APPLIED TECHNOLOGY

GENERAL

LAB SAFETY GUIDE

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GENERAL LAB SAFETY

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GENERAL LAB SAFETY

A. SAFETY REGULATIONS

The following are not allowed in any Chaffey College classroom, laboratory, or other facility:

- Fighting or physical harassment
- Horseplay or pranks of any kind
- Running
- Throwing any object
- Being under the influence of any substance
- Any activity that endangers the safety of others.

Before working in the lab or using any tools, equipment, or hazardous materials, students must:

- Complete and have on file, a Chaffey College safety test with all questions answered correctly.
- Receive safety instruction on performing the task.
- Demonstrate the ability to perform the task safely.
- Inspect all tools and equipment to be used and determine that they are in safe condition.
- Wear required personal protective items, including safety glasses, face shields and gloves.

B. DRESS AND GROOMING:

Students are responsible for dressing and grooming themselves for working safely in the laboratory. Students not groomed or dressed properly will not be allowed to work in the lab and will not receive credit for the lab.

☐ Long hair should be tied back or contained under a hat, cap, or net.
☐ Shirts must be worn at all times.
☐ Loose clothing should be removed, secured, or tied back.
☐ Long sleeves should be rolled up.
☐ Long pants must be worn in the laboratory. Shorts or skirts that expose the legs are not allowed.
☐ Closed shoes must be worn in the laboratory. Bare feet, sandals, or open-toed shoes are not allowed. Leather shoes are recommended.
☐ Jewelry, including rings, watches, and body ornaments should be removed or taped.
C. PERSONAL PROTECTIVE EQUIPMENT

EYE PROTECTION
Eye protection must be worn when engaged in or working near any activity that might endanger the eyes. Regular prescription eyeglasses are not safety glasses. Students must wear safety glasses or goggles over prescription glasses when working in the lab.

☐ SAFETY GLASSES must be worn when:
  - Operating any equipment or power tool
  - Working on or near running engines or machinery
  - Working with or near any chemicals or solvents
  - Working on or near chemical storage batteries
  - Using a hammer for any purpose
  - Chipping or cleaning welds
  - Working with or near any fluids under pressure (hydraulics)

☐ FACE SHIELDS must be worn when:
  - Grinding or engaged in any activity that creates sparks or chips
  - Pouring chemicals or working with or near chemicals in open containers
  - Working near batteries or battery acid (electrolyte)
  - Working with molten lead, solder or any hot liquids

☐ WELDING HOODS, with the correct shaded lens, must be worn when welding with electric welders. Safety glasses must be worn under welding helmets.

☐ WELDING GOGGLES, with the correct shaded lens, must be worn when using an oxy-acetylene torch to gas weld, braze, solder, or cut.

☐ EYE WASH STATION – Your lab may have an eyewash station. Be sure you know where it is and how to use it.

RESPIRATORY PROTECTION:
Avoid breathing in smoke, dust, or fumes. Work only in well ventilated areas.

☐ CHEMICALS AND HAZARDOUS MATERIALS should be opened and used only in well ventilated areas.

☐ PARTICLE OR DUST MASKS must be worn when sanding, grinding or when near or engaged in any activity that creates dust or airborne particles.

☐ RESPIRATORS or fresh air supply equipment must be worn when spray painting. The respirator must be correct for the paint or primer being applied. The respirator must be properly adjusted and tested for fit. Check with your instructor to determine which type of respirator is required. Facial hair may require special equipment or care.

HEARING PROTECTION:
Hearing protection must be worn when engaged in, or working near any activity that produces excessive noise. These activities include using rivet guns, air chisels, air hammers, and air cutters. Hearing protectors are available and/or your instructor may require that you have and use earplugs.
OTHER PERSONAL PROTECTIVE EQUIPMENT:
- GLOVES must be worn when:
  - Welding or using any tools or equipment that generates excessive heat.
  - Grinding.
  - Handling hot materials.
  - Working with or carrying sharp edged material including sheet metal and glass.
  - Working on or near hot exhaust systems or other parts.
  - When handling toxic chemicals or solvents.
- LEATHER COATS AND/OR APRONS may be required for some welding operations.

