

SOP NUMBER: 198-09-2015

ACADEMIC YEAR: 2021/2022 Onwards

DATE OF THIS ISSUE: August 2021

TITLE:

Engineering SOP

Summary of Contents:

In compliance with legislation and in line with the College's Health & Safety Policy and risk assessment process, these procedures provide Engineering staff and students with guidance and procedures to ensure they are kept safe from harm when using tools or equipment so far as is reasonably practicable.

Date Created:
27 July 2015

Last CMT Approval Date:
1 September 2015

Responsible Owner(s):

Head of School of Computing & Engineering

REVIEW INFORMATION

Reviewed: November 2016
November 2017
February 2020
August 2021

Next Review Due: February 2023

Requires CMT Approval (yes/no): No

Previous Reference (for control purposes):

174-01-2015 General Workshop Practices SOP
028-05-2013 PPE SOP
059-08-2013 Workshop Accidents & Emergencies SOP
037-06-2013 Hand Held Tools SOP
036-06-2013 Portable Electric Power Tools SOP
011-03-2013 Ladders & Stepladders SOP
035-06-2013 Pillar Drill & Mortiser SOP
054-08-2013 Hydraulic Press SOP
058-08-2013 Industrial Gas in the Workshop SOP
056-08-2013 Oxy Acetylene Welding/Allied Processes SOP
057-08-2013 Arc, Mig, Tig and Spot Welding SOP

1.0 Background

- 1.1 In compliance with legislation and in line with the College's Health & Safety Policy and risk assessment process, these Standard Operating Procedures (SOPs) provide Engineering staff and students with guidance and procedures to ensure they are kept safe from harm so far as is reasonably practicable.
- 1.2 Although staff have day to day prime responsibility for safe working practices within the areas under their control, this does not preclude the responsibilities of all staff or students of their legal duties to safe working practices and a safe environment under the Health and Safety at Work (NI) Order 1978.
- 1.3 Staff and students have a duty to take reasonable care of their own health and safety and that of others who may be affected by their acts or omissions at work. To this end, staff and students should correctly use all work items and procedures provided in accordance with their training and the instructions they receive.
- 1.4 This SOP acknowledges the College's duties under the Special Educational Needs and Disability Order (SENDO) 2005 and the Disability Discrimination Act 1995 (DDA) and the Disability Discrimination (NI) Order 2006 (DDO). However, where there is a conflict between the need to make reasonable adjustments and the duty of care, Health and Safety will be the priority.

2.0 Scope

- 2.1 The following sections apply to **ALL** Engineering staff and students:
 - Section 5 [General Workshop Practices](#)
 - Section 6 [Personal Protective Equipment \(PPE\)](#)
 - Section 7 [Workshop Accidents & Emergencies](#)
- 2.2 The additional procedures below will apply to **one or more sections** of Engineering staff and students. The applicable sections must be read and followed.
 - Section 8 [Hand Held Tools](#)
 - Section 9 [Portable Electric Power Tools](#)
 - Section 10 [Ladders & Stepladders](#)
 - Section 11 [Pillar Drill & Mortiser](#)
 - Section 12 [Hydraulic Press](#)
 - Section 13 [Industrial Gas in the Workshop](#)
 - Section 14 [Oxy Acetylene Welding/Allied Processes](#)
 - Section 15 [Arc, Mig, Tig and Spot Welding](#)

3.0 Review

These procedures will be reviewed annually or sooner if required to reflect changes in legislation or circumstance.

4.0 Communication

These procedures will be available for all staff via the SERC intranet and referred to in relevant staff induction and student training.

5.0 General Workshop Practices

5.1 General Procedures

- › NO ONE should operate or work with tools and equipment unless they have been authorised to do so.
- › **Authorised staff and students must either be trained to use tools and equipment safely or deemed competent by the HOS/AHOS before using them. Training records must be signed by both staff member/responsible person and student, and stored on the team site.**
- › **When not in use, workshops/ stores must be kept locked and all electrical and gas services must be isolated** at the main control point. When in use, all available exit doors from a workshop must be unlocked and uncluttered.
- › Clearly displayed safety rules and cautionary notices, instructions or relevant sections of codes of practice must be displayed adjacent to appropriate items of equipment and must be followed.
- › COSHH registers containing an indexed list of separate Materials Safety Data Sheets (MSDS) for all hazardous substances must be kept up to date by the allocated member of staff and prominently located in each workshop. ALL users of the workshop must be fully aware of the location of the COSHH Register. MSDS information (including handling and storage instructions) and control measures for harmful substances must be complied with.
- › Personal protection equipment (PPE) must be available, fit for purpose and worn. Appropriate footwear, aprons or workshop coats are a basic safety requirement. Specialist protective clothing for particular activities must be used as instructed. Know where the barrier cream, cleansing and after-work products are located in the workshop. Use them to help prevent dermatitis.
- › All jewellery must be removed, loose clothing tucked in and long hair tied back.
- › Good tidy workshop management must be observed at all times. Worktops must be uncluttered and the floor kept free from obstructions particularly when practical work is in progress.
- › 'Safe working zones' defined by yellow safety lines around machines must be observed.
- › Workshop users must keep alert and be aware of other people in the workshop. NEVER talk to or distract a machine operator while they are operating any machine.
- › No "horseplay" of any kind is acceptable in the workshop area - students who misbehave will be dismissed from the workshop and may be disciplined.
- › Workshop users must be aware of the location of emergency stop controls for machinery, gas and electricity.

- › Fire extinguishers must be maintained and ready for use. All workshop users must know what to do in the event of a fire and where the fire exits and evacuation procedures. Students must be thoroughly familiar with the fire evacuation drill and staff should be aware of how to use the firefighting equipment to assist with the evacuation of an area.
- › Workshop users should be aware of the location of First Aid facilities and qualified First Aiders. All accidents and incidents should be reported to the technician or tutor.
- › Machines, air hoses and work areas must be left in a safe, clean and tidy state.
- › Hands should be washed and dried before breaks, before and after eating, drinking, smoking or using the lavatory, at the end of work and before leaving the workshop using the skin cleanser provided, ensuring residue is washed off with soap and water. An after-work cream should be used to replace skin oils. Skin should be checked regularly for dryness or soreness and any symptoms or concerns should be reported to supervisors. If warts appear, medical advice should be sought.
- › Hands must never be cleaned with concentrated cleaning products, solvents or fuel.

