



SCHOOL OF PHYSICS SAFETY HANDBOOK

EMERGENCY TELEPHONE NUMBERS

	<u>Telephone</u>	
Fire, Police, Ambulance	999	or (0117 33) 112233
Emergency (24 hrs)	(0117 33)	112233
Safety Office	(0117 92)	88780
School Technical Manager	(0117 92)	88741
School Safety Manager	(0117 92)	88940
School Safety Advisor	(0117 92)	88702
Porter's Lodge	(0117 92)	87463
<u>First Aiders:</u>	<u>Room</u>	<u>Telephone</u>
Dave Linnett	1.40	88728
Gemma Winter	2.14	18101
Barb Perks	3.19	88712
Ben Maughan	4.19	16822
Jonas Rademacker	4.50	17904
Adrian Crimp	Workshop	11818

Current list of first aiders available at <http://www.phy.bris.ac.uk/safety/index.html>

If you call an emergency service during working hours, ring the Porters (87463) so that emergency personnel can be directed to the appropriate area.

July 2011

This page is intentionally blank.

SCHOOL OF PHYSICS HEALTH AND SAFETY POLICY STATEMENT

- 1 The School of Physics abides by the general University of Bristol Safety Policy Statement as approved by the University Council.
- 2 The School of Physics considers that high standards of health and safety are integral to the effective management of the School.
- 3 The School of Physics views compliance with legal requirements as the minimum acceptable health and safety standard and will endeavour to improve upon those standards where possible within the constraints of available financial resources.
- 4 The School of Physics is committed to planning, review and development of health and safety arrangements in order to achieve a continual improvement in performance.
- 5 The Head of School will ensure that appropriate personnel are appointed to assist in the formation, implementation and development of safety policy and its management.
- 6 Health and safety training for all staff, students and those with specific health and safety duties, will be given the same priority as other essential training required for the smooth and safe running of the School.
- 7 All staff, students and others working in the School are expected to co-operate on health and safety within the School and must:
 - comply with appropriate legal requirements and University requirements as laid down in the University Codes of Practice;
 - take reasonable care for their own health and safety and that of others who may be affected by their activities;
 - inform their immediate superior or the School Safety Manager of any situations that, within the limits of their competence, they consider could give rise to serious or imminent danger or are shortcomings in safety arrangements;
 - comply with the School Policy for “Children on School Premises” at Appendix 3.
- 8 More details on the implementation of this Policy are contained in the School Safety Handbook which is revised annually. Further information on health and safety will be communicated to people working in the School through the regular safety inspections, staff meetings, mail and e-mail as appropriate.

Signed: Nick Brook

Professor Nick Brook
Head of School

Date: 20.07.2011

This page is intentionally blank.

SAFETY DUTIES AND ARRANGEMENTS

All persons are responsible for complying with the applicable provisions of health and safety regulations, adhere to all University or School safety policies and procedures and comply with safety instructions issued by representatives of the University or School of Physics.

The following arrangements are in place:

Head of School

The Head of School (HoS) has the ultimate responsibility for all aspects of health and safety within the Physics Laboratory. Responsibility for health and safety matters is devolved to **about ten** members of the academic staff ("Responsible Academics") who are responsible for different areas. Within each area, responsibility is further devolved to the academic staff in their roles as research advisors (to postgraduate students), as research supervisors (to undergraduate students carrying out research projects), as undergraduate teaching laboratory organisers and academic demonstrators (for students in the teaching laboratories), and via technical and administrative supervisors (for staff in their workshops, stores or offices and jointly with the responsible academic for technicians working in laboratories). The hierarchy is illustrated on page 8 of this document.

School Safety Manager

The School Safety Manager (SSM) manages health and safety on behalf of the Head of School. The SSM provides guidance, information and appropriate technical assistance across the School to ensure safe working practices and compliance with relevant safety legislation and codes of practice.

School Technical Manager

The School Technical Manager (TM) manages all aspects of technical work within the building and has a watching brief on all safety matters. The TM provides additional guidance on safety matters, sits on the school safety steering group and committee and is able to stand in for the SSM if necessary.

School Safety Advisor

The School Safety Advisor (SSA) advises and helps on all matters concerning health, safety and safe working practices and liaises with the SSM to ensure compliance with relevant safety legislation.

A detailed statement of the duties of the School Safety Advisor is laid down in the University Health and Safety Organisation Code of Practice at <http://www.bristol.ac.uk/safety/policy/responsibilities/advisors/>

In the absence of the SSM, the SSA will assume the duties and responsibilities of that role.

Responsible Academic

A Responsible Academic (RA) is a member of the academic staff (typically a Head of Group) who is appointed by and answerable to the HoS, and is responsible for all aspects of health and safety within a defined area of the School. The area will include laboratories and offices, with the exception of nominated School offices, and the working practices of people within it. Duties will include:

- (i) consulting with relevant employees on all matters relating to health and safety, and bringing to the attention of the SSM or HoS any matter that they are unable to deal with;
- (ii) ensuring that safety and health factors are fully taken into account when organising systems of work within the Area;
- (iii) ensuring that anyone working with the Area understands the University health and safety policy and any associated local rules relating to their work;
- (iv) responding to advice or instruction from the HoS or SSM on all matters relating to health and safety within the Area within a given time-scale.

The Responsible Academic may suggest to the HoS an Area Safety Manager to take on the day-to-day management of safety issues within the Area.

Area Safety Manager

An Area Safety Manager (ASM) may be appointed by the HoS (with advice from SSM, SSA and RA) in absence of which the RA takes on the duties of ASM. If appointed, the ASM will be answerable to the relevant RA. It is the general duty of the ASM to manage health and safety issues including compliance with University and associated local rules within the Area. Any safety matters unable to be dealt with by the ASM, in consultation with the specialist advisors listed in Appendix 6, should be brought immediately to the attention of the RA, and if necessary to the SSM and HoS.