LIFTING AND CARRYING
- Do not try to lift heavy objects by yourself – get help!
- Lift with your legs – not your back.

D. LADDER SAFETY

GENERAL LADDER SAFETY
- Make sure that the soles of your footwear are free of oil, grease, or other slippery substances before using a ladder.
- Make sure that the rungs of the ladder are free of oil, grease, or other slippery substances before using it.
- Check the condition of a ladder before using it. Make sure all nuts and bolts are tight.
- Do not use a wooden ladder that is cracked or broken.
- Climb and descend facing the ladder and holding on with both hands.
- When working on a ladder, hold on with one hand at all times.
- Do not try to carry tools when climbing or descending a ladder.
- Never use a metal ladder when working with or near electrical current.
- If your ladder is positioned by a door or walkway, make sure the door is locked close, or the walkway is barricaded.

STEP LADDERS
- Check with the instructor before using a stepladder.
- Make sure the spreaders are functional and locked in place before climbing a stepladder.
- Never climb past the second rung from the top of a stepladder.
- Do not overreach while working on a stepladder. Reposition the ladder if necessary.

STRAIGHT LADDERS
- Do not use a straight ladder that does not have safety feet.
- FOLLOW THE FOUR-TO-ONE RULE. Position a straight ladder base one foot away from the wall for every four feet of ladder height (up to the support point).
- Never climb past the third rung from the top on a straight ladder.
- Tie down the ladder as close as possible to the support point.
A straight ladder should extend at least three feet past the support point. Avoid overreaching on the ladder. Do not let the trunk of your body extend past the side of the ladder. Reposition the ladder if necessary.

CHAIR AND STOOL SAFETY

Never stand or kneel on chairs or stools. Do not tip chairs or stools. Each leg or wheel must remain in contact with the floor at all times. Chairs or stools with wheels can not be used for “scooting” or moving more than short distances. Chairs and stools are not to be used for moving tools or equipment. Chairs and stools should be kept out of aisles and walkways.

F. HAND TOOL SAFETY

GENERAL HAND TOOL SAFETY

Hand tools are designed for specific purposes. Professional technicians use the right tool for the job. Do not try to use a tool for a purpose it was not designed for.

Inspect hand tools before using them. Make sure they are clean, safe and in good condition.

Make sure you have a good grip when using hand tools. Do not use hand tools with oil or grease on your hands.

Do not force tools or use objects to increase leverage (cheaters).

Do not strike any tool with a hammer, other than punches or chisels.

Do not strike two hardened tools together

Carry pointed tools with the point facing down.

Pass sharp or pointed tools by the handle.

Do not carry tools in your pockets.

Do not leave tools hanging over the edges of tables or benches.

Never strike two tools together, especially hammer heads.

If the tool is designed to have a handle, do not attempt to use it without a handle. Be sure the handle is firmly attached.

Keep the handles of tools clean and free from oil and grease.

Hold work in a vice or clamp, not in your hands.

Clean and return tools as soon as you are finished using them.

Account for all tools at the end of the work period. Make sure tools are not left in or on vehicles or aircraft.

Do not use metal tools to test for electricity.

Report all broken or damaged tools to the instructor or tool room attendant immediately.
WRENCHES
- Always use the right size wrench for the job. Be sure the wrench you are using fits snugly and will not slip.
- Do not use wrenches with spread, worn, or damaged jaws.
- Do not try to increase the leverage of a wrench by using a “cheater”.
- Use a box wrench or socket wrench instead of an open-end wrench on tight bolt heads or nuts, if at all possible.
- Use penetrating oil and heat, if necessary, on rusted fasteners.
- Never strike a wrench with a hammer.
- Never try to use a wrench on moving machinery.
- When using socket wrenches, use the correct size drive (1/4, 3/8, 1/2 inch) for the size and tightness of the fastener.
- Use a breaker bar for breaking loose nuts and bolts. Do not use a ratchet wrench.
- Do not use a torque wrench as a breaker bar or ratchet wrench.
- Do not use an adjustable end wrench in place of an end wrench or socket wrench.
- Pull, not push, on end wrenches whenever possible.
- Adjustable end wrenches should be pulled so that the force is on the fixed jaw.

