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TITLE:

Construction and Engineering Services 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 Construction and Engineering Services staff and students with guidance and procedures to ensure they are kept safe from harm when using tools and equipment so far as is reasonably practicable.

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Responsible Owner(s):

Head of School of Construction, Engineering Services and Skills for Work

REVIEW INFORMATION

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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
012-03-2013 Mobile Tower Scaffolds 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
014-03-2013 Gas Nail Gun SOP
013-03-2013 Compressed Air Powered Nail Gun SOP
015-03-2013 Woodworking Fixed Planers & Sanders SOP
016-03-2013 Woodworking Lathes SOP
017-03-2013 Fixed Woodworking Saws SOP
018-03-2013 Single-End Tenoner SOP
019-03-2013 Spindle Moulder SOP
020-03-2013 Woodworking CNC Router SOP
052-08-2013 Hazardous Substances in the Motor Vehicle Workshop SOP
053-08-2013 Motor Vehicle Lifting Equipment SOP

Equality of Opportunity and Good Relations Screening Information (Section 75):

Date Policy Screened – September 2016

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 Construction and Engineering Services 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** Construction and Engineering Services staff and students:

2.2 The additional procedures below will apply to **one or more sections** of Construction and Engineering Services staff and students. The applicable sections must be read and followed.

Section 24 Woodworking CNC Router
Section 25 Hazardous Substances in the Motor Vehicle Workshop
Section 26 Motor Vehicle Lifting Equipment

2.3 All **students and staff** within the School of Construction and Engineering Services who visit construction sites should hold a current Construction Skills Register (CSR) card.

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 and trained to do so.
- Authorised staff and students must either be trained to use tools and equipment safely or deemed competent by the appropriate person.
- 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 DHOS 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 DHOS (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.

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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, armlets.

- ***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.

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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 (eg 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 (eg 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

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8.0 Hand Held 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.

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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.

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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.

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11.0 Mobile Tower Scaffolds

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

11.1 Guidelines

Mobile access towers (also known as tower scaffolds or towers) are widely used throughout the construction industry by many different trades. They provide an effective and safe means of gaining access to work at height. With lockable wheels, they can be moved around without being completely dismantled.

Inappropriate erection and misuse of towers are the cause of numerous accidents each year. Aluminium and thin-wall steel towers are light and can easily overturn if used incorrectly. Towers rely on all parts being in place to ensure adequate strength. They can collapse if sections are left out.

11.2 Before Use

- Before selecting or specifying a tower, trained and competent staff/students must be satisfied that it is the most suitable item of equipment for the job. When possible, avoid working at height and use long-handled tools or equipment to safely carry out the work.
- All staff and students erecting or using mobile tower scaffolds must hold a valid Construction Skills Register (CSR) card.
- Only trained and competent staff may train students in erecting, moving or dismantling scaffolding**. No one other than staff who have attended SERC's one day Mobile Tower Scaffold Erecting training course are deemed to be**

trained and competent. A register of trained and competent staff must be maintained by each relevant department.

- Tower scaffolds must only be used by staff and students who have been trained in how to use the equipment safely, are fit and healthy and not taking medicine which may affect their ability to use the scaffold safely.
- Students can only erect, move or dismantle scaffold towers when they are deemed competent and have been signed off. Towers must be inspected by trained and competent staff.
- Users must be sure that scaffolding is safe, assessing the condition and suitability of the scaffold before using it, checking if there are any signs attached to the scaffold that state that it is incomplete or unsafe.

11.3 Erecting & Using Tower Scaffolds

- The trained staff member must be in possession of the manufacturer's Instruction Manual before erection begins. All components must be checked to ensure they are in good condition.
- Tower scaffolds must be situated on a firm and level base. Bricks or building blocks must never be used to take the weight of any part of the tower.
- Safe Working Height: the stability of any tower depends on the height in relation to the size of the base.
  - Inside a building: height no more than 3½ times the smallest base length.
  - Outside use: height no more than 3 times the smallest base length.
  - The height of a tower can be increased provided the area of the base is increased proportionately. The base area can be increased by fitting an outrigger to each corner of the tower.
  - Any tower higher than 9 m must be secured to the structure.
  - Towers must not exceed 12 m in height unless they have been specifically designed for that purpose.
- For mobile towers, the wheels must be in the locked position while they are in use, and only unlocked when being re-positioned.
- Any working platform above 2 m high must be fitted with guardrails and toe boards. Guardrails must be fitted at a minimum height of 950 mm. If guardrails and toe boards are needed, they must be positioned on all four sides.
- Working platforms must be fully boarded and must be at least 600 mm wide.
- If the working platform is to be used for materials, the minimum width is 800 mm.
- Always use an internal ladder for access, do not climb on the tower. Reference should be made to the SOP for Ladders/Stepladders.
- Never use a tower:
  - to hoist heavy materials or support a rubbish chute.
  - as a support for ladders, trestles or other access equipment
  - in weather conditions that are likely to make it unstable
  - with broken or missing parts
  - with incompatible components

- The appropriate personal protection equipment (PPE) for the work being carried out should be worn correctly.
- No one should interfere with or misuse scaffold – only competent staff can erect and insect scaffolding.
- If a student thinks that a tower scaffold has been interfered with or could be unsafe, they must report this to the tutor or technician immediately.
- Students must not make unauthorised adjustments to scaffolding and must never remove ties or handrails.

11.4 Moving a Tower

Only trained and competent staff and students can move a tower, in line with the following procedures:

- Reduce the height to a maximum of 4m
- Check that there are no overhead power lines or other obstructions
- Check that the ground is firm, level and free from potholes
- Push or pull using manual effort from the base only – never use powered vehicles
- Never move it while there are people or materials on the tower
- Never move it in windy conditions.

11.5 Inspection and Reports

- To identify any risks and take appropriate action, scaffolding should be inspected by a trained staff member after substantial alteration, repair, after any event likely to affect the stability (like strong winds) and at regular intervals not exceeding 7 days.
- A new inspection is not required every time a mobile tower is moved to a new location on the same site. However, a pre-use check must be carried out by a trained and competent user to make sure the tower has been reinstated correctly.
- Any faults should be corrected before use.
- Staff should report records of inspections and notification of defects to their line manager.

