SCHOOL OF MECHANICAL AND MANUFACTURING ENGINEERING SAFETY HANDBOOK

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General outline of safety structure in the School of Mechanical and Manufacturing Engineering

1.

In accordance with the legislation enshrined in the Irish government's Safety**, Health and Welfare at Work Act –2005,** DCU has formed the Framework Safety Statement **http://www.dcu.ie/safety/pdfs/safety_statement.pdf,** a document which is laid down and endorsed by the President of D.C.U.-**Prof. Brian McCraith**, and the University Safety Officer**, Ms. Eileen Tully** ext.8896 Email: Eileen.tully@dcu.ie, **http://www.dcu.ie/safety/**

It is the intention of the School of Mechanical and Manufacturing Engineering to improve health and safety whilst at work for all of its members. Consequently, the School complies with all current legal safety requirements as set down in the above statement, and applies other appropriate measures specific to the School to achieve a safe working environment. The intention to improve the health and safety at work of all members extends to all persons whilst engaged in School of Mechanical and Manufacturing Engineering, and to visitors, contractors and lessees of areas whilst on the School premises. The School of Mechanical and Manufacturing Engineering Safety Handbook is secondary to the Framework Safety Statement of Dublin City University, which applies to the D.C.U. campus as a whole. This handbook is intended to provide accurate documentation of the health and safety arrangements currently in place at the School of Mechanical and Manufacturing Engineering.

2.

The Head of School has ultimate responsibility for the provision of a safe working environment within the School of Mechanical and Manufacturing Engineering. The current head of School is Dr. Joseph Stokes ext. 8720 Email: joseph.t.stokes@dcu.ie. The Head of School reports to the Dean of Faculty of Engineering and Computing who has ultimate responsibility for the provision of a safe working environment across the various schools in the faculty.

The current Dean of Engineering and Computing is Prof. Barry McMullin ext. 534204 Email: barry.mcmullin@dcu.ie.

3.

The Head of School delegates responsibility for day-to-day maintenance of safety to a School Safety Advisor (S.S.A.), Chief Technical Officer, and the Health and Safety Working Group.

The current School Safety Advisor is Dr. Lorna Fitzsimons Ext 7716 Email: lorna.fitzsimons@dcu.ie

The Chief Technical Officer is Mr Liam Domican Ext. 8365 Email: liam.domican@dcu.ie

The other member of the Health and Safety Working Group is Mr Michael May Ext. 8885 Email: michael.may@dcu.ie

4.

Members of the School have a duty of care to co-operate with the Head of School, the School Safety Advisor, and Chief Technical Officer in any matters relating to health and safety.

In particular, members of the Academic Staff, as research project supervisors and/or advisors of undergrad/postgraduate students, are expected to be responsible for the implementation of any recommendations of the Head of School or his or her representative in any matters relating to the health and safety at work of undergraduate/postgraduate students in their care.

5.

The School of Mechanical and Manufacturing Engineering recognises the importance of training its members in matters of health and safety and attempts to carry out such training at all levels. The School of Mechanical and Manufacturing Engineering looks to the University Safety Officer for assistance in such training.

6.

Any member of the School of Mechanical and Manufacturing Engineering or student engaged in School of Mechanical and Manufacturing Engineering activities has the right to approach the Head of School, the School Safety Advisor, Chief Technical Officer, or indeed any school technical officer, on any matter relating to health and safety.

7.

Safety matters within the School of Mechanical and Manufacturing Engineering are discussed, and recommendations made, during the course of school meetings for all staff, which are held by the Head of School. Additional discussions may also be made via the school health and safety working group and/ or school safety advisors.

The S.S.A. shall also represent the School of Mechanical and Manufacturing Engineering at general **Faculty Safety Committee** (see point **11**.) meetings and also liaise with the University Safety Officer as required.

8.

It is expected that all members of the School of Mechanical and Manufacturing Engineering, students engaged in School of Mechanical and Manufacturing Engineering activities and visitors, contractors and lessees of areas on the School of Mechanical and Manufacturing Engineering premises abide by all relevant safety guidelines as contained in this handbook. It is also expected that all of the above will seek advice or clarification on any safety matters in the School, should the need arise.

