

SCHOOL OF ENGINEERING

Mechanical Workshop

LOCAL SAFETY RULES

To be read in conjunction with the School's safety handbooks, policies and guidance: [School Policies, Guidance & Resources | School of Engineering | The University of Aberdeen \(abdn.ac.uk\)](#)

Senior Technician	Mr G. McFarlane	2533
Local Safety Coordinator	Mr G. Cordiner	2788
Technical Resources Officer	Mr G. Cordiner	2788

Contents

1. INTRODUCTION	3
2. TRAINING.....	4
3. CODES OF PRACTICE FOR MECHANICAL WORKSHOP	4
3.1 The Machine Shop	5
3.1.1 Dangers from Machinery	5
3.1.2 Precautions.....	5
3.1.3 The Machine	5
3.1.4 CNC Milling Machines (Haas VF-4 & Haas Mini Mill)	6
3.1.5 CNC Lathe (Haas TL-1).....	7
3.1.6 The Work Piece	9
3.1.7 The Work Area	9
3.1.8 Vertical Pillar Drill	9
3.1.9 Horizontal Bandsaw.....	10
3.1.10 3D Printer (Ultimaker S5)	11
3.1.11 Procedures	12
3.2 Cylindrical and Surface Grinders.....	13
3.2.1 Wheel RPM.....	14
3.2.2 Magnetic Chuck.....	14
3.3 Machine Maintenance – Disconnection from Power Source.....	14
3.4 The Welding Fabrication and Fitting Shop	15
3.4.1 General Safety.....	15
3.4.2 Welding Brazing and Fitting.....	17
3.4.3 Fabrication and Fitting	20
3.4.4 Lifting and Lifting Equipment	22
3.4.5 Storage and Handling of Materials	22
3.4.6 Painting and Spray Painting	23
4. THE WOODWORKING SHOP	24
4.1 Training.....	24
5. WORKING OUT WITH THE WORKSHOP	26
5.1 Precautions.....	26
6. APPENDICES.....	26
6.1 Chemicals in the Workshop.....	26
6.1.1 Introduction	26
6.1.2 Cleaning and Degreasing	27
6.1.3. Metalworking Fluids	28
6.1.4 Decanted Chemicals	29
6.2 Chemical Datasheets	29
6.2.1 Acetone.....	29
6.2.2 Ethanol and Propanol (Ethyl and Isopropyl Alcohol)	31
6.2.3 Paraffin (Kerosine).....	33
6.2.4 White Spirits.....	34
Review Record	35

1. INTRODUCTION

The Mechanical Workshop (Fraser Noble Building FN 023) contains many types of machinery. In addition to the machines, the workshop has a woodworking shop, welding area, benches, and various hand tools. Workshop type activities using hand tools will often take place in the wider School and University.

The types of machines that are to be found in the workshop are various manual lathes, manual milling machines, a HAAS CNC lathe, two HAAS CNC milling machines, a 3D printer, a guillotine, surface grinder, vertical bandsaw, and a vertical pillar drill. These machines all require the constant attention of trained and experienced operator/setter for normal operation.

The manually operated machines: milling machines, lathes, drill, and CNC lathe operating in manual mode, require constant adjustments and alterations during their operation and so therefore safety consciousness and vigilance are of paramount importance.

The CNCs, although pre-programmed and operating behind closed doors, also require the safety consciousness and vigilance during operations. An awareness that, if the interlocks were to fail, the machine could potentially start without notice. An understanding that, despite following a programmed procedure, the programme may be faulty and cause the cutter to contact the bed.

It is the operator's responsibility to set up the machine safely and to use best practice machining techniques. If there are any doubts at any stage, then the work must be halted, and advice obtained.

It is equally the responsibility for each person to leave a machine in a mechanically and electrically 'neutral' state such that inadvertent energizing cannot cause harm to anyone moving on to it. The machine should also be cleaned ready for the next operator.

This manual is intended to highlight the risks and precautions required when operating machines/welding equipment and is not a substitute for training and experience.

Each machine should have an associated risk assessment and a list of authorised users displayed in the workshop. Users must have been trained and have read the risk assessment before being authorised to operate a machine.

Further Information: [Health and safety in engineering workshops - HSG129 \(hse.gov.uk\)](https://www.hse.gov.uk/hsg129)

2. TRAINING

It is normal practice in the University to have personnel already trained in one area (e.g., electronics) and to subsequently training them in other areas (e.g., mechanical) to a level sufficient to perform operations safely and competently. Similarly, technicians regularly have the sufficient skills and experience across multiple areas to be able to perform wide ranging functions safely and competently.

Before anyone is authorised to use the machines, they must have been suitably and sufficiently trained and competent or otherwise be able to demonstrate competence.

Operators must know:

- What the main dangers are, how the main safeguards work and who should be notified of defective safety systems or equipment.
- How to start, operate and stop the machine safely.
- What to wear (e.g., protective equipment) and what not to wear (e.g., loose clothing at some machines).

How to:

- Load and unload components.
- Remove swarf.
- Adjust coolant flow safely.
- Not to clean machines using compressed air to blow material away – industrial vacuum cleaners or brushes should be used.
- How to work safely with any metalworking fluids used.
- That before inspection, cleaning, maintenance and repair, machines must in general be switched off and isolated.
- Where power is necessary, how to work safely, for example by using:
 - Written systems of work.
 - Permits to work on complex or hazardous plant.
 - Warning signs.
 - How to maintain metalworking fluids to minimise health risks.

3. CODES OF PRACTICE FOR MECHANICAL WORKSHOP

The Mechanical Workshop from the safety point of view can be divided into four separate areas i.e.

- The Machine shop (general).
- Grinding Machines.
- The Welding fabrication and fitting shop.
- The Woodworking shop.

3.1 The Machine Shop

The main type of machines that are to be found in the machine shop are lathes, milling machines, drilling machines, and grinding machines. These machines are all manually operated in as much as they require the constant attention of highly skilled operator/setter for normal operation. These machines require constant adjustments and alterations during their operation and so therefore safety consciousness and vigilance are of paramount importance.

3.1.1 Dangers from Machinery

A person may be injured at machinery because of:

- Coming into contact with or being trapped between the machinery and any material in or at the machinery or any fixed structure.
- Being struck by, or becoming entangled in or by, any material in motion in the machinery.
- Being struck by fragments of cutting tools ejected from it.
- Being struck by material ejected from the machinery.

3.1.2 Precautions

Precautions can be divided into 4 categories, these are:

- The machine.
- The work piece.
- The work area.
- Procedures.