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12.0 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.

12.1 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.

12.2 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.

12.3 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 l eave the machine in a safe, clean and tidy state.

12.4 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.

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13.0 Hydraulic Press

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

13.1 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.

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14.0 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.

14.1 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.

14.2 Industrial Gas

SERC uses propane, acetylene, oxygen, argon and argon-mix gases in the 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 workshops. (Propane gas may be piped to the kitchens via the workshops.) Gas cylinders are supplied by authorised providers.

14.3 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.

14. 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.**

14.5 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.

14.6 Disposal

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

14.7 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.

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15.0 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'.

15.1 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 (eg 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.

15.2 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.

15.3 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.

15.4 Lighting up

- Ensure that the pre-use equipment checks have been made.
- Check that the outlets of adjustable pressure regulators are closed, ie 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.

15.5 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.

15.6 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.

15.7 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.

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16.0 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.

16.1 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.

16.2 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 (eg 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.

16.3 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.

16.4 Gas Cylinders

- Inert gas cylinders such as argon and argon-mix (eg 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.

16.5 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.

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17.0 Gas Nail Gun

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

17.1 Before Use

- Be aware (and very familiar with) the type of nail gun you are using, and how it is powered. Use only compatible fixings or accessories. Do not make unauthorised modifications to work equipment.
- Locate and ensure you are familiar with the operation of the ON/OFF starter and Emergency Stop controls (if fitted).
- Ensure the battery is charged.
- Ensure the actuation muzzle is serviceable and in place.
- ALWAYS assume that there are nails in the gun (not all slide back down the magazine).
- BEFORE you use a nail gun, make sure you have everything you need and your material is organised. Ensure correct identification of background surface.
- Be aware of the explosion/fire hazard from fuel cells. Fuel cells should be inserted according to manufacturer's instructions, away from heat, sparks or open flame.
- Work only where nail guns can be handled and used in a safe position. Establish an appropriate exclusion zone when nailing.
- Do not use in a confined space (particularly where gases may be present) or near any flammable material.
- Inspect surfaces before nailing. Remove any nails, sand, loose knots or other things that could cause recoil or ricochet.

17.2 During Operation

- Always point nail guns at the ground when walking or standing around. NEVER point a nail gun at anyone.
- Use only in contact with work surface.
- Keep your finger off the trigger when not firing nails (the centre of gravity at the trigger makes it easy to accidently fire the nail gun). NEVER carry around with your finger on the trigger.
- NEVER rest the nail gun against any body part, or try to climb a ladder with the nail gun cradled against your body.
- NEVER put any part of your body in front of what you are nailing as nails can go straight through some materials.
- NEVER use any part of your body to support the wood you are nailing.
- NEVER fire nail guns with people beside or in front of you.
- NEVER leave any nail gun unattended.

- Do not talk to anyone while operating a nail gun; keep your mind on your job.
- ALWAYS remove the fuel cell from the nail gun before transporting, reloading or trying to free a jammed nail.
- Report any malfunction or operator hazard to the tutor or technician immediately. Faulty equipment must not be used. Immediately report suspect equipment.

17.3 After Use

- REMOVE the battery from the nail gun when storing.
- NEVER leave nails inside tool when finished or storing tool.
- NEVER leave gas inside a nail gun and always replace the cap on the gas when storing in case slot.
- NEVER store fuel cells near heat, sparks, flame or flammable material.
- Return the nail gun to the appropriate storage cupboard and eave the work area in a safe, clean and tidy condition.
- Correctly dispose of spent fuel cells and batteries. Fuel cells must be safely disposed of where they will not be crushed, punctured or incinerated.

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18.0 Compressed Air Powered Tools

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

18.1 General Procedures for ALL Compressed Air-Powered Tools

- Locate the compressor in a suitable location for safe operation. Lock the wheels on the base of the compressor to prevent movement.
- CHECK that all fittings and connections are in good condition and are securely connected prior to being pressurised.
- Immediately report any machine malfunction or operator hazard to the tutor or 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 (if fitted).
- 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.

- Check the compressor at regular intervals.
- NEVER use bottled gas to power air-powered tools.
- Compressed air can be deadly - NEVER direct it against skin or use it to blow dust and dirt from hair and clothing.
- 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 jammed nail).
- ALWAYS DISCONNECT tool from air source before leaving work area.
- Leave the machine, hose and work area in a safe, clean and tidy state.

18.2 Air-Powered Nail Gun

In addition to the general procedures above, the following procedures apply when using compressed air-powered nail gun, eg Paslode.

- Be aware (and very familiar with) the type of nail gun you are using, and how it is powered. Use only compatible fixings or accessories. NEVER make unauthorised modifications to work equipment.
- Ensure the actuation muzzle is serviceable and in place.
- BEFORE you use a nail gun, make sure you have everything you need and your material is organised. Ensure correct identification of background surface.
- Inspect surfaces before nailing. Remove any nails, sand, loose knots or other things that could cause recoil or ricochet.
- Work only where nail guns can be handled and used in a safe position. Establish an appropriate exclusion zone when nailing.
- Do not use in a confined space (particularly where gases may be present) or near any flammable material.
- NEVER assume the nail gun is empty. ALWAYS assume that there are fixings left in the gun (not all slide back down the magazine).
- DO NOT load with fasteners with the airline connected, or with the tool trigger or work contacting element depressed.
- DO NOT disable or remove work contacting element – this is a safety device to prevent accidental firing.
- NEVER clamp the trigger in a locked or operating position.
- Use nail gun only in contact with work surface.
- NEVER leave any nail gun unattended.
- CARRY the tool by the handle only – NEVER by the air hose or with your finger on the trigger. Keep your finger off the trigger when not firing nails (the centre of gravity at the trigger makes it easy to accidently fire the nail gun).

- Always point nail guns at the ground when walking or standing around. NEVER point a nail gun at anyone.
- NEVER rest the nail gun against any body part, or try to climb a ladder with the nail gun cradled against your body.
- NEVER put any part of your body in front of what you are nailing as nails can go straight through some materials. NEVER use any part of your body to support the material you are nailing.
- NEVER fire nail guns with people beside or in front of you.