Duties within the area will include:-

- ensuring that all the required health and safety advice documentation is in place and up-to-date, including, but not limited to, risk-assessments, local systems of work, call-out name lists, access control notices and laboratory hazard plans;
- ensuring that all inspection documents and safety information requested by the RA, SSM, SSA or HoS are returned by given deadlines;
- ensuring that procedures recommended in risk-assessments and systems of work are followed, including, but not limited to, the provision and use of suitable personal protection equipment, separation and labelling of food and chemical fridges, disposal of chemicals, laboratory clearance, use of buddy system for out-of-hours working, compliance with PAT testing;
- ensuring that accidents and incidents are reported, on the appropriate forms, to the SSM; see <http://www.bris.ac.uk/Depts/Safety/AccidentReporting.shtml>
- arranging Local Safety Induction for workers within the Area including in particular new members of staff, research or project students;
- bringing to the attention of the RA or SSM any safety concerns specifically within the Area, but also more generally within the building, for example First Aid coverage, fire exit routes, ineffective fire doors, trip hazards, and most importantly any persistent disregard of safety matters must be reported;
- identifying safety training needs of groups and informing the SSM.
- assisting in the routine inspections of all Areas from time to time.

School Radiation Protection Supervisor

The School Radiation Protection Supervisor oversees the day-to-day compliance with the appropriate Regulations, Codes of Practice and local rules relevant to the use of ionising radiation within the School of Physics.

A detailed statement of the possible duties of the School Radiation Protection Supervisor is laid down in the University Guide to Health and Organisation (2008):

<http://www.bristol.ac.uk/safety/policy/organisation/safetyorganisation.doc>

Employees , Postgraduate Students and Postdoctoral Researchers

Employees of the University of Bristol, members of the School of Physics whether academic, technical, professional or other staff have responsibilities to:

- Take reasonable care while at work for his or her own health and safety and for that of persons who may be affected by his or her acts or omissions;
- Co-operate with the employer on safety matters in order to enable the employer to fulfil its legal duties;
- Not misuse or damage safety equipment provided by the employer.

Each employee is responsible for complying with the applicable provisions of Health and Safety Regulations and must also adhere to all University or School of Physics safety policies and procedures and comply with safety instructions issued by their individual supervisors.

Undergraduate Students and Visitors

Undergraduate students and visitors are expected to maintain the same standards:

- To take reasonable care while in the School of Physics for his or her own health and safety and for that of persons who may be affected by his or her acts or omissions;
- Not to misuse or damage safety equipment provided by the University or School of Physics.

Each such person is responsible for complying with the applicable health and safety law and must also adhere to all University or School safety policies and procedures and comply with safety instructions issued by representatives of the University or School of Physics.

Senior Management Group & Executive Committee

The Senior Management Group assists the Head of School in the day to day leadership and management of the School. The executive committee advises and assists the Head of School and Senior Management Group in the running of the School

School Safety Committee

This meets termly to discuss and make recommendations on safety matters in Physics. This Committee is chaired by the School Safety Advisor and includes the School Safety Manager, Safety Representatives appointed by the Trade Unions (e.g. UNITE, AUT and UNISON), the School Radiation Protection Supervisor, the School Laser Safety Officer, the School Technical Manager, Area Safety Managers, an advisor on chemical safety, a postgraduate student, a post-doctoral representative and a representative from the University Health and Safety Office. Decisions of this Committee are relayed to the Head of School via its minutes and to staff via staff meetings, email, etc. as appropriate.

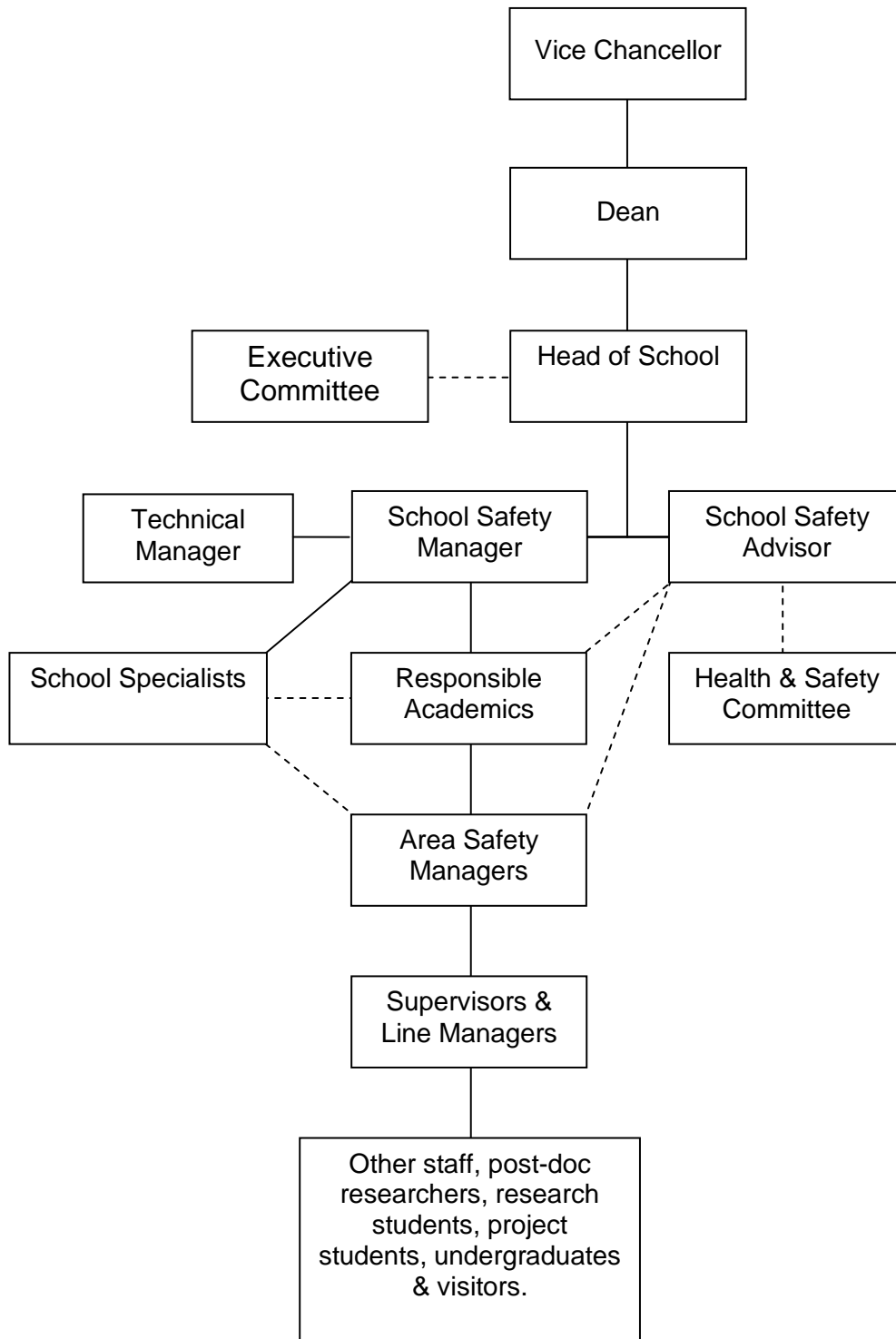
Area Safety Committee

Once a year the School Safety Committee meeting is preceded by an area safety committee meeting which includes representatives from all the users of the building (NSQI, IAC, Library, HPC, Estates services).