3.1.3 The Machine

- It is the responsibility of each authorised operator (see list of authorised operators displayed on the Health and Safety notice board) to see that the machine is in safe condition to use, both mechanically and electrically. If the authorised operator cannot make good any malfunction of the machine, then this must be reported to the Senior Technician who will take appropriate action to repair the machine. If this cannot be achieved, then the machine will be electrically isolated and locked off until an appropriate repair can be carried out. It is the responsibility of each authorised operator to check that the machine is safe to use prior to its operation however it is equally the responsibility for each person to leave the machine in a mechanically and electrically 'neutral' state such that inadvertent energizing cannot cause harm to anyone moving on to it. The elements of the machine, stationary and moving, (e.g., chucks, cutting tools, vices, drills etc.) must be properly secure.

- Guards required for safe operation of machines, must be fitted, as far as is reasonable and practicable.
- The machine beds, tables and slide ways should be free of tools, (spanners, drills, etc.) and materials (off-cuts, job items, etc.)
- Chuck keys must be removed when not actually tightening or loosening the chuck. This is particularly important when using a lathe or drill.
- The machine must be clear of excessive swarf and be sufficiently illuminated.
- Safety stops on a machine must be clearly indicated and their location known to the operative.

3.1.4 CNC Milling Machines (Haas VF-4 & Haas Mini Mill)

- Only authorised and trained personnel should operate these machines.
- Before operating the machine check for damaged parts and have them repaired or replaced.
- The machine is automatically controlled and may start at any time.
- Do not operate with the doors open.
- Do not enter the machine area anytime that the machine is in motion.
- Always wear safety goggles.
- Never place your hand on the tool in the spindle and press ATC FWD, ATC REV, NEXT TOOL, or cause a tool to change cycle. The tool changer will move in and crush your hand.
- The spindle head can drop without notice. Avoid the area directly under the spindle head.
- Improperly clamped parts machined at high speeds/feeds may be ejected and puncture the safety door. Do not machine oversize or partially clamped pieces.
- Windows must be replaced if damaged or severely scratched.
- Do not process toxic or flammable material. Deadly fumes can be present. Consult material manufacturer for safe handling before processing.
- Always remove the power before servicing the machine.
- Do not reset a circuit breaker until the reason for the fault is investigated. Only Haas trained personnel should troubleshoot and repair the machine.

Follow these guidelines while performing jobs on the machine:

Normal operation - Keep doors and guards in place while machine is operating.

Part loading and unloading – An operator opens the door or guard, completes task, closes door or guard before pressing cycle start (starting automatic motion).

Tool loading or unloading – A machinist enters the machining area to load or unload tools. Exit the area completely before automatic movement is commanded (e.g., Next Tool, ATC/Turret, FWD/REV).

Machining job setup – Press emergency stop before adding or removing machine fixtures.

Maintenance/Machine cleaning – Press emergency stop or power off the machine before entering the enclosure.

Unattended operation: The fully enclosed machine is designed to operate unattended; however, the machine process may not be safe to operate unmonitored.

The machining process must be monitored to prevent damage if a hazardous condition occurs. For example, if there is a risk of fire due to material being machined then an appropriate fire suppression system must be installed to reduce the risk of harm to personnel, machine, and building. It is especially important to select monitoring equipment that can immediately perform an appropriate action without human intervention.

It is the technician's responsibility to set up the machine safely and to use best practice machining techniques. If there are any doubts at any stage, then the Senior Mechanical Technician should be consulted.

3.1.5 CNC Lathe (Haas TL-1)

- Only authorised and trained personnel should operate this machine.
- Before operating the machine check for damaged parts and have them repaired or replaced.
- The machine is automatically controlled and may start at any time.
- In normal operation the machine should be used with the doors closed. For certain tasks the machine can be operated with the doors open but the chuck guard must be in place.
- Do not enter the machine area anytime that the machine is in motion.
- Always wear safety goggles.
- Improperly clamped parts machined at high speeds may be ejected and puncture the safety door.
- Do not exceed the rated chuck rpm.
- Higher rpm reduces chuck clamping force.
- Unsupported bar stock must not extend past the draw tube end.
- Chucks must be greased weekly and regularly serviced.
- Do not machine parts larger than the chuck.
- Follow all the chuck manufacturers warnings regarding the chuck and work holding procedures.

- Hydraulic pressure must be set correctly to securely hold the work piece without distortion.
- Windows must be replaced if damaged or severely scratched.
- Do not process toxic or flammable material. Deadly fumes can be present. Consult material manufacturer for safe handling before processing.
- Always remove the power before servicing the machine.
- Do not reset a circuit breaker until the reason for the fault is investigated. Only Haas trained personnel should troubleshoot and repair the machine.

Follow these guidelines while performing jobs on the machine:

Normal operation - Keep doors and guards in place while machine is operating.

Part loading and unloading – An operator opens the door or guard, completes task, closes door or guard before pressing cycle start (starting automatic motion).

Tool loading or unloading – A machinist enters the machining area to load or unload tools. Exit the area completely before automatic movement is commanded (e.g., Next Tool, ATC/Turret, FWD/REV).

Machining job setup – Press emergency stop before adding or removing machine fixtures.

Maintenance/Machine cleaning – Press emergency stop or power off the machine before entering the enclosure.

Unattended operation: The fully enclosed machine is designed to operate unattended; however, the machine process may not be safe to operate unmonitored.

The machining process must be monitored to prevent damage if a hazardous condition occurs. For example, if there is a risk of fire due to material being machined then an appropriate fire suppression system must be installed to reduce the risk of harm to personnel, machine, and building. It is especially important to select monitoring equipment that can immediately perform an appropriate action without human intervention.

It is the technician's responsibility to set up the machine safely and to use best practice machining techniques. If there are any doubts at any stage, then the Senior Mechanical Technician should be consulted

3.1.6 The Work Piece

- The work to be machined must be securely held mechanically or/and clamped without excessive unsupported overhang.
- On the drilling machine hand-holding the work piece should be avoided, especially thin sheet metal work pieces.
- Ensure that any long bar that may protrude from the rear of the lathe is properly guarded and supported. This is especially true when small diameter bar is being machined as it could easily bend when rotated at high speed.
- Slender work pieces must be supported in a safe approved manner (i.e. with steadies, back centres, jacks etc.)
- Lathe speeds and cutter speeds must be appropriate to the work and material in hand.
- Light tubular work pieces should be suitably plugged before gripping to prevent “spring-out” when tool pressure is applied.