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19.0 Woodworking Fixed Planers & Sanders

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

19.1 General Procedures

- Locate and ensure you are familiar with the operation of the ON/OFF starter and Emergency Stop controls (if fitted).
- BEFORE you switch on the machine, make sure you have everything you need and your material is organised.
- Start the dust extraction unit before using the machine.
- Keep the machine table and operating space around the machine clear of tools and material.
- Set all guards in the correct position and ensure they are securely fixed.
- Inspect stock before planing. Remove any nails, sand, loose knots or other things that will cause damage to the cutting blade.
- Observe the ‘safe working zones’ defined by yellow safety lines around machines.
- Use guards and push sticks when using all operations unless you receive special instructions from the tutor or technician.
- Stop your machine before making any adjustments (there are a few exceptions), and on some the Lock-Out Switch must be turned OFF first.
- NEVER leave the machine while it is running.
- 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. Faulty equipment must not be used. Immediately report suspect equipment.
- On completion of work, isolate all switches.
- Leave the machine in a safe, clean and tidy state.

- Ensure the machine is electrically isolated before any maintenance/cleaning work commences.

19.2 Thicknesser

In addition to the general procedures, the following procedures apply to thickness planers:

- Do not plane a board shorter than 350 mm. The board should be long enough for the outfeed roller to start pulling it before the infeed roller releases it.
- ALWAYS plane with the grain, never across the grain.
- Never plane plywood or fibre board because of the glue content.
- Do not cut beyond the capacity of the machine.
- Allow cutter heads to achieve full speed before introducing wood.
- 'Walk' boards hand over hand instead of sliding them through your hands. It is dangerous and unnecessary to place your hands near the infeed rollers.
- NEVER reach into the machine when it is in operation.
- Looking into the planer bed while the machine is in motion can be dangerous. Stand in an upright position and to one side while operating the machine.
- Plane only one board at a time.
- If the stock jams or fails to feed, shut off the machine and call the tutor or technician.
- Do not attempt to plane stock less than 9 mm without a backing board AND permission from the tutor or technician.
- Keep fingers away from the top and bottom sides of the board as it is being fed through the planer.

19.3 Surface Planer

In addition to the general procedures, the following procedures apply to surface (or hand-fed) planers:

- Set depth of cut and lock table. Never make a single cut greater than 2mm.
- Check and lock fence in position.
- Hands must not be closer than 100mm from the cutter head when it is rotating.
- Use push blocks wherever possible.
- Place cupped boards with the concave side against the table.
- Plane with the grain. Hold the work piece firmly and apply even feed rate.
- Stand to the side of in-feed table to avoid possible kickbacks.
- Before making any adjustments, switch off and wait for the cutter head to completely stop.
- Switch off and reset all guards to a fully closed position after use.

- Reset the depth of cut to zero after use.
- NEVER surface stock less than 300mm long x 20mm wide x 15mm thick.
- NEVER rebate at the end of the cutter-block.
- NEVER plane end grain.

19.4 Belt / Disk Sander

In addition to the general procedures, the following procedures apply to belt and disk sanders:

- Never use for more than one operation at any one time - belt sanding OR disc sanding.
- ENSURE the sanding belt or disk is not torn or loose before using the sander. (Keep the sanding disk well glued to the disk plate at all times.)
- Always remove scrap pieces and other objects from the table, backstop or belt before turning the machine on.
- Adjust the disk table to achieve the desired angle on the stock being sanded. The table can be adjusted up to 45 degrees on most sanders. Use the mitre head to hold and move stock when a precise angle must be sanded on the material.
- The belt sanding attachment can be adjusted from a horizontal to vertical position on most sanders. Adjust to best fit the sanding job being performed.
- Adjust the belt tracking mechanism so the sanding belt does not touch the machine housing when rotating.
- Try to position yourself so that sanding dust will not be thrown toward the breathing zone.
- Always hold the work firmly when sanding.
- Do not sand with the work piece unsupported. Support the work piece with the backstop or table. The only exception is curved work performed on the outer sanding drum.
- Always use the backstop when belt sander is in the horizontal position.
- Apply firm, but not excessive pressure to stock being sanded on the belt/disk sander but do not put so much pressure on the sanding disk or belt that the sander slows down.
- Always sand on the downward side of the disk when using the disk portion of the machine, so that the work is held securely on the table. Sanding on the upward side of the disk could cause the work piece to fly up which could be hazardous.
- Always maintain minimum clearance of 1/16” or less between the table or backstop and the sanding belt or disk.
- Never wear gloves or hold work with a rag when sanding.
- Do not allow hands or fingers to touch the belt or disk when sanding.
- Do not sand pieces of material that are too small to be safely supported.

- Avoid awkward hand positions where a sudden slip could cause a hand to move into the sanding belt or disk.
- Do not become over-balanced when operating the belt/disk sander.
- When sanding a large work piece, provide additional support at table height.
- Keep the floor area around the sander clear of sawdust to reduce the possibility of slipping on a slick floor.
- Always turn the belt/disk sander off when leaving the work area.
- Do not reach across the sanding disk to turn the sander off. Your arm or hand may touch the edge of the rotating disk and cause a serious cut or entanglement. Move to the front of the sander and turn the machine off.
- Disconnect the electrical power to the sander when changing the belt or disk or making major adjustments.
- To change the sanding disk, the old disk is pulled off the disk plate, a new coating of adhesive is applied to the plate and the new sanding disk is then attached to the plate.
- To change the sanding belt, the belt tension is left off, the old belt is slipped off the pulleys and the new belt is installed. Be sure the arrows on the new belt point in the same direction as the arrows on the old belt pointed.

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20.0 Woodworking Lathes

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

20.1 Preparation

- Locate and ensure you are familiar with the operation of the ON/OFF starter and Emergency Stop controls (if fitted).
- Familiarise yourself with all electrical and mechanical operations and controls, including any hand held keypad interface remote control.
- All stock must be properly secured in the lathe chuck or mounted prior to the machining process taking place. Use the correct sized clamp or vice for the stock being machined.
- Turn the chuck or faceplate by hand to ensure there is no binding or danger of the work striking any part of the lathe.
- Check to ensure the cutting tool will not run into the chuck or lathe dog. If possible, feed away from the chuck or dogs.
- Before starting the lathe, ensure the spindle work has the cup center imbedded; tail, stock and tool rests are securely clamped; and there is proper clearance for the rotating stock.
- Prior to starting the lathe, ensure that small diameter stock does not project too far from the chuck without support from the tail stock center.