9.

To check compliance with the legal requirements and with safety regulations concerning health and safety at work, inspections/audits of School of Mechanical and Manufacturing Engineering premises may be carried out by the School Safety Advisor and any member of the school health and safety working group where applicable. Members of the School in charge of workshops, laboratories, stores etc. are informed of any breaches in safety found during such inspections together with suggestions for improvements to the working environment. Such breaches must be addressed immediately. **Failure to do so may result in closure of that work area until such breaches are rectified.**

10.

Communication between the Head of School and members of the School of Mechanical and Manufacturing Engineering on matters of health and safety is achieved via school meetings, internal e-mail, health and safety working group meetings, and via safety inspections/audits. The School of Mechanical and Manufacturing Engineering Safety Handbook and documents are posted on the School of Mechanical and Manufacturing Engineering Web Page http://www.dcu.ie/mechanical_engineering/health_safety.shtml

11.

The School of Mechanical and Manufacturing Engineering is represented on the **Faculty Safety Committee**, which also encompasses the Schools of Biotechnology, Physics, Sports Science, Nursing, and faculty research companies such as N.C.S.R., B.D.I., N.I.C.B., I.C.N.T etc.. The aim of the Faculty Safety Committee is to establish common safety practices and procedures and also serve as a forum to address safety matters that pertain to the faculty. This handbook will form, in part, these common safety practices and procedures. Further information on this committee can be obtained from the office of the Dean of faculty for Engineering and Computing.

12.

The School of Mechanical and Manufacturing Engineering will also offer every co-operation and compliance necessary with inspectors from the **Health and Safety Authority of Ireland (H.S.A.),** in the event that these inspectors visit the school. Such visits may occur at any time, without prior notice from the H.S.A. The **H.S.A.** is the state sponsored body of Ireland which has overall responsibility for securing safety, health and welfare at work and it operates under the Safety, Health and Welfare at Work Act 2005

SCHOOL OF MECHANICAL AND MANUFACTURING ENGINEERING HEALTH AND SAFETY RESPONSIBILITIES

President of Dublin City University

The President of DCU has ultimate responsibility for all aspects of health and safety on the entire campus of Dublin City University.

Head of School

The Head of School has overall responsibility for all aspects of health and safety within the School of Mechanical and Manufacturing Engineering. However, for practical reasons, the Head of School delegates much of this responsibility to the School Safety Advisor, Chief Technical Officer, to technical and Administrative Supervisors, and also to Academic Staff in their roles as Research Group Supervisors (to postgraduate students carrying out Research Projects); and as Undergraduate Teaching Laboratory Organizers/Academic Demonstrators.

University Safety Officer

The School looks to the University Safety Officer for advice on all safety matters pertaining to the School should the need arise.

Employees

Under the Safety, Health and Welfare at Work Act -2005, an employee has the following responsibilities:

- Comply with relevant laws and protect their own safety and health, as well as the safety and health of anyone who may be affected by their acts or omissions at work.
- Ensure that they are not under the influence of any intoxicant to the extent that they could be a danger to themselves or others while at work.
- Cooperate with their employer with regard to safety, health and welfare at work.
- Not engage in any improper conduct that could endanger their own safety or health or that of anyone else.
- Participate in safety and health training offered by their employer.
- Make proper use of all machinery, tools, substances, etc. and of all Personal Protective Equipment provided for use at work.
- Report any defects in the place of work, equipment, etc. which might endanger safety and health.

As employees of Dublin City University, members of the School of Mechanical and Manufacturing Engineering whether Academic, Technical, Secretarial, postgraduate researchers, or other personnel have these duties, as enshrined in the **Safety, Health, and Welfare at Work Act 2005**. Each employee is responsible for complying with the applicable provisions of Health and Safety Regulations. Each employee must also adhere to all University or School safety policies/procedures, and to comply with safety instructions issued by their individual Supervisors. All employees are accountable to the Head of School in matters of health and safety.