3.1.7 The Work Area

- The work area must be of sufficient size for the safe movement of the operator and for the movement of staff passing the operator, and all machines should be laid out in such a manner as to allow free passage and a lack of interference with other operatives.
- The work area must be clear of obstructions such as materials, finished work items, machine accessories, etc.
- Skid mats, if necessary, should be installed at each machine.
- The work area must be clear of lubricants or coolant spillage's and free of swarf.

3.1.8 Vertical Pillar Drill

The drill in the workshop is a Victoria pillar drill. It is fitted with an emergency stop switch. In addition to normal operation of the drill training must include the use emergency stop switch.

How most accidents happen:

- Hair caught on rotating spindles, chucks, or tools
- Entanglement of gloves, clothing, bandages, and rings, usually at the drill tip
- Violent spinning of the workpiece because of poor clamping – causing scalping injuries, broken bones
- Not wearing eye protection causing eye injuries from machine cleaning, swarf removal and unenclosed machining
- Swarf – causing cuts.

Most ill health arises from:

- Unsafe handling
- Harmful metalworking fluids
- Too much noise

Coolant is not always required. Some local lubrication may occasionally be applied but only when the drill is stopped.

Key safety measures:

- If appropriate to the workpiece:
- Use clamps and vice provided to secure the workpiece and prevent it being caught by the drill bit
- Keep the guard in place during operation.
- Remove the chuck key before starting the drill.
- Use the correct speed for the size of the drill and the workpiece material.
- If the workpiece starts spinning do not try to stop it by hand, instead hit the emergency stop switch.

DO:

- Wear eye protection.
- Wear a suitable hat or hair net if you have long hair.
- Remove the chuck key immediately after tightening.
- Keep the guard in place

DO NOT:

- Wear gloves of the rigger/gripper/gauntlet style during operation. Close fitting disposable nitrile gloves may be used with machine running but they must easily tear to minimise risk of entanglement in moving machinery.
- Wear any jewellery (e.g., rings, watches, necklace)
- Wear a tie.
- Leave the chuck key in the chuck.
- Leave the machine while it is in operation.

3.1.9 Horizontal Bandsaw

The horizontal band saw is used to cut larger metal pieces (e.g., solid bar, square section etc.) to size, normally for further machining in the lathe, mill or drill.

The weight of the saw pressing down on the blade causes the pressure on the blade. The rate at which the saw cuts is controlled by a hydraulic lever. Once started cutting the operator must keep hands clear of the blade.

The cutting process normally requires a continuous flow of coolant.

How most accidents happen:

- Contact with the running saw blade when:
- Feeding, adjusting, or removing workpieces.
- Cleaning the machine or removing swarf
- Installing new blades.

Most ill health arises from:

- Unsafe handling.
- Harmful coolants.

Excessive noise from using the bandsaw is unlikely. But if excessive noise is being generated ear protection is required.

Key safety measures:

- Ensure that long bars which are being cut are properly supported using trestles.
- Any short pieces of material that are gripped in the vice should be supported at other end of vice with similar sized material.
- Fragile plastic tubes should be supported by inserting a suitable sized piece of material onto the base thus preventing the tube from spinning round whilst being cut.
- Wear suitable gloves of the rigger/gripper/gauntlet style when setting/removing the workpiece.
- Ensure the workpiece is properly held in jaws.
- Wear appropriate PPE: Eye, foot and hand protection.
- If coolant is being used take precautions to avoid contact with skin. Close fitting, easy tear, disposable nitrile gloves may be used for this purpose.

Changing blades:

- Care should be taken when uncoiling a new blade.
- Gloves of the rigger/gripper/gauntlet style must be worn to avoid cuts.
- The machine must be electrically isolated.
- Old blades must be placed in a metal waste bin and disposed of appropriately.

3.1.10 3D Printer (Ultimaker S5)

There is a 3D Printer located in the mechanical workshop. Some safety factors to be aware of:

Breathing in harmful materials:

- 3D printing can release particulates and other harmful chemicals into the air. The printer has an air manager which minimises any risk of harmful

chemicals in the air. It is important the air manager filter is changed with prompted by the machine.

High temperatures:

- Be aware that the 3D printer table can reach a max of 200°C. Once a part has printed, allow the print table enough time to cool before handling any prints.

Removing support structure from prints:

This is especially a problem with PLA and has caused many injuries in the 3D printing community. When you print objects that require a support, removing them can cause issues.

The support material tends to be sharp and can cut your hands very easily. It's also very painful when you have shards of material go under your fingernails so keep safety in mind when doing this.

People have reported getting permanent scars from removing support material. It's a real issue that is easily preventable if you remember these safety rules:

- Find software which minimise the use of supports.
- Work slowly when removing support structures.
- Use gloves when removing support material.
- Wear a long-sleeved top (e.g., lab coat for extra cut protection).

Other factors to remember:

- The 3D printer should only be used by trained or authorised personnel.
- Wear appropriate PPE where required (e.g., gloves or safety glasses).
- Be careful when using scraper blades.

3.1.11 Procedures

- Overalls must be kept buttoned and be in good condition with no loose or torn areas which could easily get entangled in moving parts of machinery.
- Hair must be kept short or wear a hat. This is especially important whilst operating vertical drilling machines.
- Only one person must operate a machine at any one time.
- Always use a brush or rake to remove swarf.
- Make sure that files and scrapers are fitted with handles when removing sharp edges.
- Compressed air must only be used for cleaning parts or inaccessible areas only. Never direct compressed air at anyone. It has been known for people to be killed by fooling around with compressed air.

- When the coolant supply directed at the work piece must be adjusted, this must be done, as far as reasonable and practicable, when the machine is stopped.
- Eye protection must be worn by the operative.
- Machines must be stopped when taking measurements, adjusting tools or the work piece, and cleaning swarf.
- Proper bar rests must be used when using internal and external hand chasers, and properly positioned to prevent “bite”. Freehand chasing must not be permitted.
- Hand sawing-off the lathe must only be carried out with the machine stopped/
- When using emery paper on rotating work piece, always keep fingers well clear. It is very easy to get a thumb trapped between the revolving work piece and the emery paper. Use emery sticks whenever possible.
- Rags and dusters etc., must be kept well away from rotating work and tools.
- When finishing work on a machine the machine must be left in an electrically and mechanically neutral condition. This means switching off electrical power and disengaging any drive gears such as the lead screw. The machine should also be cleaned down removing any swarf etc to appropriate bins.

3.2 Cylindrical and Surface Grinders

These are machines which are situated in the machine shop area but because of their specialised nature require to be treated with care. The following notes also apply to floor standing or pedestal grinders which are used for tool sharpening.