5.2 Using Machines or Equipment

In addition to the general procedures above:

- › Students should NOT be allowed to use machines or equipment unless they are assessed to have the necessary maturity and competence, have completed induction training and are adequately supervised.
- › Users of workshop equipment must **never work alone** and students should be supervised at all times.
- › SERC equipment and workshops may be used for the purposes of enhancing the skills and competence for both students and staff on products that are not normally available within the workshops. To meet the demands of the rapid developments within the emerging technologies of this industry, this will enhance student and staff skills and competence across a wide range and type of activities and practices within the sector. In carrying out this type of work, it is not simulated but practice in a real working environment. The activity must be approved by the appropriate AHOS and or HOS and the activity recorded in a log book.
- › Students or staff may only use SERC equipment or machinery **for extra-curricular or personal use** with the approval of the appropriate AHOS (who must inform the relevant technician). This must be recorded in a log book or equipment register. There must be no personal financial gain arising from extra-curricular or personal projects using SERC equipment or machinery. Materials used for personal projects must be supplied by the person(s) involved or taken from offcut/scrap bins. Personal projects should, as far as possible, take place when the workshop is not in use, but must never interfere with the delivery of student learning. SERC will not be held responsible for any damage caused to personal items during this activity.

- › Only one student is allowed to operate a machine or piece of equipment at any one time, others should look on at a safe distance. It is only rarely that one student helps another at a machine so as to make it safe to use. Remember “one space, one operator, one operation, at one time”.

Operators must:

- › Locate and be familiar with the operation of the ON/OFF starter and Emergency Stop controls (if fitted).
- › Where fitted and required, start ventilation units before using machines.
- › BEFORE switching on a machine, make sure everything required is organised. However, keep the machine table and operating space around the machine clear of tools and material.
- › Be familiar with all electrical and mechanical operations and controls, including emergency stop controls and any hand held keypad interface remote control.
- › Keep hands away from moving/rotating machinery.
- › Never touch swarf (even if the machine is not operational) without wearing gloves.
- › Set all guards in the correct position and ensure they are securely fixed.
- › Use suitable jigs, fixtures and feeding devices etc (eg push stick) where appropriate.
- › Ensure tooling is of the correct type for use with the machine and that cutters are securely fixed in position.
- › Not talk to any person while operating any machine; remain focussed on the job.
- › Stop the machine before making any adjustments (there are a few exceptions), and on some the Lock-Out Switch must be turned OFF first.
- › Ensure all moving parts of the machine are stationary before setting, cleaning or making any adjustments.
- › Report any machine malfunction or operator hazard to the tutor or technician immediately.
- › Ensure the machine is electrically isolated before any maintenance/cleaning work commences.
- › Leave machine and floor in a safe, clean and tidy state.

5.3 Using **Compressed Air** (see also [Compressed Air Powered Nail Gun](#))

In addition to the general procedures above:

- › All compressed air lines should be fitted with safety nozzles of a type approved by the Health & Safety Executive and then may be used only under the following conditions.

- › If using a compressor, locate it in a suitable location for safe operation. Lock the wheels on the base of the compressor to prevent movement.
- › NEVER use bottled gas to power air-powered tools.
- › Treat the compressed air supply with respect. **Compressed air can be deadly** - NEVER direct it against skin or use it to blow dust and dirt from hair and clothing or for ventilation purposes.
- › The operator and anyone else in the immediate vicinity must wear eye protection.
- › CHECK that all fittings and connections are in good condition and securely connected prior to being pressurised. Report any machine malfunction or operator hazard to the tutor/technician immediately. Faulty equipment must not be used.
- › Locate and ensure you are familiar with the operation of the ON/OFF starter and Emergency Stop controls.
- › BEFORE switching on the compressor, make sure you have everything you need and your material is organised.
- › Start the compressor noting pressure increase and cut-out/cut-in pressure. Use only clean, dry regulated compressed air with a pressure not exceeding 10% or between 80 and 120 psi.
- › LISTEN for any air leaks from any flexible airlines and immediately report if any leaks are observed. Never use a tool that leaks air.
- › Adjust pressure regulator to suit work requirements. Compressed air tools must be used only with the lowest air pressure possible. They must only be used for the removal of swarf from blind holes where no other means are available for the removal of such swarf. Use extreme caution.
- › Check the compressor at regular intervals.
- › A compressed air supply must never be connected to a sealed container or be used to pressurise a sealed vessel, other than certified air receivers.
- › Take care not to snag the air hose.
- › ALWAYS DISCONNECT tool from air source before maintenance, adjusting, changing or loading accessories, transporting or trying to free a jam (eg a nail).
- › ALWAYS DISCONNECT tool from air source before leaving work area.
- › All compressed air receivers must be subject to annual inspection and certification by a qualified SERC approved engineer.

[Back to Top](#)

6.0 Personal Protective Equipment (PPE)

PPE is defined as 'all equipment (including clothing affording protection against the weather) which is intended to be worn or held by a person at work and which protects them against one or more risks to their health or safety'.

6.1 Hazards and Types of PPE

Specific hazards and the appropriate PPE are outlined below.

› **Eyes**

Hazards: chemical or metal splash, dust, projectiles, gas and vapour, radiation.

Options: safety spectacles, goggles, face shields, visors.

› **Ears**

Hazards: loud or excessive noise, explosive sound

Options: earmuffs / ear defenders, earplugs, semi inserts.

› **Head**

Hazards: impact from falling or flying objects, head bumping, hair entanglement.

Options: a range of helmets, bump caps and face masks.

› **Breathing**

Hazards: dust, vapour, gas, oxygen-deficient atmospheres.

Options: disposable filtering face piece or respirator, half- or full-face respirators, air-fed helmets, breathing apparatus.

› **Body**

Hazards: temperature extremes, adverse weather, chemical or metal splash, spray from pressure leaks or spray guns, impact or penetration, contaminated dust, excessive wear or entanglement of own clothing.

Options: barrier creams, conventional or disposable overalls, boiler suits, specialist protective clothing eg chain-mail aprons, high-visibility clothing.

› **Hands and arms**

Hazards: abrasion, temperature extremes, cuts and punctures, impact, chemicals, electric shock, skin infection, disease or contamination.

Options: barrier creams, gloves, gauntlets, mitts, wrist cuffs, armllets.

› **Feet and legs**

Hazards: wet, electrostatic build-up, slipping, cuts and punctures, falling objects, metal and chemical splash, abrasion.

Options: safety boots and shoes with protective toe caps and penetration-resistant mid-sole, gaiters, leggings, spats.

6.2 PPE Procedures

- › All work clothes should be kept as clean and dry as possible to prevent future health problems.
- › PPE should always be the last resort in preventing accidents as it is always better to remove the risk completely, but where this is not possible PPE should be worn.
- › If PPE is required, ensure it is provided.
- › All staff and students must use appropriate PPE as instructed.