- When using wood, do not mount a split work piece or one containing knots.

20.2 **During Operation**

- When roughing stock, do not force the tool in the work piece or take too big a cut.
- Always be aware of the direction and speed of the carriage or cross-feed prior to engaging the automatic feed.
- Never leave the key in the chuck. Do not let go of the key until it is free of the chuck and secured in its proper holding place.
- Select turning speed carefully. Large diameter stock must be turned at a very low speed. Always use the lowest speed to rough out the stock prior to final machining.
- The correct speed and feed for the specific material and cutting tool must be used. Stop the machine before making adjustments or measurements.
- Do not remove metal or wood chips from the table or stock by hand. Use a brush or other tool to properly remove chips or shavings from the table or stock.
- Never attempt to run the chuck on or off the spindle head by engaging the power.
- Do not stop the rotation of the chuck by reversing the power to the lathe unless tapping holes.
- Do not leave tools, bits or excess pieces of stock on the lathe bed.
- All belts and pulleys must be guarded. If frayed belts or pulleys are observed, the lathe must be taken out of service and the belts or pulleys replaced.
- Stop the machine immediately if odd noise or excessive vibration occurs. Report any machine malfunction or operator hazard to the tutor or technician immediately.
- Only properly sharpened drill bits and cutting tools in good condition should be used. Dull drill bits and chipped or broken cutting tools must be removed from service.
- NEVER leave a lathe running while unattended.
- Disconnect the lathe from power source and wait till it comes to a complete standstill before making repairs or servicing.
- On completion of work and before leaving the lathe for any reason, the power must be shut off and the machine must come to a complete stop.
- Leave machine and floor in a safe, clean and tidy state.

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21.0 Fixed Woodworking Saws

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

The following **general procedures apply to using all fixed woodworking saws** (such as crosscut or radial arm saw; band saw; dimension saw; ripsaw and panel

saw). Reference should also be made to manufacturer's operating instructions for individual pieces of equipment.

21.1 Preparation

- Locate and ensure you are familiar with the operation of the ON/OFF starter and Emergency Stop controls (if fitted).
- Familiarise yourself with all electrical and mechanical operations and controls, including any hand held keypad interface remote control.
- Select the correct type of blade. Check the sharpness, set and general condition. Ensure all blades are sharp and free of resin build up or wear.
- Ensure that blade speed, blade tension and blade tracking are properly adjusted.
- Set all guards in the correct position and ensure they are securely fixed. Adjust all guards to minimum practicable clearances for the timber to be cut. Lock the table securely after adjustments are made.
- Ensure that the riving knife (if fitted) is correctly adjusted and securely mounted.
- BEFORE switching the machine on, make sure you have everything you need and your material is organised and that you have a push stick/jig available.
- Where applicable:
  - Ensure hydraulic damping mechanism is functioning.
  - Check coolant delivery system to allow for sufficient flow of coolant.
  - Faulty equipment must not be used. Immediately report suspect machinery.
- Inspect stock before sawing. Remove any nails, sand, loose knots or other things that will cause damage to the cutting blade.
- Keep the machine table and operating space around the machine clear of tools and material.
- Start the dust extraction unit before commencing the sawing process – if not interlocked. Adjust the dust collector shroud (where fitted) correctly for maximum efficiency.

21.2 Operation

- Always stand firmly on the floor and avoid any awkward operations so you don't slip or lose balance.
- Ensure hands are away from the blade, and then turn the machine on. Stand to one side of the line of the saw when turning on the power.
- **ALWAYS keep hands away from the cutting zone during operation.**
- Allow the saw blade to obtain maximum speed before making a cut to avoid stalling the blade and overheating the motor.
- The work piece must be held firmly against the table guide strip (fence).
- Ensure safe and correct manual handling of large or heavy sheet panel materials.
- Use a side table to provide support for long lengths.

- Operate the saw with the left hand where possible. When using the right hand to pull the saw across, keep the left hand, especially the thumb well clear of the line of cut.
- Avoid reaching over the saw line. Do not cross arms when cutting.
- The maximum cut for the machine must not be exceeded.
- Feed material only as fast as the saw will cut freely. Sawing operations must be done slowly, smoothly and, whenever possible, without stopping.
- Never remove off-cuts or waste materials while the saw is running.
- Use a suitable push stick for short or narrow timber and in removing off-cuts from the table (only when the blade is stopped and at a complete standstill).
- NEVER leave a saw running while unattended.
- Turn off the machine and bring it to a complete standstill if the blade is to be lifted out of an uncompleted or jammed cut.
- Stop the saw and bring it to a complete standstill before removing scrap pieces from the vice area or making adjustments.
- Stop the saw immediately if the blade develops a 'click'. Report it to the tutor or technician.
- Ensure the cutting head is locked in the upward position before removing work piece from vice.
- Report any machine malfunction or operator hazard to the tutor or technician immediately.
- On completion of work, isolate all switches. Switch off the saw and reset all guards to a fully closed position.
- Leave machine and floor in a safe, clean and tidy state.

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22.0 Single-End Tenoner

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

22.1 Before Use

- Locate and ensure you are familiar with the operation of the ON/OFF starter and Emergency Stop controls (if fitted).
- BEFORE you switch on the machine, make sure you have everything you need and your material is organised.
- Keep the machine table and operating space around the machine clear of tools and material.

22.2 Operation

- Set all guards in the correct position and ensure they are securely fixed.
- Use suitable jigs, fixtures and feeding devices etc. (e.g. push stick) where appropriate.
- Ensure tooling is of the correct type for use with the machine and that cutters are securely fixed in position.
- Select correct spindle speed and feed rate relevant to the tooling being used.
- The work piece MUST be properly clamped to hold it securely during the machining process. Use traversing table (with clamps) to prevent the need for hands near the cutter and work piece movement.
- 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.
- Leave the machine in a safe, clean and tidy state.
- Ensure the machine is electrically isolated before any maintenance/cleaning work commences.