Safety Steering Group

More immediate safety matters are dealt with by a smaller group (SSM, SSA , Technical Manager and DRPS). This group meets on an *ad hoc* basis and at least every two months. It reports matters to Head of School/Executive Committee as appropriate. Any safety concerns beyond the remit of an RA should be brought to the attention of the SSM immediately.

Health and Safety Responsibility and Reporting



LABORATORY PRECAUTIONS

INTRODUCTION

This code is issued for the information and guidance of all those working in laboratories and workshops in the School. It is not intended as a substitute for the University of Bristol Safety Codes of Practice which are published on the Health and Safety Office web pages at <http://www.bristol.ac.uk/safety/policy/cop/> rather, it picks out for emphasis some matters especially important in the School of Physics.

The main sources of general risk in the School can be evaluated under the following headings:

1. Electrical
2. Fire
3. Chemicals
4. Explosion

All are covered in general terms in the University Codes of Practice, often in much more detail than in this short handbook: see <http://www.bris.ac.uk/Depts/Safety/Policy.shtml> .

There are also more specific hazards associated with the use of:

5. Radioactive materials
6. X-ray generators
7. Lasers

and the University Codes of Practice outline the administrative procedures which must be followed before using materials or equipment in these categories.

Finally, Section 8 covers some general precautions, but it should be remembered that this cannot be an exhaustive list.

Training Courses

The School of Physics offers a number of safety training courses for staff and students. All persons working in the school must attend the general fire and safety induction briefing at least once every two years. Additional courses are provided for specific purposes and it is a requirement that persons carrying out these activities have attended the relevant course within the past three years. Currently available safety training courses include: Abrasive Wheel Mounting and Dressing; Bench Grinder (G35 Workshop); Biologicals and Biohazards; Chemicals / COSHH; Cryogenic Fluids; Electrical; Face Fit Testing; Fire Safety, Fire Warden; Fume cupboards; Gas Handling; Health and Safety Induction; Hot works (Gas soldering; brazing; welding); Hydrofluoric Acid; Ladders and Working at Height; Lasers; Lathe (G35 workshop); Manual Handling; Milling Machine (G35 Workshop); Pillar Drills; Portable Appliance Testing (PAT); Radioactive Sources; Radiochemicals and Sealed Sources; Risk Assessment; X-rays. Other courses are available through the University Safety Office. It is your responsibility to ensure that you attend all necessary training courses, if in doubt please consult the SSM.

1. ELECTRICAL

General

All electrical apparatus should be properly connected. For single-phase 230 volt connections use the standard 13-amp plug, correctly fused according to the load, with a supply cable of adequate capacity, and ensure that the cable is correctly clamped to the plug: see University Electrical Safety Code of Practice at

<https://www.bris.ac.uk/safety/policy/cop/electricalsafetycop.doc>

Mains wiring on apparatus must be adequately secured and mains terminals must be shielded to prevent accidental contact. Make sure that the mains cables are firmly clamped over the outer insulation sleeve. Make sure that wiring is in good condition; replace damaged or frayed wiring immediately. Do not leave mains wiring trailing over the floor, and take care not to overload mains spreaders. Mains plugs and sockets must not be used for anything other than mains circuits.

Where there are insufficient sockets available it is permissible to use an extension block; users must ensure that the total loading on a single block does not exceed its permitted capacity. It is not permitted to connect extension blocks to one another or to extension leads; they must be plugged directly into a 13 amp socket.

All external connections carrying more than 50 volts between pins or with respect to ground must use connectors which prevent accidental contact. Banana plugs and binding post connectors are not permitted. Barrier strips must be covered.

Three-phase electrical installation and maintenance is undertaken by the Estates School, organised through Physics' Technical Manager.

Electric shocks

Electric shocks can be fatal, even for voltages of 50 V, with most of the resistance of the body is in the skin, so do not handle electrical apparatus with wet or even damp hands. Apparatus out of use should be left safe; it is therefore good practice to switch off at the wall sockets at the end of the day and to take out the mains plugs. Know where the mains switches are in your laboratory and learn the elements of treatment for electric shock. Prompt action can save a life.

Earthing

All experimental apparatus and frames must be securely earthed: where high voltages are used this earthing should be accompanied by a separate braided earth connection. Where the earthing has been made by local modification testing must be carried out to ensure that the resistance of the earth path is appropriate (See University Electrical Safety Code of Practice).

Circuit modification

Before modifying circuits, switch off and disconnect from the mains. When you need to test live circuits, use properly sheathed probes. It is preferable to have secondary protection such as an isolation transformer. When working with voltages above 230 volts, ensure that there is someone else in the room who knows what you are doing.

Routine testing

It is required that all electrical equipment in the School is routinely tested for insulation resistance and earth continuity. Portable Appliance Testing (PAT) of new equipment is carried by trained technicians in the stores before the equipment is released for use. Routine regular testing is normally carried out by an external company. In cases where an item of equipment requires testing at other times suitably trained persons may carry out the testing using school equipment available from the stores. The SSM should be informed of any equipment, including new and/or personal equipment without a current School test sticker. Fixed electrical equipment (i.e. wired directly into the mains) must be tested every 2 years by a qualified electrician; currently this is done by the Estates department.

Electrical equipment that is in use should be clearly labelled indicating the date of testing and the date of the next test. Do not use equipment that is out of test, or that has failed testing. Such equipment must be clearly labelled as untested/failed and removed from service, red 'failed' labels are available from the SSM. Prior to next use such equipment must be repaired as necessary and successfully pass testing.

Manufacture of electrical/electronic equipment

Any equipment that is manufactured "in house" must be made to appropriate standards with regard to the health and safety of those using it. Reference must be made to the University Electrical Safety Code of Practice:

<https://www.bris.ac.uk/safety/policy/cop/electricalsafetycop.doc>

Flooding

Water and electricity can be very hazardous. See section 7 for advice on flood precautions.