- › Anyone using PPE must be aware of why and when it is needed, to be used, repaired or replaced and also its limitations.
- › Always ensure that PPE is cleaned, maintained and replaced when necessary, speak to your supervisor for further guidance on the replacement of certain PPE such as ear muffs and hard hats.
- › Users must wear it all the time when exposed to the hazard – there are no exemptions for jobs which take ‘just a few minutes’.
- › PPE must be properly maintained and defects must be reported to supervisors.
- › PPE must be returned to its proper storage after use.
- › Checks will be made regularly to ensure PPE is being used when necessary - disciplinary action may be taken against staff or students failing to comply with procedures.

[Back to Top](#)

7.0 Workshop Accidents & Emergencies

7.1 Definitions within these Procedures

- › **Accident**
An accident is when a person is injured and requires first aid or emergency medical treatment.
- › **Emergency**
An emergency is a sudden event or situation that threatens harm or damage to staff, student or visitor welfare, the College environment or its assets and requires the implementation of special arrangements by internally dedicated responders and/or external emergency services. The most likely workshop emergencies result from fires, gas leaks and personal accidents.

7.2 General Emergencies

Each situation is unique. Some circumstances may require full evacuation of the workplace; others may be limited to some or the entire workforce moving to a safer part of the workplace. In some instances, staff may be capable of safely managing situations.

If a situation is beyond the capability of the individuals at hand or if danger threatens the surrounding area:

- › Shut off the gas and electricity
- › Sound the fire alarm
- › Evacuate the building
- › Close doors – do not lock them
- › Proceed immediately to the nearest assembly point

Procedures for situations which may be judged manageable are set out below.

7.3 Fires

If a fire is deemed manageable, it should be tackled using the appropriate fire extinguisher. **Only trained and competent personnel should use fire extinguishers.** Staff or students should never put themselves or others in a position of danger as a result of attempting to extinguish a fire. If there is any doubt at all, operate the fire alarm by pressing the nearest break glass unit. This will activate the fire alarm and may also alert the NI Fire and Rescue Service (NIFRS). Follow SERC's evacuation procedures.

7.4 Gas Equipment Backfires, Flashbacks, Fires and Explosions

Backfire

If there is a sustained backfire in a blowtorch/cutting head (ie the flame returns into the blowtorch/cutting head and continues burning in the neck or mixing chamber):

- › Close the oxygen valve on the blowtorch/cutting head – to prevent internal burning – followed immediately by shutting off the fuel gas at the blowtorch valve.
- › The normal shutting-down procedure should then be completed.
- › When the cause of the backfire has been discovered, the fault rectified and the blowtorch cooled down, the blowtorch/cutting head may be re-lit.
- › If the backfire repeats itself, the full shutting-down procedure followed by fault identification and rectification is recommended.

Flashback, Fire or Explosion

If there is a flashback into the hose and equipment; a hose fire or explosion; a fire at the regulator connections or gas supply outlet points:

- › If it can be done safely, shut off the gas supply using the shut-off valves or emergency stop controls located prominently within the workshops.
- › Isolate the oxygen and fuel gas supplies at the cylinder valves or gas supply outlet points – but only if this can be done safely.
- › Attempts should only be made to control a fire using first-aid fire-fighting equipment if there is no undue risk of personal injury. In such cases, when the fire is extinguished, the equipment cooled down and no further danger of re-ignition, the equipment can be examined, and defective components replaced before re-starting the work.

7.5 Fires Near or Involving Gas Cylinders

- › Should there be a fire in an area where gas cylinders are stored, only attempt to shut off or move a cylinder if it is absolutely safe to do so. Otherwise shut the door and try and ensure that other staff and students are well away from the area.
- › There is always a risk of cylinder explosion in any fire involving an acetylene cylinder, and this risk should be taken into account in the established emergency procedures to deal with acetylene cylinders involved in fires is always best left to the emergency fire services.

- › **Always call the NI Fire and Rescue Service (NIFRS)**, even if it is possible to close the cylinder valve to control the fire.
- › Cool the cylinder by spraying it with water, but **only if it is safe to do so**.
- › Give full consideration to evacuating the whole building and not just the immediate work area (and only re-enter when the NIFRS have declared it safe to do so).
- › Do not attempt to move an acetylene cylinder that has been involved in a fire, or to move one which has been affected by heat from a nearby fire even if it appears to be cold. It is difficult to detect acetylene decomposition which may have started inside a cylinder, but it could lead to the cylinder exploding if it is not quenched by prolonged cooling.
- › If a cylinder has been in a fire it must not be used without speaking to the supplier first. This is particularly relevant to acetylene gas.
- › The NIFRS will advise on any further action to be taken after the incident has been dealt with.

7.6 Evacuation Procedures

- › If a situation arises that presents serious and imminent danger which cannot be safely managed, staff and students should stop work and move to a place of safety. Some circumstances may require full evacuation of the workplace; others may be limited to some or the entire workforce moving to a safer part of the workplace.
- › Follow SERC's established Fire Evacuation Procedures where everyone should proceed immediately to the nearest assembly point, closing doors behind them. Under no circumstances are doors to workshops, stores or offices to be locked on evacuation.
- › Only re-enter when the NIFRS have declared it safe to do so.

7.7 Accidents and Injuries

- › All accidents and injuries must be reported to workshop staff and a First Aider called to administer first aid as required and within their capabilities. A record of all accidents and injuries must be updated and saved on the respective team-site by the responsible person.
- › First aid personnel are provided in sufficient numbers and at appropriate locations to enable first aid to be administered without delay. Notices detailing the name of the first aider(s) and their location and the location of the first aid container should be displayed in a prominent position in each workshop. First-aid Notices must display a white cross on a green background and should meet the requirements of the Safety Signs Regulations (Northern Ireland) 1981.
- › If necessary, the First Aider will call an ambulance or instruct a named individual to do so. The First Aider should remain with the injured person until emergency medical services arrive. Students should be asked to move to another area, under the supervision of another member of staff.
- › Where the injury requires less urgent medical treatment, the injured person should attend the nearest Accident and Emergency Department.

- › The First Aider must keep a record of any first aid administered and ensure that any items used are replaced in first aid containers as soon as possible after use.
- › A list of College First Aiders (who have undergone training and hold an HSE approved qualification) is available on the SERC Intranet.