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23.0 Spindle Moulder

Students are NOT PERMITTED to use spindle moulders.

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

23.1 Before Use

- Locate and ensure you are familiar with the operation of the ON/OFF starter and Emergency Stop controls (if fitted).
- Select the correct type of cutter bit. Check the cutter for general condition, bevel and burrs.
- Before tightening the cutter, check that the collar surfaces are free of foreign material.
- Ensure that all guards and safety devices are in position and secured.
- Shaw guards (spring loaded pressure pads to form a tunnel guard);
- False fence used to limit cutter exposure and to prevent dips;
- Use demountable power feed where possible for straight cuts.
- Use concentric table rings to limit gap between the cutter and table.

- Use jigs or holders with hand holds for shaped work used in conjunction with ring fence and bonnet.
- Adjust all guards to minimum practicable clearances for the material to be machined.
- Adjust the feed rollers on any automatic feed device (if fitted).
- Check material to be machined for defects, loose knots and foreign matter such as nails.
- BEFORE you switch on the machine, make sure you have everything you need and your material is organised.
- Keep the machine table and operating space around the machine clear of tools and material.

23.2 Operation

- Start the dust extraction unit before commencing the machining process – if not interlocked.
- Lock all adjustable parts so that they are secure.
- Select correct rotational direction for the cutter. Work MUST into and against the cutter.
- Ensure the spindle speed is correct for the cutter block, collar and head assembly.
- Feed material only as fast as the cutting bit will remove freely. Operational passes must be done slowly, smoothly and where possible without stopping.
- Use a suitable push stick to safely assist when moulding short or narrow materials etc.
- Ensure all moving parts of the machine are stationary before setting, cleaning or making any adjustments.
- NEVER sweep away waste materials or wood dust while the machine is running.
- NEVER leave the machine running while unattended.
- Report any machine malfunction or operator hazard to the tutor or technician immediately. Faulty equipment must not be used. Immediately report suspect equipment.
- On completion of work, isolate all switches.
- Leave the machine in a safe, clean and tidy state.
- Ensure the machine is electrically isolated before any maintenance/cleaning work commences.
- Make sure good housekeeping practices are in place to minimise any dust/waste build up, including inside the cabinet and dust extraction ports.

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24.0 Woodworking CNC Router

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

24.1 Before Use

- Locate and ensure you are familiar with the operation of the ON/OFF starter and Emergency Stop controls (if fitted).
- BEFORE you switch on the machine, make sure you have everything you need and your material is organised.
- Start the dust extraction unit before using the machine. Adjust the dust collector shroud (where fitted) correctly for maximum efficiency.
- Be aware of any other personnel in the immediate vicinity and ensure the area is clear before using this equipment.
- Familiarise yourself with all electrical and mechanical operations and controls, including any hand held keypad interface remote control.
- Never pre-program any CNC router table to perform beyond the capacity of the machine.
- Confirm all CNC programming instructions for the table router.
- Ensure sheet material is secure to the work surface bed when cutting and/or engraving sheet materials such as ply, acrylic, aluminium, foam or rubber.
- Ensure all robotic tracking arms remain unobstructed during the cutting/engraving operation.
- Keep the machine table and operating space around the machine clear of tools and material.
- Set all guards in the correct position and ensure they are securely fixed.
- Inspect stock before planing. Remove any nails, sand, loose knots or other things that will cause damage to the cutting blade.
- Ensure you are familiar with the CNC “Nesting and Toolpathing” software functionality.
- Ensure router cutting bit size conforms to specifications. The machine must be isolated while any adjustments are made to the cutter head.
- Ensure all cutters are sharp and free of resin build up or wear. Ensure that the spindle direction is correct for right-hand or left-hand operation.
- Observe the ‘safe working zones’ defined by yellow safety lines around machines.

24.2 Operation

- Ensure the CNC machine is allowed to warm up before starting operations.
- If a complete enclosure is not in place, do not allow anyone to stand within 3m while the CNC machine is operational.
- Always stand firmly on the floor and avoid any awkward operations so you don’t slip or lose balance.

- Always conduct a dry run to ensure the program is correct.
- Avoid unnecessary touching of the operating controls while the machine is running.
- Never overload the machine table; follow the manufacturer's recommendations regarding load limit.
- NEVER leave a CNC machine in operational mode while unattended.
- NEVER attempt to remove waste materials or excess dusts from the work surface while the machining process continues automatically.
- Turn off the CNC machine and allow the machine and spindle to come to a complete stop prior to removing debris with a brush.
- If it is necessary to remove scrap stock from the table, wait until the blade has stopped rotating and use a push stick or brush.
- Do not lay tools on the CNC machine table surface.
- Before making adjustments/repairs, de-energize and lock-out all energy systems - disconnect the power cord or turn off power to the room and secure the electrical panel with a lock.
- Report any machine malfunction or operator hazard to the tutor or technician immediately.
- On completion of work, isolate all switches.
- Leave machine and floor in a safe, clean and tidy state.

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25.0 Hazardous Substances in the Motor Vehicle Workshop

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

25.1 Hazardous Substances

- Hazardous substances found in the motor vehicle workshop include (but may not be limited to) the following:
    - Paints, lacquers and under-seals
    - Fuels, brake fluids and lubricants – including waste oil
    - Fumes and gases e.g. welding and cutting
    - Dusts from abrasive wheels etc.
    - Degreasing fluids, cleaning products, including strong hand cleaners
    - Adhesives and fillers
    - Battery acid
- Students should NOT be allowed to handle hazardous substances unless they are assessed to have the necessary maturity and competence and are adequately supervised.
- COSHH registers containing an indexed list of separate loose 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. This working document should be a ring-binder type file which allows loose sheets to be easily removed and replaced as necessary to ensure the register is up to date at all times. 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 in addition to the procedures set out below.

25.2 General Procedures

These general procedures apply to all hazardous substances. Additional procedures for the use of motor vehicle fuels; lubricants and waste oils; vehicle exhaust fumes; solvent-based substances; dust from abrasive wheels; and battery charging are set out in sections 25.3 – 25.8 below.