2. FIRE

See University Fire Safety Policy at <http://www.bristol.ac.uk/safety/fire/>

Teaching

Do not forget to point out the fire exits to new laboratory and lecture classes. It is the responsibility of lecturers to ensure that students are aware of proper evacuation procedures from lecture theatres at the first meeting in a particular theatre. In the event of an alarm it is the responsibility of the lecturer (or person in charge of a laboratory class) to instruct the students to exit via the proper fire exits and to ensure that they all leave the room; once outside the building the lecturer must inform the fire marshals that the class they were responsible for has been evacuated.

General

There are obvious fire risks from naked gas flames, furnaces, soldering irons and electrical heaters: make sure that these are switched off when not in use. Laboratories should be kept tidy; old computer paper, discarded chemicals and other flammable rubbish can rapidly turn a small fire into a large one.

Smoking

Smoking in the School of Physics, and in all University buildings, is forbidden.

Flammable liquids

If you need to use flammable liquids, keep the amounts as small as possible, check the flash point and ignition point of the liquid, use fume cupboards where appropriate, and ensure there is no source of ignition in the room. Reduce as far as possible the amount of flammable solvents stored in the laboratory (normally one week's supply) and keep them in closed metal cupboards to minimize their contribution to the spread of any fire.

In case of fire

- Shout 'FIRE'.
- Raise the alarm by breaking the glass on a RED fire alarm call point.
- Call the Fire Brigade on **999** or Security on **112233**. Security officers / the Security control will call 999 on your behalf but it may save time if you call the Brigade directly if you know there is a fire, in most cases the emergency services would prefer to speak to the originator of the call rather than via a third party. If you ring 999 please ask someone else to relay the information ASAP to Security on 112233
- Do not return to your desk/work area to collect personal belongings.
- Leave the building by the nearest available fire escape route.
- Go to the assembly area and await instruction.

On hearing the fire alarm all persons not concerned with fighting / investigating the fire must evacuate the building in an orderly manner, if possible closing windows, leaving all doors closed, and using the nearest stairs.

At present neither of the lifts are suitable for evacuation and must not be used. If your normal route is blocked, use the other staircase in the building or exit via NSQI. If possible, and without endangering your safety, apparatus should be switched off, closed down, or made safe.

It is a general responsibility to ensure that any person unable to exit the laboratory unaided (e.g. anyone in a wheelchair) is assisted where necessary to get to a stairwell refuge point. Assemble outside the building either on the lawn opposite Senate House on Tyndall Avenue or in the car park to the front of Royal Fort House to the south of Physics. Ensure that exit doorways, roads and other access are left clear. Do not re-enter the building while the fire alarm is still sounding – wait until instructed to re-enter.

All persons with impaired mobility or other disability that may affect them in time of emergency or evacuation must have a Personal Emergency Evacuation Plan (PEEP) documenting how their personal requirements will be met. If you have wheelchair bound staff and students then a separate risk assessment will have to be made. The School Technical Manager can provide advice on disabled access for those who require it.

Some very minor fires can be tackled immediately, but if there is any doubt in your mind do not hesitate to raise the alarm and call the Fire Brigade. You should familiarise yourself with the location of the fire extinguishers and call points nearest to your laboratory.

Up-to-date details are found at <http://www.phy.bris.ac.uk/safety/index.html>

3. CHEMICALS

See the School of Physics chemical support pages at <http://www.phy.bris.ac.uk/chemical/>

General

The School is required under the Control of Substances Hazardous to Health (COSHH) Regulations to carry out risk assessments for the use of chemicals which are toxic, carcinogenic, harmful, irritant, corrosive, asphyxiating or explosive or are to be used in reactions which give products in these categories. Thus, if you wish to use these chemicals you must first read the appropriate assessment sheet. On these assessments you will find conditions specified not only for the chemical, but for the process it is required for, and it will be categorically laid out how to control your exposure (e.g. personal protective or extraction equipment that must be used). These should be displayed locally. For any new activity, and if you are in any doubt, you must consult the Chemical Technician, the SSA, the SSM, TM or the University Safety Office.

Toxic chemicals

In general you must prevent the inhalation of toxic vapours or dusts, prevent contact with the skin and with eyes, and the School prohibits smoking, eating and drinking in all laboratories. Do not pipette any materials by mouth. Devise and use a safe clean-up procedure, and wash thoroughly after work with toxic materials. Toxic materials should be stored securely and, like all chemicals, must be clearly labelled. The laboratory should be adequately ventilated.

Work on volatile or finely particulate toxic materials must be carried out in a fume cupboard and the Chemical Technician, the SSA, the SSM, TM or the University Safety Office should be consulted.

Corrosive chemicals

Eye or face protection should be worn for work with corrosive chemicals.

Chemical explosion

When using flammable volatile liquids (such as ether or pentane) or flammable gases (such as hydrogen) you must take all possible precautions to avoid the formation of an explosive mixture with air. Remember that as little as 1% of vapour in air can give an explosive mixture. The precautions should include adequate ventilation and the removal of all sources of ignition, including unprotected electrical equipment (including motors), which can give sparks, and the prohibition of smoking. You should be aware of the danger associated with the use of liquid oxygen and the way it supports spectacularly vigorous combustion. Remember that liquid nitrogen will condense oxygen from the air if left in an open container. Perchloric acid can give explosive reactions with many organic materials, including wood, and should be used only in a suitable fume cupboard.

Mercury

Mercury has an appreciable vapour pressure at room temperature and the vapour is toxic. Mercury diffusion pumps should be vented outside the building and it is advisable to have a cold trap in the fore-line. Care should be taken to ensure that the effects of mercury spillages are minimized by the provision of a suitable secondary container. If mercury is spilled on the floor or bench it should be cleaned up immediately, using the equipment and chemicals available from Stores. After cleaning up, the spill should be reported so that the residual vapour pressure can be checked. Regular atmospheric monitoring is advisable in areas where mercury is in common use.

Cryogenic fluids

Before using cryogenic fluids you must successfully complete the School of Physics cryogen training and quiz, conducted by the Cryogenic Manager.

You must wear suitable protective equipment when pouring or transferring cryogenic fluids. Do not travel in a lift with a container of a cryogenic fluid and you should send the lift containing the dewar to a colleague with a "no entry" notice showing. Do not carry cryogenic fluids up or down the stairs.