7.8 Reporting

- › All accidents and incidents must be reported to workshop staff. An **accident** is an occurrence which is unplanned, undesired and usually results in some sort of loss (e.g. injury, damage to equipment or property or both). An **incident** is an occurrence which is unplanned, undesired but does not usually result in loss but had the potential to do so (e.g. a ladder falling down or a breach in security). An incident may also be a near miss.
- › In line with SERC's Accident and Incident Reporting procedures set out in the [General Health and Safety SOP](#), the Head of Health and Safety must be notified immediately following any sort of accident or incident. The Head of Health and Safety will be responsible for any further investigation or report to HSE if required.
- › Although initial reports may be made by any member of staff (phone or email) this must be followed up by submission of an electronic Accident or Incident Report Form, located on the Health and Safety team site on the College Intranet.

7.9 Support and Further Advice

Further information and advice with regard to accidents and emergencies in the workshop is available from the College's Health & Safety Department. These procedures should also be read in conjunction with other relevant SERC policies and procedures, including:

- › Fire Evacuation Policy
- › Health & Safety Policy
- › Accident & Incident Reporting Policy
- › Risk Assessment Policy
- › COSHH Policy

[Back to Top](#)

8.0 Handheld Tools

In addition to the General Workshop; PPE; and Accident & Emergency procedures set out in [Sections 5 - 7](#), the following apply.

- › Never use a tool that you have not been trained to use.
- › Visually check all hand-held tools for faults before use, reporting any damage or faults to a tutor or technician.
- › Treat all tools and equipment with respect and handle them properly to ensure that they last and help produce a quality job.
- › Follow any instructions and demonstrations given on the use of tools, as well as any manufacturer's instructions provided.
- › Never 'make do' with tools – using the wrong tool for the job can be dangerous, cause damage to tools and usually breaks Health & Safety laws.
- › Never play or mess about with a tool, regardless of its type.
- › Report all faulty tools and equipment to the tutor or technician.
- › Keep tools clean and tidy.
- › Never leave tools in such a way that they become a hazard.

[Back to Top](#)

9.0 Portable Electric Power Tools

In addition to the General Workshop; PPE; and Accident & Emergency procedures set out in [Sections 5 - 7](#), the following apply.

- › Some power tools are general-purpose items that are commonly used by construction workers in various trades (drills, screwdrivers, nail guns) while others are specific to the plastering trade such as a whisk/drill.
- › Power tools present hazards such as noise, vibration, electrical, moving parts and projectiles. All have the power to cause serious injury if used incorrectly.
- › Selecting the correct tool for the job will get it done quicker and at less risk.
- › Visually check tools for faults before use. Do not use a tool that has any loose, damaged or makeshift parts. Any defects must be reported to the tutor or technician immediately. Where guards are fitted, ensure they are in place.
- › Check leads for cuts, splits or other damage.
- › The power tool plug must match the outlet - modifying plugs will increase the risk of electric shocks. Make sure the correct fuse rating is in the plug.
- › On campus, power tools should be designed for 110 volts. Where this is not possible or on site, transformers must be used to reduce the mains voltage from 240 volts to 110 volts.

- › The power must be off when connecting leads and always unwind extension leads completely from the reel to prevent the cable from overheating.
- › Power tools should be maintained and tested in accordance with manufacturer's instructions. Maintenance records should be up to date and available for inspection.
- › All power tools used on site should be regularly PAT tested by a qualified person.
- › Use the correct accessories and tool bits intended for the particular power tool. Keep accessories and tool bits in good condition, cutting tools should be sharp and clean.
- › Recharge the battery only with the charger supplied by the manufacturer to avoid risk of fire. Keep battery pack away from metal objects that could make a connection between battery terminals and short the battery. Under abusive conditions the battery may eject liquid - avoid contact - battery liquid can cause irritation and burns.
- › Make sure there is adequate light and ventilation to carry out the task safely.
- › Always treat power tools with respect: they have the potential to cause harm either to the person using them or to others around.
- › Pay attention and concentrate on the activity and safe use of the tool. Take care not to overreach and keep proper footing to avoid losing control.
- › Power tools should not be operated in explosive atmospheres as sparks may ignite dust or fumes.
- › Keep power tools out of rain or wet conditions - water entering a power tool will increase risk of electric shocks.
- › Keep power cables in good condition, avoid dragging along the ground, and keep away from heat, sharp edges and moving parts.
- › Follow any instructions and demonstrations given on the use of tools, as well as any manufacturer's instructions provided.
- › Keep tools clean and tidy. Never leave tools in such a way that they become a hazard.
- › Never use a tool that you have not been trained to use.
- › Never use when tired or under the influence of drugs or alcohol.
- › Never throw a tool onto the ground or lay a driver down while it is switched on.
- › Never carry or pass a power tool by its cable.
- › Never use a drill unless the chuck (the part in which the drill bit is held) is tight.
- › Never play or mess about with a tool, regardless of its type.
- › Never 'make do' with tools – using the wrong tool for the job can be dangerous, cause damage to tools and usually breaks Health & Safety laws.

[Back to Top](#)

10.0 Ladders & Stepladders

In addition to the General Workshop; PPE; and Accident & Emergency procedures set out in [Sections 5 - 7](#), the following apply.

10.1 Guidelines

- › When possible, avoid working at height and use long-handled tools or equipment to safely carry out the work without using a ladder.
- › Only use ladders for light work that isn't likely to last longer than 30 minutes, when alternative working platforms should be considered.
- › Only use a ladder or stepladder if you have been trained in how to use the equipment safely, are fit and healthy and not taking medicine which could stop you using ladders safely.

10.2 Pre-Use Checklist

Always examine ladders before use, using the following checklist:

- › Good condition – clean and dry, free from wet paint or oil
- › No cracks
- › No damaged or bent stiles (sides)
- › Not warped or twisted
- › No corroded metal
- › No split, rotten or decayed timber
- › No sharp edges or dents
- › No bent metal rungs (steps)
- › No damaged or missing rungs, steps or top platforms
- › No tie-rods are missing
- › No repairs have been made to the ladder
- › They have not been painted (may hide defects or damage)
- › Caps or rubber fittings are in place and in good condition

NEVER use equipment that is in poor condition, has any loose, damaged or makeshift parts. Report any defects to the tutor or technician immediately.

10.3 Erecting Ladders

- › Stepladders: open stepladder spreaders and shelf fully, locking into position. Place stepladders facing the work, never side on.
- › If the ladder is too heavy to put it in position on your own, get someone to help.
- › When using an extension ladder, always extend it before use, ensuring at least a four-rung overlap on each extension section.
- › Lean the ladder on a solid and secure surface. NEVER rest the ladder on a fragile surface such as guttering, plastic features or glass as it may break, causing the ladder to slip and the user to fall.
- › The ladder must reach at least one metre above the landing place or above the highest rung on which you have to stand, unless there is an equivalent suitable handhold.

