Contents

*New or modified section

This handbook is updated each year to incorporate developments in University policy or new information. It is available on the Safety Office website.

A limited number of hard copies are printed at the start of each year, for distribution to Schools and Departments for staff without on-line access.

Foreword

The Health and Safety at Work Act 1974 makes provision for the health, safety and welfare of all people at work and for the controlled use of dangerous substances and emissions. The Act places a responsibility for care on the whole community and it requires the co-operation of all in creating a healthier and safer working environment. There is a responsibility on all employers to maintain safe plant, systems of work and premises; to arrange adequate instruction, training and supervision; and to lay down a safety policy and to tell their employees about it. Further, all who design, manufacture, install, erect or supply anything for use at work will now be responsible for its safety. Apart from taking care to avoid injury to themselves and others at work employees must co-operate to enable health and safety requirements to be complied with.

Firstly, everyone must know the risks and potential hazards of the materials and equipment he is working with and so be alert to any dangers. This will ensure that we all adopt safe methods of work to reduce risks to a minimum.

Secondly, in addition to these special risks, there are those from "non-occupational" accidents: the slips, falls, strains and so on which occur at the work- place as much as in the home or on the playing field. We must be conscious of these hazards too as well as the specialised problems in specific work areas.

Finally, the control of physical conditions is only a partial answer to the accident problem: we have to learn to want to work safely, and to appreciate that a knowledge and awareness of the dangers of materials are not enough. We must be on our guard and always alert to the simple every day things that can bring injury if they are ignored.

All of us who work in the University should be aware of the University's Statement of Safety Policy (reproduced in this Handbook). The arrangements and advice in this Safety Handbook implement that policy and form the basis of safe working and training in safety methods in all Schools and across Professional Services. I hope it will encourage everyone to do the right thing at the right time.

Dr P Greatrix,
Chair, University Safety Committee

Health and Safety at Work Act 1974 Statement of the University's General Policy on Health and Safety at Work

As a leading research based University, this institution is committed to the achievement of a high quality of provision in all aspects of its activity. The University recognises that health and safety is an integral part of this. Consequently the University will ensure that the health and safety aspects of its activity are given equal consideration with the other aspects of its activity in order that the health and safety of its employees and all other persons who use its premises, including students, visitors and contractors, may be protected.

Workplace injuries and ill health can be prevented by the application of an effective risk control strategy. The success of this depends upon the full participation of all members of the University in ensuring that the health and safety implications of the work for which they are responsible, at whatever level, has been accounted for.

The University, through its organisational structure, will seek to ensure that the risks arising out of its activities are identified and that the necessary controls, physical or procedural, are provided, along with the training and supervision needed to support them. The effective functioning of its safety organisation will be audited by the University. The University will participate in consultation, which it recognises as part of the means for achieving a co-operative effort at all levels of the organisation in securing effective control over health and safety risks.

The University Council, as employer, carries the ultimate responsibility for safety in the University. The Registrar has been appointed by Council to be responsible for overseeing the implementation of the University Safety Policy.

Safety is a line management responsibility and the immediate responsibility for safety within any work area is borne by the appropriate Head of School or Professional Services Department. These individuals are responsible for ensuring that arrangements for safe working within their areas have been set up and published. These local arrangements form part of the University Safety Policy.
Dr P Greatrix,
Registrar

Section 1: Administrative Organisation of Safety

1.1 University Arrangements

The University Council receives advice on safety policy, which is formulated on its behalf by the University Safety Committee. Once policy has been approved by Council, responsibility for implementing it is delegated to Heads of Schools, Professional Services Departments and Hall Managers, as appropriate, with Council's duty to monitor implementation performed on its behalf by the Registrar.

The Director of Health and Safety is the Secretary of the University Safety Committee. He acts as adviser to the University, through the Safety Committee, on matters of safety and also advises directly Schools and Professional Services, Halls of Residence and individual members of staff.

1.2 Safety Committees

The University Safety Committee concerns itself with the safety of all employees and members of the University, staff and students alike, and persons who are not in the University employment and seeks to ensure that they are not exposed to risks to their health and safety while at the university. Special arrangements have been made where there is a joint responsibility, for example, in the Medical School and Teaching Hospital.

The Statutory Safety Committee has been set up at the request of Trade Union Safety Representatives under the provisions of the Health & Safety at Work Act, 1974 and its relevant Statutory Instruments of 1977. The aim of the Committee, on which appropriate University Officers and all the major Unions are represented, is co-operation and co-ordination of safety matters. Items can be placed on the agenda by both Management and Unions. The Act also provides for recognised Trade Unions to appoint Safety Representatives and all the recognised Unions have set up a network of these Representatives who have statutory functions to fulfil with regard to safety.

Many sections of the University have set up local safety committees to advise the Head of School or Department on safety and to give an opportunity for regular review of safety performance. They keep the University Safety Committee informed of their proceedings.

The Statutory Safety Committee reports to management through the University Safety Committee.

1.3 Local Management and Organisational Arrangements

The University's arrangements for managing health and safety are described in detail in "Effective Safety Management". This is published on the Safety Office website and defines a performance standard for safety management. The Safety Office will audit safety performance against this standard.

The Head of every work area has the responsibility for ensuring that hazards within the area's activities have been identified and that arrangements have been made to control the risks arising from them. In addition to the provision and maintenance of equipment and procedures to ensure safety, the arrangements for control should include provision for training, supervision and health surveillance of the people involved where necessary, and the provision of personal protective equipment.

The Head of each School or Professional Services Department or Hall Manager, should where necessary appoint a School/Departmental Safety Officer to assist him/her in carrying out his/her responsibility within the work area. (Section 4.4 of Effective Safety Management gives general guidance on the role and duties of such an Officer). In some cases Safety Officers have been nominated for particular buildings or portions of University premises.

Each School, Department, Hall etc. will, where necessary, supplement this Handbook with more specific health and safety information appropriate to its own local circumstances and special problems. Amongst other things these will explain the local arrangements for managing health and safety and specific procedures or rules covering aspects ranging from the local fire evacuation and first aid arrangements to procedures to be adopted in relation to hazardous materials, equipment, or activities within the work area. These arrangements should be reviewed, and if necessary revised, annually and in the event of any changes that may affect the level of hazards present or the effectiveness of any controls or procedures. In particular the introduction of new processes, equipment, or substances, or the implications arising from building alterations need to be considered. These local arrangements then become, for that location, part of the University Safety Policy. Section 5.2 of Effective Safety Management contains a model Safety Policy.

New recruits to the University should receive relevant health and safety information on induction. The means for providing this are determined by the School or Department etc and might include the completion of a health and safety induction questionnaire (see Safety Office Guidance).

Health and safety legislation places obligations on employees as well as the employer. The duties on employees include co-operation with the employer,

for example by following the relevant safety procedures. Consistent failure to observe the requirements of the University Safety Policy may result in disciplinary action.

Heads of School/Department and Hall Managers must make appropriate arrangements to monitor the effectiveness of their local arrangements for controlling hazards and preventing unsafe practices. This must involve a system of regular safety audits and inspections as explained in Section 4.7 of Effective Safety Management, which also gives guidance on how this should be carried out in practice. The period between inspections will depend very largely on the nature of the hazard and the level of risk involved, but the frequency must be stated and adhered to.

After carrying out any audit/inspection there should be an evaluation to determine any remedial action necessary, whether in the form of improved facilities, further training of employees or revision of the rules.

The remedial action taken must be noted and brought to the attention of those working in the appropriate area.

If necessary remedial action has been identified, but the Head of the work area is unable to carry out major work because of lack of resources, the matter should be referred to the Registrar who will arrange for it to be considered through the University's committee structure.

Where University premises are shared with another employer there are reciprocal requirements to liaise and co-operate on health and safety so as to avoid exposing the employees, students and visitors of one organisation to the risks from the others activities. The non-University employer is responsible for controlling the risks to their own staff and visitors from that employer's activities. It is also obliged to co-operate with the University to enable it to discharge its responsibilities to its own staff, students and visitors.

1.4 The Role of Individuals

Whilst the University as the employer will set the framework of safety management the successful implementations of this by way of controlling workplace risks depends upon the commitment of each member, employee and student of the University to the careful consideration and application of the safety measures related to their work. This contribution is essential at all levels of the organisation from policy formulation and planning of work to the actual execution of the tasks. This philosophy is enshrined in a range of health and safety legislation which places statutory responsibilities on employers and employees alike to ensure that the work is carried out safely,

so that neither they nor anyone else who could be affected by the work is endangered. There is a similar responsibility in respect of other parties such as contractors and visitors to conduct their work so that employees and students of the University are not placed at risk.

Everyone should make it his or her first task to become familiar with any special instructions issued for dealing with emergencies peculiar to the place in which he or she is working.

Everyone should get to know the layout of appropriate buildings; emergency and normal exits, location of fire alarms, location of fire fighting appliances and how they work, siting of telephones and first aid arrangements. Remember, it will be too late to find out very much when an emergency actually happens.

If anyone working at the University has a disability that may have implications relating to the arrangements for safety in the general work situation or in an emergency such as a fire, he or she will appreciate that it is to their advantage to make this known. The same applies to anyone on permanent medication to control a medical condition. If you have any queries on safety matters consult the appropriate safety officer.

Section 2: Emergencies

Because of the wide variety of work that is carried out in the University and the complex layout of the various buildings it is not possible to produce a set of valid and detailed emergency instructions to cover any situation which may arise. For this reason emergency procedures appropriate to each area must be established and made known. An essential feature is rapid communication stating the location and nature of the emergency. Telephone Services have established procedures for summoning assistance in the specific locations within the University. These can be accessed via the Telephone Services website. This document is designed to assist the telephone user in a specific location to know which number to call for assistance in the event of an emergency.
Many science and engineering Schools will also have their own safety regulations dealing with the more specialised aspects of their work.

These local arrangements may include circumstances requiring full evacuation, partial evacuation or a preparedness to evacuate. Specific high hazard areas may also be identified and supplemented with local arrangements. Certain individuals with specific responsibilities under the emergency procedures will be identified. It is important to know and understand the contents of the local arrangements and how they may affect your work. Such booklets are meant to be a necessary and useful addition to this general code. There is in every building a notice setting out the procedure to be adopted in case of fire. This instruction should be studied and committed to memory.

There are certain points that apply to all emergency situations.

A Commit to memory the emergency procedures inside front cover and fire regulations (page 9). You will have no time to read them in an emergency.

B Remember you are expected to act in the spirit of the instructions. There is no substitute for common sense.

C The most important consideration at all times is human safety.

D Remember: if you become a casualty someone must rescue you, possibly at personal risk to themselves. So avoid becoming a casualty.

E Act quietly and methodically. Do not rush or attempt to pass others when leaving the scene of an accident.

F The senior person present should assume control of the situation ensuring safe evacuation from the area of all persons present and be prepared to warn the Emergency Services of known special hazards.

Section 3: Fire Precautions

It is a responsibility on all members of the University to know the position of fire alarm, extinguishers and all exits of the buildings in which they are working or using.

It is essential that all members of the University know the positions of their nearest fire alarm call points, internal and external telephones, extinguishers and all the exits from the building in which they are working or using. Similarly the sound(s) of the fire alarm system should be known and their meaning understood. These features should be made known to all members of the University who will be new to working in or using the building.

All exit routes must be capable of providing safe and unimpeded passage in the event of an emergency. Consequently corridors and staircases should not be used as working or storage areas. All doors affording exit should be capable of being easily and immediately opened from within at all times that the building is occupied. Fire resisting smoke stop doors must not be left open e.g. held by wedges or extinguishers.

IN CASE OF FIRE

On discovering a Fire

(a) Raise the alarm by operating the nearest break glass call point.
(b) Dial 8888 on the nearest internal telephone stating the location of the fire. (Medical School & embedded units at QMC/City Hospital, dial 2222)
(c) Attack the fire with nearest appropriate extinguisher if safe to do so and your escape route is clear.

On hearing the Alarm

(a) Leave the building immediately do not use lift do not stop to collect personal belongings.
(b) Close all doors and windows when leaving.
(c) Report to your assembly point.

Porters and Security Staff

(a) Assist orderly evacuation of building.
(b) Prevent persons re-entering building during emergency.

Fire Precautions in the Medical School

Follow local fire procedure.

3.1 Use of Extinguishers

The prompt and intelligent use of an extinguisher in the earliest stages can prevent a serious fire. Training in the use of fire extinguishers can be arranged through the Safety Office.

In attempting to put out a fire it is essential that the correct type of extinguisher is used. The use of the wrong type could in some circumstances increase the hazard and danger to the operator.

Under no circumstances should a water extinguisher be used on electrical fires.

Materials Involved	***Extinguisher to Use*** **(and colour of extinguisher or of markings on a red body)**
All carbonaceous materials such as wood, textiles, paper, etc.	Water type (red)
Flammable liquids, solvents, petrol, oil, etc.	Foam (cream); Fire blanket; Dry Powder (blue); Carbon Dioxide (black);
Live electrical equipment and wiring	Dry powder or Carbon Dioxide

Fire extinguishers must not be used to hold open doors as they may be damaged as a result and will not be available at their expected location in the event of a fire. The holding open of fire doors, other than by automatic door release devices, is not permitted as this reduces the fire protection of the building by allowing smoke and flames to spread further and more quickly.

3.2 Reporting of Fire

A Fire Report Form must be completed immediately in respect of all outbreaks of fire occurring within the University. This is to ensure that basic information on the fire is available to the University in the event of any future enquiry and to enable the incident to be investigated with a view to the possibility of preventing further similar incidents.

The Fire Report Form should be completed by Heads of School/Department etc or Hall Managers or their respective nominated personnel. Blank copies of the form for photocopying as required have been distributed for local use. In the event of difficulty further copies can be obtained from the Safety Office. When completed, one copy of the form should be sent to the Safety Office, one to the Security Office and one retained within the location.

3.3 Fire Evacuation Procedure

Each School, Department etc is responsible for setting up fire evacuation procedures. The aim is that in the event of fire all persons in the location should leave immediately, and that by the time the Fire Service arrives, information is available on whether there are any persons remaining in the building. This is normally achieved by dividing the building into sections and personnel should on hearing the fire alarm clear each of these sections as they leave. They should then report to a co-ordinating member of staff who on completion of the evacuation should be in a position to advise the attending officer from the Fire Brigade of the position concerning the successful clearance of the building.

To assist in the management and control of this system, the majority of buildings have their sections identified by strategically placed fire tokens. A token should be taken by the first member of staff passing it on evacuating the section and who should then check that the rooms within that section have been cleared. This person then reports to the co-ordinator at the assembly point.

The co-ordinator will be one of a number of senior members of School or Department etc staff nominated to take charge in the event of an emergency. In the case of buildings used by several Schools or Departments there will be a co-ordinated system for the building as a whole.

At least one exercise of the fire evacuation procedure (fire drill) will be held annually. The assistance of the University Fire Safety Adviser (Extension 13302) must be sought prior to the exercise taking place. This will enable the necessary personnel, i.e. duty electrician etc. to be present. The exercise must be followed by a review of the procedures, as appropriate, in the light of how effective the fire drill proved to be. A report must then be forwarded to the Fire Safety Adviser at the University Safety Office.

The fire alarm system must be tested each week. (The duty electrician may undertake this task if a request is made to the Estate Office).

Outbreaks of fire, fire drills and the testing of fire alarms must be recorded.

3.4 Fire Response Procedure

This procedure (see Safety Office Guidance) deals with the response by University Security to fire alarm signals received in Trent Control. All buildings at University Park, Sutton Bonington, Jubilee, Clinical Sciences Building at City Hospital and Shakespeare Street have fire alarm systems that send a signal to Trent Security Control Room.

At Jubilee Campus, Sutton Bonington and Shakespeare Street a five-minute delay in calling the Fire Brigade is permitted ***only during certain working hours*** in order that the reason for the automatic fire alarm activation can be investigated. The procedure defines the hours during which the delay applies; this varies for different categories of building, e.g. academic, residential.

The Fire Brigade will not attend to fire alarm actuations at University Park unless they have verbal confirmation that there is an actual Fire/Incident.

At sites shared with hospitals (e.g. Medical School and City Hospital) the hospital's response arrangements are to be adopted.

If a definite report of fire is received by Trent Control, they will contact the Fire Brigade immediately.

3.5 Hazard Information for the Fire Brigade

Some activities might expose fire officers attending a fire to greater hazard than would normally be the case for that type of building. Consequently sets of floor plans showing high hazard areas are kept available for the Fire Brigade at each relevant building, mainly laboratory or workshop buildings.

Hazard plans show the location of facilities such as radiation or biohazard laboratories, chemical stores or permanent/semi-permanent gas cylinders, high power lasers. Isolators for main services are also included. Hard copies are kept in an accessible location in each building and can also be accessed via the Building Information System.

Schools are required to notify the Estate Office of any changes to the hazard locations in order that the plans can be updated and re-issued.

3.6 Emergency Evacuation of Persons with Disabilities

The University will seek to comply with the guidance in British Standards, Codes of Practice and the Building Regulations. Reasonable adjustments will be made wherever possible to facilitate safe access and egress.

The University's arrangements for the emergency evacuation of persons with a disability are published on the Safety Office website. This includes general information about the facilities available and the procedures in place. Information describing the general emergency and evacuation arrangements is contained in building access plans displayed near the principal entrances to buildings and is also available on the Estate Office website.

If these general arrangements do not seem suitable then it might be necessary to develop a Personal Emergency Evacuation Plan (PEEP). The purpose of this is to identify with the person concerned any additional arrangements that may reasonably be made to enable their effective evacuation in an emergency. This will reflect the unique characteristics of the buildings that they need to visit and their own requirements.

To initiate the development of a PEEP the University must be notified as follows:

- Students should notify Academic Support,
- Members of staff should notify their line manager,
- In the case of university accommodation by indicating on the Residence Form issued prior to arrival or subsequently the Hall Manager should be notified.

The following specific information is provided for wheelchair users concerning emergency evacuation arrangements:

All buildings are provided with a fire alarm system that is activated automatically when a fire is detected but can also be manually activated by operating a fire alarm call point. The sound of the alarm is usually a siren. Lifts must not be used in the event of a fire unless specifically designated for this purpose.

If the alarm sounds you should leave the building using the nearest suitable exit to the outside. If you are on a floor from which you cannot exit without using a lift you should make your way to the nearest refuge. A refuge is a temporary safe space for you to await assistance for your evacuation. It comprises a fire resisting enclosure that is served directly by a safe route to a storey exit, evacuation lift or final exit. The location of refuges is shown on the building access plans located inside the main entrance of the building and also accessible on the Web.

Once in the refuge you should contact Security Control using the telephone in the refuge where provided or a mobile phone (telephone 0115 951 8888) to indicate your presence in a refuge. You will be asked for your name, the location of the refuge, and if relevant your mobile telephone number so that the Security Office can keep in contact with you to provide you with information about the alarm and your evacuation. The overwhelming majority of fire alarm activations are due to reasons other than a fire so you should not worry and remain calm.

A member of the response team should contact you within a few minutes. You will not be evacuated unless it is necessary to do this. If it necessary to

evacuate you and there is not a suitable lift then you might be asked to transfer to an Evacuation Chair. This is a specially designed chair for descending staircases. You are encouraged to try one of these at an early point of your time at the University. If you have any reservations about the use or suitability of an Evacuation Chair you should make this known so that your requirements can be reviewed and alternative arrangements made.