Abrasive wheels must be mounted and dressed only by competent and trained personnel who have a certificate defined under the Abrasive Wheel Regulations.

Before being used, a grinding wheel should always be examined thoroughly and tested by tapping with a light non-metallic implement before fitting to the machine. Once fitted, guards should then be placed in position and the wheel dressed. Suitable racks should be used for storing grinding wheels.

On no account should abrasive wheels be mounted on makeshift apparatus. Floor standing grinders should be fixed to a good foundation. Bench grinders should be securely anchored to a stout bench. Work rests should be kept adjusted as close as possible to the wheel to prevent the work piece getting between the wheel and the rest. The maximum distance should be not greater than 2mm. The necessary adjustments must not be made with the wheel in motion. Rests should be examined periodically and maintained in good condition.

Means of starting and stopping grinding machines should be placed in a safe position within easy reach of the operator.

When mounting abrasive wheels, the paper washers supplied by the wheel manufacturers should always be used to distribute the clamping pressure of the flange evenly on the wheel. Before a wheel is mounted a check should be made to ensure that the operating speed of the spindle is not greater than the maximum operating speed marked on the wheel.

It must be remembered that the centrifugal force on a grinding wheel increases not directly with the speed but as the square of the speed.

3.2.1 Wheel RPM

The RPM of the grinding wheel spindle must be clearly marked in a prominent area.

3.2.2 Magnetic Chuck

Operators of surface grinders must ensure that the magnetic chuck is on before starting grinding or wheel dressing operations. This is particularly important when working with components that take on some residual magnetism which can give the impression that the chuck is on when in fact it is off!

ALWAYS CHECK THE POSITION OF THE ON/OFF LEVER BEFORE COMMENCING WORK

3.3 Machine Maintenance – Disconnection from Power Source

Before undertaking maintenance on a machine, the source of power must be removed or otherwise disabled. Lockout devices for different type of connections are available from the Senior Technicians.

Where the machine is connected to the power source by a removable plug, the plug must be removed from the socket and a lockable cover fitted over the plug. Alternatively, the plug can be taken back to the work area so that it is within site of the maintenance personnel.

Where the equipment is connected by a permanent wired outlet, the outlet must be isolated and locked off. Where two or more people are working together each person must use a separate padlock and key.

When leaving the area, even for a short while, you must check that the isolation is still in place before recommencing work.

3.4 The Welding Fabrication and Fitting Shop

Within this area there are six areas that need to be examined regarding health and safety issues. These are:

- General Safety
- Welding and brazing
- Fitting and Fabrication
- Lifting and lifting equipment
- Storage and handling of materials
- Painting and paint spraying

3.4.1 General Safety

- a) **Ventilation: Ventilation becomes a critical factor in preventing oxygen deficiency** during heavy or long periods of welding, all types of welding produce some degree of toxic fumes and it is therefore necessary to have sufficient ventilation of the work area to protect the operator. A system of LEV as installed in the fabrication shop must be used to prevent a build up of welding fumes when welding in this area. The LEV will be examined and tested every 14 months by a qualified third party and certification pertaining to this will be maintained by the TRO or their nominee.

After prolonged welding, any operative suffering from chest complaints should report this immediately to the Senior Technician or Local Safety Coordinator.

- b) **Protective Clothing:** The wearing of heat-resisting gloves is common-sense and essential to prevent burns from the work piece, sparks, and spluttering metal, except when very light welding is taking place and where the work piece can be handled safely with tongs, pliers etc.

Do not keep a box of matches or butane lighter in the pockets of overalls. It has been known for a butane lighter to explode from the heat of a stray spark or flame with consequent disastrous consequences.

Again, for heavy welding and cutting, fire resistant overalls or aprons of approved design must be worn. These should not have pockets so that molten metal and sparks cannot be trapped. Any clothing worn underneath the overalls or aprons should not have rolled-up sleeves, cuffs or trouser turn-ups for the same reason.

For heavier types of welding, and cutting, long boots or welder's spats must be worn. Ordinary shoes tend to trap molten metal, splutter, and sparks, causing burns of the feet and ankles.

UNLIT TORCHES MUST NOT BE DIRECTED TOWARDS CLOTHING, ESPECIALLY IF DAMP. GAS ENTRAPMENT CAN CAUSE CLOTHING TO IGNITE READILY.

- c) **Eye Protection:** The wearing and use of eye protection goggles or face shields are *essential* for welding and cutting operations. Goggles suitable for gas welding should only be used for gas welding. Arc welding requires the use of a shield to protect the face, and which is fitted with a window of special dark glass through which the arc can be safely viewed. The arc must never be "struck" without the face shield in the protective position. The electric arc produces intense ultra-violet and infra-red rays of such intensity that the recommended distance to view with the naked eye is 15 metres, and only then if accidental or if necessary.

Goggles and face shields must be in good condition i.e., there must be no cracks or chips in the protective glass, and no burn holes or parts broken off the face shield, and the head harness complete and fitting correctly.

FAILURE TO TAKE THESE PRECAUTIONS MAY RESULT IN PART OR TOTAL BLINDNESS, OR IN EXTREMELY PAINFUL CONDITIONS OF THE EYES.

It is essential to consider the safety of others in the vicinity of welding operations, as well as the welding operator, and, where required, fire resistant screens should be placed around the immediate welding area in such a manner that the welding operation cannot be viewed by others. It should be remembered that reflections from walls, ceilings and other objects can be of such intensity as to cause eye problems to others. Persons assisting with a welding operation must also wear the appropriate eye protection.

Eye protection in the form of clear-glass goggles must be worn for weld chipping or grinding.

- d) **Ear Protection:** Where heavy or prolonged gas welding or cutting operations are carried out for long periods, ear protection of recommended design must be worn to prevent ear damage from noise. This also prevents fumes, dust, sparks or chips of metal or flux from entering the ears and can prevent the possibility of damage or infection.
- e) **General Note:** When welding, the work piece should never be placed on a concrete floor or on certain types of asbestos sheet, as these materials can explode forcibly on heating by flame or arc.

When welding tubular or box structures, care must be taken to avoid air being trapped so completely that a “blow-out” of molten metal occurs. A standard practice is to drill a tiny hole somewhere convenient in the job to allow air to escape, and then, if necessary, to weld over the tiny hole finally when the work piece has cooled off.

3.4.2 Welding Brazing and Fitting

Reference should be made to the School’s guidance on compressed gas and LEV [School Policies, Guidance & Resources | School of Engineering | The University of Aberdeen \(abdn.ac.uk\)](#).

- a) **Oxy-Acetylene Welding:** Oxygen and acetylene cylinders, because of the high pressures of the gases they contain, necessitate special care in storage, handling, and installation.