- › The angle of the ladder should be at a ratio of 1:4 (or 75 degrees). This means that the bottom of ladder is 1m away from the wall for every 4m in height.
- › NEVER position a ladder where it can be knocked over by a door or window being opened; where it may get hit from a passing vehicle; or within 6m of an overhead power line (unless lines are disconnected or insulated).
- › Where the base of the ladder is in an exposed position, ensure it is adequately guarded so that no one knocks it or walks into it.
- › SECURE the ladder at both the top and bottom by tying it (from the stiles, not the rungs) to a secure, fixed object. Where this is not possible, the bottom of the ladder can be secured by a second person 'footing it' by standing with one foot on the bottom rung and holding a stile in each hand; however, this person must not leave the base of the ladder while it is in use.
- › Post notices informing people that a ladder is erected and there may be a danger of falling objects

10.4 Using Ladders

- › Wear clean footwear (free from mud, oil or anything that may cause you to slip) in good condition with laces tied.
- › Use both hands to hold onto the ladder, carefully taking one rung at a time.
- › The work should not require the use of both hands - one hand should be free to hold the ladder (ensuring three points of contact with the ladder at all times). You should be able to do the work without stretching.
- › Never
 - stand on the top steps or handrail of a stepladder
 - stand on the top rung of a ladder
 - allow more than one person on a ladder
 - stand with one foot on a ladder and the other on another surface
 - carry anything heavy or awkward on a ladder
 - use a ladder in strong winds or near power lines use metal ladders (or wooden ladders with metal parts) near any electrical hazard
 - use a ladder the wrong way round
 - stand the bottom of the ladder on a kerb or road
 - support scaffold boards on the rungs of a ladder
 - miss the lower rungs when stepping off the bottom of a ladder

10.5 Storing Ladders

- › Store in a dry, well-ventilated area, away from weather, dampness and heat.
- › Never hang ladders or stepladders vertically.
- › Hang aluminium or fibreglass ladders horizontally or rest the stiles on the floor.
- › Timber pole ladders must be stored off the ground, under cover and flat, supported evenly along their length, to prevent them sagging and twisting.

[Back to Top](#)

11.0 Pillar Drill & Mortiser

In addition to the General Workshop; PPE; and Accident & Emergency procedures set out in [Sections 5 - 7](#), the following apply.

The following procedures apply to all pillar drills and mortisers – additional procedures solely for mortisers are provided at 12.4 below.

11.1 Before Use

- › Wear appropriate PPE including safety shoes, eye protection, ear defenders and dust masks. **Do not wear gloves** when using these machines.
- › Locate and ensure you are familiar with the operation of the ON/OFF starter and Emergency Stop controls.
- › Familiarise yourself with all electrical and mechanical operations and controls, including any hand-held keypad interface remote control.
- › Ensure the machine and area is clean and free from obstacles. Ensure no slip/trip hazards are present in workspaces and walkways.

11.2 Preparation

- › Always select the correct drill bit/chisel/auger for the material to be used. Check their condition– they should be kept sharp and free from burrs on the shank.
- › Check that drill speed is suitable for the work to be done and adjust as required.
Rule of thumb for drill speeds: small diameters: high speeds
 large diameters: low speeds
- › Set all guards in the correct position and ensure they are securely fixed.
- › If the machine is fitted with a key chuck, tighten the chuck uniformly when the bit is inserted and always use the correct size chuck key.
- › ALWAYS remove the key from the chuck before starting.
- › Check all adjustments and setting carefully before commencing any drilling or boring operations.
- › Inspect stock before use. Remove any nails, sand, loose knots (from wood) or other things that will cause damage to the cutting blade.
- › BEFORE switching on the machine, make sure you have everything you need and your material is organised.
- › Observe the ‘safe working zones’ defined by yellow safety lines around machines.
- › Where appropriate, start the dust extraction unit before using the machine.

11.3 Operation

- › Report any suspect equipment, machine malfunction or operator hazard to the tutor or technician immediately. Faulty equipment must not be used.

- › Keep the machine table and operating space around the machine clear of tools and material.
- › Hold the work firmly, use clamps, a vice, or a jig for small irregular work.
- › Allow the bit to cut at its own speed without applying excessive pressure.
- › Keep hands clear of the bit/auger/chisel when the machine is running.
- › Ensure all moving parts of the machine are stationary before setting, cleaning or making any adjustments. Do not slow the machine down by grabbing the rotating chuck when the machine is turned OFF. Not only will this cause static electricity but may also result in injury.
- › NEVER attempt to clear a clogged bit while the machine is running and do not remove waste material from the table while the machine is running. Brush or blow away chippings and swarf. Do not touch swarf without gloves.
- › NEVER leave the machine while it is running.
- › Do not talk to anyone while you are operating any machine; keep your mind on the job.
- › On completion of work, isolate all switches and leave the machine in a safe, clean and tidy state.

11.4 **Mortisers – Additional Procedures**

In addition to the procedures above, the following apply to mortisers:

- › Always select the correct hollow chisel and auger set for the mortise to be drilled. Check the condition of the auger and chisel. They should be kept sharp at all times.
- › Set the slot in the side of the chisel bit to align with the laterally direction of your intended mortise.
- › The work piece should be moved so that the chisel is releasing chips into the already cut part of the work piece.

[Back to Top](#)

12.0 **Hydraulic Press**

In addition to the General Workshop; PPE; and Accident & Emergency procedures set out in [Sections 5 - 7](#), the following apply.

12.1 **Operating Procedures**

- › Hydraulic presses must be kept in good order. Where fitted, fixing bolts must be checked regularly with torque wrench to ensure they remain tight. Manufacturer's maintenance instructions must be followed. Scheduled routine inspection and maintenance is required and records should be kept available.
- › Appropriate signage must be displayed at equipment.

- › Safety checks must be carried out on equipment before use. Check all pins and locks are secure, there are no damaged or broken parts and there are no hydraulic oil leaks. Immediately report any malfunction or operator hazard to the tutor or technician. Faulty equipment must not be used.
- › Locate and ensure you are familiar with the operation of the ON/OFF starter and Emergency Stop controls.
- › Safety glasses **MUST** be worn along with the appropriate PPE including boiler suits, safety shoes, ear defenders (where required) and barrier cream.
- › The press table must be clean and steel weights are flat and secure on table.
- › Ensure column pins are fully engaged after adjusting height.
- › Carefully align work under press for even force to be applied.
- › Ensure the protective screen/safety guard is in place.
- › Keep hands/fingers away from all clamping and moving parts.
- › Use press handle to lower press (slowly), once press makes contact with object, monitor PSI gauge and note pressure.
- › Only use suitable material as packing. It should not be cast metal or made of wood or other soft material.
- › **DO NOT** apply excessive force.
- › Once material is pressed release pressure at release valve and return handle to storage position.
- › On completion, the handle **MUST** be returned to the storage position.
- › Leave equipment and work area in a safe, clean and tidy state.