Research group supervisors and teaching laboratory supervisors/demonstrators

Research group supervisors and teaching laboratory supervisors/demonstrators are responsible for:

- Maintaining a safe working environment and in particular providing such supervision as is necessary to ensure the health and safety of students and research workers within their area of responsibility;

- Ensuring that undergraduate students understand basic safety rules/regulations in the undergraduate teaching laboratories, and that students adhere to same when working in these laboratories.

- Research students understand the School of Mechanical and Manufacturing Engineering safety handbook, obey the associated rules relating to their work, and that they complete a School **SAFETY DECLARATION FORM** (See page.29 of this handbook) before starting work in the School.

- All new research students whose work involves the use of chemicals or biological materials in the school are expected to attend faculty of Science and Health **SAFELAB MODULE** programmes http://www.dcu.ie/science_and_health/safety_info.shtml.

- Consulting with the students and research workers for whom they have responsibility on all matters of health and safety and for bringing to the attention of the School Safety Advisor or Head of School any matter that they are concerned with.

Visiting research workers, visiting lecturers, visiting undergraduate students, and general visitors

All visitors are obliged to follow those safety regulations and procedures detailed in this handbook where applicable.

In the event of primary or secondary school students visiting/working in the Schools laboratories, adequate supervision must be provided by those members of the School of Mechanical and Manufacturing Engineering, who are organising these events. **Basic laboratory safety regulations will also apply at all times during these events.**

In the event of visiting lecturers, visiting demonstrators etc., it is incumbent upon same to follow the safety rules and regulations as laid down in this handbook. Visiting lecturers and demonstrators must liaise with those members of staff responsible for bringing them to the School, in conjunction with the School Safety Advisor and/or the university safety officer where appropriate.

School Safety Advisor (S.S.A.)

On behalf of the Head of School, the School Safety Advisor is responsible for giving advice and help on all matters concerning health and safety in the School and also for ensuring compliance with relevant safety guidelines as laid down in this handbook.

Appointing a School Safety Advisor

The appointment of a school safety advisor is done on a voluntary basis, and such appointments are made by the Head of School. The school safety advisor is a member of academic staff.

EMERGENCY CONTACT NUMBERS

First Aid personnel:	Liam Domican ***Phone:* 8365** Michael May ***Phone: 8885***
Ambulance/Fire Brigade	***Phone: 7999***
Nearest Hospital :	Beaumont Hospital ***Phone*: 8377755** ***(If ringing from within school, dial O followed by the above number)***
Poison Information Service:	Beaumont Hospital ***Phone*: 8092566** ***(If ringing from within school, dial O followed by the above number)***
Taxis:	Phone reception **Dial 9, or security at 5999**
School Safety Advisor:	Dr. Lorna Fitzsimons ***Phone*: 7716**
Chief Technical Officer:	Liam Domican ***Phone*: 8365**
Campus Nurse:	***Phone*: 5143** (8.30am-6.30pm) ***Emergency Mobile*: 087-6794552** Outside these hours, ***Phone*: Security 5999**

Doctors:	***Phone: 5143***
Security:	***Phone***: **5999**
Reception:	**Dial 9**
University Safety Officer – Eileen Tully	**Phone: 8896**
Fire wardens:	Paul Young ***Phone:*** **8216** Chris Crouch ***Phone: 5824*** Liam Domican ***Phone***: **8365** Lorna Fitzsimons ***Phone: 7716***

COPING WITH AN EMERGENCY

Normal University Working Hours:

These are from 9 a.m. to 5.15 p.m. Monday to Friday.

Precautions

Know at least two routes from your laboratory/office/workshop to a Fire Exit.
Know the location of:
Telephones
First Aid Boxes
Fire Extinguishers
Fire Alarm Points
Emergency contact numbers
How to switch off gas, water. electricity etc. in your laboratory if it is possible to do so.