Section 4: Emergency First Aid Treatment

4.1 General Arrangements

The arrangements for first aid provision across the University are described in the University Code of Practice. This includes the selection and training of first-aiders, the contents of first aid boxes and the arrangements for obtaining first aid supplies.

Identifying appropriate provision of first aid is the responsibility of each School/Department – hazard profile, location and patterns of working are amongst the relevant factors to be taken into account. Lists of first-aiders for the School/Department etc or building, their location and internal phone number will be strategically located throughout the work area or next to first aid boxes. They will also be contained within the local safety policy.

4.2 First Aid Boxes

There are many first-aid boxes located at vantage points in the University's buildings. Anyone working regularly in one place should note the position of the nearest box and the name of the First Aider responsible for it. Information on typical first aid contents is provided in the Code of Practice.

4.3 First Aid Training

Courses in first aid instruction for members of the University are arranged throughout the year by Professional Development. Two types of course are available. A one-day Emergency First Aid at Work (EFAW), or a three-day First Aid at Work (FAW) course. The choice of course depends on the risks within the area and the types of situation/injury likely to arise. Generally, the EFAW course is appropriate for those in lower risk teaching and office environments, whilst the FAW course is more applicable for higher risk laboratory and workshop environments, and fieldwork or remote working.

- EFAW training enables a first-aider to give emergency first aid to someone who is injured or becomes ill while at work.
- FAW training includes EFAW and also equips the first-aider to apply first aid to a range of specific injuries and illness.

Both require a refresher course after three years and optional annual refresher courses are available.

To be considered for training, staff should discuss with their local safety officer who has the overview on provision within the unit.

Specific training for administering first aid in the event of cyanide or hydrofluoric acid exposure is also available.

4.4 First Aid Treatment of Casualties

Serious Injury

The first object of treatment is to prevent deterioration in the injured person's condition until medical assistance arrives. The patient should be moved as little as possible to prevent further injury.

1. Ensure a clear airway to enable the casualty to breathe. Should pulse/breathing have ceased send for help (**8888**).
2. Monitor the casualty's pulse/breathing and commence resuscitation if able. Control bleeding by applying direct pressure on or near any wound.
3. Irrigate off most toxic or corrosive substances.

Do not give injured or unconscious casualties anything to drink eat or smoke.

Eye Injuries

Injury from solid objects requires medical attention. Splashes of any liquid in the eye must be regarded as potentially harmful. Irrigation of the eye with copious water should be commenced immediately and continued for 10 minutes.

All eye injuries should be referred to the Eye Casualty Department at the Queen's Medical Centre.

Poisoning

This is a medical emergency and urgent help should be summoned.

If the casualty is unconscious, place in the recovery position. Should the breathing or pulse cease commence resuscitation.

Burns and Scalds

Irrigate the burnt area with cold water for at least ten minutes and then apply a loose, non- fluffy sterile dressing. Any blistering of the skin should not be punctured.

Cryogenic Burns

Apply copious amounts of tepid water to the affected area of skin to reduce freezing in the tissue, loosen any clothing that may restrict blood circulation and move the injured person to a warm place but not a hot environment. Do not apply heat to any affected parts. To protect frozen areas apply a loose, non-fluffy sterile dressing. Seek medical attention.

Head Injury

All head injuries must be seen by a qualified first aider and medical advice sought if the injury has involved even momentary loss of consciousness.

Lacerations
Wash thoroughly with water and apply a sterile dressing. If the wound was caused by a dirty object, it is advisable to seek medical advice regarding protection against infection, especially tetanus.

Dirty/Used Sharps Injuries*, Body Fluid splash to Eyes/mouth*
The following steps should be taken after a Used/Dirty Sharps injury, e.g. contaminated syringe needle, scalpel blade etc, or a human bite or scratch or splash of body fluid into the eyes or mouth. Unused/clean sharps do not present a risk.

Encourage wound to bleed and do not suck. Wash with soap and water, dry and apply a waterproof dressing. Use copious amounts of water to wash away a body fluid splash to the eyes or mouth. Notify the incident to your line manager, academic supervisor or other appropriate senior staff in the area. Complete an accident report form.

The infection risk will need to be assessed. If the injury is caused by a used or dirty sharp, human bite or scratch, human body fluid splash of known /unknown source the following procedure must be followed:

Immediately attend Accident & Emergency department at Nottingham University Hospital Queen Medical Centre:
0115-9249924

Additionally during normal hours contact Occupational Health
Mon-Thursday 0830 -1630 Friday 0900 – 1630
Tel: 0115 951 4329

Outside normal hours contact:
Contact OH at first available time above.

OH MUST be provided with an incident risk assessment

After A and E intervention the injured person should attend OH as soon as possible for potential HEP B vaccination and blood storage services

The full procedure for sharps injury can be found through the Safety Office Policies and Guidance website.

Injuries Involved Radioactivity
These should be dealt with in the manner laid down in the local rules on Radiation Safety.

Electric Shock
If the Casualty is Unconscious
Switch off current and use an insulating material to pull the victim away from the conductor.

If the breathing and the pulse cease send for help and commence resuscitation.

If the Casualty is Conscious
Treat as for "shock" below.

"Shock"
This is a state of collapse, which may result from physical or emotional injury and symptoms range from faintness to complete collapse and unconsciousness.

The patient should be laid down and, if possible, the feet raised higher than the head. A shocked person needs reassurance and should not be moved unnecessarily. Keep a shocked case warm with a blanket. Severe shock is a medical emergency and an ambulance should be sent for - dial 8888.

4.5 AEDs (Defibrillators)

The University has a number of portable automated external defibrillators (AEDs) on its main campuses, both on security vehicles and in fixed locations. The equipment is intended for use by any person in emergency situations when a casualty has a serious cardiac rhythm disturbance causing unconsciousness, such as heart attack. AEDs are not effective for all cardiac emergencies but they are of benefit in a small proportion of acute emergencies. The quicker life saving first aid and an AED are used on a casualty, the better the outlook for survival. The University has response procedures in place to ensure that the AED and a trained operator reach the casualty promptly.

All staff have the opportunity to attend training/familiarisation sessions, these are publicised through the Safety Office website.

Detailed information on the arrangements including training and the emergency response procedure is available.

The locations of the AEDs are as follows.
Further information on contact details and building access is available on the Safety Office Workspace.

UNIVERSITY PARK
Chemistry foyer
Coates Bldg, Telford Exchange, Bldg Attendant's station
East Midlands Conf. Centre behind reception
Hallward Library, opposite Front Desk
Lakeside Arts Centre, Box Office
Law & Social Sciences Bldg, B19
Maths entrance foyer
Physics Bldg, B218
Psychology entrance foyer
Sports Centre main reception area
Trent Building, Trent Security
Mobile Security Vehicles
JUBILEE CAMPUS
Jubilee Sports Centre, reception area
Djanogly Learning Resources Centre - entrance
KINGS MEADOW
Main Reception area
Rear staff entrance – corridor to left
SUTTON BONINGTON
Main Building adjacent to Enquiry Office
Plant Sciences Foyer
SVMS (Vet School) Building Foyer
Sports Centre Reception
MEDICAL SCHOOL, QMC
A floor foyer, near Security office

Section 5: Reporting of Accidents

5.1 Health & Safety Executive Requirements

In the case of a major incident occurring, the Health and Safety Executive may choose to visit the scene as soon as possible, before anything significant has been disturbed. The Reporting of Injuries, Diseases & Dangerous Occurrences Regulations 1995 therefore require that for major incidents information must be transmitted as soon as possible to the local office of the Health and Safety Executive. The University's procedure for this is outlined in Safety Office Guidance.

The policy describes the situations requiring a report to the Health & Safety Executive and the University arrangements for doing so. The essential requirement is that the Safety Office must be notified as soon as possible on ext. 13401/mailto:bb-safety-office@exmail.nottingham.ac.uk, in case of extremely serious incidents. Notification to the Health & Safety Executive of such incidents will be made by the Safety Office. If there is uncertainty about whether an incident is notifiable to HSE, Schools/Departments are expected to inform the Safety Office who will advise on application of the Regulations.

The types of incident which require notification to the HSE are:

- **Major Injuries to staff**, includes
  - most fractures
  - major dislocations
  - some eye injuries
  - serious injuries from electrical incidents
  - some types of loss of consciousness
  - acute illness arising from exposure to harmful substances
  - injuries resulting from work-related assault
  - any injury which results in the person being detained in hospital over 24 hours
- **More than 7 days lost time incidents to staff**
- **Certain dangerous Occurrences** (these do not necessarily have to have involved injury of persons)
  - uncontrolled release or escape of a potentially hazardous material
  - collapse, overturning or failure of load-bearing parts of lifts and lifting equipment.
  - explosion, collapse or bursting of any closed vessel or associated pipework

- plant or equipment coming into contact with overhead power lines
- electrical short circuit or overload causing fire or explosion

- **Certain occupationally-acquired diseases**
  - certain poisonings
  - some skin diseases such as occupational dermatitis, skin cancer, chrome ulcer, oil folliculitis/acne
  - lung disease including : occupational asthma, farmer's lung, pneumoconiosis, asbestosis, mesothelioma
  - infections such as leptospirosis, hepatitis, tuberculosis, anthrax, legionellosis and tetanus
  - other conditions such as: occupational cancer, certain musculoskeletal disorders, decompression illness and hand-arm vibration syndrome
- **Member of the public/visitor** taken from the scene of an incident straight to hospital for treatment - students are classed as members of the public under these Regulations.

5.2 University Requirements

University guidance describes the internal accident reporting system. For ALL incidents (injuries, near misses/dangerous occurrences and occupational health cases), including those mentioned above, an Incident Report must be completed. This includes accidents to ANY person, including students and visitors, in ANY part of the campus, including conference facilities, Halls of Residence and sports facilities. This is to ensure that basic information of the incident is available to the University in the event of any future enquiry and to enable the incident to be followed up with a view to the possibility of preventing further similar incidents.

Reporting of work-related injuries, diseases and dangerous occurrences/near misses is done via the on-line incident reporting system, which replaces the previous paper-based system.
The paper form is still available in most School/Departments for use at a local level, the details are then transferred by the School/Department to the on-line system.

The on-line incident report form consists of a report section enabling rapid notification of the incident to the relevant staff and the Safety Office and may be completed by anyone who has sufficient information, e.g. the injured person, supervisor, first aider etc. In addition there is an

investigation section enabling further information to be provided once the full details are known, this is completed by the local manager and/or safety officer. A comments/actions section is also available.

In the case of any fire occurring at the University, a Fire Report must be completed. (See page 11).

Section 6: General Precautions

6.1 Risk management

The most important way of ensuring good health and safety is through an effective risk management strategy. Individuals must be aware of the hazards (i.e. things that can cause harm) involved in their work whether it be a simple task of lifting or a complex experimental procedure. The primary aim should be to prevent harm occurring, however it is recognised that this may not always be possible, in which case control measures should be identified that will as far as reasonably practicable reduce the risk of harm occurring to an acceptable level.

Control measures should be considered and applied in the following order:

- Prevention – the work/use of the substance must be fully justified and necessary.
- Substitution – can a less harmful substance/material or more suitable equipment be used?
- Enclosure/engineering controls – separate the individual from the hazard. e.g. by using a fume cupboard or provision of machine guards.
- Defining procedural handling controls e.g. using a trolley to assist in moving a piece of equipment, avoiding use of sharps, controlling the temperature of a reaction.
- Personal Protective Equipment [PPE] – identify what is required **in addition to the above controls** to minimise risk (e.g. safety specs, footwear, lab coats, gloves). Where PPE is deemed necessary it must be worn. Students failing to comply may be excluded from particular practical classes or areas.

Risk assessment (as required by the Management of Health and Safety at Work Regulations) should be the first step in deciding the control measures needed. For more complex procedures/operations the control measures identified to minimise risk should be incorporated into a written standard operating procedures approved and checked by supervisor /manager.

Advice on specific safety aspects of a procedure should be sought from the local Safety Officer or the University Safety Office. Information is also available on-line from the following sources:
Safety Office Guides & Publications
Health & Safety Executive website

Training and supervision
One of the most important elements of controlling the risks and making sure that the controls are properly used is the provision of information, instruction and training to those doing the work. This also needs supplementing with supervision to make sure that the information etc. has been properly understood and that the task is being competently carried out. The extent of direct supervision can be relaxed as the person demonstrates competence but adherence to correct procedures must form part of the ongoing monitoring arrangements. The responsibilities of academic supervisors toward post graduate and undergraduate students are described in Safety Office Guidance.

Monitoring
It is essential that individuals remain vigilant toward the general conditions in an area and/or of any equipment or materials used in their work. Any defects must be reported immediately to their line manager or supervisor and if necessary the item taken out of use until repaired.

6.2 University Codes of Practice, Policies and Guidance

The Safety Office has produced topic-specific guidance where there is a particular hazard likely to occur in different Schools/Departments etc. Such guidance is produced with the intention of achieving uniform standards of safe practice. This handbook refers to specific University codes of practice, policy or guidance where it exists and the entire listing is given on the Safety Office website.

6.3 Occupational Health

The primary function of the occupational health service is to advise on matters relating to health and the working environment. This is carried out in close co-operation with the Safety Office.

Where the work could involve exposure to hazardous substances or agents medical screening might be required before the work is undertaken and periodically thereafter. Examples include; allergy screening for those working with animals) and farm workers; checks for prospective users of ionising radiations, lasers and certain hazardous chemicals (e.g. respiratory sensitisers); and exposure to noise or vibrating equipment. It is the Line Manager's responsibility to arrange for health surveillance with Occupational Health. Further advice is available from the Occupational Health Unit or the Safety Office.

6.4 Slips and Trips

A common type of incident in the working environment is falls, caused by slipping or tripping on a level, on stairs/steps, from access equipment (e.g. ladders) or from roofs.

Some of the important factors in maintaining a low risk of people falling include:

- Appropriate floor surface for the activity taking place
- Maintenance of floor surfaces (dealing with defects such as cracked flagstones, lifting carpet tiles)
- Suitable cleaning regimes that effectively deal with the likely contamination (weather, spillages, leaks, sand, dust, etc.)
- Maintaining clear and unobstructed walkways
- Effective positioning of matting inside entrances
- Non-slip footwear in certain environments (kitchens)
- Training in relation to access equipment and use of roof-work permits

It should also be noted that where spillages or leaks occur, it is crucial, if the slip risk is to be substantially reduced, to either keep people off the wet surface or to clean **and dry** the surface as soon as possible. Wet mopping that leaves the surface damp does not actually decrease the slip risk (findings of both HSE and University slip tests).

The Safety Office is able to assess floor surfaces to give an indication of the slipperiness using the HSE's Slip Assessment Tool. This takes into consideration the type of floor, the cleaning regime, the footfall and the likely contaminants (weather, chemicals, dusts, etc.)

In all situations, the risks of tripping or slipping in the workplace should be considered and where identified as a significant risk, should be incorporated into local risk assessments with the aim of formulating an action plan to reduce the risk.

Corridors and staircases must provide safe circulation and emergency escape routes and hence they must not be used as working or storage areas. Never run on polished floors of corridors or common rooms. Bicycles must not be brought into University buildings as they can cause serious obstruction either within work areas or along routes comprising a means of escape from the building (see University Statement)

6.5 Office Safety

In offices, falls are a common source of accidents. Therefore, it is necessary to keep floors clear and free of goods, litter, trailing cables, etc. Also proper provision must be made for access to high level storage, e.g. by means of step stools and NOT by standing on chairs. Increasingly office equipment such as printing and duplicating machines, guillotines etc. are being introduced and these can cause serious injury if used carelessly. Chemical,

electrical and mechanical hazards may be involved and the appropriate sections of this Handbook should be consulted.

6.6 Display Screen Equipment

The use of display screen equipment is subject to the Health & Safety (Display Screen Equipment) Regulations and the University's Policy for implementing these is outlined in Safety Office Guidance. The Regulations apply to workstations used by people for a significant part of most days; i.e. a user as legally defined. In general terms someone whose workstation use averages 2 hours per day over the course of a week would be a "user", even if the actual use is for short periods at each time. Where the nature of the work requires prolonged and intensive sessions, then this threshold is lowered such that a single 1 hour intensive session each day is also likely to lead to an individual being defined as a user. Where the amount of use falls between these two types of use, then each case needs to be considered on its merits.

Local arrangements should ensure that the workstations of DSE users are assessed in order that the design and layout will minimise the risk of problems from aching backs, shoulders and wrists, or visual fatigue. In the first instance all users should complete the self-assessment workstation checklist (see guidance) and then forward it to the local DSE assessor/coordinator for review and action. Users should also be provided with training in the safe use of the display screen equipment. Computer-based training is available as are courses run by the Safety Office. A summary of DSE information for users is available on the Safety Office website.

Display screen equipment users may request an eye and eyesight test if they are concerned about any potential visual problems arising from the work. The mechanism for arranging this is described in Safety Office Guidance. The University operates an eye-test voucher scheme for DSE Users i.e. those who operate display screen equipment "as a significant part of their normal work", which usually interpreted as continuous intensive use for more than about an hour on most days of the week. Contact you manager or local safety officer for details. This scheme includes special corrective appliances, e.g. basic spectacles, where these are required to enable the person to work with display screen equipment.

The Safety Office provides training for DSE assessors, courses may be booked via the Safety Office website.

Monitors should be switched off at the end of the day to reduce the risk of fire and save energy.

6.7 Manual Handling Operations

Manual handling operations, i.e. tasks involving lifting, moving and supporting of loads by way of physical effort, are subject to the Manual Handling Operations 1992. Guidance on implementing these is contained in University Guidance.

Manual handling operations should be avoided if it is reasonably practicable to do so, for example by eliminating the task, by redesigning the operation, or by way of automation or mechanisation. A large number of tasks cannot be eliminated however, in which case the operation should be assessed in order that those aspects of the task which could give rise to injury are identified and precautions taken to minimise the risks, so far as is reasonably practicable. The precautions may involve alterations to the task layout or design; alterations to the load, such as making it lighter or providing handles; or the provision and use of mechanical aids such as trolleys or lifting appliances.

Employees whose duties involve manual handling should be provided with training in safe handling. They should attend the Moving & Handling Course which is available centrally through the Safety Office and they should be provided with specific training at a local level, relating to the actual handling activities they will be doing.

Where handling equipment or procedures have been provided by Schools or Departments etc, then staff should ensure that these are used. Where communal equipment has been used, it is important that it is returned to its designated storage location to assist in its subsequent use.

6.8 Psychological Wellbeing and the Avoidance and Management of Stress

Stress is an adverse reaction displayed by a person to excessive pressures and demands placed upon them. Stress will reduce a person's ability to function effectively and if prolonged may damage their psychological wellbeing. Psychological wellbeing is as important to an individual as good physical health and can affect their efficiency and effectiveness whilst at work. This is recognised by the University and a policy for psychological wellbeing and the avoidance and management of stress is in place. Please refer to Section 3 of the University Staff Handbook (available from the Human Resources Department Website). The policy outlines steps for the management of stress, information on factors that are known to increase stress and the recognised signs and symptoms of stress.

6.9 New and Expectant Mothers

Information will be provided to female workers of childbearing age in relation to work activities and processes that could adversely affect them or their unborn child. The risks may be **physical** (e.g. manual handling, ionising radiation), **biological** (e.g. contact with blood and body fluids, micro-organisms, zoonoses) or **chemical** (e.g. carcinogenic substances).