PLIERS
- Be sure that pliers are in good condition before using them. Do not use pliers that have sprung or damaged jaws, or nicked cutting surfaces.
- Use the correct type and size of pliers for the job.
- Do not use pliers on nuts or bolt heads.
- Never hammer on pliers or use pliers as a hammer.

SCREWDRIVERS
- Before using a screwdriver, be sure that the tip, shank and handle are in good condition and that the handle is firmly attached.
- Use the right size and type of screwdriver for the size and type of fastener.
- Never hold the work in your hand when using a screwdriver.
- Do not carry screwdrivers in your pocket. Carry screwdrivers with the tip facing down.
- Do not use screwdrivers as chisels, punches, pry bars, or can openers.
- Do not use screwdrivers to conduct electricity.
- Use insulated screwdrivers when working around live electrical circuits.

CHISELS AND PUNCHES
- Check the condition of chisels and punches before using them. Do not use chisel or punches that are bent or cracked.
- Do not use any punch or chisel with a “mushroomed” head.
- Chisels must have a sharp, undamaged cutting edge.

HAMMERS
- Select the right size and type of hammer for the job.
- Use a soft-faced hammer when striking hardened surfaces.
- Never use a common claw hammer with chisels or punches.
Inspect the hammer to make sure it is in good condition and the handle is firmly attached.
Never use a hammer with a chipped, damaged or "mushroomed" head.
Never strike two hammers together.
Grip the hammer handle near the end and use a normal swing. Do not "choke up" on it.
Check in front and in back of you before using a hammer. Swing the hammer so that it will not hit another person if you lose your grip.

FILES
Be sure you have the right type and size file for the job.
Check the condition of files before using them.
Do not use a file without a handle. Be sure the file handle is firmly attached.
Be sure files are clean and sharp. Use a file card to clean dirty files.
Do not use files as pry bars.

CUTTING TOOLS
Be sure cutting tools are sharp and in good condition before using them. Dull cutting tools are dangerous.
If the tool is designed to have a handle, do not use it without one. Be sure the handle is firmly attached.
Do not carry cutting tools in your pockets.
Carry cutting tools with the point or cutting edge facing down.
Pass a cutting tool to another person by the handle.

HACKSAWS
Be sure you have the right type of hacksaw frame and blade for the job.
Make sure that the hacksaw blade is in the frame with the teeth pointing in the right direction.
Do not put excessive pressure on the hacksaw frame when cutting.
Do not put any side pressure on the blade when cutting.
Cut on the forward stroke only.
Slow down and ease up on the pressure when the cut is almost through.

G. POWER TOOL AND EQUIPMENT SAFETY

GENERAL POWER TOOL SAFETY
Get permission from the instructor before using any power tools or equipment.
Do not use any tools or equipment that you do not know how to operate.
Eye protection is required when using power tools or equipment.
Make sure that all power tools or equipment are in safe operating condition before use.
Be sure all required guards, covers, or shields are in place and are securely attached.
Do not, under any circumstances, remove any machine guard or protective devices.
Do not use electrical tools or equipment while standing in or near water.
Check the condition of the power cord and plug before use. Do not use if the insulation is worn through or the plug is not in good condition.

When using portable electric tools, make sure the power cord will not get cut or wrapped up in the tool.

Clean, lubricate and make all adjustments or settings before turning the equipment on.

Only one person at a time may use a power tool or piece of equipment. Only one person may be in the marked or unmarked safety zone around a power tool or piece of equipment.

Make sure the area is clear around any power tool or piece of equipment before turning it on.

Stand with one foot slightly in front of the other, when using power tools or equipment.

Turn the equipment off and let it come to a complete stop before removing the work, removing chips or waste, or attempting to clean the work or the tool.

Never leave any tool or equipment unattended while it is running.