Evacuation Procedure

- **AT ANY TIME, IF A FIRE ALARM SOUNDS - EVACUATE THE BUILDING THROUGH THE NEAREST EXIT, AND FOLLOW THE FIRE WARDEN'S INSTRUCTIONS.**

- **COMPLY WITH DIRECTIONS FROM FIRE WARDEN OR SECURITY STAFF. FAILURE TO COMPLY WITH A FIRE WARDEN'S INSTRUCTION MAY RESULT IN DISCIPLINARY PROCEEDINGS UNDER THE UNIVERSITY'S CODES OF DISCIPLINE.**

- **NEVER USE A LIFT**.

- **ASSEMBLE AT THE NEAREST FIRE ASSEMBLY POINT. These are highlighted green signs located on the campus.**
- **DO NOT RE-ENTER THE BUILDING UNTIL THE ALARM IS SILENCED AND YOU ARE TOLD IT IS SAFE TO DO SO BY SECURITY STAFF OR BY A FIRE WARDEN.**

On Discovering a Fire

- **THE MAIN PRIORITY IS TO RAISE THE ALARM BY USING THE 'BREAK GLASS FIRE ALARM' ASSUMING THAT THE ALRM HAS NOT ALREADY ACTIVATED AUTOMATICALLY), AND EVACUATE THE BUILDING IMMEDIATELY.**

- **DO NOT ENDANGER YOURSELF. OPERATE THE NEAREST FIRE ALARM POINT, AND INFORM TECHNICAL STAFF (8365) OR SECURITY (5999) IMMEDIATELY**.

Safety equipment requests

Requests for additional safety equipment, which may needs to be purchased for a particular work area, should be submitted to the S.S.A in the first instance. It may be that an operation will have to be risk assessed using a **Risk Assessment Form** or a **Risk Assessment Experimental Method Form (**see pages 32 and 33 of this document) before such requests can be complied with.

Safety information

For updated information on all aspects of safety, visit www.hsa.ie

Aiding an Injured Person during normal university hours

If a staff member/student/member of the public has suffered an injury in the school, contact any registered **first aider** for the area as soon as possible. There are also first aid boxes and emergency contact cards located in each laboratory within the school

Aiding an Injured Person outside normal university hours

If a staff member/student/member of the public has suffered an injury in the school outside normal university hours contact security on ext. 5999 immediately for assistance, or contact the emergency services on 7999.

Where Emergency treatment is required

(Note: Even if a fire alarm sounds, do not attempt to move the injured person out of the building unless there is imminent danger to that person and the first aider. Stay with the injured person until help arrives.)

- Dial 5999 (DCU Security Emergency Line) and notify Security that an injury has occurred. State your name, room number/location, the nature of the injury, and request that security contact ambulance as soon as possible.
- Security will meet the ambulance at Reception and accompany it (or direct it, if after hours) to the designated building.
- If possible, have someone wait at the entrance to the building to take the ambulance personnel directly to the casualty

Where Non-Emergency treatment is required

(Note: Even if a fire alarm sounds, do not attempt to move the injured person out of the building unless there is imminent danger to that person and the first aider. Stay with the injured person until help arrives.)

DCU has approximately 60 staff members on campus who are trained Occupational First Aiders. It is expected that the majority of occupational injuries sustained by campus users, will be dealt with by trained First Aid teams working in conjunction with the DCU Health Centre in the first instance.

For the School of Mechanical and Manufacturing Engineering all injuries are generally dealt with first aiders, most of whom are technical officers. They may be contacted as per Emergency Contact numbers.

Occupational injuries requiring medical attention outside clinic opening hours must be referred to Charter Medical Clinic, The Forge, Smithfield Market, Dublin 7 Tel. 01-6579000 (See http://www.chartermedical.ie), or to Beaumont Hospital A&E. These referrals will normally be done by the DCU Health centre.

On Discovering a Flood/Water Leak

- If it is obvious, stop the leak/turn off water at source; phone the Buildings Office immediately (ext. 5362/5142) or a member of the technical staff. Outside normal university hours contact Security (ext: 5999).
- Warn people in the labs below to safeguard equipment etc.
- DO NOT ATTEMPT TO MOVE WET ELECTRICAL EQUIPMENT UNTIL IT IS DISCONNECTED FROM THE MAINS.