School cryogen guidance and emergency procedures are available from

http://www.phy.bris.ac.uk/safety/Documents/Cryogen_Guidance.pdf

Disposal of chemicals

Please refer to the School Procedures for Disposal of Waste Chemicals and Contaminated Sundries:

http://www.phy.bris.ac.uk/safety/Documents/Waste_Chemical_Disposal.pdf

4. EXPLOSION

General

If there is any risk of explosion, you must ensure that all persons are protected in the event of an accident.

When there is any possibility of an explosive reaction or of the rapid release of a large amount of stored energy you should consult the SSM, Chemical Research Technician or the University Health and Safety Officer before proceeding.

Implosion

Evacuated glass apparatus, including dewars and cathode ray tubes, can project sharp fragments at high speed if broken. Unprotected glassware of this kind should be covered with tape or cling-film: sometimes a Perspex shield may be advisable.

High pressure

Gas cylinders should be stored and used in an upright position and properly secured. They should be transported only using the correct trolley and never dragged or rolled. Always use an appropriate regulator to control the output pressure from the cylinder and make sure that the gas is turned off at the main cylinder valve when not in use. High-pressure lines should be regularly leak-tested. Compressed gas regulators and flashback arresters should be inspected annually by a competent person and replaced every five years. All compressed gas regulators should be registered with the SSM.

You should take further advice before using acetylene or hydrogen cylinders and before starting high pressure experiments. Large pressure vessels will need to be officially tested before use: see the SSM in the first instance.

Flammable gas

Gas and air is a flammable and potentially explosive mixture. Gas leaks should be reported immediately to the TM (Technical Manager). Gas fittings and pipework should only be modified by Gas Safe registered personnel, arranged through the Technical Manager. Staff and students may only connect and disconnect appliances with rubber tubes from established gas taps.

5. RADIATION SAFETY

See University Radiation Safety Policy at <https://www.bris.ac.uk/safety/uobonly/radiation>

Those proposing to use radioactive materials must first consult with the School Radiation Protection Supervisor (DRPS) for them to obtain the approval of the University Radiation Protection Advisor before starting work. The use of radioactive materials is subject to certain legal controls and University regulations as set out in the policy document.

Strict control is exercised by the University over the procurement, storage and disposal of radioactive materials, and over personal monitoring, instruction and medical supervision. Those proposing to work with external neutron facilities should first see the DRPS.

The use of X-rays in the School is regulated by the School Radiation Protection Supervisor. X-ray generators must be adequately shielded and the use of totally enclosed X-ray beams is advised. Students must have an approved scheme of work before starting work on X-ray equipment. Regular and adequate monitoring must be carried out and all workers must wear finger dosimeters. Medical supervision may be advised. New users of radiation should see the DRPS for advice on registering.

6. LASERS

The School is required to keep a register of all laser products rated class 2 and above (i.e. classes 2, 2M, 3R, 3B and 4). This excludes equipment like laser printers, CD ROMs and DVD players which may be class 1 or 2 products, but includes most He-Ne lasers and many solid state devices such as laser pointers, diode lasers. Details of new lasers (including any laser pointers) should be sent to the SSM and the School Laser Safety Officer.

Precautions that need to be observed

These vary with the class of the laser and are mostly, but not exclusively, aimed at eye protection. It should be noted that the main cause of accidents from lasers is electrocution from exposed electrical parts during repair or adjustment. Some of the main points are as follows:

Class 2 & 2M products These are the most common categories including, typically, the He-Ne lasers used in undergraduate laboratories. Power levels or beam divergence are such that the retina can be damaged by staring into the beam or by using optical viewing instruments. These lasers should have warning labels "Laser product class 2" and "Do not stare into beam". In use, the laser beam needs to be confined within the experimental area by a suitable beam stop and open beam paths at eye level should be avoided. For undergraduate experiments, in particular, we need to be sure that students follow good practice where lasers are involved and are aware of the risks when instructions are not followed. For routine experiments, as in the year 1 laboratory, these points are mostly covered by laboratory scripts, but it is important that new experimental set-ups (mainly in year 3/4 projects) are checked by the School Laser Safety Officer.

Class 3R products With higher powers (up to 5mW continuous wave) these lasers require some additional precautions over those for class 2. The main points to ensure are that all users receive some training and instruction and that laser warning signs are displayed at the entrance to areas where these lasers are operating. The warning labels on the laser might now read "Laser product class 3R" and "Do not stare into beam or view directly with optical instruments".

Class 3B and 4 products These lasers have sufficient intensities to cause eye damage both through the direct beam and specular reflections and should only be used in "Designated Laser Areas" for which a series of safety measures and a risk assessment is needed. Anyone with lasers in these categories should see the School Laser Safety Officer for copies of the relevant safety guidelines.

7. GENERAL PRECAUTIONS

Personal protective equipment

Wear appropriate footwear when working in labs or workshops, e.g. not flip flops or sandals, to protect your feet from injury (crushing, chemical or liquid nitrogen burns, etc) and to reduce the risk of slipping or tripping.

Lab coats should be worn when working with chemicals, oils, dirty equipment, biological samples, etc, to prevent contamination of clothing.

Eye protection in the form of safety glasses, goggles and visors may be appropriate in many instances and should be specified in the risk assessment. Glasses offer poor protection from chemical splashes and goggles or a visor are more appropriate.

When using gloves it is important that the correct type is selected due to potential incompatibility of glove material and chemical being used, with different materials and thicknesses providing very different breakthrough times and permeability rates.

Disposable latex gloves should be avoided due to fragility, breakthrough time and potential latex sensitisation and allergy, and should be substituted with an alternative material whenever possible, e.g. nitrile or neoprene. Disposable gloves in general are not overly robust and will offer little tangible protection to cuts and needlestick injury.

Appropriate glove type must be identified in the risk assessment, for a useful glove selection tool see <http://www.ansellpro.com/specware/index.asp>

Lifting and transporting equipment

Manual handling assessments are required for the lifting and moving of heavy loads which is a major cause of injuries and accidents. Do not attempt to lift heavy objects unaided. If you need to move heavy equipment, consult the Workshop Supervisor and use appropriate trolleys and hoists. For moving office furniture, notably filing cabinets, you should in the first instance consult the TM. Gas cylinders should only be moved using the proper cylinder trolley by trained persons and guidance is available when applying for keys to the storage cages.