Where the nature of the work area or work activities may present a risk to a new or expectant mother it is the responsibility of that person to notify local management at the earliest opportunity to enable the work to be specifically assessed. Where significant risks are identified appropriate action will be taken. The Head of School may require written confirmation of pregnancy from her medical adviser. Similar arrangements also apply to those who return to work and are breastfeeding where aspects of the work could adversely affect them or the infant.

In all circumstances, it is the responsibility of the individual to notify Human Resources of pregnancy in accordance with the University's Maternity Leave Regulations, i.e. receipt of a 'Mat B' Certificate 13 weeks before the expected date of confinement.

There may be other issues to be considered that might affect the expectant mother at work, including nightworking and rest at work. Further information is contained in Safety Office Guidance on new and expectant mothers at work.

6.10 University of Nottingham - No Smoking Policy

The University has a No Smoking Policy which is a corporate policy of the University and is not subject to reinterpretation by local management. The full policy is available via the Safety Office website.

The following key points should be noted:

1. Prohibition of Smoking within University Buildings etc.
   i. Smoking is prohibited throughout all University buildings, subject to points 1(iii) and 1(iv) below.

   ii. The prohibition on smoking inside buildings inherently includes all general circulation areas such as corridors, stairs, lifts, foyers, reception and toilet areas; bars and eating areas; libraries; meeting rooms; and offices including those which are single occupancy.

   iii. Within the Halls of Residence, each Hall Council will determine the local policy relating to smoking in study bedrooms, which are

deemed to be private areas. Smoking is otherwise prohibited inside the Hall of Residence, including in all common areas and all communal rooms, bars, lounges, eating facilities and circulation areas.

iv. Smoking will be permitted in private areas of University houses used as the primary residence of members of staff, for example staff houses and Wardens' Houses.

v. Smoking is prohibited in University-owned vehicles, vehicles leased to, or on hire to, the University, and in any other case whilst travelling with others on University business. Vehicles provided under the University Car Leasing Scheme are considered to be equivalent to a privately owned vehicle for the purpose of this policy.

2. Smoking Areas Outside Buildings.

i. Unless specifically prohibited by the policy of a host organisation on whose site the University operates smoking is permitted outdoors in open areas away from entrances, windows and other openings into University buildings.

{Please note that staff and students wishing to smoke are requested to do this away from doors, windows and access routes into the buildings. This is to prevent smoke entering the building through windows; to avoid the accumulation of litter at entrances; and to enable people to enter and leave the building without passing through an area used for smoking. A distance of 10m from windows is normally enough to ensure that smoke is effectively dissipated. To assist in this the Estate Office reviews the location of litterbins to facilitate smoking away from these areas}

ii. To avoid the accumulation of unsightly smoking litter, facilities such as small bins at suitable locations away from building openings will be provided. Where small bins for extinguishing cigarettes are provided on the approach to building entrances these are only to enable safe and responsible extinguishing of cigarettes before entering the building and do not indicate that smoking is permitted at that location.

3. Implementation.

i. Every encouragement will be given to smokers who wish to give up the habit of smoking. Support in stopping smoking is available

through New Leaf, the free NHS free stop-smoking service, which can be accessed directly or by referral through GPs. Further information can be obtained from Occupational Health or via the New Leaf website.

ii. In cases of difficulty of implementing the policy, help and advice can be obtained from the Safety Office.

iii. It is expected that smokers will take a responsible attitude to the practice of smoking at work. Where individuals have difficulty in adapting to the policy they should be invited to discuss the issues with their manager or academic supervisor and referred to New Leaf for support. In the event of persistent non-compliance with this policy or in response to specific complaints, appropriate action will be taken including, where applicable, disciplinary action.

6.11 Alcohol and Drugs

The University recognises that the excessive use of alcohol and drugs can lead to increased risks of accidents in laboratories and workshops, etc. and to long-term adverse effects on the health of the individual concerned. The University policy is published on the Safety Office Website and aims to provide support in avoiding these adverse effects.

6.12 Safety of Children and Young Persons on University Premises

The University Policy to ensure the safety of children whilst on its premises is described in Safety Office Guidance.

Briefly:

Members of the University are discouraged from bringing their children into University premises (other than the public areas of the public buildings, e.g. Portland Building and the Libraries) except for social purposes such as organised functions or brief visits with new-born babies etc. which are restricted to low hazard areas.

Bringing of children into University premises at other times (e.g. accompanying the parent whilst at work due to child care difficulties) is at the sole discretion of the Head of School/Department to whom application should be made for written authority-which may or may not be granted.

Children must be placed under close supervision at all times whilst on University premises.

This Policy does not apply to organised visits, e.g. open days etc. since they are an integral part of the University's activities to which the normal safety arrangements would apply.

6.13 Safety of Adults Companion Assisting in University Work

The University Policy to ensure the safety of adults informally assisting members of the University in their work is described in Safety Office Guidance. Briefly, this is discouraged but should the need for this arise then permission for this will be at the discretion of the Head of School/Department. This will be refused where it is believed that the appropriate health and safety measures are not in place.

6.14 University Residences

Safety in University residences is the immediate and full responsibility of Hall Managers who must ensure that members of the accommodation acquaint themselves with the general safety regulations and also the particular regulations applicable to their own building, as well as studying the appropriate Hall Safety Handbook issued to them.

Events organised in Halls by the JCR (or similar committee) require specific risk assessment in line with Student Union procedures.

Conference guests are given essential safety information for their stay in Hall accommodation.

6.15 Work Areas

The design and layout of working areas, e.g. workshops, stores, offices, kitchens, must provide adequate space, heat, light and ventilation for both safety and reasonable comfort. Noise levels should be as low as the work permits and within safe working limits.

Areas of special hazard should be clearly signposted and appropriate equipment should be provided for dealing with the particular hazards present, particularly for persons who do not normally work in the area and who, therefore, need to be made aware of the hazards. Special arrangements should be made for access to such restricted areas.

6.16 Entry into hazardous areas by contractors and maintenance staff

Entry by contractors and maintenance staff into laboratories, workshops and other hazardous areas is subject to arrangements being made to prevent their exposure to hazardous processes and substances, for example areas where radiation, biohazards, lasers, high power magnets, or toxic chemicals

are used. The procedure to be followed is published on the safety Office website. The principles are:

- Entry of maintenance operatives into such areas is prohibited without the permission of a responsible person for the area. Signage with contact details to be displayed at the entrance to the room, suite, or building.
- The area shall be safe from process hazards for the maintenance work to proceed.
- Entry shall be subject to a permit confirming either that the area is clear of process hazards or specifying the precautions to be followed to ensure safety.
- Maintenance operatives from both the Estate Office and contractors are instructed in this procedure.
- It is the responsibility of schools and departments to ensure that independent contractors appointed by them are made aware of these procedures and are managed in accordance with them.

For planned maintenance the entry form should be emailed to the Helpdesk at the same time the works request is submitted. This will avoid a delay on the day. For emergency work a supply of the forms should be available in the area to be completed at the time.

6.17 Management of Asbestos

The hazardous nature of asbestos and asbestos products is well known and it is the university's aim that no one is put at risk from this hazard in their working environment. The Estates Office works to established Asbestos Procedures and any member of the University who is in doubt about this issue should contact the Estate Office at the earliest opportunity.

Asbestos incorporated into the fabric of the buildings is managed by the Estate Office and recorded in the asbestos register for each building. The Estate Office must be contacted prior to any work involving penetration of the building fabric in order that the asbestos register can be checked. This should be done through notifying the Helpdesk at least 7 days before the work is carried out.

Asbestos components within items of equipment, for example gaskets, seals, refractory linings and insulation, are the responsibility of its owner, which must arrange for:

- Equipment containing asbestos to be identified,
- The condition to be assessed and monitored,
- The repair or removal of damaged or deteriorating material,
- A record to be kept of condition checks and of any remedial work.

The Estate Office must be notified any of asbestos-containing equipment so that this can be added into the Asbestos Register.

A local inventory of asbestos-containing equipment, which identifies the components concerned and records the findings of regular checks, must be maintained. Asbestos-containing material is considered to be in poor condition if the exposed surface is in a state where there are areas of visibly loose fibres that may be released by minimal disturbance.

Equipment should either be labelled that it contains asbestos or the fact be recorded in operating instructions or other documentation that is readily available and brought to the attention of those who may disturb the material when using the equipment. Any work on the equipment that could disturb the components must be covered by a risk assessment to prevent exposure.

If confirmation of the presence of asbestos components is required, please contact the Estate Office, which will arrange for the equipment to be checked.

6.18 Confined Spaces

Particular care must be taken when working in confined spaces likely to be unventilated (e.g. storage tanks and service ducts). In these areas there is a risk of the build up of flammable, toxic or suffocating atmospheres, with no obvious indication of the hazard. In such circumstances only specifically trained and authorised persons are permitted to enter, and the necessary required precautions must be taken before work can begin. Entry must be carried out in accordance with a "permit to work" which formalises the precautions needed. For detailed advice please contact the Senior Engineer in the Estate Office or the Safety Office. See also section 7.7 concerning Hot Work Procedures.

In all high-risk areas and for persons working outside normal working hours there must be ready access to telephones.

6.19 Working at Height

The Work at Height Regulations apply to all work at height where there is a risk of falling that is liable to cause personal injury. There is no minimum height at which they apply as the risk is related to what the person could fall onto as well as the height of the fall. The regulations also concern protection of persons from being struck by falling objects or persons.

Work at height must be properly planned and organised, and take into account weather conditions that could endanger a person's health and safety. All persons involved in working at height should be trained and

competent. All equipment for working at height must be appropriately inspected. Where work on fragile surfaces is unavoidable this must be properly controlled.

Access equipment and associated safety equipment must be on a local inventory to enable and record inspections of it. The equipment will usually be colour coded to indicate that it is "in-date".

The safest and most appropriate work equipment must be used for the task. A ladder may only be used for work at height where the risk assessment demonstrates that the use of more suitable work equipment is not justified because of the low risk and short duration or there are existing features on work area that cannot be altered. See section 7.12 for guidance on the use of ladders.

Collective measures to prevent falls (such as guard rails and working platforms) must be chosen before other measures which may only mitigate the distance and consequences of a fall (such as nets or airbags) or which may only provide personal protection from a fall.

Any equipment used for work at height that is obtained from another organisation or company must be covered by an inspection certificate. Similarly such equipment if transferred from the University to another organisation must be accompanied by a current inspection report.

Do not loan access equipment to or borrow access equipment from contractors.

6.20 Respirable Crystalline Silica

Silica is one of the most abundant materials in the earth's crust. There are three different forms:

Quartz – most common, found in most rocks, sands, clays, gravel.
Crystobalite
Tridymite

Within the University silica may be used or generated in certain laboratory and/or engineering processes. It can also be generated during building operations, such as drilling of concrete and sandblasting masonry.

Silica in its crystalline form has been classified by the International Agency for Research into Cancer as a Category 1 Carcinogen. Prolonged exposure and inhalation can lead to silicosis and chronic obstructive pulmonary disease. These are serious conditions leading to permanent disability and early death.

As with any other hazardous substances, a risk assessment must be carried out for any procedure which involves the use of silica, or which can generate respirable silica particles and appropriate control measures put in place to eliminate or reduce risk to an acceptable level. Further details can be found in guidance on the Safety Office website.

6.21 Disposal of Waste Material

It should always be remembered that someone else will have to handle material put into waste bins. Therefore do not dispose of hazardous materials except in the approved manner prescribed for your area, and in approved containers.

Be especially careful with sharp objects of metal and glass, which should be well segregated before disposal.

Guidance is published on the Safety Office website concerning the particular requirements for the disposal of biologically hazardous/clinical waste and radioactive waste. This is to ensure the waste is packaged, labelled and transferred, or otherwise disposed, of in the correct and safe manner. This is supplemented by local procedures.

The University Environmental Manager, based within the Estates Office, can provide advice and guidance on waste disposal procedures. The Sustainability section of the Estates Office website contains more detailed information on the University's arrangements for disposal of hazardous waste.

The University has approved a number of licensed waste contractors who must be used for the disposal of hazardous waste. These are listed on the Safety Office website.

Advice on disposal of radioactive waste can be obtained from the Safety and Radiation Protection Office.

Any waste containing asbestos must be must be disposed of via the Estate Office to ensure that it goes to a licensed disposal contractor.

6.22 Out of Hours Working

Some Schools are open outside normal working hours for experimental work. The potential dangers of carrying out experimental work alone at night are much greater than normal and this practice should be strongly discouraged. Any practical work out of normal hours must only be carried out with the knowledge of the School Safety Officer and the consent of the

Head of School. If such work is essential, every effort should be made to ensure that another worker is within hearing distance and the Security Staff should be asked to make regular contact. To facilitate this it is essential that any out-of-hours register or equivalent is filled in on entry AND departure from the School or building.

General study facilities out of normal hours should be concentrated in specific areas to ensure the control and safety of persons involved. Notices to advise on the action to take in case of emergency should be posted in 24-hour access computer rooms.

6.23 Lone Working

The University acknowledges that there may be implications for its employees, students, visitors and contractors when working alone. Whilst there is no general legal prohibition on working alone there are some specific legal prohibitions affecting a small number of well-established dangerous situations such as working with live electrical conductors and entry into confined spaces.

Wherever possible lone working should be avoided but where there is a real requirement for lone working a suitable risk assessment must be carried out to identify the risks to the lone worker and safe working arrangements must be identified and introduced to minimise the risks as far as is reasonably practicable.

Those who may be at risk shall be provided with information and training as appropriate in order to minimise the risks when working remotely from colleagues or other persons and/or outside normal working hours.
The arrangements that the University considers to be best practice are described in separate guidance that is available on the Safety Office website. Where this guidance does not cover a particular situation, further advice may be sought from the Safety Office.

6.24 Work Experience

The University welcomes and encourages work experience placements for children below statutory school leaving age and young adults and recognises that they are an important part of secondary education. Guidance has been developed to ensure that the placement is planned and organised in such a way as to provide a safe and interesting learning experience for the student.

Health and safety Regulations place the following requirements on employers concerning these types of placements:

1. To take particular account of certain specified factors when carrying out or reviewing risk assessments;

2. That the risk assessment be carried out **before** the young person starts work;

3. To prohibit young person from certain work if risk assessment identifies a significant risk which cannot be eliminated; and

4. In cases where the young person is a child, to provide information to parents/guardians/carers concerning the risk assessment.

All work experience placements must have the approval of the Head of School/Manager in charge or a person with delegated authority of the HOS/Manager. The School/Departmental Safety Officer must also be consulted and involved in setting up the placement. Guidance on the issues relating to setting up placements is available on the Safety Office website. This includes templates for the risk assessment and correspondence with parents/guardians/carers. In particular the young person must:

- Not be left alone in the School/department, nor work alone or out of hours, and must be properly supervised at all times.
- Not be exposed to ionising radiation.
- Not be involved in work with any carcinogenic or toxic substances and must be kept away from areas where such materials are handled.
- Not work beyond their physical or psychological capabilities. They must not be involved in lifting or handling of significant loads. Contact with patients will only be considered after thorough assessment has been made of the psychological risks [see below if relevant].
- Not be exposed to excessive noise, vibration, heat or cold.
    - Not be exposed directly to respiratory sensitisers.
- Not be involved in the use of workshop machinery with moving parts, automatic/semi-automatic cutting machinery, guillotines, power presses, woodworking machinery, compressed air tools or similar hazardous machinery.

Applications concerning children under the statutory school leaving age should be arranged through the local education authority's placement organisation. This will address many of these requirements.

6.25 Team Building Events

Participation in team building events or away days will usually be as part of a person's employment. Such events might include unusual and/or higher risk activities such as climbing or assault courses or be in unfamiliar environments. Guidance is available on the Safety Office website to ensure that the university's responsibilities relating to the planning of these are addressed.

The external facilitator or provider will be primarily responsible for the safety of the equipment and the conduct of activities provided by them. However, the University is responsible for making reasonable attempts to establish the competency of the provider and the suitability of the activity. There is also likely to be a need to provide information to the participants to ensure that they are properly prepared and know what to expect.

The key elements include:

- Ensuring a risk assessment is carried out for any hazardous activities
- Ensuring appropriate health and safety information is obtained from the event provider
- Checking suitability of the activity for participating staff
- Ensuring appropriate levels of employee and public liability insurance is in place where external providers are used. Commercial services must be consulted in relation to the insurance implications for hazardous activities organised within the University.

6.26 Industrial Visits

When undertaking an industrial visit the host organisation will normally be responsible for ensuring the safety of those visiting. The School concerned should ensure that staff and students visiting an industrial site understand the local safety requirements and comply with them.

6.27 Student Placements

The primary responsibility for the health and safety of placement students lies with the employer providing the placement. However, the University has produced guidelines to ensure that placements are satisfactory in terms of their health and safety standards. They relate to placements where a student works for an employer as a temporary employee and is required to do so as part of the course of study, typically commercial or industrial situations.

The placement provider must have been formally approved by the University, the student will be provided with general health and safety

information, and conditions at the placement will be monitored by a combination of tutors' visits, and feedback from the student as appropriate. Any concerns that a student has about health and safety standards at their placement should be notified to their academic supervisor. If the placement is outside of Great Britain then appropriate personal travel insurance should be taken out.

Each School is responsible for having adequate arrangements in place. Further detailed information is published on the Safety Office website.

6.28 Working Overseas

Whilst working overseas individuals may be exposed to additional non-work related hazards arising out of the general conditions within the country being visited, e.g. tropical diseases, crime or political instability. Guidelines have been issued to enable these issues to be assessed and the visit planned accordingly. Information on the latest situation in any country may be accessed via the Safety Office website.

When planning an overseas trip, the organiser or individual should consult the MASTA Travel Health website, which has comprehensive health advice for travellers and also contact either their GP or local Travel Clinic (available at Cripps Health Centre and in Nottingham City Centre) at the earliest opportunity to identify and organise the vaccinations they require. Contact arrangements between the University and the host at the destination should also be established.
A checklist of practical tips to help overcome the kinds of problems, which may arise, is included in the above guidelines.

6.29 Fieldwork

Fieldwork is defined as any practical work carried out by staff or students of the University for the purpose of teaching or research in places which are not under the direct supervisory control of the University, but where the University is responsible for the safety of its staff, students, or others who may be affected by their activities.

School policy in relation to fieldwork activities must include procedures to ensure adequate risk assessment, the establishment of safe working procedures, clear lines of responsibility in the field, competence, training, and fitness of individuals to do the work, contingency plans for foreseeable problems and procedures for the review of the safety of fieldwork activities.

Group working is preferred. Lone-working in the field presents particularly high risks and should be avoided whenever possible. Particularly stringent codes of practice are required for unsupervised work.

Where fieldwork is carried out on the premises of another organisation, Schools should be satisfied that the local safety procedures are adequate for the work envisaged and that the individuals concerned understand and comply with them.

Schools should also ensure that accommodation for field trips outside the United Kingdom meets an acceptable standard of safety. Where possible such accommodation should be booked through a travel agency or tour operator affiliated to the Association of British Travel Agents.

Expeditions to hostile, remote and/or inaccessible locations present a higher degree of risk than standard field expeditions. As such they will require rigorous risk assessment and identification of control measures to reduce risks to a level that is acceptable to both the University and the individual participants.

The University Safety Committee has established an Expedition Peer Review Panel [EPRP] comprised of University employees who have experience of organising these types of expedition and who will review and approve risk assessments and emergency response plan and advise the relevant Head of School as to its adequacy or otherwise.

