



WHS Guidelines – Tools, Machinery & Specialised Equipment

1. Scope

These guidelines are applicable to all environments where tools, machinery and specialised equipment are used. The purpose of this document is to detail minimum requirements for working with tools, machinery and specialised equipment and as a guide to assist personnel when conducting risk assessments and developing proper and safe procedures and appropriate documentation.

2. Introduction & Definitions

A wide variety of tools, machines and specialised equipment are located in workshops, laboratories, field stations and technical areas within the School. These can be extremely hazardous if misused. Misuse can result in injury to the user and/or others and damage to the equipment or work. Proper training, correct selection & usage of tools and equipment, appropriate precautionary measures, as well as good housekeeping are essential in these areas to alleviate or minimise risk.

When conducting risk management activities, managers and WHS delegates should:

- Ensure that minimum requirements are in place.
- Using the hazard summary table and tips in proper work practices below, in conjunction with their experience and expertise, identify any other hazards in the environment and implement appropriate mitigation strategies.

3. Definitions

Tools will be defined here as hand tools. Some hand tools are electric such as drills and grinders. Other hand tools include screwdrivers, hacksaws and hammers. Machinery refers to larger equipment and includes drill presses, lathes and other workshop machines. Specialised equipment refers to special purpose apparatus, either purchased, custom made, or modified, often used in research & teaching areas.

4. Minimum Requirements

- Before using electric hand tools, machinery, or specialised equipment personnel must receive training and be deemed to be competent by an approved trainer as nominated by the School Safety Committee. Trainers and competent people will be listed on the School's WHS website along with the types of tools and equipment they are authorised to use.



5. Hazards Summary Table

Hazard	Possible consequences	Mitigation Options
Rotating tools and Machinery	Entanglement Flying debris causing physical injury	<ul style="list-style-type: none"> – Personnel to receive training and be deemed competent by an approved trainer – Develop and provide training on safe operating procedures – Ensure personnel properly restrain clothing and hair – Ensure all safety equipment is fitted and functional. – Provide appropriate personal protective equipment
Electric shock	Serious injury or death	<ul style="list-style-type: none"> – Ensure portable electric tools are PAT tested on a regular basis
Sharp edges	Serious Injury requiring hospitalisation	<ul style="list-style-type: none"> – Develop and provide training on safe operating procedures – Provide personal protective equipment
Pinch points	Serious injury requiring medical attention	<ul style="list-style-type: none"> – Develop and provide training on safe operating procedures
Hot surfaces	Burns	<ul style="list-style-type: none"> – Provide training on safe operating procedure – Provide personal protective equipment
UV radiation (welders)	Injury requiring medical attention	<ul style="list-style-type: none"> – Provide training on safe operating procedure – Provide personal protective equipment
Dust	Long term injury	<ul style="list-style-type: none"> – Isolate dust source where possible – Install fixed dust extraction – Provide personal protective equipment (dust masks)
Fumes	Short & long term injury	<ul style="list-style-type: none"> – Isolate source of fumes – Install air extraction/ventilation – Provide personal protective equipment (respirators)
Noise	Hearing loss	<ul style="list-style-type: none"> – Isolate noisy machinery where possible – Provide hearing protection (ear muffs/plugs)



6. Hazard Descriptions

(a) Rotating Tools and Machinery

Many electrically powered tools and machines have a rotary action. Pistol drills, lathes & milling machines are examples. There is a risk of entanglement with any rotary tool or machine. If loose clothing or long hair becomes wrapped around the rotating part severe injury will usually result. Mitigate by ensuring that loose clothing and gloves are not worn when using this type of equipment and that long hair is contained in a hair net. Also ensure that rags or similar are never used with rotary equipment. When cutting metal and plastics long pieces of waste (swarf) often result that can become entangled on the rotating part and flung around it. Should this occur stop the machine and carefully remove it. Ensure that hands or other body parts are kept well clear of the rotating parts when the tool or machine is in use. Always use safety glasses when using rotating tools and machinery to protect the eyes from flying swarf.

(b) Electric Shock

Many electric tools and machines use mains power (240V or 415V). Making contact with mains power can result in serious injury or death. Should a fault develop that causes the active wire to make contact with metal parts of the tool or machine these parts can become live and, unless the metal parts are earthed, this will cause electric shock and/or electrocution of the user. Modern portable power tools are usually double insulated to minimise this risk but many older power tools and other electric tools are not. Regular PAT testing and tagging of portable power tools is important to verify that they are safe. Power tools and extension cords should not be left switched on at the wall when the user leaves the area. Power cords and extension cords, if cut through with metal swarf or sharp edges on metal items, can result in the swarf or metal item becoming live. In this case it is highly dangerous as there is no earthing to protect the user. Specialised equipment may use other types of power that can be even more dangerous eg. very high voltages can jump a considerable gap. Refer to other specific WHS guidelines on the Physics WHS site for more information on electricity.

