

Health and Safety

Disclaimer and ground rules

By ticking the acknowledgement below, you agree that neither ASPIRE or any person involved with this website or the project is responsible for your personal safety or the safety of others due to your actions, and that any loss of property or personal injury to you or others due to your actions is your sole responsibility.

Do not undertake any experiment or practical work without first fully understanding and implementing the protection and safe procedures that are required.

IF YOU DO NOT FEEL COMPETENT TO DO THE EXPERIMENT, THEN DON'T DO IT. LIKEWISE DO NOT DO ANY WORK IF YOU FEEL UNSAFE.

Competent Authority

Most countries have a competent government authority which deals with Health and Safety issues. Such an authority normally advises on and enforces legislation and acts to disseminate good practice. In the UK this authority is the "Health and Safety Executive" or HSE: [HSE: Information about health and safety at work](#).

You should always consult the information supplied by your country's competent authority to ensure that you are following recommended procedures and practices and complying with the law.

If your own country does not have such laws or a useful competent authority, then we would recommend following the advice of the UK HSE as supplied by the links in this document.

Minimum Personal Protection Equipment (PPE)

You should not do any practical work (even, for example, constructing and testing an electronic circuit) without minimal safety equipment. This consists of, approved:

- Eye protection (for example safety glasses) in all circumstances
- Face and head protection (for example a faceguard and hard-hat) if there is any danger of free material entering your surroundings.
- Protective clothing (for example a lab-coat or overall) again to protect against free material.
- Hand protection (for example gloves) is required wherever there is a danger of damage to your hands.
- Protective footwear (for example steel toed shoes) is required in any workshop type surroundings or anywhere else where there is a potential danger to your feet or from falling objects.

In addition, all loose pieces of clothing, jewellery and hair should be removed or secured. If there is any danger of ignition your normal clothing should also not be flammable.

Specialist Protective Equipment

In addition to the minimum equipment described above, you should equip yourself further or upgrade your equipment to the required standard if you are working with specialist equipment or materials – for example: High or low temperatures, loud noises, high or low pressures, inflammable materials, machine tools or chemically dangerous materials (for example caustic or toxic substances). In the UK, the British Standards Institute (BSI) publish basic standards for equipment to be used in many such circumstances: [BSI Shop - Buy British Standards. \(bsigroup.com\)](https://www.bsigroup.com).

Below are examples of some specific areas about which you should read, before performing any practical work:

High and Low Pressures

Pressurised air is used in some windtunnel and flow experiments. As minimum good practice you should:

- Never use any pressure vessel (for example an air-receiver, tank or cylinder) out-with its rated pressure.
- Have all pressure vessels and similar equipment inspected, tested and approved at the recommended or legally required intervals.
- Make sure all valves and other fittings are well maintained and fitted correctly.
- Always wear the recommended PPE when working with pressurised gasses.
- Avoid exposure of bare skin to fast flows, wear eye, hand, face and body protection if there is any danger of this.
- Do not stand (or allow anyone else to stand) in the air path – blowing debris or a loose fitting may hit them.
- Remember many pressure vessels are rated for constant pressures. Quickly fluctuating pressure (as when a vessel is discharged quickly) causes metal fatigue and means that the maximum pressure used should be lower than the rated pressure (typically half): [Fatigue \(material\) - Wikipedia](https://en.wikipedia.org/wiki/Fatigue_(material)). Some materials, like many steels, have a critical stress below which they will not fail. Others (like many aluminium alloys), have a maximum number of cycles which they can safely endure.

Detailed advice from the UK competent authority can be had here: [Safety of pressure systems: Pressure Systems Safety Regulations 2000. Approved Code of Practice L122 \(hse.gov.uk\)](https://www.hse.gov.uk/l122/)

High and Low Temperatures

If you are working with high or low temperatures it is essential to make sure that your PPE is rated for the temperature at which you are working. It should include, eye and face protection, body and leg protection and hand and foot protection.

Advice for hot temperatures can be found in the “molten metal” section of the HSE web site (although this advice is written for people handling molten material, the

general principles apply to any material hot enough to cause injury): [Health and safety in the molten metals industry \(hse.gov.uk\)](https://www.hse.gov.uk/health/safety/molten-metals/).

Similarly, for materials cold enough to cause injury: [Care with Cryogenics \(ucd.ie\)](https://www.ucd.ie/cryogenics/). This BOC (British Oxygen Company) leaflet explains the dangers with respect to cryogenic gasses, but again the general principles apply to other cold materials.

Chemical Risks

Never use any chemical or material without fully understanding its properties and dangers. In the UK, advice and legal requirements are given in the COSHH (control of substances hazardous to health) guidance: [Control of Substances Hazardous to Health \(COSHH\) - COSHH \(hse.gov.uk\)](https://www.hse.gov.uk/coshh/). In general, a common substance will have a safety datasheet associated with it. This will outline the hazards of working with the material, how to avoid them and what precautions to take. This sheet should be read and understood before working with any new substance.

Explosive and fire risks

Explosive risks are particularly dangerous because it is not just you at risk, but also others around you and their property. You should therefore take every possible precaution if there is any danger of either fire or explosion.

Plan what you are doing very carefully and make sure that you site your experiment in an area where there is minimal danger and chance of injury (particularly from spreading fire or flying debris) if something were to go wrong. You may also wish to use automated or remote-controlled equipment. It is also possible to build a protective wall or enclosure if necessary. Some of the HSE guidance on these risks can be found here: [Controlling fire and explosion risks in the workplace: A brief guide to the Dangerous Substances and Explosive Atmospheres Regulations \(hse.gov.uk\)](https://www.hse.gov.uk/controlling-fire-explosion-risks-workplace/).

Workshop risks

Do not use tools unless you have the correct PPE and are sufficiently trained in their safe use. Also ensure all tools are well maintained, correctly adjusted, secured and in good condition. Tripping and slipping are common risks in workshops, so ensure that the area is well maintained and that these risks are minimised. The HSE guidance for workshops can be found here: [Health and safety in engineering workshops HSG129 \(hse.gov.uk\)](https://www.hse.gov.uk/health/safety/engineering-workshops-hsg129/).

Working with computers

Working with computers can have its own risks – for example, you need to ensure:

- You are comfortably positioned with good posture.
- You avoid eye strain.
- That you take regular breaks and do not work for too long at a time.

HSE advice and regulations can be found here: [Working with display screen equipment \(DSE\) \(hse.gov.uk\)](https://www.hse.gov.uk/working-with-display-screen-equipment-dse/)

Only some of possible hazards are outlined above – before tackling any new practical task perform a risk assessment to ensure that you account for all possible eventualities: [Risk assessment - HSE](#). In particular, identify any areas which are not covered in the points above and look up the appropriate precautions.

Also make sure that you address the simple hazards, present in all environments (for example slips and trips: [Slips and trips - HSE - Slips and trips - HSE](#) and Electrical safety: [HSE - Electricity](#)), etc.

Lastly avoid working alone and make sure someone responsible knows where you are.