The University has also engaged the services of International SOS to provide advice on high risk expeditions and security, medical assistance and evacuation of casualties in event of emergency.

The University Guidelines for Safety in Fieldwork and the associated addendum for high risk expeditions which is available on the Safety Office website should be consulted for further information.

6.30 Diving Operations

Any diving carried out as part of a work activity is subject to the Diving at Work Regulations 1997. Diving in pursuance of the activities of the University, such as fieldwork activities and student projects that include diving to obtain samples or to study underwater systems etc. would be subject to these requirements. Although limited to operations within Great Britain and its territorial waters the Regulations provide a sound framework that should be applied to diving projects elsewhere unless adequately covered by other local legislation.

The Safety Office must be notified in advance of any proposal for a work-related University activity involving diving in order that necessary

notifications to HSE can be made and appropriate arrangements confirmed. A minimum of 3 months should be allowed for this.

Diving operations require formal risk assessment and diving management arrangements by way of "diving project" plans and records, and the appointment of competent diving supervisors. Each diving project must be controlled by a single person who is responsible for planning, managing and conducting the work safely. A diving project plan (in effect a written risk assessment covering all the various operations, identification of supervisors and describing the information and instructions given to the divers) must be prepared before diving commences and kept up to date. A competent, formally qualified "diving supervisor" must be appointed to supervise those operations that they are responsible for. There must only be one diving supervisor for each diving operation and they must not participate in the dive.

The individual divers must be formally qualified and posses a certificate of medical fitness to dive as issued by an HSE approved medical practitioner (this can be arranged through Occupational Health). Divers must keep a record of each dive in a logbook, which must be retained for at least 2 years after the last entry.

There are some relaxations relating to work as part of diver training, recreation and activities carried out in a swimming pool or similar. Further information can be obtained from the Safety Office. Safety Office Guidance is also available from the website.

6.31 Threatening or violent situations.

These guidelines relate to a violent and/or threatening, or potentially violent and/or threatening, behaviour or situations on University property.

The situations to which these guidelines relate include verbal abuse, threats, and physical attacks.

With over 30,000 students and 5000 staff and numerous daily visitors to the University it is not always easy to either predict or guard against violent or threatening behaviour. It is incumbent on all staff and students to be vigilant and aware of their surroundings and the potential for any situation to become threatening or violent.

Incidents of work-related violence should be reported to the Safety Office on a University accident report form and might require notification to the Health and Safety Executive. Such incidents are monitored by the Safety Office and reported to the Safety Committee.

Where the nature of the work activities or environment is such that there is a particular risk of encountering a threatening or violent situation then this should be included in the risk assessment for the activity or area. The Security Office should be consulted for advice on physical and procedural measures, including training, to minimise the risk. The Safety Office can also offer advice.

Actions to be taken in the event of a threatening or violent situation.

1. If a situation is likely to become threatening or violent and if possible leave the area, having alerted other staff, students or visitors in the area.

2. Report any incidents as soon as possible to University Security using the emergency number 8888.

3. If a situation does become violent and/or threatening if possible do not get involved unless in self-defence or to save life.

4. Never try to protect property, life is more important.

5. If the situation warrants phone the Police before University Security.

If you have been affected by a threatening or violent situation you might find it helpful to contact the University Counselling service.

6.32 Driving on University Business

General

It is important that anyone driving on University business takes note of the guidance contained in the document ' Driving on University Business' which is available on the safety office website and must be read in conjunction with the University's **Business Travel Policy** which can be found on Commercial Services website. In summary anyone driving on University business, is required to:

- Adhere to the Road Traffic legislation and the Highway Code published by HMSO.
- Drive with due care and consideration for themselves and other road users.
- Adhere to **University Traffic Regulations** when driving on University campuses. These Regulations include requirements relating to speed limits, permits, roadworthiness and parking.
- Be aware of insurance and breakdown service contact details if driving a University vehicle.

- Ensure that when driving a privately owned vehicle it is roadworthy, has a current MOT where applicable, is insured for business use and has a valid road fund license.
- Possess a valid licence to drive the vehicle.
- All drivers driving under the University motor insurance policy must hold a **valid permit to drive**.

In addition there are specific University policies that prohibit drivers from:

- Using hand-held **mobile phones** whilst driving on University business. Drivers are discouraged from receiving or making phone calls on hands free phones. Where hands free phones are required these should be obtained via the telephone services manager and meet the required standard.
- **Smoking** in University vehicles and in any other case whilst travelling with others on University business.

The University does not advocate or condone illegal parking or driving in excess of speed limits. Payment of any fines or court costs resulting from these activities is the driver's responsibility and will not be met by the University.

6.33 Minibus Driving

There are some particular restrictions that apply to drivers of minibuses. Those who passed their car driving test before 1st January 1997 may drive minibuses with up to 16 passenger seats and tow a trailer exceeding 750kg, subject to a vehicle/trailer combination limit of 8.25 tonnes (gross vehicle weight), until their current driving licence expires. This applies within the UK. However, those passing their car test from 1st January 1997 may only drive vehicles up to a maximum of 8 passenger seats. To drive minibuses with 9 to 16 passenger seats an additional driving test is required to obtain Category D1 (or D1+E to tow a trailer exceeding 750kg) entitlement on their licence.

Any person wishing to drive a minibus and holding a driving licence that was issued before 1st January 1997 is required to undertake an assessment via the Minibus Driver Awareness Scheme (MIDAS). This is valid for 4 years after which it must be refreshed. Similarly any minibus driver with the D1 entitlement on their driving licence must also undertake MIDAS refreshers every 4 years from the fourth anniversary of the licence issue date.

All minibus drivers must be notified to Procurement. There is a minimum age (for insurance purposes) of 25 for driving minibuses belonging to or hired by the University.

When taken abroad, minibuses must be fitted with a tachograph and Procurement must be informed. Any members of the University driving a minibus abroad must pass the D1 test independently of when they passed their car-driving test. Documentation is also required: "Own account certificates" if the minibus is owned by the University and "Waybills" if the minibus is hired. Procurement has copies of these forms.

All minibuses owned or hired by the University must display a “small bus permit”. Contact Procurement for further information.

Please refer to the University's Code of Practice for the Safe Use of Minibuses.

6.34 Use of Mobile Phones Whilst Driving on University Business

It is illegal to use a hand-held mobile phone whilst driving. Members of the University must not use hand-held mobile phones whilst driving any vehicle, including personally owned, university owned or hired to the University, whilst driving on University business. If it is necessary to be contactable whilst driving then the Head of School or Department may authorise a suitable hands-free kit, obtainable via the Telephone Services Manager. Alternatively the phone should be left to divert to voicemail and answered at a safe time whilst not driving.

Wherever possible telephoning colleagues whilst they are driving should be avoided.

The University policy on use of mobile phones whilst driving is published on the Safety Office website.

Section 7: Precautions with Work Equipment

7.1 Statutory Requirements

Great care should be taken when using any machinery to avoid both personal injury and damage to equipment. School codes of workshop practice, establishing who may use any particular equipment, the times of such use and the conditions governing such use, must be strictly observed. Only trained and authorised persons should be allowed to use hazardous equipment and adequate arrangements should be made to prevent their use by unauthorised persons.

The Provision and Use of Work Equipment Regulations 1998 apply to work equipment, the definition of work equipment being any machinery appliance, apparatus or tool, or any assembly of components which in order to achieve a common end are arranged and controlled so that they function as a whole. This definition is very wide and examples would include power press, guillotine, air compressor, lifting sling, microbiological safety cabinet, portable drill and overhead projector.

The regulations cover two aspects of safety in relation to work equipment:

- *Management* issues - selection and suitability, maintenance, information, instruction and training and compliance with Product Safety Regulations.
- *Physical* characteristics - machinery guarding, other specified hazards, extremes of temperature, controls, isolation, stability, lighting, markings and warnings.

For further details, please refer to Safety Office Guidance relating to Work Equipment.

Subsequent sections below deal with specific issues and certain types of equipment.

Suppliers of work equipment have a duty to design work equipment in line with these regulations and Schools should be aware of the requirements when introducing new work equipment.

The Supply of Machinery (Safety) Regulations 1992 are one example of product safety regulations. These regulations give essential health and safety requirements which equipment should be designed in accordance

with, prior to supply in EC countries. The CE mark should indicate that relevant product safety regulations have been complied with.

In-house Construction of Work Equipment
Work equipment manufactured in-house at the University must comply with the above in terms of satisfying the essential health and safety requirements (EHSRs). Specific University guidance is available. As a minimum, relevant technical information relating to the construction must be gathered together and a checklist of the EHSRs must be completed to demonstrate that they have been adequately covered.

Certain types of equipment can contain a **radioactive source** even though the equipment might not be considered as being used for radioactive purposes. An example is the use of a small source as part of a monitor or detector (e.g. electron capture detectors used with some gas chromatographs and some types of static eliminators). The information provided by the manufacturer or supplier should indicate if a radioactive source is present. **The Safety Office must be notified in advance of the equipment coming onto site as these sources are strictly regulated.**

7.2 Clothing and Personal Protective Equipment

Loose clothing must not be worn near moving machinery. Particular attention should be paid to ties and other forms of neckwear. Suitable footwear must be worn in workshops and laboratories. Long hair must be protected from contact with machinery by wearing suitable headgear. Goggles must be worn when using grinding wheels or any other process where there are flying particles. The use of dust masks is recommended where there is prolonged exposure to dust or particles. Rings should not be worn when using machinery.

7.3 Guarding

Hazardous machinery must always be guarded. The British Standards Institute has published a document, PD5304:2000, "Safe Use of Machinery" which gives practical guidance on complying with the relevant BSEN Standards (which are also listed). This document can be accessed through the Safety Office website.

Do not use machinery without the appropriate guards and be sure that guards are replaced after a machine has been re- set. Guard interlocking devices must never be defeated. Report any defects in guards or interlocks immediately.

Suitable guards should be provided for destructive testing machines to prevent injury from any flying particles.

7.4 Machinery Noise

It is the aim of the University to minimise the risk of noise induced hearing damage to all who may be affected by keeping exposure to noise as low as is reasonably practicable and where the Upper Action Value is likely to be exceeded, control measures will be put in place to reduce it. Heads of Schools must ensure that appropriate measures are taken to deal with noise from machinery.

The Noise at Work Regulations require that assessment of noise levels must be made wherever there is a noisy environment. In any cases of excessive noise, steps must be taken to reduce this at source. If this is not practicable then ear protection must be made available to employees, who must wear it in any prescribed areas of high noise level.

The lower exposure level (first action level) is 80dB(A) as an 8-hour time-weighted average (8-hour TWA). This is the level at which hearing protection must be made available.

The upper exposure level (second action level) is 85dB(A) (8-hour TWA). This is the level above which engineering controls should be used as far as is reasonably practicable to reduce the noise exposure, for example by noise enclosure of equipment, silencers, sound refuges etc. Where noise levels remain above this the area will become a compulsory hearing protection area.

There is also an Exposure Limit Value of 87dB(A) (8-hour TWA). This is the level of noise above which a person may not be exposed having taken into account the noise controls to be used and the pattern of exposure.

The peak sound pressure level is 137dB(C) - i.e. from instantaneous or percussive operations.

Audiometry is required for those exposed to noise above 85dB(A) and is carried out by Occupational Health. This should be done initially and every 3 years although in some circumstances Occupational Health might consider that shorter intervals of 1 or 2 years are appropriate. Individuals can also request a check in between if they have any concerns.

Further more detailed guidance is published on the Safety Office website.

7.5 Abrasive Wheels

Only authorised persons who have received an approved course of instruction are allowed to change or dress abrasive wheels. The maximum spindle speed should be marked on the equipment.

The grinding of aluminium and magnesium requires special care and the appropriate literature should be consulted.

7.6 Welding

Electric welding is a powerful source of light with a high ultra violet light content which is very dangerous to the eyes (see section on electromagnetic radiations). Any areas where welding is taking place must be suitably screened and ventilated.

Manual electric arc welding involves the operator working in close proximity to the live electrode and the workpiece with the consequent danger of receiving an electric shock. Although relatively low voltages are involved whilst welding, higher open circuit no-load voltages are required to strike the arc. These can be up to 80V ac or 100V dc and can be dangerous in confined conducting locations or wet surroundings. Earthing of the workpiece and of any metalwork in contact with it is important. The welding return lead should be placed as close as possible to the point of welding. The welding leads should be fully insulated. In the case of the return lead poor positioning or damaged insulation can result in stray currents which could damage safety critical parts of other equipment.

7.7 Hotwork

Hot Work is defined as work involving the application or generation of heat such as cutting, welding, brazing, soldering and the use of blowlamps. Hot work involving the application of heat, either directly to, or adjacent to plant, tanks, vessels and pipes that have contained or do contain explosive, flammable or toxic substances can create the following hazards:

- Explosion as a result of flammable vapours under pressure being ignited within a confined space.
- Fire from sparks and heat generated in areas containing combustible and flammable materials
- Eye injury including ultra-violet damage, burns, heat exhaustion
- Asphyxiation by gases or vapours or poisoning by toxic fumes

For routine hotwork, such as that carried out in designated facilities, a standard operating procedure must be drawn up which can be followed each time the hotwork is carried out.

For non-routine hotwork, a risk assessment must be carried out by a competent person and a Permit to Work issued for each job taking into

account the specific hazards involved. This applies to hotwork carried out by contractors as well as University staff.

Further guidance is available from the Safety Office website.

7.8 Use of Compressed Gases

The main hazards from compressed gases are

- Explosion of the cylinder due to mechanical damage, weakness or over-pressurisation
- Exposure to released gas or fluid, which may have harmful properties [asphyxiant, toxic, corrosive]. Oxygen is particularly dangerous as it can promote fires and explosion and sustains combustion.
- Fire due to escape of flammable gas/fluid.
- Over-pressurisation in the event of fire
- Impact from falling cylinders
- Manual handling injuries

Standard Precautions to be observed

- No person should use a gas cylinder or change the cylinder regulator unless they have received appropriate training and are authorised to do so by their supervisor or line manager.
- Ensure the regulator and pipework is appropriate for the type of gas and pressure regime.
- Wear a suitable face visor or safety glasses [to protect against impact] when changing/fitting regulators.
- Do not use grease or PTFE tape on threads - this can present an explosion risk and indicates unsatisfactory seal being made which could leak.
- Check for leaks using leak detection fluid - proprietary sprays are recommended. [Tepol/water can be used as vegetable based but soapy water must not be used as it is oil-based].
- Use only brass spanners (these do not create sparks) when fitting regulators to cylinders of highly flammable gas.
- Ensure the cylinder is secured in a trolley or securely chained/strapped to the wall or bench.
- Transport cylinders in suitable trolleys with dust cowls in place.
- Wear suitable safety shoes when transporting cylinders.
- Store in a safe place outside or in a room that has adequate ventilation.
- Do not store flammable gases near any source of ignition.

Gas cylinders should be handled gently and used only with the correct fittings. In particular the materials from which any components of the system are made should be compatible with the gas being used. Detailed information on this is contained in British Compressed Gases Association

publications (CP4 and CP5 are particularly relevant and can be accessed via the safety Office web-site). They should always be secured to prevent them being knocked over accidentally. Cylinder valves must not be lubricated.

Cylinders of compressed gases can be a hazard if fire breaks out. Wherever practicable all cylinders containing gas should be kept outside a building in a well-ventilated area.

Oxygen is particularly dangerous since it is more likely to promote fires or explosions than is air. Compressed air should be used with caution and never in the context of practical jokes.

Acetylene used at > 9p.s.i. is subject to specific regulation and special notification to the appropriate agency is required. Contact Safety Office for details.

Inspection & Maintenance

University guidance informs Schools/Departments of the key requirements for the safe operation and management of piped compressed gas systems attached to transportable gas cylinders and stand-alone transportable compressed gas cylinder installations. The primary objective is to prevent danger from unintentional release of stored energy. Information on the competency requirements for the design, installation, operation and maintenance of systems is included as well as the frequency of maintenance; testing and examination regimes that are required for the various high and low pressure components which make up such systems.

Due to the increased dangers associated with the use of stand-alone transportable compressed gas cylinders located in buildings in the event of fire, the guidance also specifies the circumstances under which such stand-alone systems should be considered and the justification required for their use.

Schools/departments where compressed gases are used/stored should ensure that regulators are inspected visually and tested for correct function e.g. creep test; associated pipe-work checked for leaks; pressure relief valves checked for correct operation by a competent trained person at least annually.

Regulators and other high pressure components such as flame arrestors, hoses & pigtail should be exchanged on a five yearly cycle. Pressure relief valves should be exchanged or serviced on a six yearly cycle

Further reference may be made to the BOC publication 'Safe Under Pressure (also available on video] and in HSE Guidance note INDG 308 (May 2000] 'The safe use of gas cylinders' and BCGA Code Of Practice, CP23. For application of the Pressure Systems Safety Regulations, please refer to Section 7.14.

7.9 Paint Spraying

Paint spraying must only be carried out in a suitably ventilated area or booth complying with the appropriate regulations. Particular care must be taken when using isocyanate containing ("2-pack") paints since this material is a potent respiratory sensitiser. Additional precautions include total protective clothing, airline-fed breathing apparatus and health surveillance by the Occupational Health Unit.

7.10 Woodworking Machinery

Woodworking machines are particularly dangerous and difficult to guard and it is essential that only adequately trained persons should operate them. Access by other persons must be prevented. The Woodworking Machines Regulations 1974 have been revoked and superseded by the Provision and Use of Work Equipment Regulations 1998. In addition there is HSE guidance and an approved code of practice specifically concerning the safety of Woodworking Machinery.

7.11 Centrifuges

Large quantities of energy are stored in the rotor of a centrifuge when in operation and it is necessary for users to have adequate instruction in the correct method of operation of these machines.
Centrifuges should conform to BSEN 12547:1999+A1:2009.

7.12 Ladders

Work should not be done from ladders if it is reasonably practicable to use other forms of access equipment - see section 6.3 for guidance on work at height.

Ladders and other forms of access equipment should be inspected regularly, including before and after use, and if any defect is found immediate action should be taken. Wooden ladders and steps must not be painted. They should be checked for rot, decay or mechanical damage such as warped stiles, excessive cracks, splintering and wear and tear at the head and foot of the stiles. Rungs should be checked for looseness, excessive wear, or decay where the rung enters the stile. Metal ladders should be checked for twisting, distortion, oxidation, corrosion and excessive wear, especially on the treads.

In use a ladder must always stand level and firm footing and be placed at an angle of 75 degrees (1 foot horizontal for each 4 feet vertical).

For ladders less than 10 feet long it is sufficient to ensure that the ladder is securely placed so as to prevent it from slipping of falling. Longer ladders should be securely fixed at the upper end or if this is not practicable, at or near the lower end. If neither of these is practicable then a person must be stationed at the foot of the ladder when in use to prevent it slipping, but this concession can only be applied when the ladder is less than 20 feet long.

Arrangements should always be made to support the ladder to prevent undue swaying or sagging. When in use over- reaching and the carrying of loads should be avoided.

7.13 Lifting Equipment

Each School/Department owning lifting equipment will have appointed a Responsible Person to co-ordinate maintenance and examination of such equipment. All new items of lifting equipment must be notified at the time of installation or purchase to the Responsible Person who will arrange for them to be insured and regularly inspected in line with the Lifting Operations and Lifting Equipment Regulations 1998. The procedure for this can be found via the Safety Office website.