The oxygen cylinder usually contains a higher pressure than the acetylene cylinder, and the acetylene cylinder fittings are left-handed.

Oxygen and acetylene cylinders must be stored vertically in a designated area away from the risk of fire, heat, and sources of ignition. In compliance with this requirement a cage for cylinder storage is provided outside of the workshop adjacent to the Fraser Noble Building rear exit. As welding operations require only one oxygen and one acetylene cylinder, it is safer to have only the two required cylinders in the work area, and to return “empties” immediately to the storage area and to keep all spare cylinders in storage until required. Cylinders must be transported on proper trolleys and not “rolled” to the work area.

Examine each cylinder before installing for use, and if any defect is detected, reject immediately and return to the supplier. The cylinder must be installed and used vertically, chained to wall racks, or secured in welding trolleys. Line snubbers and flash-back arrestors to the most recent British Standard Specification must be in position for both oxygen and acetylene to prevent fire or explosion by “blow-backs” rupturing regulator diaphragms. It is preferable to have each gas hose of the same equal length, taped or clipped together to prevent hose loops catching on any protruding objects.

Ideally a source of nitrogen should be used when clearing dust and debris from a cylinder before fitting a new regulator. In practice ‘blowing-off’ or ‘snifiting’ the cylinders prior to installing the regulators is standard industry practice. The process of ‘snifiting’ requires the following procedures to be followed:

- Ensure there is nothing in the way of the gas jet.
- There are no naked flames in the vicinity.
- Eye protection and gloves must be worn.

- Do not look into the cylinder valve.

DO NOT USE A CYLINDER IF THE LABEL IS MISSING OR BADLY DAMAGED.

NEVER RELY SOLELY ON THE COLOUR OF THE CYLINDER TO IDENTIFY ITS CONTENTS. READ THE LABEL!

All cylinders must carry a label. The label is the only sure means of identifying the gas inside the cylinder. It may also give the pressure the gas is stored at and outline basic safety requirements in accordance with Chemical (Hazards Information and Packaging for Supply) legislation. The label should be complete and be attached to the cylinder.

The hoses and regulators must be in first-class condition. If not, replace immediately. Welding nozzles (if threaded types are used) must be undamaged and screw freely into the gun to produce a tight seal. The welding gun should be also in first-class condition and checked periodically for leakage at valves, hose connections and body joints if they exist.

The valve keys must be kept in position on each cylinder valve so that in the event of a malfunction the cylinders can be quickly shut off.

The flame should only be ignited by flint gun or “striker” and never by naked flame or match. Lighting by match can result in severe finger burns. Cigarette lighters should not be used for the same reason.

High pressure oxygen reacts violently with oils, greases, tarry substances, and some solvents. This includes things like soap, butter, and some hand creams.

Check your equipment regularly for leaks. When testing for leaks always use the proprietary liquids that are intended for detecting leaks.

Do not use soap and water. Some soaps contain fats that react violently with oxygen.

The acetylene cylinder requires a few special considerations for safe usage. It usually contains a quantity of acetone in which the acetylene is dissolved, and if an attempt is made to use the cylinder in the horizontal position, the acetone can leak into the regulator, gauges, and hoses.

Free acetylene gas must never be stored a pressure above 15psi. Above this pressure it is extremely unstable and may explode.

Acetylene gas must never be allowed to meet unalloyed copper (e.g., copper tubing) apart from the welding torch nozzle. Copper acetylide will form which is an extremely reactive chemical which can explode violently.

REMEMBER: ACETYLENE IS A HIGHLY FLAMMABLE AND EXPLOSIVE GAS.

In addition to the schools guidance other valuable other information is available from HSE [The safe use of compressed gases in welding, flame cutting and allied processes - HSG139 \(hse.gov.uk\)](#) , BCGA [Codes of Practice - BCGA](#) and BOC [Pressure System Safety Regulations | BOConline UK](#).

- b) **Arc Welding:** Electric arc welding need not be a hazardous process if prescribed precautions are followed, such as have been detailed in previous chapters.

There is, however, always the possibility of electrical shock. Therefore, it is necessary that all cables, electrode-holder insulation, earthing clamp and electrical mains wiring is maintained to a high standard and defect free. The earthing of the welding control cabinet must be checked periodically. Stray currents can cause severe shock.

Arc welding should not be carried out on damp or wet floors. Hands and clothing should be kept dry.

Care must be taken to avoid allowing the un-insulated part of the electrode holding coming in contact with the “earthed” job or the earthing clamp while the current is switched. The flash produced is extremely dangerous to the eyes.

The arc must never be “struck” without the face shield being in its protective position and must be kept in the protective position until the arc extinguishes. Even momentary flashes are extremely dangerous to the eyes.

- c) **Spot, T.I.G., M.I.G. Welding:** The Safety rules and precautions for gas and arc welding, as previously enumerated, apply in general to all other types of welding.
- d) **Brazing (with gas equipment):** Protective gloves must be worn to prevent hand burns, except perhaps on very small work, but protective gas welding goggles must be worn for all classes of brazing, except for silver soldering where clear glass goggles should be used.

Suitable tongs must be available for handling “pre-heated” work and the work in hand and must be in good condition.

LEV style fume extraction must be used as most brazing rods contain percentages of zinc, phosphorus, copper etc., all of which when heated

produce highly poisonous fumes. In addition, many brazing fluxes are corrosive and toxic fume-producing. The corrosive fluxes are usually removed when brazing is completed, and suitable gloves must be worn for the washing operation to avoid skin complaints and the eyes are protected from splashing by wearing clear-glass goggles.

Silver soldering may be considered a brazing process. Many of the proprietary low melting point silver solders contain cadmium, which is an extremely toxic fume-producer and on no account should these fumes be breathed in during a silver-soldering operation. Again, efficient fume-extraction is essential, and the operator should keep as far back from the work piece being silver-soldered as is practical to avoid the fumes.

3.4.3 Fabrication and Fitting

- a) **Guillotine:** The authorised operator must ensure that all moving parts of the guillotine are guarded and that interlocking guards are correctly fitted and working correctly prior to using the guillotine. Any malfunction must be reported to the Senior Technician immediately. Care should be taken when handling large sheets of steel material and the use of protective gloves should be used provided there is no danger of getting trapped in moving machinery.
- b) **Linisher:** Before using the linisher always check there are no cuts or holes in the abrasive belt by hand rotating the belt one complete turn. Do not use if it is damaged as the torn edges could easily catch on the work piece and throw it violently. Always ensure that the work piece is resting against the fence during the finishing process and that the fence is properly maintained with only the minimum of clearance between the fence and the moving belt.