Notify the instructor if any tool or equipment is not operating properly or is making unusual noises or emitting unusual odors.

BENCH VISE

Be sure that all work is securely clamped in the jaws of the vice.

Never strike the vise handle or jaws with a hammer.

Close the jaws when finished with the vise.

PORTABLE ELECTRIC DRILL (DRILL MOTOR)

Obtain permission from the instructor before using a portable electric drill.

Wear eye protection when using the portable electric drill.

Be sure the chuck key is removed from the chuck before turning the drill on.

Before you start to drill, make sure you know what or who is on the other side of the material you are drilling.

Work must be center punched. Loose work should be held in a vise or clamp. Never hold work with your hands.

Hold the drill straight and steady with both hands.

Do not push excessively on the drill.

Do not put any lateral (side) pressure on the drill bit.

Apply even pressure until the drill bit begins to break through, and then ease up.

DRILL PRESS

Obtain permission from the instructor before using the drill press.

Wear eye protection when using the drill press.

Be sure the chuck key is removed from the chuck before turning the drill press on.

Work must be center punched and securely held in a vise or clamp. Never hold work with your hands.

Use a back-up board when drilling sheet metal. Clamp both securely to the drill press table.

Set the drill press speed before you begin drilling. Never try to shift the belt or make adjustments while the drill press is turning.
- If the drill bit catches on the work and the work begins to spin – step back from the drill press and turn it off. Do not try to grab the work.
- Do not put excessive pressure on the drill bit.
- Apply even pressure until the drill bit begins to break through, then ease up.
- Turn the drill press off and let it come to a complete stop before attempting to remove work, chips, or shavings, or cleaning the table.
- Be sure that you have a good grip on the drill press table before releasing the table lock.

**BENCH AND PEDESTAL GRINDERS**
- Obtain permission form the instructor before using a bench or pedestal grinder.
- Wear a face shield when using a bench or pedestal grinder.
- Adjust the tool rest so that it is as close as possible to the grinding wheel (never more than 1/8" clearance).
- Adjust the tongue guard, if equipped, so that is within 1/4 inch of the wheel.
- Inspect the grinding wheel before you use it. Make sure it is not chipped, broken, cracked, or loaded up with metal.
- Do not attempt to grind aluminum, brass, or other nonferrous materials. Check with the instructor if you are not sure what you are grinding.
- Do not use a grinding wheel that is loaded up with aluminum or other non-ferrous materials.
- Stand to one side when turning the grinder on.
- Turn the grinder off if the wheel wobbles, or the grinder shakes or sounds unusual.
- Do not grind on the sides of the grinding wheels.
- Use light pressure on the work. Do not push it into the wheel.
- Move the work slowly across the face of the wheel when grinding.
- Check with the instructor before grinding small pieces of work.
- Do not hold work with a rag or while wearing gloves.

**WIRE WHEEL/BUFFER**
- Obtain permission form the instructor before using a wire wheel or buffer.
- Wear eye protection when using a wire wheel or buffer.
- Hold all work below the centerline of the wheel.
- Use light pressure on the work. Do not push it into the wheel.
- Keep your hands clear of the wheel.
- Do not hold work with a rag when using the wire wheel.

**HYDRAULIC PRESS**
- Obtain permission from the instructor before using the hydraulic press.
- Wear eye protection when using a hydraulic press.
- Check work to be pressed apart to make sure all lock rings, keys, or pins have been removed.
- Apply light pressure, and then check the work to make sure it is still centered.
- Have the instructor check your setup before you apply full pressure.
- Stand to one side of the work when applying pressure.
□ Do not apply excessive pressure. If the work to be pressed seems to be taking too much pressure, stop and check with the instructor.
□ Use the guards, shields, or blanket supplied with the press.