Equipment such as lifts, cranes, chairs, ropes and slings must not be loaded beyond the safe working loads specified for each one. Safe loads must be clearly marked on each piece of equipment and the appliances should be tested periodically, as advised by the insurance inspector.
Forklifts must be operated by authorised persons only. The standard to which operators should be trained is specified in the Approved Code of Practice "Rider Operated Lift Trucks - Operator Training".

7.14 Pressure Systems

The Pressure Systems Safety Regulations 2000 require that all pressure vessels and certain parts of their associated pipework must be assessed initially to determine the appropriate regime of regular inspection and testing ("written scheme of examination"). Thereafter arrangements must be made for this inspection and testing to be undertaken at the correct intervals.

Therefore the details of all systems, including for example autoclaves and air receivers, must be notified at the time of installation or purchase to the Department or School's Responsible Person, who will arrange for them to be assessed, insured and regularly inspected. The procedure for this is available on the Safety Office website.

The safe working limits of the system must be clearly marked on it. As a minimum this should include the maximum pressure for safe working. Larger, complex systems may also require marking with temperature, time, volume, flow rate, heat input or coolant flow limits as appropriate. The operating instructions should contain all the information needed for safe operation of the system including start-up, shutdown, standby and emergency situations.

In addition to any thorough examinations in accordance with the written scheme, the system should be subject to routine maintenance and inspection checks. These checks should include looking for signs of corrosion, leakage and external damage. Particular attention should be paid to the seals at doors and lids. Systems should be regularly cleaned out or drained of condensate, to ensure the removal of corrosive residues.

7.15 Autoclaves

Staff operating autoclaves must receive adequate instruction and supervision. Manufacturer's operating instructions must be observed at all times. Any seals or pressure relief valves should be examined carefully at frequent intervals for signs of wear, usually cracking or hardening. Seals and valves may also require regular replacement irrespective of condition—follow manufacturer's recommendations.

Always wear a face visor and heat resistant gloves when removing material from the autoclave and never attempt to do so until the temperature of the contents is below 80 C otherwise an explosion may occur.

7.16 Vehicles

University vehicles must be driven only by appropriately trained and authorised persons. This includes forklift trucks and other battery operated vehicles. In particular, drivers of rider-operated forklift trucks **must** have passed an accredited course of instruction and be formally authorised for a specified period of time. Although not a legal requirement, in the interests of best practice, all operators must hold a full UK driving (category B) car licence to operate University owned Lift Trucks.

Although there is no specific legal requirement to provide refresher training after set intervals, lift-truck operators need to be re-assessed from time to time to ensure that they continue to operate lift trucks safely. This assessment should form part of a school / departments normal monitoring procedures and be formally time-tabled to ensure that it is done at a suggested interval of not greater than three years. In addition to routine monitoring formal re-assessment is likely to be needed where operators:

- Have not used Lift Trucks for some time.
- Are occasional / infrequent users.
- Appear to have developed unsafe working practices.
- Have had an accident or a near miss.
- Have experienced a change to their working practices or environment.
- Have experienced a change in personal circumstances which could potentially affect their performance as a Lift Truck operator.

Drivers must be aware of any special areas into which vehicles must not be taken, e.g. areas in which highly flammable liquids are used or stored. Fuel for vehicles or stationary engines must be kept in the appropriate licensed storage.

If a vehicle becomes faulty, there must be a system for this to be reported immediately. If the fault is potentially dangerous, e.g. in the braking system, arrangements must be made for all potential users to be made aware of this and for the vehicle to be rendered physically incapable of use until satisfactory repairs have been carried out.

Please see section 6.12 for Minibus Driving information.

7.17 Vibration

Prolonged use of high-vibration hand-held or hand-guided tools is associated with a risk of developing Hand-Arm Vibration Syndrome (HAVS). This condition may result in effects to the hands and arms, including impaired blood circulation and damage to the nerves and muscles. It is felt as a tingling or numbness in the fingers or where finger blanching occurs. There are other names for the condition: 'vibration white finger', 'dead finger' and Secondary Raynaud's Syndrome. There are however other medical conditions that may cause similar effects.

The affects are cumulative and as time passes the attacks may involve considerable pain and loss of manual dexterity, resulting in clumsiness and reduced grip strength.

Although the risk depends on the magnitude of the vibration and length of exposure, the grip, push and other forces used to guide and apply vibrating tools or workpieces, temperature, smoking and individual susceptibility can also influence the condition.

The following is an indicative list of the types of equipment found in the University that may present a vibration hazard:

- Grounds work, e.g. chainsaws, strimmers, mowers, blowers, hedgetrimmers, etc.
- Workshop equipment, e.g. grinding tools, rotary burring tools, powered hammers, concrete breakers, sanders and drills.
- Grinders and other rotary tools
- Timber and wood machining tools
- Percussive metal-working tools
- Percussive tools used in stoneworking, quarrying, and construction.

The Control of Vibration Regulations came into force in April 2005. They lay down specific exposure limit values and action values:

- For hand-arm vibration the daily exposure **limit** value is 5 m/s² A(8) and the daily exposure **action** value is 2.5m/s² A(8)
- For whole body vibration the daily exposure **limit** value is 1.15m/s² A(8) and the daily exposure **action** value is 0.5m/s² A(8)

Further more detailed guidance is published on the Safety Office website.

If there is a significant risk of HAVS, i.e. where an individual's vibration exposure exceeds 2.5m/s2, then a health surveillance programme via the University's Occupational Health provider must be arranged. The aim of this is to identify at an early stage any member of staff who may be showing medical signs of developing HAVS. If at any time between the routine checks, a member of staff notices any of the signs of HAVS, they should report it to their line manager in order that referral to Occupational Health can be organised and investigation of the equipment carried out by the School/Department.

Should a user of such equipment feel that performance has deteriorated in terms of vibration, they must report it at the earliest opportunity so that further investigations can be made. Also if a user notices any of the signs of HAVS, they should report it to their line manager in order that referral to Occupational Health can be organised and investigation of the equipment carried out by the School/Department.

7.18 General

Horseplay and practical joking is very dangerous in workshops. Never direct a jet of compressed air against anybody or yourself - this can be fatal. Ensure that flexible hoses used with compressed air are properly terminated, and carefully maintained. Where machinery is in use arrangements must be made so that a second person is within calling distance should an emergency arise.

Section 8: General Laboratory Precautions

8.1 Personal Protective Equipment

The Personal Protective Equipment [PPE] at Work Regulations 1992 require that where PPE is supplied it must have been assessed to ensure it is suitable for the intended purpose.

The appropriate local regulations should be consulted. In many laboratories the wearing of approved types of laboratory coats and safety spectacles is compulsory. The occupants of the laboratory should ensure that any visitors or tradesmen are similarly attired. In some laboratories additional items of personal protective equipment (e.g. face-shields, dust masks, gloves, plastic aprons, etc.) are also provided; the protection worn must be appropriate to the work being undertaken.

8.2 Protective Clothing and Footwear

Bare skin presents areas for contamination by chemicals, micro-organisms and radioactive substances etc.

The laboratory coat provides protection for the arms and body. The choice of style and fabric of lab coats provided must be arrived at as a result of risk assessment of the nature and quantities of the hazards involved and the circumstances of use. The Safety Office has issued guidance to assist in making the correct choice which can be found on the Safety office website.

Laboratory coats may become contaminated with toxic materials and should normally be left behind when leaving the work area. They must not be worn in any area set aside for tea and coffee making or for the consumption of food or beverages.

They should be washed regularly and whenever they become contaminated with chemicals.

It is necessary to protect the feet and legs from chemical spillage or from damage from heavy equipment being dropped. Suitable footwear must be worn. The wearing of open-toed shoes or sandals in laboratories is not permitted, as their use makes the feet extremely vulnerable to injury from broken glass, spilt corrosive substances, liquid nitrogen, etc. Loose fitting sandals, especially those with no heel restraint, are not secure and may present a tripping hazard.

Loose long hair can be a danger to personal safety in the laboratory. It is readily ignited (lacquer increases this risk) or it could become trapped in equipment or machinery. Long hair should always be tied back.

8.3 Protective Gloves

Gloves may be required to protect the hands against one or more of a range of different hazards, including chemical, biological, heat, and cold. In general. no one type of glove protects well against more than one type of hazard. This makes it very important to select the correct type of glove for the intended use.

Chemical protective gloves are available in a range of materials including natural rubber, neoprene, nitrile, butyl, PVA, PVC and viton. The degree of protection against chemical permeation depends on the glove material, its thickness and the way it is made. Different materials offer widely ranging resistance to permeation as defined by the "breakthrough time". Glove suppliers provide information to assist in glove selection. It should be remembered that the liquid may be the solvent for other more hazardous chemicals being used and as such will enable these to diffuse through the glove with the solvent, which may also carry the chemical to into the skin.

Solvents may also adversely affect the physical characteristics of the glove and impair its protective properties, for example by leaching plasticising agents out of the glove causing it to become more brittle, cracking and thus leak.

It is important to check gloves for damage such as holes, cuts and distortion. Reusable ones should be examined for signs of internal contamination.

Gloves which bear the term 'Examination Gloves' on the box are intended for use in clinical examinations where the patients are to be protected from contamination by the person examining them. These are termed Category 1 gloves and are suitable only for low risk activities. In a laboratory setting, their value is very limited, because they offer little or no protection to the wearer against either biological or chemical hazards. They are of use only in preventing the work from being contaminated by the wearer.

Category 3 gloves will bear CE mark plus four digits e.g. CE 0121 and will be suitable for protection against biological and chemical hazards for most of the uses in the laboratory.

The University Safety Office has published more detailed guidance on the selection and use of gloves for protection against hazardous substances.

Gloves worn in the laboratory **must** be removed and placed for disposal before leaving the laboratory suite in which such work is being undertaken. The wearing of potentially contaminated gloves in the corridor, rendering others at risk, is strictly forbidden, unless, as a result of risk assessment, the School has sanctioned alternative procedures [e.g. having a glove free hand to negotiate doors]

The normal requirements on removal of protective clothing prior to entering offices, seminar rooms, rest areas and when entering public areas apply.

8.4 Allergy to Natural Rubber Latex

Latex gloves are widely used to protect against exposure to harmful substances and also to protect work from contamination. Latex allergy is particularly associated with the use of **powdered latex gloves** – the powder helping to disperse the latex protein, resulting in exposures fifty times higher than arises from non-powdered gloves. The powder used in these gloves can also penetrate the pores of the skin and when combined with sweat produced within the glove this can lead to adverse skin reactions.

The use of **pre-powdered latex gloves is prohibited** within the University, because of the risk of these provoking dangerous allergic reactions and skin conditions.

The use of **disposable non powdered latex gloves must be avoided** wherever possible and in all cases where there exists a viable and practicable alternative to the use of latex gloves the alternative should be utilised. Their use is only permitted where latex provides a distinct advantage over alternative gloving materials for the task and the justification for selecting latex must be documented in a risk assessment,

Where latex gloves are used, this must be fully justified, documented and supported by a risk assessment. Users must be provided with information on the risk of latex allergy, information on how to recognise possible allergic reactions to latex and on the need to report suspicion of allergic reactions to the Occupational Health Department.

Suitable alternative gloves must be provided for users with diagnosed latex allergy. Advice on any additional necessary precautions should be sought from the Occupational Health Department as in more serious cases latex may need to be removed from the entire area.
Further and more detailed information is available on the Safety Office website.

8.5 Hygiene

During laboratory work contamination on the hands may not be noticed immediately. Never touch any part of the body (the area around the eyes is especially vulnerable) without washing your hands first. Always wash off any chemical contamination immediately. This includes washing contaminated gloves. If you do contaminate anything (e.g. the bench top or water tap) clean up the contamination immediately. Always wash you hands before leaving the laboratory.

8.6 Food and Drink

Food and drink for human consumption must not be stored, prepared, or consumed in laboratories. Special areas are set aside for the consumption of food or beverages. Where food or drink is required for human consumption under laboratory conditions, i.e. as an authorised research or teaching programme, then special arrangements to ensure the safety of these are required.

Food and drink along with preparation equipment and eating utensils must be stored and handled separately from chemicals and biologically toxic materials. Separate refrigerators must be provided for the storage of food and drink and laboratory refrigerators should not be used.

8.7 Smoking

Smoking is prohibited in all laboratory areas.

8.8 Experimental Work

Ensure that you are properly briefed, or that you have done your literature work before attempting a new experiment. If you do not fully understand an instruction, are unsure how to operate a piece of equipment, or are unsure about the potential risks of an experiment, then seek help from a competent person before proceeding further. **Unauthorised experiments are strictly forbidden.**

It is important that communal work areas and facilities are kept scrupulously clean and tidy. The next person could be injured by the debris or chemicals you have left behind.

Take care when entering or leaving a laboratory to avoid bumping into someone carrying chemicals or equipment. Never run! Chemicals must be transported in purpose-made carriers; a suitable trolley should be used for transporting other bulky or heavy items.

8.9 Emergencies

Before starting an experiment you must consider what emergency action to take should it go wrong, or if the apparatus should break.

When the fire alarm sounds: If practicable make the experiment safe (e.g. turn off heating sources), extinguish naked flames, close windows and doors and follow the local evacuation procedure.

When starting work in a new area, you should check the location of all fire exit routes, the location of the fire fighting equipment and internal and external telephones.

8.10 Out of Hours Working

Laboratory working by individuals or the unattended operation of experimental apparatus outside of normal hours must be subject to appropriate local regulations and risk assessment. A contact telephone number must be left in case of emergency.

Leaving experiments unattended should only be done where the risk assessment has identified that this it acceptable and emergency contact and action details must be left on the entrance to the laboratory.

8.11 Glassware

Glassware must always be handled carefully. Glass tubing can easily be broken and can cause severe damage to hands. Protect you hands and use appropriate lubricant when fitting flexible plastic or rubber tubing over glass tubing, or fitting a glass pipette into a safety filler or dispenser. Particular care should be taken when breaking ampoules open. Where the contents are hazardous, e.g. toxic, carcinogenic, infectious, a proprietary ampoule breaker should be used.

Any crack considerably reduces the strength of glassware, and the item should either be sent for repair before further use, or discarded. Chipped glassware should also be discarded. The appropriate waste disposal methods must be used.

8.12 Syringes

Contaminated or broken syringes and syringe needles must be placed in one of the "Sharp-Safe" containers provided (i.e. a sharps container that complies with BS 7320:1990 and/or type approved under the *Carriage of Dangerous Goods (Classification, Packaging and Labelling) Regulations*). When full these containers are sent away for incineration. They should not be placed inside other bags. Do not place syringes or other sharps in the general-purpose waste bins. Further information on use is contained in Section 10.5.

8.13 Vacuum Systems and Manometers

Glass systems are particularly vulnerable and should be protected against the risk of implosion should mechanical defects develop while the system is under vacuum. Do not evacuate thin-walled or non-spherical glass flasks.

When liquefied gases are being handled there is a risk of over-pressurising the system, leading to an explosion risk, if valves are not opened and closed at the correct times or in the correct sequence.

Liquid nitrogen when exposed to the air slowly condenses oxygen, and may assume a pale blue colour. Liquid oxygen presents a severe fire risk and it reacts violently with a range of materials and chemicals.

Manometers should be protected against damage. Mercury manometers must be provided with a tray to contain all the mercury in the case of any spillage or breakage. Any spillage of mercury must be cleared up immediately and disposed of as hazardous waste.

8.14 Electrical Equipment

Electrical equipment is checked regularly and should normally carry an in-date sticker to show this. Out of date equipment should not be used. The guidance contained in the University "Code of Practice for Electrical Safety" should be followed.

However, faults can occur between checks. Therefore always check before use for damage, loose wires or exposed terminals and for water or solvent spillage.

Faults must be reported immediately to a competent person and a suitable notice must be attached to the equipment prohibiting further use until repairs are made.

8.15 Photographic Dark Rooms

Because it is often necessary to work with reduced lighting levels it is most important to ensure good housekeeping. Keep floor areas clear and avoid trailing cables. Chemical, electrical and mechanical safety must be carefully considered and it is important to ensure good ventilation.

8.16 Cryogenic Gases

Cryogenic gases in the form of liquid nitrogen and helium are often associated with work in laboratories within the University
The properties of these gases are as follows

Property	Nitrogen	Helium
Boiling point [1]	-196^{0}C	-269^{0}C
Liquid /gas ratio [2]	683	739
Volume of liquid per m^3 that will reduce the oxygen level to 19%	0.14 litre	0.13 litre

[1] Temperature at which gas turns to liquid
[2] this is the expansion factor. 1 litre of liquid nitrogen will expand to produce 683 litres of gas.

Hazards associated with the use of these gases are:

1 Asphyxiation due to oxygen deficiency,
Normal atmosphere contains 20.9% oxygen by volume. Increasing the amount of cryogenic gas into the environment will displace the oxygen. The physical effects are increasing pulse rate tiredness, headaches and dizziness, fainting. The severity and speed of onset of these effects increase as the oxygen level decreases and beneath 10-12% they can occur without the person's knowledge, without prior warning and can prove fatal. The liquid gas ratio indicates the volume that 1 litre of liquid gas will expand to fill when spilt. This happens instantaneously and thus a spill of liquid gas in a poorly ventilated room can have very serious consequences.

Precautions. Confined spaces present a problem. Store and dispense gas only in well ventilated areas. A risk assessment should have been carried out to establish if the oxygen concentration could drop below 19% in the event of spillage. If this is the case consideration must be given to provision of an oxygen monitoring system for the work area.

Lifts are confined spaces and cryogenic gases must not be transported in them unless a risk assessment has established that oxygen deficiency will not occur under the conditions and quantities to be used. If oxygen deficiency could occur then the vessel should be unaccompanied. The use of additional personnel and barriers will be required to prevent entry into the lift. These measures should be described in a standard operating procedure. Further advice can be obtained from the Safety Office, which can carry our oxygen monitoring.

2 Cold burns.
Prolonged exposure may lead to frostbite and the destruction of body tissue. This may not be immediate or obvious. Also the skin may freeze instantly to cold surfaces and attempts to remove the skin can cause serious damage.

Precautions. The following personal protective equipment should be worn.

- Lab coat with apron over top will prevent liquid gas entering pockets and areas where spillage can collect.
- Thermal gloves of non-absorbent waterproof material. They should be securely banded at the wrist or arm.
- Full-face visors must be worn to prevent liquid splashes to eyes, face and mouth.
- Full shoes that extend up the ankle allowing trousers to fit over the shoe.
- Tongs and forceps for handling vials.
- First aid response is given in Section 4.4 of this manual.

3 Cold effect on lungs. Inhalation of cold mists, gases or vapours can be serious and lung damage may result. This will be a consideration for larger scale use. Ensure area is well ventilated and wear a face visor.

4 Ice plug formation. These may form in the neck of Dewars when moisture comes into contact with the cold gas in the neck of the Dewars. This can then form a seal across the neck preventing normal venting and leading to increased gas pressure. The ice plug may be ejected at high velocity or the Dewar may explode.

Precautions

- Always fit the Dewar's protective cap
- Ensure the cap is in good condition
- Do not leave uncapped Dewars outdoors in moist environments
- Ensure Dewars are fully emptied after use

In the event of an ice plug being found in the neck of the Dewar immediately evacuate the area.