[Back to Top](#)

13.0 Industrial Gas in the Workshop

In addition to the General Workshop; PPE; and Accident & Emergency procedures set out in [Sections 5 - 7](#), the following apply.

13.1 Training

- › **AUTHORISED STAFF** must be trained in the safe storage and use of industrial gas and know the location of the shut-off valves and emergency stop buttons. Workshop staff should be able to carry out an external visual inspection of gas cylinders and any attachments (e.g. valves, flashback arresters, and regulators) to determine whether they are damaged.
- › **AUTHORISED STUDENTS** must be trained in the safe use of industrial gas and know the location of the shut-off valves and emergency stop buttons.

13.2 Industrial Gas

SERC uses propane, acetylene, oxygen, argon and argon-mix gases in the engineering workshops for the following processes:

- › Oxygen and acetylene are combined to form oxy-acetylene, used for welding; soldering; brazing; flame cutting; and heating
- › Propane, used for forging; and pot casting
- › Argon, used for tig welding
- › Coogar 5 (argon-mix), used for mig welding

Gas is supplied in portable cylinders or piped directly into the engineering workshops. (Propane gas may be piped to the kitchens via the workshops.) Gas cylinders are supplied by authorised providers.

13.3 Storing Gas Cylinders

- › Workshop staff are responsible for ensuring the safe handling and storage of gas cylinders. They should satisfy themselves that the legal manufacturing requirements have been carried out by examining either the written certificate which accompanies the gas cylinder; or the stamp or mark of the relevant inspection body on the gas cylinder itself.
- › Gas cylinders must be clearly marked with at least the name of the material contained and the hazards associated with their contents.
- › Reactive or fuel gas cylinders (acetylene, oxygen and propane) should be stored outside in dry, safe and secure enclosures on a flat surface in the open air. The enclosures must be properly labelled, and the door or gate kept locked when not in use to prevent tampering or damage. Cylinders must be stored upright and securely restrained (with chains or straps) to prevent them falling over. (If outside storage is not reasonably practicable, store in an adequately ventilated building or part of a building specifically reserved for this purpose. Gas cylinders containing flammable gas should not be stored in part of a building used for other purposes.)
- › Inert gas cylinders such as argon and argon-mix (e.g. cougar 5) may be stored and transported within the building on properly designed cylinder trolleys. Cylinders must be securely strapped in. Refer to Section 3.5 for moving cylinders.
- › Gas cylinders must be protected from external heat sources that may adversely affect their mechanical integrity. Gas cylinders should be stored away from sources of ignition and other flammable materials and where they are not vulnerable to hazards caused by impact, e.g. from vehicles such as fork-lift trucks. "No Smoking" and "No Open Flames" signs should be conspicuously posted in these areas.
- › Cylinders must be grouped by type of gas and the groups segregated as to compatibility. Oxygen and flammable gas cylinders must be separated by a wall.
- › Used cylinders must be separately stored from ones containing gas. Ensure the valve is kept shut on empty cylinders to prevent contaminants getting in.
- › Cylinder valves must be kept closed when not in use. Replace dust caps, where provided, when a gas cylinder is not in use.

- › Locations of all cylinders, particularly portable cylinders, MUST be recorded in case of emergency.

13.4 Handling Gas Cylinders

- › Wear suitable safety shoes, safety glasses and other personal protective equipment when handling gas cylinders.
- › Always double check that the cylinder/gas is the right one for the intended use.
- › Do not drop, roll or drag gas cylinders.
- › Before connecting a gas cylinder to equipment or pipework make sure that the regulator and pipework are suitable for the type of gas and pressure being used. Where appropriate, fit cylinders with residual pressure valves (non-return valves) to reduce the risk of back flow of water or other materials into the cylinder during use that might corrode it.
- › Before connecting a new gas cylinder to the pipework, a purge of the outlet valve should occur.
- › Flammable gases such as acetylene must be fitted with a suitable flashback arrestor.
- › Valve outlet threads are screwed left-hand (anti-clockwise to tighten) for all fuel gases. Valve outlet threads for non-combustible gases, including oxygen, are screwed right-hand (clockwise to tighten). Never open valves more than one and a half turns to allow quick closure if necessary.
- › Oil, grease or jointing compounds must never be used on valves because of risk of fire or explosion. The risk is much greater with cylinders containing oxygen.
- › Only regulators labelled for oxygen gas may be used with oxygen. They contain no oil or grease. Using a regulator labelled for a different gas could result in a fire or explosion. If an oxygen regulator has been used with another gas it must never be used again with an oxygen cylinder unless it has been serviced and declared safe. Never use oil or grease.
- › Oxygen should never be vented into a potentially flammable atmosphere or where it can adversely react with other chemicals.
- › Regulators must not be used if they are damaged or tampered with, are over 10 years old, specified below the maximum pressure of the cylinder or have no maximum pressure markings.
- › Regulators should be replaced if they are over 5 years old and not serviced, the adjusting screw is non-captive, the output connection is damaged or if the regulator is from another gas.
- › In line with an agreed schedule, technicians must periodically examine gas cylinders at appropriate intervals to ensure that they remain safe in service. The law requires that all gas cylinders are examined and tested by the relevant inspection body, in accordance with relevant regulations and at the appropriate intervals (and permanently marked by a relevant inspection body to show the date of the last periodic examination).

- › Workshop staff should check all gas connections and equipment for faults and leaks, immediately repairing or replacing leaking components as appropriate. Cylinders leaking when the valve is closed should be reported to the cylinder supplier immediately.
- › Any system connected to a gas cylinder must be risk assessed. Findings of significant risk must be recorded in writing.
- › In addition to the external manifold/regulator control valves, gas pipelines have shut-off valves inside the workshops, near the point of use. There are also a number of emergency stop buttons located prominently within the workshops.
- › **Staff and students must be aware of the locations and operation of the shut-off valves and emergency stop controls in the workshops.**
- › **Where the propane gas pipeline also supplies the kitchens, catering staff must be made aware immediately of unplanned interruptions to the gas supply.**

13.5 Mobile Gas Cylinders

- › Where the required gas is not piped directly into the workshop, properly designed cylinder trolleys should be used and cylinders securely strapped in.
- › Wear suitable safety shoes, safety glasses and other personal protective equipment when handling gas cylinders.
- › Do NOT use any trolley which shows signs of wear or damage – report this to the technician or tutor immediately.
- › Cylinders should only be manually handled when loading/unloading onto the trolley.
- › Cylinders should only be manually transported around the workshop under the following conditions:
 - Over short distances
 - Even ground
 - Dry conditions
 - Well-lit areas
- › When moving a cylinder manually you should use the 'churning' method. This involves placing one hand at the top of the cylinder and rolling it with the other. Move the trolley by pushing and not by pulling.
- › Cylinders must not be accompanied in lifts
- › Move cylinders with the cap securely in place to protect the valve stem.
- › Due to the way the cylinder is handled it is recommended that the individual is at least as tall as the cylinder if you are intending to manually handle it.
- › Cylinders must NEVER be left freestanding – they must be secured firmly in an approved location.