Flooding

Flooding due to the failure of inadequate water connections is dangerous, causes great inconvenience to others and is easily avoidable. Water connections should be made in copper where possible or, failing this, reinforced rubber or plastic hose should be fixed securely with screw clips. It is particularly important that the return to the sink or cup should be securely clamped to the waste pipe or its surround, so as to make it impossible for the normal evening rise in water pressure to dislodge the return tube. Any connections to glass apparatus must be securely wired. Water should not be left running overnight unnecessarily. Thin-walled gas-tubing should never be used for water connections.

Machinery

All moving parts should be guarded and in particular all belt drives to machinery must be adequately enclosed. Pillar drills and milling machines should be suitably guarded. Access to machine tools in the laboratory is limited to those with appropriate training or experience. Control of access is the responsibility of those in charge of the machines.

When operating machine tools, ensure that you have no loose clothing, such as ties, that can be caught up in a rotating tool and that any long hair is safely secured out of the way - otherwise you could be scalped. Make sure that the work is securely clamped to the table in a miller or drill press; this is especially important when making large holes in sheet metal. Do not attempt to remove swarf from the machine while it is in motion. You should wear eye protection when using machine tools; goggles are available from workshops or from Stores.

The mounting, dressing and truing of grinding wheels must be carried out only by those qualified to do so.

Out-of-hours and lone working

If you enter the building outside of normal hours you must sign in and out using the sign in log in the foyer. OOH access is only granted after a fire and safety induction has been completed, these have to be updated every 2 years

All out-of-hours laboratory or workshop work must be covered by a risk assessment. Do not undertake potentially hazardous activities alone, since in the case of an accident or emergency assistance may not be readily available and you may not receive help or rescue for some considerable time. Arrangements will need to be made to conduct potentially hazardous activities either in normal working hours or with a formal arrangement for a buddy system or dual working in place.

Out of hours office based work is covered by a generic risk assessment (http://www.phy.bris.ac.uk/safety/Documents/Out_of_Hours_Office_Risk_Assessment.pdf) you must read and agree to carrying out the precautions noted in the risk assessment before you will be permitted to enter the building out of hours.

The School procedure for out-of-hours and lone working can be found at

http://www.phy.bris.ac.uk/safety/Documents/Lone_Working.pdf

It is best not to use lifts outside working hours. However, both main lifts have emergency lights and emergency telephones.

Make sure that all gas, water and electricity supplies are turned off when you leave for the day. It is especially important that any out-of-hours working is covered by a satisfactory risk assessment.

Equipment left running overnight

If you need to leave equipment running overnight, you must leave an instruction card stating who to telephone in case of an accident, and simple instructions on how to switch off. For apparatus which is **routinely** left running overnight, instruction cards should be permanently fixed in a prominent position (e.g. on the inside or outside of the door or by the equipment) and a copy provided for the TM (Room G.48). This should highlight the action needed in the event of any alarm activation, which may or may not have safety/security implications.

Biological tissues

Work on human or animal tissues may not be undertaken without clearance from the Biological and Genetic Modification Safety Committee. Project application forms and worker registration forms are required, and are available from

<http://www.bristol.ac.uk/safety/biological/>

New and expectant mothers

It is requested that when a member of staff becomes pregnant that they inform their Head of Group/Line Manager in writing so that a risk assessment can be carried out to ensure that their tasks or working environment do not present risk to the unborn child or the mother. The expectant mother may inform the SSM in the first instance if they wish to keep the information initially confidential. Once notified the appropriate group leader must ensure that a risk assessment is drawn up, necessary changes made and arrange for relevant advice on hazards to be given. Guidance notes can be found at <http://www.bristol.ac.uk/safety/health/guidance/gn05-14.pdf>

Obstructions

Never allow apparatus or furniture to obstruct corridors, passageways or access to fire fighting equipment, isolation valves or switches. Always ensure that you have adequate space for yourself and your apparatus.

Chemicals

Large bottles of chemicals must be carried in the carriers held in the Stores. All bottles containing chemicals must be clearly labelled; any unlabelled bottles found in laboratories will be disposed of, with the potential of a financial penalty on the group concerned, as disposal of unknown chemicals is very expensive. Similarly, when a project is drawing to a close, all equipment and chemicals must be made safe for disposal, and the laboratory 'signed-off' by the responsible staff, again at the risk of penalties if not carried out to his satisfaction.

Waste disposal

Rubbish bins and wastepaper baskets must not be used for the disposal of chemicals or sharp objects.

The bright yellow plastic containers to be found in most laboratories are to be used for the disposal of sharp objects such as broken glass, knife blades, hypodermic needles etc. Full details are given in the School Procedures for Sharps Bins and Sharps Disposal:

http://www.phy.bris.ac.uk/safety/Documents/Sharps_Procedures.pdf

The disposal of chemicals is explained above.

Magnetic fields

Strong magnetic fields can pose health risks, particularly to people with pacemakers fitted. If you are generating such fields consult the SSM.

Due to the strong magnetic field in G.32 people with pacemakers or other electrically operated medical implants should not use the 1920s wing ground floor corridor or 1920s basement service tunnel.

GENERAL

Finally, safe working in the laboratory is not merely a matter of following the rules given here. In addition you need to:

- (a) think about what you are doing and about what can happen when something goes wrong;
- (b) make yourself aware of hazards associated with your work;
- (c) try to plan your experiments and working practices so as to minimize the effect of any accidents; and
- (d) if you are in any doubt seek further advice - from your Supervisor, the SSM or from the University Safety Office.

EMERGENCIES, ACCIDENTS AND DANGEROUS INCIDENTS

Despite all our precautions, accidents and dangerous incidents may occur in the School. You should think carefully about what you should do when these incidents arise.

Current first aiders are listed at <http://www.phy.bris.ac.uk/safety/index.html>

Locations of first aid boxes are detailed in Appendix 9 and at http://www.phy.bris.ac.uk/safety/Documents/First_Aid_Boxes.pdf

In the case of **emergencies** telephone 999 or (0117 33) 112233 to contact fire, ambulance and police services. If you call 999 please also call the Security Office (0117 33) 112233 so that they can provide assistance.