Take great care to ensure that the work piece does not have any small protrusions which could get jammed between the fence and the rotating belt.

The temptation to use gloves whilst finishing is very great as the work piece can get hot quite quickly. This is something that must be avoided as any loose-fitting gloves could very easily be pulled into the gap between the fence and the rotating belt. Have a container of cold clean water handy to keep the work piece cool.

- c) **Hand Tools:** All files and scrapers etc. must be fitted with the correct size of handle. Hammer heads must not be allowed to become loose. Chisel heads should not be allowed to become “mushroomed”.

Hardened steel components must not be struck or hammered with another hardened component (e.g., H.S.S. tool bits struck with a steel hammer). They can very easily splinter and cause serious eye injury.

- d) **Portable Tools:** All portable electrical equipment must be regularly inspected both electrically (PAT) and mechanically every 12 months. This will be carried out in house by suitably qualified personnel.

An RCD (Residual Current Device formerly known as an Earth Leakage Circuit Breaker or ELCB) must be used when working in environments outside the main workshop area.

Wheels for portable grinders may be obtained in types suitable for either low or high speeds and care is necessary to ensure that a low-speed wheel is not fitted to a high-speed machine.

Before changing a wheel, portable grinders must always be disconnected from either the electricity supply or the air line.

Machines should be regularly checked and tested; particular attention being paid to the flexible cable.

Only persons possessing a Certificate defined under the Abrasive Wheels Regulations may change or dress abrasive wheels.

More information can be found in the HSE publication HSG17 [Safety in the use of abrasive wheels \(hse.gov.uk\)](https://www.hse.gov.uk/publications/hsg17/) and in publication HSG107 [Maintaining portable electrical equipment \(hse.gov.uk\)](https://www.hse.gov.uk/publications/hsg107/).

The maximum operating speed marked on an abrasive wheel should not be exceeded under any circumstances.

The grinding wheel guard must always be in position and properly adjusted before a wheel is run.

Truing and Dressing: Wheels used for off-hand grinding should be frequently trued to eliminate out-of-balance conditions and to enable the work rest to be adjusted close to the wheel surface.

Cutting-Off Wheels: The correct wheel for the job, as recommended by the wheel maker, should be used. Cutting-off wheels should be inspected before mounting for possible warping or other defects. A warped wheel may cause excessive vibration at high speeds, side pressure, or heating and possible wheel breakage. Cutting-off wheels should be mounted only on machines designed for their use. Power should be adequate, otherwise stresses may build up and the wheel may stall and break. Pressure should be applied evenly. Care should be taken to avoid twisting or exerting pressure on the side of the wheel. The work piece should be rigidly supported and firmly clamped. Lack of rigidity either in the wheel or the work piece can lead to wheel breakage.

3.4.4 Lifting and Lifting Equipment

Maintain all lift trucks regularly in accordance with the manufacturer's instructions. All lifting equipment will be load tested every 12 months by a qualified third party and records will be maintained by the TRO or their nominee.

- Ensure operating surfaces are strong enough, well maintained and not too steep.
- Do not use forks, pallets, or bins to lift persons to work at heights unless these are suitably modified; use properly designed work platforms.
- All chains, ropes, lifting tackle, hoists and lifts must be thoroughly examined every 6 months by a competent person (often employed by an insurance company); obtain and keep the report. In addition, a load test will be carried out every 12 months by a qualified third party and records will be maintained by the TRO or their nominee.
- Lifting appliances shall be used only by or under the direct supervision of, persons who are qualified by training, or experience, to use the appliances in a proper and safe manner.
- All lifting appliances and equipment *must* have test certificates and clearly marked with S.W.L. (Safe Working Load).
- Every part of a load shall be securely suspended or supported and secured to prevent danger from slipping or displacement.
- The lifting of a load should be halted after the load has been raised a few inches and the security of the slinging attachments should then be checked before proceeding with the operation.
- Take adequate steps using suitable packing or otherwise to prevent the edges of a load from meeting any sling, rope, or chain.
- Make sure slings or straps have no frayed parts or cuts.
- When using shackles ensure that the pin is screwed properly into place.
- If a lifting hoist must have chains lowered, make sure no-one is under them and lower the chains, don't drop them.
- If lifting with a forklift (of pallet truck), make sure the load is secure.
- Never stand under a hoist, a forklift, or any lifting appliance. Keep your feet clear.

3.4.5 Storage and Handling of Materials

When moving and storing materials all personnel will:

- chock objects which may roll, such as drums, and keep heavy articles near floor level

- inspect pallets, containers, and racks regularly for damage. Prevent damage from fork-lift trucks and other vehicles
- stack palletised goods vertically on a level floor so they won't overbalance.
- 'key' stacked packages of uniform size like a brick wall, so no tier is independent of another.
- use a properly constructed rack where possible - and secure it to a wall or floor.

And will not:

- allow items to protrude from stacks or bins into gangways
- climb racks to reach upper shelves - use a ladder or steps
- lean heavy stacks against structural walls
- de-stack by throwing down from the top or pulling out from the bottom
- exceed the safe loading of racks, shelves, or floors.

Sharp edges: These cause as many as a third of all accidents in some engineering workshops, resulting in cuts, abrasions, infected wounds, dermatitis, amputations and occasionally fractures. Those working with sheet metal, either flat or coiled, heavy sharp items, such as tools and cutters, and scrap metal and swarf are most at risk. Consider how to avoid handling sharp edges, and if this is not reasonably practicable, reduce exposure to them. Reducing the risks:

- Remove sharp edges or protect them before handling.
- Avoid handling by using, for example, trays, jigs, holders, or baskets.
- Store articles correctly so that they are retrieved easily.
- Use personal protective equipment such as gloves, gauntlets, and aprons, but only where these do not add to other risks from machinery, such as entanglement.

3.4.6 Painting and Spray Painting

Access to a ventilated paint spray booth is in the workshop welding area.

4. THE WOODWORKING SHOP

It cannot be overstated that Senior Technician must diligently enforce the legal and statutory regulations regarding the safety requirements for the preparation and operation of all wood working machines in their charge.