5 Explosion due to rapid expansion. Due to the high liquid:gas expansion ratio if liquid cryogen becomes trapped in a confined area or container can cause the container to explode due to rapid expansion. Examples of where this can occur:

- Removing cryogenic vials from liquid nitrogen – liquid within the vial can cause the vial to explode as the vial warms up. Always place vials behind a screen or within a robust container and wear a visor, or ensure vials are stored only in the vapour phase of the freezer.
- Cryogenic liquid becoming trapped between the inner and outer walls of certain types of dewars which have seals around the rim of the dewar. Avoiding use of this type of dewar is strongly advised, where they are in use it is important to inspect dewars regularly for any cracks/ breaks in the seal and withdraw from use.

6 Oxygen enrichment. This may occur around the hose of a pressurised Dewar, or in the bottom of an open Dewar. Since liquid nitrogen and liquid helium are colder than the boiling point of liquid oxygen, air coming into contact with a very cold surface will cause oxygen to condense out of the air. Liquid oxygen may drip from the hose giving the impression of a leak. These effects can result in oxygen-enriched air being formed, which present an additional fire hazard. Also cryogenic liquid oxygen dripping onto surfaces might cause embrittlement.

Precautions. No smoking or naked flames in the vicinity of cryogenic transfer.

Solid Carbon Dioxide Ice [Cardice]
Cardice will produce carbon dioxide gas, which is an asphyxiant. It is also is extremely cold and can cause cold contact burns. The precautions outlined for the hazards associated with cryogenic gases should be adopted for handling cardice.

Treatment for cryogenic burns – see section 4.4

Use of Small Dewars – potential explosion hazard

It should be noted that the small DILVAC type of dewars can lead to potential problems because of the seal becoming defective and allowing liquid cryogen between the inner and outer layers of the dewar - the rapid expansion as the liquid becomes gaseous can then lead to an explosion. Ideally such dewars should be replaced with ones that do not have a seal around the top. Certain suppliers have dewars that are not constructed in this way because of this potential risk.

Where the DILVAC style of dewar is still in use, managers must ensure that the seals are inspected for defects and that any that are defective are immediately taken out of use. The best course of action would be to replace any that have seal defects with a different type of dewar, however it is possible for suppliers to provide replacement seals and instructions on how to fit them.

If this type of dewar remains in use managers must ensure that users are made aware of this potential problem and of the importance of inspecting the seal carefully before each use to ensure it is intact.

8.17 Use of Personal Communication and Entertainment Devices in Laboratories

Due to the more hazardous nature of work undertaken in labs and workshops the University has issued guidance to restrict the use of mobile

phones, personal stereos, mp3 players and i-pods etc. in these areas. More detailed information is available on the Safety Office website.

8.18 Transport of Hazardous Substances

The transport of hazardous substances by road, rail and air is subject to very specific and complex regulations. . The University has therefore engaged the services of a Dangerous Goods Safety Adviser to provide advice on the correct means of transporting hazardous substances and biological materials. For further details of this service contact the Safety Office.

Section 9: Precautions with Chemicals

9.1 General Guidance

Work with chemicals can present toxicological and/or physical hazards. Where the work could present a toxicological, i.e. health, hazard then it is subject to the requirements of the Control of Substances Hazardous to Health Regulations 2002 (COSHH). Work with substances presenting a flammable or explosion risk are subject to the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR).

Substances defined as being hazardous to health include those that are very toxic, toxic, harmful, corrosive or irritant. These categories of danger are shown on the label of the container for the substance as commercially supplied. There are also a large number of chemicals for which there are occupational exposure limits. These are published in HSE Guidance Note EH 40 which is up-dated annually and a copy held in the Safety Office. These chemicals are also subject to COSHH, as would be harmful intermediates or metabolites created during the reaction etc.

Substances with chronic or delayed effects, for example, carcinogenic, mutagenic, teratogenic or respiratory or skin sensitisation are also subject to these regulations. Again, suppliers have a duty to pass this information on to the user through Material Safety Data Sheets (MSDS) on first supply. Supplier's websites usually give access to this information. Links to other MSDS websites are available through the Safety Office website.

Where substances hazardous to health are used the work needs to be assessed to identify whether there are any stages within it that could result in a harmful exposure. This requires consideration of the toxicity of the material, the quantity involved in relation to this, its physical form (power, in solution, gaseous etc.) and the route by which exposure can occur, i.e. inhalation, ingestion, absorption or via injection or cuts/grazes. Having identified those stages, if any, where a harmful exposure could occur, certain control measures need to be applied. A less or non-hazardous alternative should be used if possible. If not then exposure could be minimised, for example by working in a fume cupboard, using scrubbing devices, using the substance in a safer form (aqueous solution instead of powder) or containment within a sealed vessel. Good general ventilation of the working area is important. Personal protective equipment such as dust masks, gloves, impermeable clothing should only be used where

engineering controls or procedural modifications are either not feasible or only partially effective.
Under some circumstances health surveillance by the Occupational Health Unit will be needed. These circumstances are where an adverse health effect may occur as a result of the type of exposures occurring during the work and there is a means of detecting the effect. The main purpose is to identify any exposure-related ill health at an early a stage as possible. Safety Office Guidance details the University's arrangements for providing health surveillance for people whose work may involve a significant exposure to respiratory sensitisers. Some chemicals, metals and natural substances of animal or plant origin may give rise to sensitisation. Natural rubber latex (commonly used for some types of disposable surgical gloves) can also give rise to skin or respiratory sensitisation (see Section 8.4). Further information on Health Surveillance available can be obtained from Occupational Health.

For some work activities there may be standard procedures to ensure safe working with the chemical. On the other hand there could be situations where each chemical reaction or process requires a unique assessment which should be recorded permanently. In most cases this record should be written into the experimental notebook adjacent to the details of the process undertaken. The School or Departmental arrangements for your work area should be consulted as to which course of action is needed.

For the hazards associated with particular substances refer to the manufacturer's hazards data sheets or consult a reference book. `Dangerous Properties of Industrial Materials' by N.I. Sax, `The Registry of Toxic Effects of Chemical Substances' by R.J. Lewis, `Hazards in the Chemical Laboratory' edited by S.G. Luxon (5th edition), and the Sigma-Aldrich `Library of Chemical Safety Data' are to be found in the George Green Library. Several Schools have computer database compilations of toxicity data and other reference texts. There are also links from the Safety Office website to websites containing Material Safety Data Sheets. If it is possible to substitute a hazardous substance with a less hazardous one able to perform the same function, then this substitution must be made.

All users of chemicals must be adequately trained to be aware of the hazards of the materials they use and the correct precautions to be adopted. If necessary users should seek advice from specialists. For example the hazardous properties of many substances are not readily apparent, and there may be problems of incompatibility when two or more chemicals are mixed.

The use and storage of all chemicals should be adequately controlled, especially those which are flammable, explosive, toxic or carcinogenic. All containers must be labelled with accurate information as to the contents and where appropriate, with information on the hazards. The minimum quantity necessary should be used and hazardous materials should be safely disposed of as soon as possible after use. See Safety Office guidance on the safe storage of chemicals and guidance on working with hazardous substances.

Before carrying out an experiment with an unfamiliar and potentially hazardous chemical, plans should be made to deal with any emergency arising from unexpected releases of materials by spillage or other means. For example, spill kits containing neutralising substances should be available and if appropriate suitable chemically resistant suits and overshoes. Where corrosive/toxic vapours could be released respiratory protective equipment and staff trained in its use should be made available**.** Breathing apparatus will only be appropriate where there is a rigorous regime of trained operators, maintenance and face fit testing is in place.

When carrying out any chemical manipulation always have someone within easy calling distance who can render assistance or aid in case of accident. Potentially hazardous operations by lone workers are not allowed.

Further information on chemical safety is available on the Safety Office website. There is also guidance on nano-materials.

Specific Guidance

9.2 Fume Cupboards

Fume cupboards provide one of the most important controls over exposure to hazardous substances. They can also provide protection against physical hazards. There should be clear indication of the purpose for which a fume cupboard may or may not be used. Users of fume cupboards must always match the work being undertaken to the suitability of the cupboard concerned. There must be a system for regularly monitoring the effective operation of fume cupboards.

Fumecupboards must provide effective containment of the fumes/vapours etc. This is achieved through selecting a suitable face velocity for the fumecupboard and the type of work and careful use of the cupboard.

- Standard hazard work should be carried out in fumecupboards with a face velocity of 0.4 m/s,
- Storage only is permitted in fumecupboards with a face velocity exceeding 0.2 m/s.

- High hazard work might require an increased face velocity and/or a fumecupboard with an emission scrubbing system, usually a wet wash.

Poor housekeeping or layout of equipment in the fumecupboard can significantly reduce the effectiveness of containment. In particular ensure that:

- The fumecupboard is working - check the airflow indicator and/or use an anemometer. A simple tell-tail (strip of paper to deflect with the air movement) can also be useful!
- Do not overload the fume cupboard
    - Leave a 150mm clear space at the front – "Safety Line"
    - Do not obstruct the air slots at the base of the back for the fume cupboard.
- Always lower the sash when not working at it.
- Don't leave or trail things over the sill – this can cause leakage out.

The Engineer's section of the Estate Office maintains a register of all fume cupboards and arranges for them to be examined and tested every 12-14 months. Copies of the result from this are held both by the School concerned and the Estate Office.

A considerable number and variety of chemical compounds should only ever be used inside an efficient fume cupboard; benzene and carbon tetrachloride are but two examples. You must always be aware of the hazardous properties of the compounds you are using so that risk of exposure can be estimated. If the hazards are unknown, then a fume cupboard should be used.

9.3 Skin Hazards

Acids, alkalis and other corrosive materials can cause burns on the skin. Some chemicals have an irritating action and may cause sensitisation or dermatitis, while some others pass freely through the skin barrier and thereby directly into the blood stream. Toxic effects can be almost immediate, but frequently effects are delayed or may result from long-term exposure. Some chemicals are carcinogenic. It is prudent therefore to keep all chemicals off the skin.

Always wear the approved personal protection

(i.e. safety glasses, laboratory coat and sensible stout shoes and keep bare legs covered). Rubber or plastic gloves should be worn when handling chemicals, and in cases where there is a risk of splashing then face shields, plastic aprons and rubber boots may be necessary.

You should be aware of the best method for dealing with accidental skin contact before using a chemical. In many cases the remedial action involves immediate and thorough washing and prolonged rinsing with water and, if in doubt, then this procedure should be used. However, many chemicals are not particularly soluble in water and alternative methods for removal are often necessary (e.g. soap and water may suffice). Unless you have information to the contrary, avoid the use of organic solvents for the washing process since some of them have the ability to carry contaminants through the skin.

9.4 Eye Hazards

It must be assumed that all chemicals will cause damage if allowed to contact the sensitive surface of the eye. Some chemicals have a severe damaging effect, especially acids, alkalis and those chemicals, which are classified as corrosive or as irritants. Many solvents fall into this category. **Hence, the wearing of safety spectacles or other appropriate and approved eye protection in laboratories is essential when handling chemical compounds.**

9.5 Pesticides

The Control of Pesticides Regulations (1986) require that any person who uses a pesticide shall take all reasonable precautions so as to protect the health of human beings, creatures and plants, and to safeguard the environment and in particular to avoid pollution of water. Trained personnel with a certificate of competence should use pesticides approved for agricultural purposes. Untrained personnel may only use pesticides under the direct supervision of such a person. Further guidance is given in a Code of Practice on the Agricultural and Horticultural use of Pesticides, which includes sections on operator training, storage and transport of pesticides, and the safe use of pesticides.

Local rules should outline appropriate systems of work which users must observe.

9.6 Risk of Poisoning - Planning for Emergencies

In all work involving the risk of poisoning it is particularly important that a comprehensive assessment is made under the COSHH Regulations before work starts. Very careful consideration must be given to the apparatus design and engineering controls so that the risk is minimised.
Particular chemical poisons may have a specific antidote. If there is one which may be administered by lay persons it should be made readily available beside the experiment.

If the treatment must be administered by medically trained personnel, make arrangements with the University Health Centre to have the recommended emergency treatment kit readily available for immediate use.

9.7 Personal Hygiene

All chemicals should be regarded as toxic by ingestion. **Hence, pipetting liquids or solutions by mouth is strictly prohibited**; use a pipette pump, syringe or a mechanical dispenser. Never deliberately taste, swallow or inhale any chemical.

Chemicals can also enter the body through the skin absorption or through the accidental inhalation of vapours or dusts. Suitable protective equipment must be worn when handling chemicals. Cuts and wounds are particularly vulnerable and may allow direct entry of chemical substances into the bloodstream. Broken skin should be covered with a suitable dressing, but if the wound is on the hand then the dressing should be waterproof and rubber gloves must be worn while handling chemicals.

Always wash your hands before touching other parts of your body (especially the area around the eyes) or before taking food.

Do not smoke, eat or drink in the presence of chemicals.

9.8 Flammable Liquids, Vapours or Gases

The majority of organic materials are flammable, and many organic solvents are highly flammable (e.g. alcohol, acetone, ether, petroleum products, and toluene—to name just a few). The quantity of any highly flammable liquid present in a work area must be as small as is reasonably practicable having regard to the processes or operations being carried out.

The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) define the controls for fire and explosion risks associated with working with flammable materials. They are concerned with fire and explosion risks from substances or preparations that may be hazardous due to the potential to give rise to fire, explosion or other similar event. The following classes of substances are covered:

- oxidising;
- extremely flammable;
- highly flammable; or
- flammable.

These "Dangerous Substances" may give rise to fire or explosion in the form of gases, vapours, mists and dusts. The following controls are required:

- Risk assessment

- Elimination or reduction of risks
- Identification, classification and signing of areas where an explosive atmosphere may be produced, (zoning of areas according to specified criteria for the potential for forming a hazardous atmosphere and selection of appropriate equipment that will not ignite it for use in the zones),
- Preparation of accident, incident and emergency arrangements,
- Provision of information, instruction and training,
- Identification and marking of containers and pipes containing dangerous substances.

This approach, i.e. the requirement for risk assessment is consistent with other recent health and safety legislation. To focus on the aspects required by DSEAR, please refer to University guidance which includes specific forms for the purpose of carrying out and recording a suitable DSEAR risk assessment.

Risk of fire or explosion
The risk assessment should consider how the substance could be released and the likelihood of it igniting under normal use, maintenance, and forseeable accident. The quantity, form and duration of the release are significant, for example whether a sufficient quantity or concentration to sustain a fire or explosion could be involved. Whether a release could be ignited will depend upon proximity to ignition sources such as standard, unprotected electrical equipment and switches that could produce a spark, naked flames, hot surfaces and sparks from grinding and cutting processes.

Control measures
Controls to prevent fire/explosion from occurring include correct design, selection and maintenance of the equipment and protective devices. Containers and pipework must be marked as to contents. Substitution of dangerous substances for a less dangerous alternative should be considered. Reduction of quantities used or stored. Avoidance of release of substance by using sealed systems. Preventing explosive atmospheres from developing by means of ventilation. Removing sources of ignition. Separation of potentially reactive materials.

For flammable gas systems, installation in accordance with British Compressed Gases Association Codes of Practice would meet the physical requirements of these regulations - inert gases would not be covered by these regulations.

Those working with flammable liquids should also be aware of the existing guidelines within the following HSE documents:

* **HSG 140** - safe handling and use of flammable liquids
* **HSG 51** - storage in containers – limit of 1/2 days supply or 50 litres in metal cabinet in any workplace.

Flammable liquids must be kept in securely lidded and labelled containers. When moved they should be carried in a manner to prevent breakage or spillage, for example enclosed Winchester carriers.

When decanting from drums, the drum and the receptacle must be earthed to prevent static build up – discharge of this is likely to ignite the liquid.

Solvents that need to be stored at low temperatures must be kept in purpose built spark-free refrigerators, not the usual domestic type. In the event of a solvent fire, water should not be used to fight it. Burning solvent usually floats on water and dousing with water can rapidly increase the spread of the fire!

Mixtures of flammable organic materials (whether gases, solvent vapours or dusts) and air may explode on ignition. To avoid this the proportion of flammable gas, vapour or dust in the air should be kept to a very low level by adopting safe working practices, giving careful thought to apparatus design, and by maintaining good ventilation, for example by working in a fumecupboard. The vicinity should be kept clear of ignition sources (e.g. flames, hot surfaces or sparks).

Zoning

The regulations also specify criteria for the classification of hazardous zones on the basis of the frequency and duration that an explosive atmosphere of vapours, gases, mists or dusts may occur. Equipment for use in such zones must be selected on the basis of the requirements set out in the Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres regulations 1996, which correlate design specification with the zone of intended use. Where assessment has identified such a zone, these should be clearly signed.

Spillages

Minor spillages must be cleaned up quickly. In the event of major spillages the laboratory should be ventilated by opening the windows, evacuated and the door closed. Do not switch any electrical equipment on or off since this could cause a flashback to the spillage.

Please note the following:

1) The DSEAR Regulations repeal the *Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972,* which previously required controls on storage and use of these types of flammable substances.
2) *The Petroleum Consolidation Act 1928* is amended to remove the requirement to licence certain types of solvent stores – licensing now only applies to storage of petroleum spirit in tanks for pumping to supply tanks of internal combustion engines.

9.9 Carcinogen, Mutagens and Substances Toxic to Reproduction

There are specific requirements under the COSHH Regulations concerning working with carcinogens.

Carcinogens are identifiable by the risk phrases R 45 "**may cause cancer**" or R49 "**may cause cancer by inhalation**" and fall into three categories Carcinogens are divided into three categories:

- **Category 1 -** substances known to be carcinogenic to humans. There is sufficient evidence to establish a causal association between human exposure to the substance and the development of cancer.
- **Category 2 -** substances that should be regarded as if they are carcinogenic to humans, for which there is sufficient evidence, based on long-term animal studies and other relevant information, to provide a strong presumption that human exposure may result in the development of cancer.
- **Category 3 -** substances that cause concern owing to possible carcinogenic effects but for which available information is not adequate to make satisfactory assessments.

Categories 1 and 2, if purchased from a supplier, will carry the "toxic" (**T**) symbol and the Risk Phrase R45 (**May cause cancer**) or R49 (**May cause cancer by inhalation**). These are subject to specific control under COSHH.

Category 3, if purchased from a supplier, carries the "harmful" (**Xn**) symbol and the Risk Phrase R40 **(Limited evidence of carcinogenic effect)**. These are not included in the COSHH definition of a carcinogen but are subject to the general requirements of COSHH.

Mutagens are substances that cause heritable genetic changes (mutations). Most mutations are harmful and most mutagens are carcinogens and vice versa. Substances that are known to impair fertility or to cause developmental toxicity in humans are defined as **toxic to reproduction**. (**STR**). This definition covers a broader range of health effects than the

earlier "teratogenic" which applied only to substances that adversely affected the developing foetus.

Mutagens and STRs are classified similarly to carcinogens in Categories 1 to 3.

- Category 1 and 2 mutagens carry the Risk Phrase R46 "May cause heritable genetic damage" and substances toxic to reproduction carry the Phrase R60 "May impair fertility" or R61 "May cause harm to the unborn child".
- Category 3 mutagens have the Risk Phrase " Possible risk of irreversible effects" and Category 3 substances toxic to reproduction are classified by R62 "Possible risk of impaired fertility" or R63 "Possible risk of harm to the unborn child".

These substances, unlike carcinogens, are not specifically prescribed in COSSH. However because of the nature of the hazard, workers should adopt the precautions and principles outlined in this section.

As with any other chemical, a **risk assessment** must be carried out for the procedure involving the use of a carcinogen. The risk assessment must identify the means by which exposure can be **prevented** or if not *reasonably practicable* **controlled**.