Emergency failure of mains Services

If there is a failure of fumehood, gas, water, electricity or lift services during working hours, phone the Buildings Office (ext: 5362/5142), or log the fault by electronic means via https://www.dcu.ie/estates/helpdesk/Login.aspx
For failure of mains services OUT OF HOURS, phone Security (ext: 5999)

Preventing Fires and Floods

Fire
Apart from the obvious dangers of horrendous injury/death, fires are enormously destructive.

The Fire Detection System

All parts of the School are fitted with detectors in or near the ceiling. The detectors are on alert at all times. A red light appears when a detector is activated, the alarms bells will ring and you must leave the building until the alarm is over.

PLEASE TAKE GREAT CARE TO AVOID CAUSING FALSE ALARMS!
WILFUL TAMPERING WITH FIRE ALARMS IS A VERY SERIOUS OFFENCE AND SUBJECT TO THE UNIVERSITY'S CODE OF DISCIPLINE!!

Solvents in Laboratories
A working minimum of flammable solvents should be stored in a given laboratory in an appropriate solvent cabinet. In event of fire, excess amounts of solvent could endanger lives and the fabric of the building. As far as possible, and certainly overnight, solvents should be stored in the ventilated cupboards under the fume hoods or in solvent cabinets. Full 2.5 liter glass winchesters of solvent should not be routinely stored on a laboratory work bench. Place lids back on solvent bottles when finished using them.

Leaving a Laboratory or Workshop

Serious damage often occurs in unoccupied areas where a piece of equipment which has been left on inadvertently or incorrectly. When you leave your workplace in the evening (or during the day if you are to be away for long) you have the responsibility to check that:

- There are no obvious problems with any equipment left running.

- Flammable solvents are properly stored in closed storage cupboards.

- Unnecessary electrical equipment (e.g. ovens) is turned off and NO NAKED FLAME OR FLAMMABLE GAS IS LEFT ON.

- If water has to be left running, the tubing is in good condition and is secured in the event of water pressure fluctuations. Otherwise, switch off running water sources.

- All fume cupboards have their covers lowered.

- Lights are turned off.

- Fire doors and other doors are closed.

Floods

Apart from the damage they can cause to equipment and paperwork, and the considerable inconvenience to personnel, floods can be dangerous, for example by bringing down ceiling tiles and soaking live electrical equipment. The greatest care must be taken to avoid floods. In the event of a flood, notify a member of technical staff, or outside normal working hours contact security at 5999.

Water cooling connections

It is recommended that plastic or rubber tubing bringing cooling water to laboratory equipment should be fastened on to the apparatus and the water taps with wire, plastic cable ties, or screw clips. The exit tube must pass the water properly down a drain that is able to cope with the flow and be anchored to prevent splashing or ejection if the water pressure rises.

PERSONAL SAFETY

General principles

- **THINK BEFORE YOU START A TEST OR AN EXPERIMENT**
- **RISK ASSESS, IF THE PROCEDURE WARRANTS IT. CARRY OUT A RISK ASSESSMENT OF YOUR EXPERIMENTAL METHOD.**
- **IF A PROBLEM OCCURS DURING AN EXPERIMENT, AND THERE IS AN IMMEDIATE THREAT TO YOUR SAFETY AND WELL BEING, PUT YOUR PERSONAL SAFETY FIRST.**
- **WEAR PPE (Personal Protective Equipment) WHEN APPLICABLE AT ALL TIMES!**
- **NEVER PERFORM HAZARDOUS TEST/EXPERIMENTAL WORK ALONE IN A LABORATORY**
- **KEEP YOUR LABORATORY/WORK BENCH/FUMEHOOD TIDY**

Safety/Risk assessment forms

The School of Mechanical and Manufacturing Engineering currently uses five Health and Safety forms which are explained as follows:

- **Safety Declaration Form for Research Workers (See p.29 of this handbook or http://www.dcu.ie/mechanical_engineering/health_safety.shtml**) must be filled out for the project by the postgraduate research student undertaking the project, in close consultation with their academic supervisor. This form is filled out when a new researcher joins the School, and is explained in detail to the researcher in safety induction by the S.S.A. This form must be filled out by hand and countersigned by the academic supervisor and school safety advisor. This form is then filed by School secretary.