- › Following transportation of cylinders to the required location, the cylinders should be immediately secured in position and a gas regulator attached.

13.6 Disposal

- › Compressed gas cylinders, including any unused gas, must be collected by the authorised supplier from which the cylinder was hired.

13.7 Use of Gas Equipment in the Workshop

- › Students should NOT be allowed to use gas-burning equipment unless they are assessed to have the necessary maturity and competence and are adequately supervised.
- › Gas burning processes must only be carried out in designated areas.
- › Any combustible materials (e.g. flammable liquids, wood, paper, textiles, packaging or plastics) must be removed from the vicinity of the work.
- › Appropriate PPE including safety shoes, eye protection, face mask and fire retardant gauntlets must be worn.
- › For specific processes, refer to the relevant SOP (e.g. Welding SOP; and Metal Forging and Casting SOP).
- › If repairs to plant, equipment or buildings are required, the Head of School, Head of Health and Safety and the Estates Manager must be informed.

[Back to Top](#)

14.0 Oxy Acetylene Welding/Allied Processes

In addition to the General Workshop; PPE; and Accident & Emergency procedures set out in [Sections 5 - 7](#), the following apply.

In this section naked flame processes of oxy-acetylene welding, flame cutting and allied processes are referred to as 'welding'.

14.1 Preparation and Checks

- › Check the type of material is suitable for oxy-acetylene welding.
- › Welding processes must only be carried out in designated areas.
- › Do not weld where flying sparks can strike flammable material. Remove combustible materials (e.g. flammable liquids, wood, paper, textiles, packaging or plastics) from the vicinity of the work.
- › Remove any combustibles, such as butane lighters or matches, from your person.
- › Familiarise yourself with all operations and controls.
- › Locate and ensure you are familiar with the operation of the ON/OFF starter, shut-off valves (gas) and Emergency Stop controls

- › Check that all necessary safety devices are fitted, correctly set and that the equipment and leads are undamaged - it should be examined before use by the technician or tutor. Faulty equipment must not be used. Damaged or defective hose or hose assemblies should only be replaced or repaired by a competent person.
- › Check that all necessary safety devices are fitted and that the equipment is undamaged - it should be examined before use by a knowledgeable person. Damaged or defective hose or hose assemblies should only be replaced or repaired by a competent person. In cold weather, moisture trapped in the equipment may freeze and, for example, cause valves to malfunction. It is recommended that equipment is thawed out with hot water and cloths, never with naked flames.
- › Clothing and cleaning materials should also be kept as free as possible from oil and grease, and the only lubricants used should be those known to be suitable for oxygen service. It is also important to completely remove residues of any solvents used to clean equipment before the equipment is exposed to oxygen.
- › Use the appropriate Personal Protection Equipment (PPE) set out below, ensuring it is fit for purpose.
 - Safety shoes with reinforced toes.
 - Approved welding helmet with proper shade of filter lenses.
 - Approved safety glasses with side shields under your helmet.
 - Protective skin barrier cream.
 - Oil-free protective clothing made from durable, flame-resistant material.
 - Fire retardant gauntlets.
 - Ear protection if noise level is high.

14.2 Fumes and Gases

Fumes from welding vary greatly in composition and concentration. Different jobs lead to different levels of exposure to different substances.

- › Where exhaust fumes cannot be controlled by general ventilation of the area, ensure they are controlled using local exhaust ventilation systems.
- › Do not breathe welding fumes and gases.
- › Do not weld on coated materials unless the coating is removed from the weld area.

14.3 Oxy-acetylene Gas

Supplied in flexible hoses via non-return valves, oxygen (blue hose) and acetylene (red hose) combine to form oxy-acetylene in the blowtorch/cutting head.

- › SERC's 'Industrial Gas in the Workshop' SOP must be referred to and procedures followed in relation to the safe storage, handling and transportation of oxygen and acetylene gases.
- › Record locations of all cylinders, particularly portable cylinders, in case of emergency.

- › Use only correct compressed gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
- › Protect compressed gas cylinders from excessive heat, mechanical shocks, physical damage, slag, open flames and sparks.
- › Keep protective cap in place over valve except when cylinder is in use or connected for use.
- › Shut off compressed gas supply when not in use.

14.4 Lighting up

- › Ensure that the pre-use equipment checks have been made.
- › Check that the outlets of adjustable pressure regulators are closed, i.e. that the pressure-adjusting screw of the regulator is in the fully unwound (anticlockwise) position.
- › Check that the blowtorch valves are closed.
- › Turn face away from the valve outlet when opening cylinder valve. Slowly open the cylinder valves (or gas supply point isolation valves) – to avoid sudden pressurisation of any equipment.
- › Adjust pressure regulators to the correct outlet pressures. Or, check that the pressures in distribution pipework are suitable for the equipment and process.
- › Open the oxygen valve at the blowtorch/cutting head and allow the flow of oxygen to purge* air out of oxygen hose and equipment. If necessary, reset the pressure regulator to ensure correct working oxygen pressure.
- › Close the oxygen valve at the blowtorch/cutting head.
- › Open the fuel gas valve at the blowtorch and allow the gas flow to purge* air or oxygen from the fuel gas hose and equipment. If necessary, reset the pressure regulator to ensure correct working fuel gas pressure.
- › Light the fuel gas immediately and preferably with a spark lighter. Never use a cigarette lighter – or keep a cigarette lighter in pockets or on the workbench.
- › Open the oxygen valve at the blowtorch/cutting head and adjust it and the fuel gas valve to give the correct flame setting.

* **Purging is important.** It removes flammable gas mixtures from the hoses and equipment which could result in explosions and fires when the blowtorch is first lit. It should be carried out in a well-ventilated area, and it may take from several seconds to a minute or more depending on the length of hose and gas flow rates. Point the torch/cutting head at the extractor while purging.