Wood working machines (e.g., circular saws, planers, routers, spindle moulders, bandsaws etc.,) are inherently hazardous in operation due to several factors, including:

- the cutters are necessarily sharp, run at very high speeds and are always partly exposed.
- unlike most other mechanical workshop machines, the work piece is not normally clamped, and the operator must manually present the work piece to the cutter.
- wood is a natural material and has many imperfections which tend to alter the normal progress of the cut and/or feed and sudden changes in texture may introduce additional safety hazards (e.g., snatching, throw-back etc.,)

IMPORTANT

- It is unlawful for untrained personnel to operate woodworking machines and/or be permitted to 'take off' or assist at the machines.
- Only personnel who have been qualified and certificated as authorised operators will be permitted to use woodworking machines. A list of qualified personnel will be displayed in the workshop.
- Due to the restricted workspace only two persons may work in the woodworking shop when fixed machinery is in operation.

4.1 Training

It is normal practice in university engineering workshops to employ personnel already trained in metalworking and with the view to subsequently training them in woodworking techniques.

Since these machines are used intermittently and often with long periods between usage and extended period of comprehensive training may be necessary for the 'trainee' to reach an acceptable standard of competence and reliability.

The Senior Technician must ensure that all 'trainees' are not subjected to risk and that they receive clear and positive instruction on all the operations of the machines including their safety regulations which must be enforced by careful and diligent supervision.

There is an extensive range of woodworking machines which each having its relevant safety requirements. Some examples of the requirements would include:

- All woodworking machines and their cutters and attachments must be properly used and maintained.
- All machines must be fitted with the necessary approved safety guards and attachments, and it must be insisted that they are used and properly adjusted by the operators.
- Adjustable guards/covers must be fitted where there are unused and exposed sections of cutters (e.g., cutter blocks behind the guide fence on planers, saw blades projecting under saw benches etc.).
- An emergency (mushroom type) stop button, additional to that fitted on the started, must be suitably sited adjacent to circular saw benches.
- A “push-stick” of the recommended dimensions must always be sited at circular saws and they must be used by the operator (when applicable).
- Operators must wear suitable eye protection during all cutting operations (additional protective equipment may also be necessary - e.g., ear defenders/plugs, respiratory masks etc.).
- For the operator’s safety there must be adequate space around the machine for the throughput of the work piece and floors must be kept clear of off-cuts and other hazards.
- As indicated in (6) respiratory masks are also provided as an extra precaution and should be used in conjunction with the local exhaust ventilation (LEV) system where heavy wood dust contamination is likely.
- The LEV system must be always used when using all the permanently fixed woodworking machines.
- The LEV system must be thoroughly examined and tested every 14 months by a suitably qualified and competent third party. Records of these inspections will be maintained by the TRO or their nominee.
- When a woodworking machine has been switched off, the machine should not be left unattended until the cutter has stopped turning.

There are three machines which are in regular use in the woodworking shop, and these are:

- The circular saw
- The planer and thicknesser
- The crosscut saw

There are many safety procedures that must be adhered to before attempting to operate these machines. These specific procedures should be well known to the trained operator, but as these machines are used on an irregular basis, there are three separate safety notes on each machine.

These notes will be displayed prominently in the woodworking shop for easy and quick reference.

5. WORKING OUT WITH THE WORKSHOP

The major problem here is unfamiliarity with the surroundings. Many areas are accessed by us. These include chemistry labs, biological labs, animal labs, and electrical labs. They present us with hazards which must be considered.

5.1 Precautions

- a) Always check with a responsible person before commencing work. If you can't check then do not start work. A responsible person is the TRM/TRO/Team Leader or the person in charge of the area or apparatus. Generally, an undergraduate is not considered a responsible person.
- b) Ask specifically about any hazards associated with the equipment or the area. For instance, if a label stating 'Biological Hazard' is apparent then ask what the precautions are before starting work.
- c) When leaving the area, even for a short period, ensure that any work unfinished is left safe by locking off the isolator and labelled appropriately to prevent injury to others. If necessary, tell the responsible person.
- d) When finished the work ensure everything is left in a safe condition, ensuring that all wires are safely terminated and isolated, all covers are replaced and that where appropriate the earth terminal is sound. The appliance should be tested for earth continuity and insulation and labelled accordingly.
- e) Notify the responsible person when the work has completed and ensure that he/she is satisfied with the completed work.

6. APPENDICES

6.1 Chemicals in the Workshop

6.1.1 Introduction

Standard chemicals used in workshops can pose a potential risk to health and safety. Hazardous chemicals should be provided with Safety Data Sheet (SDS) and COSHH risk assessment. COSHH risk assessments and SDS must be held within the workshop and freely available to study. Before using any chemicals for the first time, instructions and precautions on the container must be read along with the SDS and where necessary the workshop COSHH assessment amended. Inexperienced personnel must receive training in the use of chemicals or other substances which pose a hazard to health. Where in doubt seek guidance from the Senior Technician or the Local Safety Adviser.

Exposure to hazardous chemicals most frequently occurs when:

- Machining.

- Welding.
- Painting.
- Cleaning and degreasing.

The most common health effects are:

- Dermatitis from metal working fluids and oils.
- Lung problems from isocyanate paints and glues.
- Poisonings such as lead poisoning and rarely cancer from mineral oils.

To minimise hazards:

- Read data sheets.
- Read precautions on containers.
- Seek advice.
- Avoid skin contact and inhalation.
- Use in well ventilated conditions using fume extraction where necessary.
- Wear appropriate personal protective equipment.
- Wear barrier cream.
- Wash frequently with soap and water.
- Dispose in accordance with manufacturers recommendations and environmental regulations.

6.1.2 Cleaning and Degreasing

Many cleaning and degreasing substances used are harmful if not used properly, either through direct skin contact or through breathing in mist or vapour given off, commonly causing dermatitis and narcotic effects. Some cleaners give off vapour which is easily ignited.

To minimise hazards:

- Compare manufacturers data sheets and use the least harmful
- Read safety data sheets
- Avoid spills and evaporation by keeping lids on containers
- Mark contents clearly
- Wear appropriate protective equipment such as gloves, overalls, eye, and foot protection to prevent contact with fluids.

When using liquids:

- Work in well ventilated areas and avoid working in confined spaces
- Where necessary to work in a confined space special precautions are necessary, and a risk assessment required

VAPOUR DEGREASING TANKS

Using these badly may cause exposure to harmful levels of vapour which if inhaled may cause drowsiness or in extreme cases unconsciousness. Direct contact may cause irritation and dermatitis and should never be frequent or prolonged.

To minimise exposure:

- Position tanks in an area free from draughts
- Stack components inside container so that they drain properly
- Allow them to dry before removing them
- Use covers when not using tank

6.1.3. Metalworking Fluids

Ill health from metal working fluids, used neat or mixed with water, most commonly arises from:

- a) Skin contact during
 - Preparation, application, and removal of fluid
 - Handling of workpieces
 - Splashing and machining
 - Changing and setting of tools
 - Maintenance and cleaning of machines
- b) Breathing in aerosols, mist, and fumes when machining causing irritation of the eyes, nose and throat and occasionally breathing difficulties.