- **Risk Assessment Form (See the template on p. 32 of this handbook, the electronic version is available at http://www.dcu.ie/mechanical_engineering/health_safety.shtml)** must be filled out to identify the hazards and risks associated with equipment used in the School of Mechanical and Manufacturing Engineering. The academic supervisor has the ultimate responsibility to ensure that the risk assessment is undertaken. This risk assessment is generally carried out by the research supervisor in conjunction with the student and relevant technical staff member. The relevant information is collated using the Risk Assessment form and an electronic copy should be sent to the S.S.A. If a more comprehensive and detailed Risk Assessment is required, it should be carried out according to the HSA guidelines; examples of general risk assessments are included in this document in Appendix 2. The **main findings** of the comprehensive Risk Assessment should be entered in the Risk Assessment Master

Template. For these cases an electronic copy of **both versions** of the Risk Assessment should be sent to the S.S.A.

- **Risk Assessment Standard Operating Procedures - Experimental Method Form (See p. 33 of this handbook and** http://www.dcu.ie/mechanical_engineering/health_safety.shtml) is to be completed for any activities not covered by the **List of Standard Risk Assessments** given in Appendix 2 of this handbook, or for new experiments that may be potentially more hazardous to the researcher than normal e.g. working with biohazards or chemicals, for example, hydrofluoric acid. This form must be filled out by the researcher proposing to do the task, and countersigned by the academic supervisor and school safety advisor. Typically this form is used if new hazardous operations are to be undertaken by researchers with new pieces of equipment, biohazards, chemicals etc. This form is filled out with the help of the S.S.A. and the relevant technical staff member.

- **Control of Substances Hazardous to Health (COSHH) form,** see p. 36 of this handbook or **http://www.dcu.ie/mechanical_engineering/health_safety.shtml).** This form is to be completed by the researcher wishing to use a chemical agent in the School of Mechanical and Manufacturing Engineering. This form must be countersigned by the academic supervisor. These forms should be completed and sent to the S.S.A.. **For more detail on COSHH, consult Appendix 1 of this handbook.**

- **Postgraduate Finish Up Form MME_RES1 (see p.45 of this handbook or http://www.dcu.ie/mechanical_engineering/health_safety.shtml)** This form is used by postgraduate researchers who have completed their practical work in the laboratory, have written up and wish to graduate. The form must be filled in by the postgraduate researcher and countersigned by the relevant personnel. This form must be filled out in good time, copies of which **MUST** be sent to the School of Mechanical and Manufacturing Engineering Office so that the postgraduate student is allowed to graduate, while at the same time ensuring the postgrad does not leave behind large quantities of chemical/biological/other waste generated during the course of their research.

Eating, Drinking or Smoking

These are strictly forbidden in laboratories and workshops. Smoking is forbidden in all parts of the School.

Mobile phone usage

It is advised not to have mobile phones switched on while working in laboratories. They can be a source of immediate distraction when they ring in a laboratory, and such distraction may cause occupational accidents.

MP3 players/Personal stereo equipment

During normal course of lab work, the use of such equipment is forbidden for reasons as outlined in' Mobile Phone Usage' and also for not being able to hear a colleague in distress, fire alarm sounding etc.

Personal protective equipment- PPE

Safety Glasses: Have a pair of Safety Glasses if required, which you can wear in comfort and use them in all designated areas and whenever you are handling chemicals, glass, vacuum or pressure apparatus and equipment with moving parts. In the case of research workers that require prescription glasses or contact lenses to see clearly, the School will provide individual prescription safety glasses. (In this case, contact the S.S.A., who can arrange fitting.).
For undergraduates wearing prescription glasses, the campus shop provides safety glasses, which can be worn over their prescription glasses when in the laboratory.