Prevention of exposure can be achieved through substituting with a less harmful substance, modifying the process to avoid using the carcinogen, or avoiding the formation of carcinogenic by-products or intermediates. Where this is not reasonably practicable the first choice must be the use of a totally enclosed system such as a glove box or cytotoxic cabinet.

If prevention cannot be achieved then exposure should be **controlled** through the use of partial enclosure and/or local exhaust ventilation along with safe handling systems, the general principles of which include:

- Handling must be confined to dedicated areas that are clearly identified with appropriate hazard signs and non-essential personnel excluded from these areas.
- Minimise the quantity to be used and or frequency of exposure.
- Try to avoid having to dispense powder by purchasing the carcinogen in pre-weighed vials/iso-vac containers.
- If the compound is stable in solution then weigh out enough for several experiments and divide into suitable aliquots for future use.
- Work in an enclosed glove box or if not available use a fume cupboard or powder weighing cabinet.

- Always work over a tray.
- If working in a fume cupboard be aware of air turbulence as this can spread fine powders within the fume cupboard.
- If weighing fine powders be aware of static and try to reduce it by rinsing gloves first under water or using an earth strap.

Personal protective equipment may be used as secondary protection but must never be the primary means of controlling exposure.

- Lab coat should be double fronted, side fastening with cuffs.
- Gloves should be of the correct type depending on the nature of the compound and any associated solvent that may be involved. Check glove manufacturers charts or seek advice.
- Respiratory protection [RPE] such as face masks may only be worn as a secondary means of protection in addition to working in a fume cupboard or in the event of a spill outside primary containment. RPE must be of the correct type and, depending on type, may require face fit testing.

Individuals required to work with carcinogens must be fully **trained** in how to handle carcinogens safely and be assessed as fully competent by their supervisor before handling the carcinogen. This training will be recorded. A very high level of **supervision** should also be maintained to ensure that workplace standards and working practices are maintained.

Storage & Transport
Keep storage of carcinogenic substances to a minimum. Containers and storage areas must be clearly labelled with appropriate hazard signs and kept locked.

Transport in double containers that are clearly labelled as to hazard.

9.10 Nano-materials
Nano particles are usually defined as having one or more external dimensions in the order of 100 nm or less i.e.: < 0.1 micrometre / micron. A precautionary approach is advised when using nano-materials. In particular, there are concerns due to:

1. The small size of nanoparticles means that they could reach parts of biological systems that are not normally accessible by other larger particles. This process is known as translocation and in general, nanoparticles can translocate much more easily than other larger particles for example by:
    - the increased possibility of crossing cell boundaries,

- passing directly from the lungs into the blood stream and so on to all of the organs in the body,
- through deposition in the nose, directly to the brain, or
- through skin absorption or penetration.

2. Due to their small size nanoparticles have a relatively much higher surface area than the same mass of larger particles. If surface area is a driver for toxicity this can result in potentially increased toxic effects.

3. If the rationale for developing nano-materials and nanoparticles is that they will have new and different properties than larger particles of the same material then it is conceivable that these new properties could include increased toxicity.

It must be noted that there are currently no Work Place Exposure Limits specifically for nano particles. The information contained within the Material Safety Data Sheet [MSDS] for a substance in conventional micron size, cannot be regarded as relevant for the same substance in the nano range.

Risk Assessment
For nanomaterials the primary concern will be the health effects due to inhalation, skin contact or ingestion. However consideration must also be given to fire and explosion risk and control measures that may be required under DSEAR. In carrying out the risk assessment and identifying appropriate risk control strategies the precautionary approach must be followed where the hazard of the nanomaterial is unknown:

- Consider the form and minimise / avoid generation or manipulation of free nano powders or aerosols of solutions containing nano materials.
- Otherwise employ suitable local exhaust ventilation (e.g. MSC/glove box), potentially HEPA filtering if determined by risk assessment.
- Minimise the quantities handled/manipulated, the frequency and duration of use/handling and the number of workers involved.
- Use handling methods that minimise the chance of the material becoming airborne (e.g. damping down).
- Employ suitable personal protective equipment:
    - Category 3 gloves, 2 layers
    - Appropriate respiratory protective equipment
    - Clothing that does not allow dust penetration (e.g. Tyvek)

For further information see: Guidance and Safety Requirements for the Creation and Manipulation of Engineered Nano Materials.

9.11 Disposal of Waste Chemicals

Great care must be taken when disposing of potentially hazardous material. The appropriate waste disposal methods must be used as given in local waste disposal procedures.

Only innocuous materials may be disposed of via dustbins or drains. It may sometimes be possible to use a chemical deactivating process, as for example outlined in the Aldrich Chemical Company catalogue. Any such deactivation process must have undergone suitable and sufficient risk assessment to ensure that unnecessary risks are not introduced.

The disposal of hazardous substances is subject to a legal "Duty of Care" under the Environmental Protection Act 1990 and is also subject to the Hazardous Waste Regulations. Waste must be appropriately segregated, collected in suitable containers and correctly labelled as to contents.

The University has an Environmental Manager who works within the Estates Office who can provide advice and guidance on waste disposal procedures. The Environment section of the Estates Office website contains more detailed information on the University's arrangements for disposal of hazardous waste.

The University has approved a number of licensed waste contractors who must be used for the disposal of hazardous waste. These are listed on the Safety Office website.

9.12 Restricted Chemicals

Certain classes of chemicals are subject to specific licensing controls due to the potential for misuse.

1. Some chemicals that can be used for illicit manufacture of narcotic or psychotropic drugs (drug precursor substances) are subject to Home Office licensing. The licences are chargeable and are specific to the research area. The arrangements for working with these materials are summarised on the Safety Office website.
2. Production, use or possession of chemicals that are agents associated with chemical warfare are subject to licensing controls under the Chemicals Weapons Act 1996 via the Department of Energy and Climate Change. Any quantity of, or intention of work with, a schedule 1 substance must be notified to the Safety Office for approval against any licence held or to be applied for. Approval is based on adequate risk assessment, written safe operating procedures and training records, and suitable facilities including security for the material and the disposal of waste. For Schedule 2 and 3 substances schools are required to provide an annual retrospective notification to the Safety Office via a local designated person. The Safety Office will submit the annual statutory declaration.
3. Part 7 of the Anti-terrorism, Crime and Security Act 2001 places requirements on the security of pathogens and toxins in response

to heightened concerns over potential terrorist threats. These regulations are overseen by the Home Office and enforced by the Police. The purpose of the regulations is to enable checks to be made on the physical security and access by individuals to specified more dangerous pathogens, toxins and related genetic material. Premises holding stocks of any of the prescribed materials are required to be notified to the Home Office. The Safety Office submits such notifications on behalf of the University. Further guidance on the security of pathogens and toxins is published on the Safety Office website.

9.13 Uranium and Thorium and their Compounds

These elements have non-radioactive uses but are subject to regulation and annual notification of holdings to regulatory authorities. There are also aggregate limits of holding for each site of the elemental and compound forms of these.

Local records of holdings must be maintained and notified to the Safety Office to enable annual statutory notifications to be made.

9.14 Respirable crystalline silica [see Section 6.20]

Section 10: Precautions with Biological Materials

10.1 General

Biological materials present a range of hazards, which include infection, sensitisation and environmental damage. There are a number of regulations relating to the control of these hazards and these are supported by a large quantity of guidance.

The most important legislation in relation to the use of biological material is the Control of Substances Hazardous to Health Regulations 2002 (COSHH) which provide the major framework for control of the hazards. Biological agents and other biological materials that are hazardous to health need consideration under these regulations. (Safety Office Guidance describes how the biological agent's provisions of these regulations should be implemented.) Where any work with these could lead to harmful exposures the risks should be anticipated and controlled by a mixture of engineering and procedural means.

Biological Agents include the general class of micro-organisms [virus, bacteria, fungi, yeast etc], cell cultures and human endoparasites and have been classified into four hazard groups. These are shown below, with some possible examples which you may encounter in your work.

Group 1	Unlikely to cause human disease. *E.g. Tissues and cell lines of non primate/non human origin. Human/primate cell lines that are long established and have long history of safe use [e.g. HeLa cells] Disabled/attenuated/non-pathogenic strains of some bacteria and virus.*
Group 2	Can cause human disease and may be a hazards to employees; it is unlikely to spread to the community and there is usually effective prophylaxis or treatment available. *E.g. tissues and primary cell lines of human/primate origin. Adenovirus, clostridium, most strains of E coli*
Group 3	Can cause severe human disease and may be a serious hazard to employees; it may spread to the community, but there is usually effective prophylaxis or treatment available. *HIV, Hepatitis B, E coli 0157, salmonella typhi.*
Group 4	Causes severe human disease and may be a serious hazard to employees; it is likely to spread to the community, and there is no effective prophylaxis or treatment available. *E.g. Rabies, Ebola Virus but it is highly unlikely that any such agents would be permitted in the University*

10.2 Notification Requirements

The Safety Office must be notified of any new work involving any Hazard Group 3 biological agents. Individuals working intentionally with Group 3 (or above) biological agents will have a personal record sheet completed in respect of their work activities with these agents. The record sheet should be kept locally within the School and updated as necessary with the information copied to Occupational Health. This will be kept for at least 10 years following cessation of work with the biological agents. Schools will be responsible for ensuring the long-term storage for these records.

In addition to the above, the **Anti-terrorism. Crime & Security Act 2001** requires the University to notify the Home Office of its holdings of certain hazardous biological agents and toxins. A list of these agents and more details of the requirements of this legislation can be found in Safety Office Guidance. Where an individual intends to import or export any item contained on this list the prior approval and consent of the Safety Office will be required.

10.3 Information and Sources of Guidance

There are several important documents which give very helpful guidance on the hazard associated with biological agents and how to control the risk: These are listed below and can be accessed via the HSE Biosafety Resources pages.

- Control of Substances Hazardous to Health Regulations 2002 and associated Approved Code of Practice for Biological Agents.
- Scientific Advisory Committee for Genetic Modification - Compendium of Guidance
- Genetically Modified Organisms (Contained Use) Regulations 2003
- The management, design and operation of microbiological containment laboratories [ACDP 2001 , ISBN 0717620344]
- Biological agents: Managing the risks in laboratories and healthcare premises.
- University information on work with Biological Agents and Genetically Modified Organisms.
- Transmissible Spongiform Encephalopathy Agents: Safe Working and the Prevention of Infection.

10.4 Risks Associated with work with Biological Agents.

The main risk associated with working with biological agents is the potential for infection. There are three main potential routes of infection to be aware of.

Inhalation - for example breathing in a fine aerosol or vapour mist which may contain a viable organism

Ingestion - through poor hygiene practice, mouth pipetting, [this should never be done] or eating/drinking in a lab area

Skin penetration - This could be as a result of injury with a contaminated sharp object, contact with mucous membrane of eyes/nose/mouth or entry via an uncovered wound.

10.5 Ways to control risks.

Detailed information on how to control risk is contained local School Codes of Practice and in departmental/school procedural risk assessments. These should be made available to you by your supervisor, make sure you read them and apply the controls specified in them. The following is intended as a brief guide on the control measures that should be applied when working with biological materials.

- **Avoid the production of aerosols** - if this is not possible then contain the process e.g. use of a microbiological safety cabinet and sealed centrifuge buckets.
- **Safe use of sharps.** Avoid use of needles and scalpels and wherever possible use plastic items instead of glass. If this is not possible do not pass needles/scalpels, directly from hand to hand, do not re-sheath needles by hand, dispose of sharps at point of use directly into an approved sharps container. Sharps containers must not be overfilled or left in public/general circulation areas and should be disposed of in accordance with local procedures. Sharps injuries must be dealt with in accordance with those outlined in Section 4 of the handbook. Do not pick up broken, potentially contaminated glass by hand, use forceps or tongs.
- **Wear gloves** to protect hands and make sure that all cuts are covered with waterproof dressing. If you develop skin lesions or eczema report this immediately to Occupational Health. Remove before leaving the laboratory and wash hands.
- **Wear a side fastening lab coat with knitted cuffs** - remove before leaving lab to enter other 'clean areas'.
- **Avoid hand to mouth contact.** No eating drinking, smoking or application of cosmetics in lab areas. Wash hands frequently and always before leaving the lab.
- **Vaccination & Immunisation**. It is recommended that any potential worker be successfully immunised against hepatitis B before commencing work with human/primate samples. Immunisation may also be appropriate for work with other organisms. ACDP guidance

document [10.3.1 above] identifies these, Health surveillance and immunisation can be arranged through Occupational Health at Cripps Health Centre by completing the relevant form.

- **Training and supervision** are essential requirement for safe working with micro-organisms. Training should cover the hazards of the work and the practical use of special procedures, techniques and equipment that are needed to minimise the risks. Ancillary and cleaning staff should be instructed in safety procedures in so far as the hazards of the work area could affect them. An appropriate level of supervision must be maintained.
- **Waste Treatment**. All biohazard/clinical waste must be rendered safe to handle before leaving the laboratory. It should be clearly identifiable as to the type of waste and the originating location and disposed of via the appropriate route. Further information is contained in in Code of Practice for Work with Biological Agents and Genetically Modified Organisms.

10.6 Guidance on Other Biological Hazards

10.6.1 Genetic Modification.

Genetic modification includes any introduction of genetic material into organisms and micro-organisms and the subsequent use of the modified organism. These activities are regulated by the Genetically Modified Org*anisms (Contained Use) Regulations 2000. The release of genetically modified organisms is covered separately by the Genetically Modified Organisms (Deli*berate Release) Regulations 1992.

The University's arrangements for securing compliance with these Regulations can be found via the Safety Office website.

The key requirements for Schools engaged in or wishing to engage in work with genetically modified organisms are:

- Appointing a Biological Safety Officer and
- Establishing a link with one of the University Genetic Modification Safety Committees [GMSC] for approval and monitoring of the work. The University Biological Safety Adviser will advise on the appropriate GMSC.
- Assessment of risks to humans and the environment must be made on the appropriate GM assessment form and this must be submitted for approval by the relevant GMSC. Details and assessment form are in the above policy document.

The Safety Office must approve local arrangements for controlling work involving genetic modification.

Some types of high risk/high category or release work require that the HSE be notified of the work in advance, and that they approve the work and the containment facilities.

The HSE has published an extensive "Compendium of Guidance", which describes in detail the controls required and the relevant laboratory standards. This is available from the HSE website. The control measures shown in 10.5 above also apply to work with genetically modified material.

10.6.2 Biological Sensitising Agents

A number of biological materials are powerful sensitising agents the commonest being

- urine and dander from laboratory animals – for more detail see 10.5 below
- dust from locusts and flour,
- grain and hay associated with handling, milling and malting grain and baking.
- Natural rubber latex – see Section 8.4 for information.

Other biological substances known to cause respiratory sensitisation include antibiotics, proteolytic enzymes, dusts from castor bean, green coffee bean, guar gum, soybean and tea.

Exposure can in some individuals cause rhinitis and conjunctivitis with the symptoms of hay fever, i.e. runny or stuffy nose and watery or prickly eyes. A dry cough can occasionally occur. Continued exposure to the agent after developing these symptoms can lead to asthma— periodic attacks of wheezing, chest tightness and breathlessness resulting from constriction of the airways.

The symptoms are substance specific and may occur after a latent period of months or years. Removal from exposure to the agent alleviates the symptoms but the sensitisation is permanent.

Ways to minimise exposure

The aforementioned COSHH regulations require that, as far as reasonably practicable, exposure is either prevented or kept to a minimum. The best way to achieve this level of control is to enclose the process in some way with the addition of local exhaust ventilation, such as a fume cupboard or powder booth. In animal facilities a degree of control is also afforded by having a very high standard of ventilation in areas where allergens may be present. However it is usually necessary to supplement these measures by wearing some form of respiratory protective equipment [RPE], such as a facemask, in addition to protective clothing and gloves. If the local risk assessment requires that RPE be worn to protect against exposure the

individual should be consulted and involved in its choice and be face fit tested and trained in how to attain the best fit so that it provides maximum protection. It is then incumbent upon the individual to make sure that he/she wears is correctly and reports any defects. Further information on RPE can be found via the Safety Office website.

Additional information and help with the selection of RPE can be found at the Healthy Working Lives website.

Health Surveillance

Work with biological sensitising agents may require that the individuals exposed be subjected to health surveillance by Occupational Health. University guidance summarises the health surveillance currently provided by OH.

Should an individual experience any of the symptoms outlined above they must immediately report this to their supervisor or manager who will arrange for them to attend the OHU.

10.6.3 Mammals and Higher Vertebrate Animals

Animals in the University are kept in areas licensed by the Home Office and to which authorised persons only have access.

All persons working with laboratory animals, with the exception of undergraduate students involved in work of less than 6 weeks duration, will be subject to health surveillance by Occupational Health. Other staff who need to routinely enter animal houses, e.g. maintenance and cleaning, will also be subject to this. Health surveillance will comprise both pre-employment screening and periodic surveillance. Initial screening, with follow-ups at six weeks and twelve weeks and will be carried out by Occupational Health. Periodic screening will entail an annual check-up by Occupational Health, spirometry and the completion of a confidential questionnaire which will be included into the person's health record. Permission to work with laboratory animals will be refused or withdrawn in the event of the person's non-compliance with this policy. Safety Office Guidance describes the health surveillance arrangements and includes at Appendix 3 a summary of the condition known as "allergy to laboratory animals". (All new workers should be made aware of this condition).

In addition to the risk of sensitisation [10.6.2], a further risk which should be considered is that of zoonoses, i.e. infections which can be transmitted from animals to humans. Examples include ringworm, orf, leptospirosis, psittacosis and brucellosis. Where possible careful stock selection or possibly treatment could remove the risk by eradicating the organism. However, this will not always be possible therefore good animal husbandry, personal hygiene and the use of protective clothing will be needed. The correct

disposal of waste and disinfection of contaminated areas is needed. In many cases health surveillance can be provided to detect early signs and apply treatment. The Occupational Health Unit should be consulted. Further information is also contained in the HSE publication "The Occupational Zoonoses" ISBN 0-11-886397-5.

10.6.4 Lower Vertebrate and Invertebrate Animals

There are certain hazards (e.g. venoms, allergies, etc.) associated with some lower vertebrate and invertebrate animals which must be treated as individual cases. The scales and frass produced by certain insects (e.g.locusts and crickets) is a particularly powerful respiratory sensitiser and the health surveillance requirements described in the preceding section apply. When the introduction of such animals into laboratories is expected the School Safety Officer must be notified in advance.

10.7 Ancillary Equipment

Care must always be taken to avoid contaminating any equipment, and to ensure that the operation of the equipment does not in itself spread contamination. (This is particularly important in the case of centrifuges). The procedure for decontaminating contaminated equipment must be stipulated in the relevant protocol.

Where equipment requires service or repair it must as far as is reasonably practicable be rendered safe by an appropriate means and a safe conditions certificate attached.

Autoclaves are designed to sterilise at high temperatures. Therefore periodic checks must be carried out to ensure that the design temperature is actually reached. Additional operational checks are also required see section 7.15 of his handbook

Microwave ovens are being used increasingly for microbiological purposes. Working procedures must always ensure that there is no risk of explosion.

Incubating water baths at operating temperatures of 200C to 45^0C can be a source of legionella infection, particularly if fitted with a paddle stirrer which could produce an aerosol. Advice on how to minimise this risk is contained in Safety Office Guidance.