- **Always refer to the COSHH register** before using any substance or product, and follow the procedures set out in the relevant MSDS.
- **Store** products securely as instructed in the MSDS, away from the main work area in a cool, dry, dark place, capable of keeping in spills. Don't store far more than is needed.
- Don't store more than a total of 50 litres of flammable liquid indoors. Use a flammables store.
- **Only use products** for purposes for which they are designed.
- Always **read and follow the instructions** on the product label carefully. Replace caps on containers immediately. Never decant substances into an unlabelled container.
- **Look for signs** of leaks, wear and damage. If you find any problems, tell your supervisor immediately. Do not just carry on working.
- The appropriate **PPE** for the substance and task must be worn e.g. safety glasses, steel toe capped boots, ear defenders, coveralls, barrier cream and vinyl or nitrile gloves cream. (Single use gloves should be thrown away every time they are taken off.)
- Avoid undue exposure to vapours and ensure good **ventilation** when working with toxic or flammable substances. Local exhaust ventilation systems must be used and regularly checked and tested.
- Keep **flammable** substances away from sources of ignition and take measures against electrostatic charging if appropriate. Do not carry cloths soaked in flammable liquids in pockets.
- Keep the work area clean - use a vacuum cleaner. Never use compressed air to clear dust.
- Keep hazardous substances away from **food and drink**. Remove contaminated clothing and PPE before entering areas where food is consumed.
- **Hand washing** – wash and dry hands before breaks, before and after eating, drinking, smoking or using the lavatory and at the end of work using the skin cleanser provided, ensuring residue is washed off with soap and water. Use an after-work cream to replace skin oils. Check skin regularly for dryness or soreness

tell your supervisor if these symptoms appear. If warts appear, seek medical advice.

- Never clean hands with concentrated cleaning products, solvents or fuel.
- **Fire extinguishing** equipment must be available. Be aware of suitable and unsuitable extinguishing media as set out in the MSDS.
- **Avoid contact with skin** (this does not apply to hand cleaning products or barrier cream). Avoid contact with eyes and clothing.
- Clean up **spills** safely and promptly as specified in the relevant MSDS. Absorb liquid with a 'soak up' medium such as sand, earth or other recommended absorbent material e.g. 'oil-dry' or cat litter. Sweep up and remove to suitable, clearly marked lidded containers for disposal in accordance with local regulations. Do not disperse using water or detergent.
- **System for Disposal:**
  - Collect hazardous waste materials in suitable, dedicated, clearly labelled containers e.g. vehicle fuel, waste oil, hydraulic brake/steering fluids, paint, anti-freeze and oil filters. These should be as specified in each MSDS and stored away from the workshop in a separate building or cage enclosure.
  - Do not pollute the soil, water or environment with the waste product.
  - Hazardous waste must be recycled/disposed of through a specialist, licenced handler in accordance with local and national regulation.
  - Records of hazardous waste collection, including consignment notes and related paperwork, must be retained for official inspection by for 5 years.

25.3 Motor Vehicle Fuel

In addition to the general procedures at 25.2, the following should also be followed:

- Always use a fuel retriever for draining tanks.
- Change LPG fuel cylinders in a well-ventilated place.
- Carry petrol only in a clearly labelled and securely closed metal or plastic can.
- If splashed, keep well away from ignition sources and change clothes as quickly as possible. Splashed clothing should be removed immediately and dried outside in the open air.
- During vehicle fuelling and all other operations extreme care must be taken to avoid any sources of ignition from igniting the vapour.
- Special care must be exercised when working on vehicle fuel systems and in particular vehicle running tanks. These must always be removed from the vehicle in the open air after the battery has been disconnected and removed.
- Put petrol soaked rags in a lidded bin, kept in a secure place outside.

25.4 Lubricants and Waste Oil

In addition to the general procedures at 25.2, the following should also be followed:

- Wipe up all leaks and spills before they spread.

- Use designated storage areas capable of retaining spills for lubricants and waste oil. Keep these areas free of ignition sources.
- Ensure that storage tanks have contents gauges or indicators. Store only minimum amounts of waste engine oil and ensure proper labelling.
- Never allow waste oil to be contaminated with petrol or solvents.
- Never keep oily rags in pockets. They should be placed in a dedicated bin with a sealed lid.

25.5 **Vehicle Exhaust Fumes**

In addition to the general procedures at 25.2, the following should also be followed:

- Connect an exhaust gas extractor to the vehicle tailpipe.
- Turn on extraction fans before starting vehicles.
- Check that inlets for makeup air are not blocked.
- Startup diesel-fueled vehicles outside.
- Turn off the engine when the vehicle is not needed.

25.6 **Valeting etc. with Solvent-Based Products**

In addition to the general procedures at 25.2, the following should also be followed:

- Make sure there is a good enough through draught for work done inside a vehicle, e.g. by using an industrial fan with the windows open.

25.7 **Dust from Abrasive Wheels**

In addition to the general procedures at 25.2, the following should also be followed:

- Make sure a manometer or pressure gauge is fitted near the extraction point, to show that it is working properly.
- Discharge extracted air to a safe place, away from doors, windows and air inlets.
- Have a supply of clean air coming into the workshop to replace extracted air.
- Be aware that some metal dusts and oily cloth fibres can self-ignite.
- Confirm that the extraction is turned on and working at the start of work.

25.8 **Battery Charging**

In addition to the general procedures at 25.2, the following should also be followed:

- Wear gloves and suitable eye protection, preferably goggles or a visor.
- Wear a plastic apron and suitable boots when handling battery chemicals such as sulphuric acid or potassium hydroxide.
- Empty your pockets of any metal objects that could fall onto the battery or bridge across its terminals.
- Keep sources of ignition – such as flames, sparks, electrical equipment, hot objects and mobile phones – well away from batteries that are being charged, have recently been charged, or are being moved.
- Use suitable single-ended tools with insulated handles.

- Fit temporary plastic covers over the battery terminals.
- Charge batteries in a dedicated, well-ventilated area.
- Share the load with a workmate when lifting batteries – they can be very heavy. Use insulated lifting equipment and check there are no tools, cables or other clutter you could trip on.
- Do not overcharge the battery or leave it to charge overnight – stop charging as soon as it if fully charged.
- Wash your hands thoroughly after working with batteries, especially before eating, smoking or going to the toilet.