In the case of **accidents**, ring for a first aider or if the injured person appears to need hospital treatment, first ring for an ambulance (999 or 112233) and then a first aider, and inform the Porter. Subsequently, an accident report form should be completed and passed to the SSM (available from the TM, SSM, SSA, or downloadable from http://www.phy.bris.ac.uk/safety/Documents/Adverse_Incident_Report_Form.doc)

The same form should be used to report **dangerous incidents** i.e. incidents in which no-one was injured but which had the potential to cause personal injury. These forms play an important part in our efforts to eliminate hazards in the School.

Full guidance notes on the reporting of accidents, incidents and near-misses, together with the appropriate forms can be found on the Safety Office website at <http://www.bristol.ac.uk/safety/accidents.html>

Scope

The Management of Health and Safety at Work Regulations 1999 require that suitable and sufficient risk assessments be conducted for all potentially hazardous activities in the working environment.

While many routine activities are covered by local rules it is necessary for a written risk assessment to be in place before experimental activity is started. Specific risk assessments are also needed in the following areas:

- Biologicals
- Chemicals
- Computer workstations and display screen equipment
- Lasers
- Manual Handling
- Mechanical safety
- Radiation

Format

Whenever possible the standard Physics risk assessment form should be used as this ensures a standardised approach, familiarity with the layout and completeness of information.

The assessment should include a description of the activity, the hazards likely to be encountered, the procedures and control measures to be adopted to minimise these hazards, the level of risk that the hazards pose both before and after control measures are in place, emergency procedures in case of accidents, special training required for those taking part, waste disposal procedures for waste generated, lone working arrangements and the date of the next scheduled review.

Attempts must always be made to lower the residual risk to as low as is reasonably practicable, with the risk rating being estimated using a 3 x 3 risk matrix.

The standard Physics risk assessment form is available from:

http://www.phy.bris.ac.uk/safety/Documents/Physics_Risk_Assessment.doc

Guidance notes for the completion of the risk assessment form are at:

http://www.phy.bris.ac.uk/safety/Documents/Risk_Assessment_Guidance.pdf

Signatures

Risk assessments should be signed by at least the Principal Investigator (PI) who has initiated the work, and by an additional competent person depending on circumstances:

If all risks are assessed to be **low** with all control measures in place the risk assessments only needs to be signed by the PI who has initiated the work. If for any reason the PI does not regard themselves as competent to review and sign the assessment then they should ask another competent person to review and sign the assessment to confirm that the assessment is appropriate. The competent person can be a specialist advisor, SSA, SSM, TM, colleague from another group or external to the School, for example. The PI should also

sign the assessment in this case as this indicates that they have read and understand the implications and requirements of the assessment.

Where any risks are assessed to be **medium** with all control measures in place it is necessary that both the PI and another competent person review and sign the assessment. Reasonably practicable efforts must be made to lower the residual risk to low.

Where any risks are assessed to be **high** with all control measures in place it is necessary that both the PI and another competent person review and sign the assessment, which is then referred to the Head of School and School Safety Manager for review. High risk work must not be undertaken without the formal written authorisation of the Head of School and School Safety Manager.

Availability

Risk assessments should be readily available in the lab to which they relate and may be displayed on a notice board or back of the door or, where there are a number of assessments in force, held in an easily accessible and clearly labelled ring binder. Copies of risk assessments must be forwarded to the School Safety Manager.

Review

Risk assessments should be reviewed at least annually, or sooner if the nature of the work changes or in case of failure or accident.

If changes to or failures of the assessment are identified these will need to be accounted for in an updated assessment. Changes may include, for example, working arrangements, concentrations of chemicals, the people conducting the work (experience, ability, pregnancy or other physiological changes) or the revision may come about due to new information becoming known. If the previous assessment remains unchanged the form can simply be resigned and redated by the PI without reauthoring the assessment.

Enforcement

The Head of School, SSM or University Health and Safety Office may stop any work not covered by a current suitable and sufficient risk assessment.

1. Safety Induction

All new starters are legally obliged to attend a health, safety and fire induction session and should also be provided with 'local' group safety information on the day that they start. This local information will include procedures on discovering a fire, location of fire fighting equipment and fire call points, location of first aiders and first aid boxes and any potential hazards in the work area.

The School safety induction is typically scheduled for the first week of every month, contact the SSM for more information. All new starters are to receive and sign for a copy of the School Safety Handbook. Fire and Safety inductions should be renewed / updated every 2 years

Visitors to the School should be given information that specifically relates to the areas that they will be visiting, e.g. magnetic fields, chemicals, lasers, radiation, etc, by their host. Additionally there is a visitors' safety information leaflet, available at http://www.phy.bris.ac.uk/safety/Documents/Visitors_Contractors_Info.pdf

2. Risk Assessment

A suitable and sufficient risk assessment must be completed before any work commences. This should be completed in accordance with Appendix 1, Risk Assessment.

3. Training

Local safety training will be given by the academic staff in charge of the lab. However, the following are applicable to new postdoctoral staff, postgraduate and undergraduate students:

- (i) There will be two and a half days of compulsory safety training for new postgraduate students at the beginning of October. Persons starting at other times of year will need to attend the monthly safety induction session.
See <http://www.phy.bris.ac.uk/safety/induction.html> for scheduling.
- (ii) Richard Exley runs short courses on gas handling (e.g. cylinders, regulators, hoses) and ladder use. These will normally be run in the October course but contact Richard if you need training at another time. Gas cylinders will not be issued to those who have not attended the gas handling course. Steps and ladders must not be used without ladder training.
- (iii) Radiation training must be completed by all users working with radioactive sources and x rays. Contact the DRPS to arrange.
- (iv) Laser safety training conducted by the DLSO must be attended by all users of class 3R lasers and above. It is strongly recommended that all laser users complete this training.
- (v) Cryogenic fluid training is required by all users of cryogenic fluids, this is provided by the Cryogenic Manager. Access to the Low Temperature Laboratory and to cryogenic fluids is prohibited to those persons who have not completed this training.
- (vi) Users of potentially hazardous chemicals must complete chemical safety training conducted by the School Chemical Technician.
- (vii) Note that training may need to be refreshed from time to time.

As required by Council, the School of Physics has formulated the following policy for the protection of children under the age of 16 years on its premises. This policy is to be adhered to by all students, members of staff and visitors to the School.

Policy

- 1 All rooms within the School fall into one of three categories which are clearly labelled on the room access notices:

High risk rooms indicated by red access notices; **medium risk rooms** indicated by amber access notices and **low risk areas** rooms with green access notices.

In addition for the purposes of the school policy on children on school premises the 1960's stair well above the ground floor has been defined as **medium risk**.