14.5 Handling Lit Blowtorches / Cutting Heads

- › Handle lit blowtorches/cutting heads with great care as they may cause severe burn injury from even the briefest contact with exposed skin and can easily ignite clothing and other materials.
- › Avoid distractions from the work in hand that may lead to inadvertent contact with the flame.
- › Never hang a lit blowtorch on a gas cylinder shroud or other parts of equipment.
- › Never weld on a pressurized cylinder – explosion will result.
- › Never leave a lit blowtorch unattended even for a short period of time.
- › Extinguish the flame when work stops temporarily.
- › If an economiser is fitted, ensure proper use at all times and that the pilot flame is correctly set.

14.6 Fire Prevention

Fires may arise not only from direct contact of a flame on combustible materials, but also from slag or hot workpieces which may take a considerable time to cool down.

- › Watch for fire and keep a fire extinguisher nearby.
- › Hot materials must be cooled by dipping in a tank of water.
- › COLD scraps of metal must be placed in the scrap metal bin.
- › Oxygen leaks also increase the fire risk. Clothing contaminated with oxygen, even fire-retardant clothing, will catch fire easily and burn very fiercely. Oxygen can cause explosions if used with incompatible materials. In particular, oxygen reacts explosively with oil and grease. Take the following precautions:
 - Never use oxygen to blow dust off clothing.
 - Never attempt to improve air quality inside confined spaces by releasing oxygen in the space.
 - Never allow oil or grease to come into contact with oxygen valves or cylinder fittings.
 - Only use equipment designed for use with oxygen. In particular, check that the regulator is safe for oxygen and for the cylinder pressure.

14.7 Shutting Down

- › Close the fuel gas valve at the blowtorch/cutting head.
- › Immediately close the oxygen valve at the blowtorch/cutting head.
- › Unless the equipment is to be immediately used again, close the gas supply point isolation valves for both oxygen and acetylene.
- › Close the outlets of adjustable pressure regulators by winding out the pressure-adjusting screws.

- › Open both blowtorch/cutting head valves to vent the pressure in the equipment.
- › Close the blowtorch/cutting head valves.
- › Follow the correct processes for lighting up and shutting down the equipment.
- › Leave the equipment and area in a safe, clean and tidy state.

[Back to Top](#)

15.0 Arc, Mig, Tig and Spot Welding

In addition to the General Workshop; PPE; and Accident & Emergency procedures set out in [Sections 5 - 7](#), the following apply.

15.1 General Procedures

- › Peripheral screens and appropriate warning signage must be in place to protect others in the welding vicinity.
- › Wearers of Pacemakers and other Implanted Medical Devices should consult their doctor and provide written consent to the College before going near arc welding operations.
- › Arc flashing may trigger seizures in people with epilepsy (particularly photosensitive epilepsy). People with epilepsy should consult their doctor and provide written consent to the College before going near arc welding operations.
- › Contact lenses may be worn but always with safety glasses.

15.2 Preparation and Checks

- › Check the type of material is suitable for arc welding.
- › Welding processes must only be carried out in designated areas.
- › Do not weld where flying sparks can strike flammable material. Remove combustible materials (e.g. flammable liquids, wood, paper, textiles, packaging or plastics) from the vicinity of the work.
- › Remove any combustibles, such as butane lighters or matches, from your person.
- › Ensure machine is correctly set up for current, voltage and gas flow. Familiarise yourself with all operations and controls. Do not touch live electrical parts.
- › Locate and ensure you are familiar with the operation of the ON/OFF starter, shut-off valves (gas) and Emergency Stop controls.
- › Check that all the correct items of equipment are available for the gas being used.
- › Check that all necessary safety devices are fitted and that the equipment and leads are undamaged - it should be examined before use by the technician or tutor. Faulty equipment must not be used. Damaged or defective hose or hose assemblies should only be replaced or repaired by a competent person.

- › Only qualified staff may remove doors, panels, covers, or guards for maintenance and troubleshooting as necessary.
- › Use the appropriate Personal Protection Equipment (PPE) set out below, ensuring it is fit for purpose.
 - Safety shoes with reinforced toes.
 - Approved welding helmet with proper shade of filter lenses.
 - Approved safety glasses with side shields under your helmet.
 - Protective skin barrier cream.
 - Oil-free protective clothing made from durable, flame-resistant material.
 - Fire retardant gauntlets.
 - Ear protection if noise level is high.

15.3 Fumes and Gases

- › Avoid or limit breathing welding fumes and gases.
- › Ensure the area is ventilated.
- › Only work in a confined space if it has a forced extraction system to remove welding fumes and gases.
- › Do not weld near degreasing, cleaning or spraying operations. The heat and rays of the arc can react with vapours to form highly toxic and irritating gases.
- › Do not weld on coated materials unless the coating is removed from the weld area.

15.4 Gas Cylinders

- › Inert gas cylinders such as argon and argon-mix (e.g. cougar 5) may be stored and transported within the building on properly designed cylinder trolleys. Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
- › SERC's '[Industrial Gas in the Workshop](#)' procedures must be referred to and procedures followed in relation to the safe storage, handling and transportation of gases.
- › Protect compressed gas cylinders from excessive heat, mechanical shocks, physical damage, slag, open flames, sparks, and arcs.
- › Keep cylinders away from any welding or other electrical circuits.
- › Never drape a welding torch over a gas cylinder.
- › Never allow a welding electrode to touch any cylinder.
- › Never weld on a pressurized cylinder – explosion will result.
- › Use only correct compressed gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts/equipment in good condition.
- › Turn face away from valve outlet when opening cylinder valve.

- › Keep protective cap in place over valve except when cylinder is in use or connected for use.
- › Use the right equipment, correct procedures, and sufficient number of persons to lift and move cylinders.
- › Shut off compressed gas supply when not in use.

15.5 **Operating Arc Welding Equipment**

- › Ensure fume extraction unit is turned on before beginning welding operations.
- › Keep the welding equipment, work area and gloves dry to avoid electric shocks.
- › Follow the correct processes for lighting up and shutting down the equipment.
- › NEVER point gun toward any part of the body, other people, or any metal when threading welding wire.
- › Ensure work leads do not cause a tripping hazard.
- › Strike the arc before placing the tip of the filler rod in the weld zone.
- › Watch for fire and keep a fire extinguisher nearby. Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- › NEVER leave the welder running attended.
- › Turn off the power while changing electrodes.
- › After completion of work, inspect area to ensure it is free of sparks, glowing embers, and flames.
- › When removing/chipping slag, eye protection must always be worn.
- › Hot materials must be cooled by dipping in a tank of water.
- › COLD scraps of metal must be placed in the scrap metal bin.
- › Follow the correct processes for shutting down the particular equipment and ventilation system.
- › Leave all equipment and areas in a safe, clean and tidy state.
- › The tutor or technician must allow a sufficient 'cooling down' period before leaving the workshop.

[Back to Top](#)