H. AIR (PNEUMATIC) TOOLS

GENERAL AIR TOOL SAFETY
□ Obtain permission from the instructor before using any air tools.
□ Wear eye protection when using air tools.
□ Check the hose and all connections for leaks or damage before using the tool.
□ Protect the air hose from damage. Do not drag the air hose over equipment or around sharp edges or corners.
□ Do not leave air hoses where they can be run over or trip someone.
□ Be sure you have a firm grip on the end of the air hose before disconnecting any fittings.
□ Do not attempt to repair air hoses or repair or replace any air hose fittings, connections, or couplers.
□ Hearing protection is required when using tools that produce excessive noise, such as air chisels and rivet guns.
□ Never remove any guards, retainers or other safety devices from air powered tools.
□ Air powered tools produce varying levels of vibration while operating. Stop using any tool if discomfort, a tingling feeling or pain occurs.

IMPACT WRENCHES
□ Always use impact sockets (black oxide finish) with impact wrenches.
□ Check sockets before use to make sure that they are not cracked, worn, or damaged.
□ Be sure the ring retainer is in place on the square drive of the impact wrench.
□ Inspect the square drive of the impact wrench for wear and damage.
□ Use the correct size impact wrench and socket for the drive. Generally the square drive of the impact wrench should be the same size or larger than the diameter of the bolt.
□ Final tightening of lug nuts should be done with a torque wrench.
□ Never free-spin an impact wrench with a socket attached.

AIR RATCHETS
□ Always use impact sockets (black oxide finish) with air ratchets.
□ Check sockets before use to make sure that they are not cracked, worn or damaged.
□ Use air power to snug the fastener, and then tighten by hand.
□ Never free-spin an air ratchet with a socket attached.

CUTTING TOOLS (DIE GRINDERS, CUT-OFF TOOLS)
□ Turn off or disconnect the air supply before changing any attachments.
□ Never remove any guards, retainers, or other safety devices.
□ Keep hands and fingers away from cutting edges and wheels. Wear gloves.
Before making any cut, make sure you know what or who is on the other side of the material you are cutting.
- Use only cutting wheels or backing pads with a rating equal to or greater than rated speed of the tool.

**AIR HAMMERS, AIR CHISELS, RIVET GUNS**
- Wear hearing protection when using air hammers, chisels, or rivet guns.
- Turn off or disconnect the air supply before changing any attachments.
- Always use a retaining spring with attachments.
- Never remove any guards, retainers, or other safety devices.
- Do not pull the trigger unless the tool is held firmly on the work.

**AIR SANDER, GRINDERS, BUFFERS**
- Turn off or disconnect the air supply before changing any attachments.
- Wear a dust or particle mask when sanding or grinding.
- Use only sanding discs, grinding wheels, or backing pads with a rating equal to or greater than the rated speed of the tool.

**AIR DRILLS**
- Turn off or disconnect the air supply before changing drill bits.
- Be sure the chuck key is removed from the chuck before turning the air drill on.
- Center punch the work before drilling.
- Hold work in a clamp or vise. Never hold work to be drilled in your hand.
- Hold the drill straight and steady with both hands.
- Before you start to drill, make sure you know what or who is on the other side of the material you are drilling.
- Do not push excessively on the drill.
- Do not put any lateral (side) pressure on the drill bit.
- Apply even pressure until the drill bit begins to break through, and then ease up.

## I. BATTERY SAFETY

**WORKING WITH AND NEAR BATTERIES:**
- Always wear eye protection when working near batteries.
- Immediately flush with water any part of your body that comes in contact with battery acid.
- Wear a face shield when filling batteries with battery acid.
- Wash your hands immediately after servicing batteries. Avoid touching your eyes or face.
- Never smoke, light matches, or use a lighter near a battery.
- Keep flames and sparks away from batteries.
- Never grind or weld near a battery.
- Stay away from batteries that are gassing excessively.
- Never lay tools on a battery.
- Add only water after a battery has been in service. Never add more acid.
Always disconnect the ground or negative cable from the battery first and reconnect it last to avoid sparking.

HANDLING BATTERIES
- Use a special battery lifter or strap to remove and carry batteries.
- Carry batteries as low and as far away from your face as possible.
- Be careful handling cracked or bulging batteries.