To minimise hazards:

DO

- Read and follow manufacturers guidance.
- Top up in accordance with supplier's instructions.
- Keep machines clean and free from debris.
- Clean sumps, pipework, and machines before refilling with fluids which should be mixed outside of the machine.
- Wash with soap and water regularly to remove metalworking fluids.
- Keep oily rags out of pockets.

DON'T

- Wear jewellery, rings or watch straps under which fluids may collect.
- Use unrefined mineral oils and mildly refined distilled oils which may cause cancer and for which safer alternatives are available.
- Use fluids beyond their normal life.
- Allow other oils to contaminate the metalworking fluid.
- Allow fluids to overheat.
- Allow water-mix fluids to stagnate when not in use.

- Eat or drink in working areas.

6.1.4 Decanted Chemicals

Some chemicals may be supplied in larger containers kept in chemical stores and decanted into small bottles for local use. These smaller bottles or containers must be properly marked with the contents and labelled with their hazards for example Flammable.

Chemicals commonly found in the workshop are listed here together with their safety data sheets on the following pages hazards.

- Acetone.
- Ethanol and Propanol.
- Paraffin (Kerosene).
- White Spirits.

WARNING! Methanol

Methanol is commonly mistaken for ethanol however the serious hazards (toxicity) associated with Methanol means it should not be used as a solvent in the Workshop and there are safer alternatives.

6.2 Chemical Datasheets

6.2.1 Acetone

Hazards
Extremely flammable liquid and vapour. Vapour may cause flash fire. Harmful if swallowed or inhaled. Causes irritation to skin, eyes and respiratory tract. Affects central nervous system.

First Aid Measures	
Type of Exposure	First Aid Measures
Ingestion	Ingestion

<p>Swallowing small amounts is not likely to produce harmful effects. Ingestion of larger amounts may produce abdominal pain, nausea and vomiting. Aspiration into lungs can produce severe lung damage and is a medical emergency. Other symptoms are expected to parallel inhalation.</p> <p>Skin</p> <p>Irritating due to de-fatting action on skin. Causes redness, pain, drying and cracking of the skin.</p> <p>Eyes</p> <p>Vapours are irritating to the eyes. Splashes may cause severe irritation, with stinging, tearing, redness and pain.</p> <p>Inhalation</p> <p>Inhalation of vapours irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache. Higher concentrations can produce depression, narcosis, and unconsciousness.</p>	<p>Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Get medical aid immediately</p> <p>Skin</p> <p>Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.</p> <p>Eyes</p> <p>Immediately flush eyes with plenty of water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get medical aid immediately.</p> <p>Inhalation</p> <p>Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.</p>
--	---

6.2.2 Ethanol and Propanol (Ethyl and Isopropyl Alcohol)

WARNING! Methanol

Methanol is commonly mistaken for ethanol however the serious hazards (toxicity) associated with Methanol means it should not be used as a solvent in the Workshop and there are safer alternatives.

Hazards

Flammable. Harmful if swallowed or inhaled. Causes irritation to skin, eyes and respiratory tract. Affects central nervous system.

First Aid Measures

Type of Exposure

Ingestion

May cause irritation with nausea, vomiting and diarrhoea. May cause kidney damage. May cause headache, dizziness, drowsiness, and nausea. Advanced stages may cause unconsciousness and respiratory failure.

Skin

May cause skin sensitization, an allergic reaction, which becomes evident upon re-exposure to this material. Prolonged and/or repeated contact may cause de-fatting of the skin and dermatitis. May cause irritation with pain and stinging, especially if the skin is abraded.

First Aid Measures

Ingestion

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Skin

Flush skin with plenty of soap and water. Get medical aid if irritation develops or persists.

<p>Eyes</p> <p>Produces irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury.</p> <p>Inhalation</p> <p>Inhalation of high concentrations may cause headache, dizziness, unconsciousness and coma. Inhalation of vapour may cause respiratory tract irritation.</p>	<p>Eyes</p> <p>Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid immediately.</p> <p>Inhalation</p> <p>Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid immediately.</p>
---	---

6.2.3 Paraffin (Kerosine)

Hazards
Classified as flammable and as harmful due to the aspiration hazard. Prolonged and repeated skin contact can lead to irritation and dermatitis.

First Aid Measures	
Type of Exposure	First Aid Measures
<p>Ingestion</p> <p>Small amounts unlikely to cause adverse affect. Larger amounts may cause irritation with diarrhoea and vomiting.</p> <p>Skin</p> <p>Prolonged or repeated contact may cause short term irritation, de-fatting of the skin and could result in dermatitis.</p> <p>Eyes</p> <p>May cause short-term irritation with redness and stinging.</p> <p>Inhalation</p> <p>Fumes or vapour may cause irritation to eyes and mucous membranes, and drowsiness leading to loss of consciousness.</p>	<p>Ingestion</p> <p>Wash mouth out with water and give water to drink. If a large amount has been swallowed get medical advice. Do not induce vomiting.</p> <p>Skin</p> <p>Wash skin as soon as possible with soap and water. Change contaminated clothing immediately and launder before re-use. Get medical advice if irritation persists.</p> <p>Eyes</p> <p>Wash out immediately with large amounts of water. If redness or irritation persists get medical advice.</p> <p>Inhalation</p> <p>Remove to fresh air. Get medical advice if symptoms persist.</p>

6.2.4 White Spirits

Hazards
Flammable. Harmful: May cause lung damage if swallowed. Toxic to aquatic organism.

First Aid Measures	
<p>Type of Exposure</p> <p>Ingestion Soreness and redness of mouth and throat. Nausea and stomach pain may occur. There may be vomiting.</p> <p>Skin Irritation or redness of skin</p> <p>Eyes Irritation and redness, eyes may water profusely</p> <p>Inhalation Irritation of throat with feeling of tightness in the chest.</p>	<p>First Aid Measures</p> <p>Ingestion Wash out mouth with water. Do not induce vomiting. If conscious give half a litre of water to drink immediately. Get medical aid.</p> <p>Skin Remove all contaminated clothing and footwear unless stuck to the skin. Drench affected area in running water for 10 minutes. Get medical aid.</p> <p>Eyes Bathe the eye with running water for 15 minutes. Get medical aid.</p> <p>Inhalation Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.</p>

Review Record

Issue	Who	Date	Reason for Review
2	ES/GM	26/01/2023	General update and separation into one document for Mechanical Workshop