(c) Sharp Edges

Many tools have sharp edges that are used for cutting the work and can also cut the user unless due care is taken. Knives, scalpels and cutting tools always have sharp edges. Sharp edges can also often be found on workpieces, especially if they have just been cut or machined, and even raw materials such as new sheet metal often have sharp edges. Metal swarf resulting from metal drilling or machining is also often very sharp, with the added danger of movement, especially if it becomes wrapped around a rotating workpiece or cutting tool.

(d) Pinch Points

Many hand tools, machines and other equipment have areas where fingers or other body parts can become pinched and subjected to high pressures causing injuries to occur. Even simple tools such as pliers and wire cutters can supply very high leverage near the pivot points which can result in injuries should there be a finger or other body part (ouch!) at this point when the tool is used. Step ladders are quite hazardous in this regard. Some equipment, such as metal folders, have areas where a whole finger can be crushed. Ensure that persons using tools that

they are unfamiliar with are made aware of any pinch points, and that SOP's have been developed covering this hazard (if applicable) for any other equipment.

(e) Hot Surfaces

Some electric equipment such as heat guns and soldering irons rely on producing heat and consequently both the equipment & the workpiece will become very hot. Welding, brazing and soldering will always cause hot surfaces. Materials, especially metals, can also become heated from friction that results from machining operations such as drilling, turning in a lathe, milling, grinding etc. This can result in burns if the tool or the workpiece is inadvertently contacted. Ensure that proper precautions are taken with heat related operations such as proper procedures and appropriate PPE and that a fire extinguisher is nearby.

(f) UV Radiation

Electric Arc Welding produces UV radiation that is extremely hazardous to the eyes. It is most important when arc welding to never look at the arc with the naked eye and to ensure that there is no one else in the vicinity that can see the arc. Looking at the arc for even a brief period can result in 'welding flash' which can be very painful and feels like sand in the eyes. Prolonged exposure can cause severe and permanent eye damage. Exposure of the skin at close range to electric arc for more than a brief period will result in burning similar to sunburn. Alleviate by using appropriate PPE such as a welding shield with a suitable shade of filter, heavy gloves, and ensuring that other areas of skin are covered. Ensure that there is no one else in the area that can be flashed and that anyone else that wants to view the process is supplied with an appropriate welding shield.

(g) Dust

When working with tools and machinery dust is often created. Dust created from working with certain materials can be extremely hazardous to health if inhaled. Some very common materials such as MDF (Medium-Density Fibreboard) and fiberglass, for example, can produce dust that is quite harmful. Asbestos is a known carcinogen and although no longer used can often be found in old ovens, furnaces, and other heating equipment where it is used as a heat insulator. Asbestos and materials containing asbestos, such as fibro, should never be disturbed or worked on at all and should be disposed of properly. Before working with materials in a way that may create dust it is most important to refer to the Material Safety Data Sheet (MSDS) for the particular material to verify if there are any special risks or precautions that need to be taken. Ensure that appropriate PPE is used. Dust masks (respirators) come in various levels ranging from disposable types for less hazardous tasks, face masks with replaceable filters, to air fed full face units for severe hazards. Ensure that the correct type is selected by referring to the MSDS and considering other circumstances such as the amount of dust likely to be created and the available ventilation. Dust extraction equipment may be necessary.

(h) Fumes

Operations such as welding, soldering, spray painting and some machining procedures create fumes. Certain types of materials can create fumes that can be highly toxic if inhaled and may cause sickness or permanent damage. Some highly evaporative solvents & chemicals produce



very dangerous fumes (eg. Methyl Chloride found in paint stripper is a known carcinogen). Alleviate by using appropriate fume extraction equipment and PPE (respirators). Refer to the MSDS for the material being used to ascertain the degree of hazard and to help select appropriate PPE and other necessary precautions.

(i) Noise

Many workshop and other operations create noise. Prolonged exposure to noise, or even brief exposure to very loud noise, can result in hearing damage and eventually hearing loss. Minimise the noise as much as practical and always ensure that appropriate hearing protection such as ear muffs or ear plugs are used. Ear muffs are available in various levels of attenuation. When selecting hearing protection consider the loudness and frequency of the noise and the length of time of exposure. When selecting any type of PPE be over cautious rather than take any chances.