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26.0 Motor Vehicle Lifting Equipment

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

26.1 Motor vehicle lifting equipment includes:

- Jacks and Axle Stands
- Gearbox Jacks
- Engine Cranes
- 2 Post and 4 Post Lifts and Scissor Lifts
- Slings, Chains and Shackles

26.2 General Procedures and Preparation

These general procedures apply to all motor vehicle lifting equipment. Additional procedures for specific equipment follow this section: Trolley Jacks and Axle Stands; Gearbox Jacks; Engine Cranes; and Vehicle Lifts.

- Lifting equipment must be correctly installed to the manufacturer's specification and must be tested before use by a competent person.
- Lifting equipment 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 and consumable items, such as lifting pads, replaced before they become unsafe.
- Scheduled routine inspection and maintenance of all lifting equipment is required and records should be kept available.
- Always use the right equipment for the job. Don't be tempted to take short cuts or use inappropriate equipment to lift heavy items.
- Safety checks must be carried out on equipment before use. 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.

- Do not exceed the rated capacity (safe working load) of any lifting equipment.
- NO ONE should be in a vehicle which is being partly or fully lifted.
- Leave vehicle lifting equipment, accessories and work area in a safe, clean and tidy state.

26.3 Trolley Jacks and Axle Stands

In addition to the general procedures at 26.2, the following apply to trolley jacks, axle stands and high-reach axle stands:

- Jacks are for lifting only – do not move a load using the jack as a dolly.
- Use the correct jack for the job. It should be capable of taking the load of the vehicle to be lifted. NEVER exceed the rated load for the jack.
- Ensure that all parts are in good condition and operating smoothly, the wheels are sound and that no cracks or distortion is apparent. Do not use if an oil leak is apparent. If in doubt do not use.
- Securely chock all wheels remaining on the ground BEFORE LIFTING proceeds.
- Ensure the jack is on a firm, solid base, and there is no possibility of it slipping when under load.
- Apply to the correct jacking point of the vehicle underside, as identified by the manufacturer. Ensure the load is taken by the FULL saddle and that the point of lift on the load is of sufficient strength to support the full load adequately.
- Always ensure that the load is stabilised or supported in such a way that it will not shift during lifting or lowering operations. Never push a load off the jack.
- Ensure that all personnel are well clear of a load being raised, or lowered.
- The jack should not be relied upon as the sole support if work is to take place beneath the vehicle or if more than one axle is raised
- NO ONE should get under a vehicle that is only supported on a trolley jack: this practice is even more dangerous when working with a hydraulic jack; not only can the car slip off, but there is the added possibility of a leak in the hydraulic cylinder that could cause the jack to suddenly fail.
- ALWAYS supplement jacks with appropriate axle stands that are in good condition and inspected every year. Do not exceed the rated capacity of the axle stand.
- Make sure that each stand is securely located under a strong point on the vehicle - consult the vehicle manufacturer's handbook for guidance.
- No more than a single pair of axle stands should be used. Use only the appropriate pins to adjust the height of the stand. When these pins are lost or damaged replace them with close-fitting pins of the correct specification, and not screwdrivers, bolts, or other items of unknown load capacity.
- Inspect the structure and integrity of the axle stand, especially welded joint areas, regularly.

26.4 Gearbox Jacks

In addition to the general procedures at 26.2, the following apply to gearbox (transmission) jacks:

Preparation

- Keep all unauthorised persons away from the jack during lifting and lowering and when a load is in transit.
- Before use, ensure the gearbox weight and size does not exceed the capacity of the jack.
- DO NOT get the jack wet or use in damp or wet locations or areas where there is condensation.
- Ensure the jack saddle is fully lowered and is clean, dry and oil free before attempting to move the jack with or without a load. DO NOT transport the jack, with or without a load, with the saddle in the raised position.
- DO NOT make any adjustments or modifications to the jack or the safety valve.
- Ensure the vehicle from which the gearbox is to be removed is correctly positioned, handbrake applied, raised and stabilised at the correct height.

Positioning the Gearbox Jack

- DO NOT place any part of your body within or under the jack during use.
- Ensure the saddle is in its lowest position and centrally position the jack beneath the vehicle transmission.
- Hold the handle to steady the jack and raise the saddle. When it is just beneath the transmission, re-adjust alignment if necessary to centralise the saddle. Continue to raise the saddle until it locates on the transmission.
- NEVER raise or lower vehicle lifts whilst the jack is being used.

Lowering the Load

- DO NOT move the jack without suitable restraint on the load. Ensure the load is central and stable on the jack saddle and is fixed in place before attempting to lift, lower, or transport.
- Turn the jack release valve to lower the saddle smoothly to the minimum height before attempting to transport load.

Transporting the Load

- Ensure the jack saddle is fully lowered and the load is fixed in place before attempting to lift, or transport.
- Transport the load over level and solid ground, preferably concrete, and ensure the floor is swept clean beforehand.
- Be diligent in continually monitoring the load in transit. Keep all other persons at a safe distance.

- DO NOT use on tarmacadam, or any soft surface as jack may sink or topple. Serious or fatal injury may result.
- WARNING – if the jack tips or leans, move quickly to a safe distance – DO NOT TRY TO HOLD OR STEADY THE JACK.

On Completion

- Before storing the gearbox jack in a safe area, ensure all parts are clean, free of grease and oil (especially saddle), and lower the saddle to the lowest position.
- Periodically check the pump piston and piston rod for signs of corrosion. Clean exposed areas with a clean oiled cloth.
- Only a qualified person should lubricate and maintain the jack.

