removed from the saw after use.

Users helping with “out feed” of materials should not push or pull the stock but only support it. The operator must control the feed and direction of the cut at all times.

When you complete your work, turn off the machine and remain until the blade has stopped. Return any removed guards. Clear the saw table and throw away your scraps.
METAL WORKING EQUIPMENT

SHEET METAL SHEAR
Get the approval from the Shop Manager before using this machine.
This machine is used to shear (cut) mild steel, copper, brass, aluminum and other sheet metals.
CAPACITIES:
mild steel 16ga .0625”
aluminum 12ga .0875”
stainless steel 20ga .0375”
plastics 3/32” .09375
NEVER exceed material thickness capacities.
NEVER use shear to cut rod, bar, tube or cable stock.
Keep fingers clear of shear blade.
Remove waste material when completed with your work.

SHEET METAL SHEAR/BRAKE/ROLL
Get the approval from the Shop Manager before using this machine.
This machine is used to cut, bend and roll (coil) sheet metal and other sheet materials.
Get the approval of a Shop Attendant before using this machine.
CAPACITIES:
mild steel 20ga .0375”
aluminum 16ga .0625”
stainless steel 22ga .0312”
plastics 3/32” .09375
NEVER exceed material thickness capacities.
NEVER use shear to cut rod, bar, tube or cable stock.
Keep fingers clear of shear blade.
Remove waste material when completed with your work.
HORIZONTAL BAND SAW

Get the approval from the Shop Manager before using this machine. This machine is used to cut metal tube, rod, bar and other shapes.

Raise the cutting arm enough to clear the workpiece.

Lock the cutting head by closing valve on hydraulic cylinder.

Adjust vise angle to desired position.

Set workpiece FLAT on saw bed.

Clamp workpiece firmly in vise.

Turn on saw (the coolant pump comes on automatically).

Unlock the cutting head by opening valve on hydraulic cylinder.

Adjust feed speed by turning dial on hydraulic cylinder.

Do not attempt to cut metal too fast, it damages the blades.
VERTICAL BAND SAW

Get the approval from the Shop Manager before using this machine. The vertical band saw in the metal shop is adjustable speed, check with a shop attendant before cutting to confirm the speed is appropriate for the material you are cutting.

YOUR STOCK MUST SIT FLAT ON THE TABLE OR BE SECURELY CLAMPED TO SOMETHING SITTING FLAT ON THE TABLE!

Wheel guard doors must be closed and the blade properly adjusted before turning on the machine.

Adjust the upper guide assembly so it is ¼ inch above the work.

Check blade guides for proper set-up.

Allow the saw to reach full speed before feeding the work.

Use appropriate fence and/or guide. The stock MUST be held flat on the table.

Feed your stock only as fast as the teeth will easily remove the wood.

Whenever possible plan saw cuts to avoid backing out of curves.

Make turns carefully and do not cut radii so small that the blade is twisted.

STOP the machine before backing out of a long curved cut.

Round stock should be mounted securely in a jig or hand screw.

If the blade breaks: step away from the saw, shut off the machine and wait for the machine to come to a complete stop. Have a Shop Attendant install a new blade.

Turn off the machine as soon as you have finished your work. Do not leave the machine until it has stopped running.
MIG WELDING (METAL INERT GAS) AKA: WIRE FEED WELDING
Get the approval from the Shop Manager before using this machine. MIG welding is the simplest way for a beginner to produce quality welds in mild steel.

See an attendant to schedule a demonstration before attempting any welding.

Use only raw mild steel. (Galvanized) steel and steel coated with paint and other products may off-gas toxic fumes while welding.

Always ground the workpiece or table.
Always don a welding hood prior striking any arc.
Turn on shielding gas.
Adjust voltage and wire feed speed as appropriate for the material and workpiece thickness.

ALWAYS close shielding gas tank when you’re done welding.

TIG WELDING (TUNGSTEN INERT GAS) AKA: HELIARC WELDING
Get the approval from the Shop Manager before using this machine. TIG Welding is an advanced welding process that can produce the best welds in a variety of materials (mild steel, tool steel, stainless steel, aluminum, titanium, etc)

Schedule an Orientation with Kevin before attempting any TIG welding.
Always ground the workpiece or table.
Always don a welding hood prior striking any arc.
Turn on shielding gas.
Adjust controls for the material and thickness of workpieces.
Select proper electrode for the job.

ALWAYS close shielding gas tank when you’re done welding.