10.8 Transport of biological material -

Details on the safe transport of biological materials and genetically modified organisms is available on the Safety Office website in the University Code of Practice for the Transport of Dangerous Goods. The University has engaged the services of a Dangerous Goods Safety Adviser to provide advice on the correct means of transporting biological materials and other hazardous substances. For further details contact the Safety Office.

Section 11: Precautions in use of Electricity

The fundamental hazard is of electrocution. 25 volts can be fatal under certain circumstances. The voltage normally available at socket outlets and lighting points is 230 volts. Voltage on 3-phase equipment such as electric motors etc. is 415 volts. Electrical shock can be caused by bodily contact between two conductors or between a conductor and earth. Electrical shock and high frequency burns can be sustained from equipment such as oscilloscopes and T.V. apparatus.

All precautions must be aimed at reducing the risk of contact with unprotected conductors of electricity at potentially hazardous voltages. The principle is to ensure that electrical equipment and wiring is safe by design, and remains safe throughout its use.

All work with electricity must conform to the Electricity at Work Regulations 1989, which are based on this principle. The University's Code of Practice for Electrical Safety provides guidance on implementing these Regulations and on safe working practices in general).
Part A deals with the safe use, maintenance, inspection and testing of commercial electrical equipment.
Part B deals with electrical equipment and test rigs designed and/or constructed within the University.
Part C deals with live working situations.

The introduction and Part A will be of universal application to Schools and Departments etc, whereas Parts B or C will be relevant to a very limited range of sections.

11.1 General Precautions

Under no circumstances must electrical installations be interfered with. The fixed electrical installation of the buildings is the responsibility of the Chief Engineer within the Estate Office. The fixed installation includes wiring up to and including the socket outlet, or the isolator in the case of more permanently installed pieces of equipment. No one may work on the fixed installation without permission from the Chief Engineer. Schools and sections are responsible for wiring installations and equipment from the socket or isolator outwards.

An inventory of electrical equipment is kept by Schools and Departments etc to enable necessary examinations and tests to be made. All equipment, including second hand equipment, which is new to the location, should be entered on the inventory and checked in accordance with the Code of Practice. Should equipment be mothballed and taken off the inspection and testing programme then it should be clearly labelled "Not to be used until inspected and/or tested" and disabled for use, for example by removal of the plug.

People using electrical equipment, as with all work equipment, should report any defects that they note so that remedial action may be taken. Defective equipment should be labelled as faulty and its associated plug removed if it is not repaired immediately. The range of checks which users should be able to carry out as a routine part of their work includes:

- damage (apart from light scuffing) to the insulating sheath around the cable;
- damage to the plug;
- joints in the cable other than by way of proprietary cable connectors;
- the ineffective securing of the outer insulation sheath of the cable where it enters the plug or the equipment, e.g. the coloured insulation of the internal cable cores was showing;
- damage to the external casing of the equipment;
- evidence of overheating, e.g. burn marks or discoloration to plugs, cables, or casings;
- evidence of inappropriate use, e.g. it is wet or excessively contaminated with chemicals, oil or dirt etc.

Any loose connections, for example loose screws in plugs and switches, must be reported for remedial action to be taken.

11.2 Flexible Cables

Ensure that flexible cables are of the correct size for the load to be carried and sheathed with rubber or PVC to withstand mechanical damage.

Flexible cables should be examined frequently to ensure that earth continuity is maintained and that no damage has occurred. Frayed or un-anchored cables or plugs must be reported immediately for remedial action to be taken.

The use of flexible cables of excessive length is to be avoided. Extension cables should be used with great care and must not be joined except by the use of proper plugs and sockets.

The use of multiple cables from one plug should be avoided. Approved 2, 3 or 4 way multiple sockets are available, but care should be taken not to exceed 3kW total load. Multiple socket boards are available with a mains neon indicator lamp, and consideration should be given to using an RCCD plug with such socket assemblies. Trailing cables can constitute a tripping hazard. Wherever practicable, there should be sufficient socket outlets to allow for the use of flexible cables of minimum length. Flexible cables must not be used for voltages above 240 or a loading greater than 3 kilowatts.

Twin core cables, such as bell wire and twisted flex must not be used on 230 volts.

11.3 Portable Appliances

These should be used with great care and particular attention paid to the condition of the flexible cable and its termination at the equipment and at the plug. It is recommended that low voltage or double insulated equipment should be used wherever possible and all new portable hand tools should be of this type. It is preferable that low voltage equipment should be of the cordless type, which does not need a transformer. If a 110 volt transformer is used it should be centre tapped to earth. (See HSE Guidance Note GS 27). It is a requirement of the Electricity at Work Regulations that all electrical equipment is maintained to avoid dangerous situations arising. Part A of the Universities Code of Practice for Electrical Safety describes the arrangements for formal inspection, and testing where necessary, of portable electrical appliances.

This applies equally to all privately owned mains-operated electrical equipment brought into the University. Such equipment must be approved by the School, Department or Hall and arrangements made for its regular testing.

11.4 Fuses

The smallest fuse compatible for the apparatus should be used in order to protect the equipment and flexible cable and to reduce the fire hazard. It is important that only proper cartridge fuses are used for replacement and in no case should any substitutes be employed. Before replacing a fuse, the reason for the fuse blowing should be ascertained and the cause remedied. Under no circumstances must an attempt be made to replace a fuse in a main fuse board.

11.5 Fire Hazard

The amount of electrical energy available from a socket outlet is more than sufficient to cause a fire if the equipment is misused or wrongly connected. It is recommended that plugs be removed from sockets when apparatus is

not in use in order to reduce the hazard from live flexible cables. Use dry powder or Carbon Dioxide extinguishers only on electrical fires and isolate the source of supply if possible.

Particular care should be taken when working near wet batteries during or shortly after charging. The hydrogen produced during charging could be ignited by an open flame or an electrical spark, for example a conductive tool short-circuiting across the terminals. Non-conductive or insulated tools should be used when working with wet batteries.

If in doubt about any electrical apparatus advice can be obtained from the Senior Engineer within the Estate Office.

11.6 Radiation Hazards from Certain High Voltage Electrical Equipment

In equipment incorporating electronic tubes operating at potentials above 5000 volts e.g. cathode ray tubes, electron microscopes, there is a risk that X-rays may be emitted. Work with such equipment may therefore be carried out only with the knowledge and approval of Director of Health and Safety (see "Precautions with Sources of Ionising Radiation").

Section 12: Precautions for Working with Non-Ionising Radiation

Non ionising radiation is electromagnetic radiation covering the range of wavelengths from 100nm [Ultra Violet] to > 1000km [Electromagnetic fields EMF].

The types of non-ionising radiation are:

Ultraviolet [UV]	]	
Visible Light	]	Optical radiation
Infrared [IR]	]	
Laser	]	

Electric & Magnetic fields [EF/EMF]
Radiowaves [includes microwaves]

The highest energy is emitted by UV with EMF being at the lower energy end of the spectrum.

12.1 Optical radiation

The tissues of the body affected by optical irradiation are the skin and eyes. The biological effects are as follows

Skin	Eyes
Sunburn [UV] Ageing [UV] Cancers [UV] Burns [Visible & IR]	Pain, light sensitivity, tearing [UV] Cataract [UV & IR] Burns and retinal damage [Vis, IR]

12.1.1 UV radiation (UVR) [100nm to 400nm]

Typical sources of UV within the University are:

- Sun [outdoor workers, field trips]
- Electric arc welding
- Mercury, metal halide and high-energy discharge lamps [e.g. curing, drying, printing processes
- Certain laboratory equipment [spectrophotometers, transilluminators etc.]

a) Sun

People working outdoors for prolonged periods, are likely to be exposed to UVR from the sun, even on cloudy days. Those travelling aboard on field trips and other University business are also at risk of exposure.

A combination of the following precautions should be taken.

- Use of shade structures and awnings made from material offering sufficient protection.
- Planning and timetabling for outdoor work to minimise exposure to direct sunlight during periods of greatest intensity and to limit the total duration of exposure.
- Use of UVR protective clothing [loose with close weave]
- Wear wide brimmed hat.
- Use protective eyewear with side protection
- Where sun cannot be adequately protected by clothing, some people may choose to apply sunblock or high SPF suncream. Apply generously 15 minutes in advance of exposure and repeat application frequently

b) Electric arc welding involves intense forms of UVR. Staff involved in this work must have received appropriate training. The following precautions must be taken:

Work-piece and work area must be shielded and enclosed as much as possible
Restrict access to area where possible and prevent inadvertent exposure.
Both eyes and skin must be protected using appropriate visors and clothing.
Protect others that have to be in the area.

c) Laboratory equipment. Laboratory UVR sources such as transilluminators and gel documentation equipment usually emit UVR in the region of 280nm to 400nm. Detailed information and guidance on their safe use can be found on the Safety Office website. Eye and skin protection is required.

12.1.2 Infra-red radiation [IRR]

Intense IRR sources can result in skin burns or a risk of cataracts developing. The hazard is associated with furnace work and powerful heating and drying processes using IRR. Glass or metal doors with interlocks and warning notices are recommended.

12.1.3 Lasers

The use of lasers in the University is subject to the University Code of Practice for Laser Safety. This is published on the Safety Office website. The following summarises many of the key aspects of this. Lasers embedded in office equipment such as printers, CD-ROM drives and class 1 or 2 laser

pointers are not considered to be hazardous are not subject to these controls.

Work with laser systems may only be undertaken after assessment of the hazards associated with it and providing that suitable facilities, local procedures and organisational arrangements are in place. Users must be trained and competent and be adequately supervised.

Most types of laser operating in the visible and near infrared regions are sufficiently intense as to represent a hazard to the eye. Although damage may be caused to all parts of the eyes, the most vulnerable part is the retina, on which the beam may be focussed by the eye lens resulting in the destruction of tissues and the creation of permanent blind spots. High power lasers can also damage the skin.

It is important to establish whether the laser used produces a beam in the visible part of the EM spectrum or not. In the case of the latter, personnel may be unaware that they have been exposed to laser radiation unless clear warning is given that the laser is operating.

Laser hazard is identified by classification of the laser (1 to 4, with 3 and 4 posing greater hazard). The class of each laser must be marked clearly by the supplier. Lasers falling into class 3 (either 3R, the lower hazard subdivision of this class, or 3B, the higher hazard subdivision), or class4 must be registered with the Safety Office. Laser registrations must be accompanied by a risk assessment and a Laser Survey Form.

Users of class 3 or 4 lasers must also be registered with the Safety Office. Users of class 3B and 4 lasers must attend for an eye examination at Occupational Health. In the event of a suspected eye exposure to such a laser the user must notify their supervisor or School Laser Supervisor and a further examination will be arranged.

Safety measures usually concentrate on making the beam path inaccessible, thus preventing exposure. In many applications (i.e. particle sizing, interferometry and Raman spectrometry) the laser will be enclosed. Where research applications with unenclosed high power beams are involved, a mixture of engineering controls, administrative procedures and personal protection will be needed.

Lasers should be operated with as high a background level of illumination as possible to ensure that the pupil of the eye is small and in some cases it may be advisable to wear protective goggles. The goggles to be worn should be appropriate to the wavelength of the laser beam being used.

Care should be taken to check the paths of all possible reflections and if necessary non-flammable opaque screens should be used to protect personnel.

There is a University Laser Safety Officer and Schools using Lasers have appointed School Laser Supervisors. The University Laser Safety Officer can be contacted via the Safety Office.

A video entitled "Laser Safety in Higher Education" is available from the Safety Office and describes the hazards and controls in detail. All users of class 3 and 4 lasers should attend the introductory session on laser safety as part of their laser training programme. All users should receive appropriate local training in the systems that they will be using.

Warning notices should be displayed where Lasers are in use. A laser beam should never be looked along directly.

Laser hazard label:
Symbol and border in black - Background yellow

12.2 Electric and magnetic fields.
Electric and magnetic fields arise from the generation, transmission, distribution and use of electricity and in broadcasting and telecommunications, radar, induction and dialectic heating

12.2.1 Electric fields are produced as the voltage forces electricity along a wire. The higher the voltage the stronger the field produced. Electric fields around a wire only cease to exist when the appliance is unplugged or switched off at the socket. They will still exist however around the cabling within the wall or infrastructure.

The direct effects on the body include perception effects such as tingling skin, small harmless shocks and induced currents in the body that may cause adverse effect.

12.2.2 Magnetic fields are created when an electric current flows, the greater the current the stronger the magnetic field. Certain items of equipment [NMR machines & MRI scanners] used within the University intentionally produce very strong magnetic fields. These may induce much larger currents in the body than electric fields and can interfere with the functions of the nervous system and light flashes may be noticed in the eye.

At frequencies in excess of 10MHz heating effects can occur and in excess of 100MHz these can lead to adverse health effects.

There are a number of indirect effects that can occur including
- Movement (potentially violent) of ferrous metal objects in the field
- Spark discharge
- Heating and interference with pacemakers, metallic implants etc.

The door to any room containing a powerful magnetic source should have a warning sign indicating the hazard and access should be restricted whilst the magnet is in operation.

12.3 Radiowaves

12.3.1 Radio waves are made up of both electric and magnetic fields and are the basis for telecommunication and broadcasting systems. Antennas radiate or receive radio signals. Those that irradiate can do so in all directions for broadcasts or in narrow beams for point to point communications.

The strength of field is dependent on:
- The total radiated power [the higher the power the stronger the field]
- Radiation pattern [narrow beams contain stronger fields]
- Distance from the antenna – as distance increases field strength decreases

Health Effects
The only established health effects of the body absorbing radio waves are due to partial or whole body heating which could cause tissue damage or heat stress. This occurs at frequencies above 10 MHz, with the depth of penetration decreasing with increasing frequency. At lower frequencies currents could be induce which can interfere with function of nervous system.

Metal objects near high-powered transmitters can cause burns if touched.

The current evidence for an association between exposure to electromagnetic fields and cancer is weak and no biological mechanisms have been established for such an effect. It would however be prudent to minimise exposure to the lowest practicable level whilst working with or near sources of radiowaves.

12.3.2 Mobile Phones. These convert sound into radio waves for transmission or reception. Handsets are used close to the body and the

head of the user will absorb some of the waves. There is no evidence that this has detrimental effect but applying precautionary principles and limiting use is advised. The use of hand-held mobile phones whilst driving is prohibited (See Section 6.14)

12.3.3 Microwaves are radio waves and are emitted by certain types of equipment such as open-ended wave-guides and microwave ovens.

Care must be taken when using open-ended wave-guides. Burning of the skin may occur if any part of the body is placed in the path of the beam. The eyes are particularly vulnerable and in no circumstances should one look down an open-ended wave-guide when the source of microwave power is switched on. Some microwave generating equipment may also produce X-rays.

Microwave ovens are designed to ensure that all microwave radiation is contained within the working volume. However, if damage occurs there is a possible risk to operating personnel. It is therefore necessary to arrange for periodic measurements of the radiation levels outside the oven. The Engineering Faculty Workshop has the facilities to carry out these tests and is prepared to do so on request.

Microwave ovens are also widely used in laboratories. Specific guidance on their safe use is available on the Safety Office website.

Further information on the occupational exposure levels associated with the use of sources of optical and electric and magnetic fields available from the safety office or can be accesses on the Public Health England website.

Section 13: Precautions with Sources of Ionising Radiation

The use in the University of radioactive materials and apparatus producing ionising radiation is governed by the Ionising Radiations Regulations 1999. The acquisition and disposal of radioactive materials is regulated by the Radioactive Substances Act 1993, which is enforced by the Environment Agency. The Director of Health and Safety exercises general supervision in these matters.

The University's arrangements for managing work with sources of ionising radiation are described in Safe Working with Radiation, which is published on the Safety Office web-site.

The Safety Office must be pre-notified of any intention to commence work with radiation sources for the first time or of subsequent significant changes, for example at a new location, or with new or additional sources, or for a new application using existing sources. This to enable the Safety Office to ensure that the work can be carried out in accordance with the legal requirements. Particular attention must be paid to certain types of analytical equipment which, although not involving deliberate work with radioactive material, might contain a radioactive source as part of the detection system, for example electron capture devices found on some gas chromatograms, or calibration sources for liquid scintillation counters.

Each School working with radiation sources must:

- Appoint at least one Radiation Protection Supervisor to provide local control and advice on radiation matters. No work with ionising radiation is permitted without such an appointment.
- Develop a set of written Local Rules for safe working with radiation, and the acquisition and disposal of radioactive materials.
- Register radiation workers with the Safety Office.
- Pre-notify to the Safety Office the intention to acquire, relocate, modify, decommission or dispose of closed radioactive source or X-ray equipment.
- Pre-notify to the Safety Office the intention to work with radiochemicals.
- Prior to working with radiation sources, a risk assessment must be completed and written procedures for use produced.
- No radiation work may be carried out without the knowledge and consent of the Radiation Protection Supervisor and the Safety Office.

Every individual working with ionising radiations or radioactive substances has a duty to protect both themselves and others from any hazard arising from his work. They must inform themselves of the correct safe working procedures as outlined in the University booklet "Rules for Radiation Safety" (personal issue as part of the worker registration process) and in the Area Local Rules. Further information may be found in the notes accompanying the radiation training that is held for new radiation workers. A copy of these notes can be found at the Safety Office website.

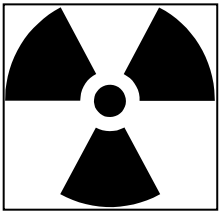
It is a legal requirement under the Radioactive Substances Act that radioactive materials may be brought into the University, and radioactive waste disposed of, only in accordance with authorisation from the Environment Agency. Hence all orders for radioactive materials must be countersigned by the School Radiation Protection Supervisor. Radiochemical orders, stocks and disposals must be recorded on Isostock at the time that the transaction is made. Regular recorded checks (usually at least monthly) are made of both radiochemical stocks and closed sources. Undergraduates must not attempt to dispose of any radioactive waste.

There are also strict controls on the movement or transport of radioactive materials between different premises. These controls include requirements on the packaging and labelling to be used, documentation to accompany the package and duties on the driver of the vehicle. Radioactive materials cannot be sent through the post or carried on public transport. There are couriers who specialise in this. Advice must be sought from the Safety Office if work of this nature is being considered, e.g. collaborative work with other organisations or between different campuses. Information is also available on the Safety Office website.

Uranium and thorium holdings are subject to additional controls – see section 9.14

Access to laboratories where the Trefoil Radiation symbol is posted on the door is strictly limited to authorised personnel.

Black Trefoil on yellow background



For Further Advice Contact:
The Safety Office - tel. 13401 or the School Radiation Protection Supervisor.

Section 14: Sources of Health and Safety Information

The key source of University-related safety guidance is the Policy and Guidance section on the Safety Office website. In addition, the Safety Office holds original copies of key publications that are of significant use in the University, for example HSE documents relating to legislation, statutory "Approved Codes of Practice" and guidance on the application of legal standards. The Safety Office also subscribes to an on-line source for health and safety information.

The key source of national safety guidance, including health and safety legislation, is the Health and Safety Executive (HSE) website.

Academic areas of the university can access British Standards via the elibrary gateway service provided by Information Services.

Section 15: School Safety Officers

All Schools and Departments have one or more Safety Officers who are appointed by the Head of School, Department or equivalent, and notified to the Safety Office.

The name(s) of the Safety Officer(s) in any area should be publicised through normal School/Departmental arrangements and listed within the local safety policy. A list of all School Safety Officers is maintained on the Safety Office Workspace.

If you are unable to access this list or require further information to identify the appropriate person for your area please contact the Safety Office by emailing bb-safety-office@exmail.nottingham.ac.uk.