REMEMBER: PRESCRIPTION GLASSES ARE NOT SAFETY GLASSES.

With respect to contact lenses, there is no definitive recommendations regarding their use, save that it is incumbent upon the research worker to inform his/her supervisor that he/she is wearing same during laboratory work. The important thing to remember is that proper eye protection be worn at all times when working in the laboratory or in other areas where safety glasses are required. If there are any further concerns regarding contact lenses and individuals who need to wear them, contact the School Safety Advisor.

Laboratory coats: Wearing a laboratory coat can give considerable protection against splashed chemicals and flash burns. If your work requires the use of a lab coat as part of your PPE, YOU ARE REQUIRED TO WEAR ONE (fastened) and to keep it reasonable order

Protective gloves: If your work requires the use of gloves, YOU ARE REQUIRED TO WEAR THEM. The proper use of gloves/glove selection should form part of any COSHH or Risk assessment for a chemical reagent. In addition, anyone working with furnaces and/or high temperature materials is required to wear gloves as part of their PPE. For further information on gloves and gloving materials see the following links as an example:

http://www.labsafety.com/refinfo/ezfacts/ezf191.htm

http://www.aiha.org/aihce01/handouts/pf126oppl.pdf

http://www.hse.gov.uk/pubns/indg330.pdf

It should be pointed out that disposable nitrile gloves offer barrier protection against most solvents and solid chemical agents. However, disposable gloves should only be worn if there is a risk of direct contact with chemical agents during the course of actual working with them. Nitrile gloves are not designed for prolonged 'day long' use. Also, remove nitrile gloves when you are leaving the lab.

Mechanical Safety

Rotary equipment: Make sure equipment with rotating parts, e.g. stirrers, rotary evaporators, rotary pumps cannot catch hair, clothing, or any trailing wires/ tubing.

Gas cylinders:

Every effort should be made to minimize the need for gas cylinders in laboratories. However, due to the continually changing needs of the School, it may be necessary to install other gas cylinders in the laboratories from time to time.

Cylinders must be installed via liaison with any member of technical staff. The key point with cylinder installation in laboratories is that they be safely secured. Ratchet straps, available from most hardware stores, can be quite useful in this regard.

A **Risk assessment Standard Operating Procedures - Experimental method Form** must be filled out, particularly if toxic or highly flammable gases are to be used. All risk assessments must be submitted to the academic supervisor and school safety advisor for approval. All cylinders must be secured in the work area, and tested for leakages where applicable. See Risk **Assessment #4 "The transport and use of compressed gas cylinders" – Appendix 2**

Postgraduate workers who intend using gas cylinders as part of their research should inform the S.S.A. of their intentions, and must be instructed in the safe use of same. Undergraduates/Postgraduates must never attempt to move or fit compressed gas cylinders. In general, if you need to transport gas cylinders or fit regulator, contact any member of technical staff.

Electrical Safety

Notice the danger signs. On all electrical equipment you use, watch for signs of wear on the cable and insulation problems where it connects to the plug or equipment. If it looks less than perfect, contact any member of technical staff. Do not bring old equipment into use without first having it checked for safety.

Consult technical staff, if there is any doubt.

Water and electricity: Wet electrical equipment is very dangerous. Disconnect from the mains before touching it. Inform any member of technical staff.

Never use equipment, which carries a "Failed", “Do Not Use” or any other visible indication that it is not fit for use. All old, broken electrical equipment should be submitted for W.E.E.E. collection when such collections are organized. Contact technical staff for more information.
Consult the standard **Risk Assessment #3- on the "Use of Standard Electrical Equipment"-Appendix 2**

Chemical Safety

Risk Assessment

In accordance with guidelines and codes of practice for the handling of chemical agents, as laid down by the Safety, Health and Welfare at Work Act- 2005, (and enforced by the Health and Safety Authority of Ireland see http://publications.hsa.ie/index.asp?locID=7&docID=-1 for more details), a risk assessment must be carried out on all chemical agents before they are used. In the case of undergraduate teaching laboratories, this will be carried out by members of academic staff and technical staff, in conjunction with undergraduate students where necessary. In the case of postgraduate/post doctorate research staff, such risk assessments will be carried out using a C.O.S.H.H. (Control Of Substances Hazardous to Health) form, see **Appendix 1**.