GENERAL GUIDELINES

Access & Supervision

- Access to laboratories and technical environments should be controlled and only be granted after a safety induction has been completed and recorded.
- Supervision may be required depending on the experience and attitude of the user and the risk and difficulty of the task. Supervision should continue until the supervisor is satisfied that the user can perform the task properly & safely on their own.
- Persons supervising others in these areas should have sufficient time, appropriate qualifications and experience, and always be available in the vicinity of the work area.

Housekeeping

- All work areas should be kept clean and orderly.
- Floors should be kept free of slip & trip hazards.
- Ensure that there is no excessive clutter on work benches or work areas.
- Stairways, emergency exits, and corridors should be kept clear to ensure free passage in an emergency. These areas should not be used for storage.
- Materials, equipment, boxes & containers should be stored in a manner that enables them to be easily accessed and prevents them from falling.
- All dangerous goods, including combustible materials and flammable liquids, should be stored in accordance with statutory requirements.
- Ensure that power cords do not cause a trip hazard.
- Ensure that power cords or extension cords are not left switched on when the user leaves the area.

Tools-Hand & Power

- Use tools only for the purpose for which they are designed and within their capacity limits.
- Always seek instruction before using an unfamiliar tool or performing an unfamiliar procedure.



- When working with fasteners use only the correct type of tool and ensure it is a good fit. Use properly fitting screwdrivers. With nuts & bolts use spanners in the following order of priority: Ring spanner, socket spanner, open end spanner, adjustable spanner (last resort). Always use washers.
- When using spanners try to pull on them rather than push, with arm at 90 Deg. to the spanner.
- Look after tools, store them properly. Take extra care with measuring tools. Do not leave them lying about mixed up with general tools. Never sacrifice any tool for the sake of the job.
- Report any damaged tools and do not use until repaired or replaced.
- When using power tools ensure that the power tool has a current test tag fitted.
- Ensure that appropriate Personal Protective Equipment (PPE) is used.
- With power tools always wear safety glasses. If the machine makes loud noise wear hearing protection. If it creates dust wear respiratory protection etc. Dust extraction may be necessary.
- Ensure that any safety features (such as safety guards) are fitted and used as intended.
- Exercise extreme caution with angle grinders, circular saws or any other high speed power tool.
- Ensure rags or similar are kept well clear of rotating items such as drill bits, etc.

Machinery

- Qualified or suitably trained persons only to use.
- Typical hazards associated with machinery and workshop areas include noise, vibration, dust & vapours, moving machine parts, heavy weights, sharps, possible flying metal fragments, compressed air, gases, solvents, chemicals and electricity. Due care should be exercised where these or any other hazards are present. More detail on some specific hazards can be found on the School of Physics WHS site.
- Ensure Safe Operating Procedure (SOP) has been developed for the particular machine. SOP's for standard workshop machines and some other workshop equipment (e.g. welding) are available for download on the School of Physics WHS site.
- Ensure SOP for the particular machine is read prior to use and is complied with.
- Use machinery only for the purpose it was designed and within its specified capacity limits.
- Ensure all safety features are fitted and operable.
- Always use appropriate PPE (as specified in the Safe Operating Procedure).
- Never distract the attention of a person using machinery.
- Never use compressed air for cleaning machinery or clothing.
- Do not use rags or similar near rotating workpieces or machine parts.
- Report any damage to or faults with machinery. Do not use until repaired.

Specialised Equipment

- This refers to all specialised apparatus, either purchased, custom made, or modified, often used in research & teaching areas.



- Hazards additional to those mentioned above may be found in association with specialised equipment. They may include lasers, high electric power (high voltages and/or currents), RF, stored electrical energy (e.g. capacitors), stored potential energy (springs, weights at a height etc), radiation, magnetic fields, pressures, vacuums, extreme high/low temperatures, biological hazards, unusual gases/fluids etc. Due care should be exercised where these or any other hazards are present.
- Qualified or suitably trained persons only to use. Must be listed as an authorised user after verification of qualification.
- Develop Safe Operating Procedures (SOP) in accordance with School of Physics guidelines, and ensure that all users are aware of them. Undertake Risk Assessment to aid in this process. Refer to specific documents on the School of Physics WHS website dealing with particular hazards where present. Some equipment may also require Emergency Control Procedures.
- Ensure SOP for the particular equipment is read prior to use and is complied with.
- Use equipment only for the purpose it was designed and within its specified capacity limits.
- Ensure all safety features are fitted and operable.
- Always use appropriate PPE (as specified in the Safe Operating Procedure).
- Report any damage to or faults with the equipment. Do not use until repaired.
- Never attempt to alter or modify the equipment without first seeking approval.
- If equipment is modified amend the SOP appropriately if necessary.