CHARGING BATTERIES
- Obtain the instructor’s permission before using the battery charger.
- Know how to operate the battery charger before attempting to charge a battery.
- Charge batteries outdoors or in a well ventilated area.
- Be sure the battery charger is turned off before connecting it to a battery. Be sure the battery charger is turned off before disconnecting it from the battery.
- Be sure the battery charger cables are connected to the battery correctly before turning it on.
- When charging a battery outside of the vehicle, place the battery on the floor.
- Charge the battery at as low (slow) a rate as possible.
- Stop charging any battery that is gassing excessively.

J. ELECTRICAL SAFETY
- Do not use electrical tools or equipment while in damp or wet locations.
- Verify the grounding of all electrical tools. Power tools must have a three-wire plug, with ground, or be double insulated.
- Inspect any electrical tool for frayed cords, loose or broken switches, and other problems. Notify the instructor or tool room attendant of any problems.
- Never use a plug with the ground prong removed.
- Keep electrical cords away from flames and sharp edges.
- Keep electrical cords off the floor. Do not leave electrical cords where they can be run over.

K. FIRE SAFETY AND EVACUATION
All of the elements required for fire can be found in the lab. As a result, students must follow fire prevention guidelines. The instructor should be notified immediately of any fire. Students must also know how to use fire extinguishing equipment and how to evacuate the building in case of fire.

K.1. FLAMMABLE LIQUIDS
- Never smoke, or use lighters or matches near flammable liquids.
- Keep only a one-day supply of flammable liquids in the work area. All other material should be stored away from the actual work area.
- Store flammable liquids in safety cans or closed metal containers. Make sure all containers are properly labeled.
Do not leave flammable liquids in open containers.
Use flammable liquids outside or in well-ventilated areas only.
Do not use flammable liquids near flames, sparks, or hot metals.
Do not weld, solder, or use torches near flammable liquids.
Use only approved cleaning materials. Do not use gasoline or solvents for cleaning.
Cleanup spilled flammable liquids immediately.
Keep rags and waste that have been used with flammable liquids in closed metal containers.

**FIRE ALARMS**
Know where fire alarms are located and how to use them.
Do not cover or block access to fire alarms.

**FIRE EXTINGUISHERS**
Know where fire extinguishers are located in the lab and classroom.
Notify the instructor before attempting to extinguish any fire.
Know which type of fires can be extinguished with each of the fire extinguishers in the lab and classroom.
Never turn a fire extinguisher on a person.
Do not cover, lean, or hang anything on fire extinguishers.
Do not block access to fire extinguishers.

**EVACUATION**
Know where all exits are located.
Become familiar with the evacuation routes posted in the lab and classroom.
If evacuation is necessary, meet the instructor at the designated location for roll call.

**L. HAZARDOUS MATERIALS**
Hazardous materials are used in the laboratory. Students are responsible for following safety precautions when using or working around hazardous materials.

**MATERIAL SAFETY DATA SHEETS (MSDS)** are kept on file by the college for all hazardous safety materials used or stored in the laboratories. Students should review this information before using any material.

All hazardous material must be used, handled, stored, cleaned up, and disposed of as described on the Material Safety Data Sheet.

Students with an ALLERGY or other MEDICAL CONDITION related to any material should review the Material Safety Data Sheets to determine if that material may be in use.

Students may not bring any hazardous material into the laboratory without a Material Safety Data Sheet and the permission of the instructor.
M. HOUSEKEEPING

Students are responsible for helping to keep the lab in a clean and safe condition. Each student is responsible for cleaning up after himself or herself and for an assigned cleanup task at the end of each work period.

Students must:

☐ Report any unsafe condition to the instructor immediately.
☐ Cleanup spills immediately. Notify the instructor and consult the MSDS for cleaning up spilled hazardous material.
☐ Cleanup scrap and litter as soon as possible.
☐ Do not let stock or tools hang over the edges of benches or tables.
☐ Return materials, tools, and equipment as soon as finished using them.
☐ Keep aisles and walkways clear.
☐ Avoid leaving hoses, power cords, etc. in aisles or walkways where someone could trip on them.
☐ Do not block doorways or exits with tools, equipment, or vehicles.