26.5 Engine Cranes

In addition to the general procedures at 26.2, the following apply to engine cranes:

- Clear personnel from the area where the load is being moved.
- Observe the Safe Working Load of the crane. The weight rating of the crane must be greater than the weight of the object to be lifted. The weight of accessories may need to be taken into account in determining the overall weight of the load.
- Always extend the legs of the crane in relation to the lifting arm to ensure adequate stability.
- The lifting arm is moved by a hydraulic cylinder and is adjustable for length. If the arm is lengthened, the lifting capacity of the arm is reduced. The weight limit is usually marked on the arm so that the arm or the hydraulic mechanism is not damaged by attempting to lift too heavy a load.
- Make sure the lifting attachment at the end of the lifting arm is strong enough to lift the engine and is not damaged or cracked.
- Inspect the chain, steel cable or sling and bolts to make sure they are in sound condition. They must be strong enough to support the weight of the engine. The sling should be long enough so when the engine is lifted, the angle at the top of the sling is about 45 degrees.
- When attaching the lifting chain, or sling, to an engine ensure it is firmly attached and that the hoist is configured to lift that weight. Make sure that the fasteners attaching the lifting chain, or sling, have a tensile strength that is in excess of the weight of the engine.
- Leave enough length in the sling so that when the engine is hanging, the angle at the top of the sling is close to 45 degrees and not exceeding 90 degrees.
- Look carefully around the engine to determine if it has lifting “eyes” or other anchor points. If the engine has lifting eyes, attach the sling with “D” shackles or chain hooks with spring latches. If bolts and spacer washers are required to lift the engine, ensure the correct bolt and spacer size for the chain or cable are used. Screw the bolts until the sling is held tight against the engine.
- Attach the hook of the hoist under the centre of the sling, ensuring the spring latch is now closed to prevent the hoist slipping out of the hook, and raise the hoist just

enough to lift the engine an inch or two. Double-check the sling and attachment points for safety. The centre of gravity of the engine should be directly under the hook of the hoist, and there should be no twists or kinks in the chain or sling.

- Raise the hoist high enough so that the engine is clear of the ground and any obstacles. Slowly and gently move the hoist and engine to its new position.
- Never leave an unsupported engine hanging on a workshop crane. Secure the engine on an engine stand, or on the ground, before starting to work on it. If using engine stands, make sure they are designed to support the weight of the object being lifted.
- If removing an engine from an engine bay, once it is lifted free and away from the vehicle, lower the engine so that it is close to the ground. If the engine is lifted high in the air, the hoist will be unstable.
- When moving a suspended engine, lower the engine to just above the ground, before slowly moving the hoist. Do not change direction quickly because the engine will swing and may cause the whole apparatus to tumble.
- Lower the engine until it touches the ground, making sure it is positioned correctly using suitable props or blocks. Spacers may be required under the engine to stabilize it. Ensure the engine is stable before lowering the hoist, removing the sling and any securing fasteners.
- Return the equipment to its storage area.

26.6 Vehicle Lifts (2-Post, 4-Post and Scissor lifts)

In addition to the general procedures at 26.2, the following apply to vehicle lifts:

- The lift surrounding area must be free from people or objects which could be a danger for lifting operations.
- Check all the pipelines and joints before use. The machine only can be used after there is not any leakage.
- Ensure the ‘dead man’s switch’ operation system is used.
- Always follow the vehicle manufacturer’s recommendations regarding vehicle lifting. In particular, ensure the equipment is suitable when lifting larger cars, 4x4s and light commercial vehicles.
- Ensure that vehicle chassis and chassis jack points are identifiable and in a satisfactory condition. Vehicle jacking points are usually identified by a symbol on the vehicle sill - if in doubt always consult the car handbook.
- Check that the lifting arm rubber mounting pads are in serviceable condition and, where necessary (e.g. to avoid the lift arm fouling the car bodywork) are set at the correct height before the vehicle is raised.
- The lifting arms must be carefully positioned before each lift in accordance with the manufacturer’s instructions. This is to ensure correct weight distribution and proper contact with load-bearing points so the vehicle is stable.
- Lifting pads must be in good condition, appropriate for the vehicle being lifted, and kept clean from oil and grease. A damaged or contaminated pad may allow the

arm to move under pressure, thus allowing the vehicle being lifted to fall off the lift. Use proper steel pad extensions where required, not blocks of wood.

- Correct positioning of vehicle on the lift is essential. Always follow the vehicle manufacturer's guidelines and if lifting on the vehicle body or chassis (wheel free) always use the vehicle manufacturers recommend lifting points.
- It is ESSENTIAL that the load is evenly distributed across all of the lifting points and securely supported. The horizontal and vertical position of pick-up plates must be carefully adjusted before elevating the vehicle. Normally this will be achieved by using the vehicle manufacturer's recommended lifting points and this should be sufficient for general servicing work and inspection.
- BE AWARE that the centre of gravity can alter significantly if heavy components (gear box, engine etc.) are removed. Such work should preferably be carried out using a 4-post lift.
- It is ESSENTIAL that arm-locking devices are engaged when the vehicle is raised. Operators should always check that the arm locks are maintained properly, show no signs of damage or deterioration to their locking teeth and become engaged properly during use.
- Check the vehicle is secure by lifting to about a metre, confirming the lifting pads are positioned correctly, and then rocking the vehicle.
- Check that the restraint gears are fully engaged– if gears have not fully engaged, lower the vehicle and gently move the arms forward and back until the gears fully lock into place. Never be tempted to deactivate safety devices – they are there for a reason.
- Keep hands and feet away from any moving parts. Never allow anyone to go under the lift when raising or lowering. Keep feet clear of lift when lowering.
- Where possible, the person working beneath the vehicle should remove and keep the ignition key.
- If the vehicle engine needs to be running, sure there is good communication between workers.
- Vehicle lifts should be regularly serviced (maintained) by a competent engineer and undergo a thorough examination by a competent person every 6 months. Thorough examination is in addition to, not a substitute for, regular inspection and ongoing maintenance.

26.7 Slings, Chains and Shackles

In addition to the general procedures at 26.2, the following apply to using slings, chains and shackles:

- Under no circumstance should rope be used to lift.
- Lifting equipment must be stamped with the Safe Working Load (SWL). Check the SWL against the load to be lifted. SWL must not exceed the rated capacity.
- Check the condition of splices, rings and thimbles on slings.
- Make sure that chains are not kinked or twisted.

- Never shorten a chain by knotting it. Never lengthen a chain by joining pieces together.
- Don’t lubricate chain slings – oil can pick up abrasive materials such as sand or grit.
- Don’t expose chains to acids or corrosive substances.
- Use the right type of shackle for the job in hand. Don’t use any shackle which isn’t marked with the SWL. Check the bow and pin for damage, destroy if doubtful. Ensure the pin is free, but not loose, in tapped hole.

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