- 2 **Children aged 10 and under**

Children in this age range are forbidden in high and medium risk areas except the teaching laboratories where they must be closely supervised at all times. Close supervision is also required in all corridors and stair cases.. Supervision is also required in low risk areas.

- 3 **Children aged 11-16**

(a) Children in this age range are not permitted in high risk areas.

(b) For occasional and day visits (e.g. Open Days) children aged 11-16 must be closely supervised in medium risk areas. Supervision is also required in low risk areas and in corridors and staircases.

(c) For longer visits (e.g. work experience) where access to medium or high risk areas is needed, the Head of School may make ad hominem exceptions subject to appropriate control measures being put in place..

- 4 **Special arrangements**

Special arrangements may be made for school parties and other organised groups. The Head of School must be notified in advance.

- 5 **Hiring of rooms by outside groups**

Hirers must ensure that children are closely supervised at all times.

- N.B.** The supervisor is responsible for the safety and behaviour of children in his/her care. With regard to very young children in particular, this includes a duty of consideration to all staff members and other users of the building.

APPENDIX 4

DISPLAY SCREEN EQUIPMENT

Perhaps surprisingly, there are health hazards that can arise from incorrect use of Display Screen Equipment (DSE). The School is required to minimize this risk as far as reasonably possible. There are some obvious, immediate hazards and these are covered in the University code of practice <https://www.bris.ac.uk/safety/policy/cop/dsecop.doc>

If you need further DSE advice please contact the SSM.

APPENDIX 5

FURTHER INFORMATION

Much useful information can be found on the University Safety Office Web Site:

<http://www.bristol.ac.uk/safety/>

The School of Physics safety website has more detailed information on aspects of safety in the School:

<http://www.phy.bris.ac.uk/safety/index.html>

The School of Chemistry has a good site with much useful information regarding Chemical Safety:

<http://www.chm.bris.ac.uk/safety/safehome.htm>

1. School Safety Related Posts

School Technical Manager	Steve Neck
School Safety Manager	(Post Vacant)
School Safety Advisor	Peter Barham
School Laser Safety Officer	Andrei Sarua
School Radiation Protection Supervisor (X-rays, radiochemicals)	David Cussans
Local Radiation Protection Advisor for X-rays	Adrian Barnes
Radiation Badges	David Cussans
School Chemical Technician	post vacant

2. Specialist Advice

Biological tissue	Simon Golding , Biological Safety Officer in Safety Office on 88783
Chemicals, COSHH	Refer to the University Safety Office
Cryogenic Fluids	Bob Wiltshire
Electrical	Steve Nash
Explosives	Refer to the University Safety Office
Fire	Steve Neck
High Voltages	Refer to the University Safety Office
Ladder safety	Richard Exley
Lifting gear, manual handling	Richard Exley
Magnetic Fields	Tony Carrington
Office Safety, Display Screen Equipment	School Safety Manager
PAT Testing	School Safety Manager, or Peter Barham or Steve Neck,
Pregnancy	Liz Greaves, Health & Safety Advisor in Safety Office on 17704
Pressure lines, pressure vessels, compressed gas	Richard Exley
Workshop machinery	Adrian Crimp, Richard Exley

Astrophysics

Head of Group	Mark Birkinshaw
Responsible Academic	-
Area Safety Manager	Ben Maughan

Centre for Quantum Photonics

Head of Group	Jeremy O'Brien
Responsible Academic	-
Area Safety Manager	Jonathan Matthews

Correlated Electron Systems (Ground Floor)

Head of Group	Tony Carrington
Responsible Academic	-
Area Safety Manager	Bob Wiltshire

Correlated Electron Systems (4th Floor)

Head of Group	Tony Carrington
Responsible Academic	Stephen Dugdale
Area Safety Manager	Stephen Dugdale

Micro & Nanostructural Materials

Head of Group	Martin Kuball
Responsible Academic	-
Area Safety Manager	post vacant

Nanophysics and Soft Matter

Head of Group	Merv Miles
Responsible Academic	Ian Lindsay
Area Safety Manager	Delegated to individual lab supervisors

Particle Physics

Head of Group	Dave Newbold
Responsible Academic	-
Area Safety Manager	David Cussans

Theoretical Physics

Head of Group	James Annett
Responsible Academic	-
Area Safety Manager	James Annett

Electronics Workshop

Responsible Academic	Joel Goldstein
Area Safety Manager	Steve Nash

Mechanical Workshop

Responsible Academic
Area Safety Managers

Ashraf Alam
Adrian Crimp, Richard Exley

MSci Laboratory

Responsible Academic
Area Safety Manager

Tony Carrington
Tom Kennedy

Project Laboratory

Responsible Academic
Area Safety Manager

Stephen Dugdale
Tom Kennedy

School Areas

Responsible Academic
Technical Manager

Nick Brook (Head of School)
Steve Neck

Year 1 Laboratory

Responsible Academic
Area Safety Manager

Adrian Barnes
Gemma Winter

Year 2 Laboratory

Responsible Academic
Area Safety Manager

David Cherns
Mike Rothwell

APPENDIX 8**ROOM OCCUPATION**

For up-to-date information regarding the occupation of rooms and areas please contact Jessica Inglis, Head of School Administration.

Floor	Location	Comment
4 th	Room 4.30	Particle Physics
4 th	Lobby next to 4.13	Adjacent to Starlink Room
3 rd	Room 3.32	Staff/Postgraduate Common Room
3 rd	Room 3.14	Library, in office
2 nd	Room 2.40	Microstructures specimen preparation, includes HF neutralisation gel.
2 nd	Room 2.36	Common office
2 nd	Room 2.32	Microstructures research laboratory
2 nd	Room 2.18	Undergraduate project laboratory
2 nd	Room 2.15	Undergraduate MSci laboratory
2 nd	Room 2.14e	Laboratory Technicians' office
2 nd	Room 2.14	1 st and 2 nd year undergraduate laboratories(2 boxes)
2 nd	Room 2.13	1 st year undergraduate laboratory
Mezzanine	Adjacent to M.13 + M floor lift	Corridor
1 st	Room 1.40	Stores
1 st	Room 1.31	Richardson laboratory
1 st	Room 1.35	Electronics Lab
1 st	Room 1.28	CQP office
Ground	Room G.56	Nano office
Ground	Room G.50	Porters' Lodge
Basement	Room B.10	Nano prep laboratory