Chemical Training

All personnel in contact with Hazardous Substances should receive Chemical Hazard Awareness Training as required under the Safety, Health & Welfare at Work Act 2005.

Personal Protection Equipment (PPE)

All personnel working with Hazardous Substances should wear suitable Personal Protection Equipment and be fully trained to use the PPE correctly.

Engineering/Ventilation Controls /Special Handling Procedures and Storage Requirements

- A partitioned area in room SB13a has been designated for chemical operations
- An eye wash station is provided in the partitioned area
- Fume-hoods should be used when working with chemicals in the School. The Fume-hood should be cleared of equipment when not in use. Chemical Systems Ltd., in conjunction with the Buildings/Estates office, services all fume-hoods on a twice-yearly basis. Fume-hood Sashes should be kept closed when not in use.
- Fumehoods must be booked in advance at http://136.206.98.61/ScheduleIt/index.php

- Chemicals should be stored in the cabinets that are vented through the fume-hood. They should not be stored in non-vented cabinets or left on laboratory benches.

All defects in fume hood function should be reported to the Buildings office at https://www.dcu.ie/estates/helpdesk/Login.aspx. Quote fume-hood serial number, and room location when reporting any problems with fume-hoods.

- All chemicals should be appropriately labelled. The label is a legal requirement that provides the primary source of health and safety information. It should contain standard phrases indicating special risks arising from the use of the product and standard phrases relating to the safe use of the product. The label should also include the owner's name and expiry date of the substance.
- Appropriate Safety Signage should be positioned at all relevant locations and points.

Spill and First Aid Procedures

Minor Chemical Spill (chemical type and quantity which is not an immediate threat to health and does not result in contamination to body)

a) Contact Technical support and alert workers in the vicinity of the spill

b) Ventilate area

c) Wear appropriate protective equipment

d) Avoid inhaling any vapours emitted from the spill

e) Neutralize spill with appropriate material.

f) Gather all contaminated material in a plastic bag, seal and label.

g) Clean and mop spill area with soap and water.

h) Decontaminate the area, equipment and broom/brush/dustpan.

i) Dispose plastic bag as chemical waste

Major Chemical Spill or Spills of hazardous or toxic chemicals

a) To minimize exposure, alert people in the laboratory to evacuate and contact Technical support.

b) Cordon off affected area and post a warning sign at the entrance of the site to warn others while trained personnel arrive to clean up the spill.

c) Contact estates office ext. 5362/5142, or security at ext. 5999

ALGOSOL is a neutralizing material suitable for the neutralisation of acids, such as hydrochloric, sulphuric, nitric and hydrofluoric acid

Chemical Waste Disposal

Minimum quantities of chemical should be purchased and a method of disposal should be identified. The method of disposal should be documented in the Control of Substances Hazardous to Health form (C.O.S.H.H).

Chemical disposal that cannot be managed within the school should be disposed of through an external waste management company. Waste should be stored in appropriate containers, labelled accordingly and a copy of the Material Safety Data Sheets (MSDS) should be passed on to the disposal company.

Waste disposal company used by DCU:

Initial Medical Services
The Royal Mews
10 Dublin Street
Carlow
Ireland

For those researchers in the School of Mechanical and Manufacturing Engineering working with chemicals, please note the following guidelines from the School of Chemical Sciences:

When working with chemical agents, the following points are worth emphasising:

***Solvents/Powders*:** Many common solvents, e.g. dichloromethane, are toxic and in handling (or spilling them) on the lab bench you will easily exceed danger limits for the vapour concentration (see Appendix 1). Use an effective fume cupboard at all times whenever possible. Dusty substances can be as dangerous as highly volatile substances both in toxicity and in explosion risks. Wear protective dust masks where applicable.

Mercury: Mercury is very toxic. All glass apparatus containing mercury MUST have secondary containment to catch mercury in the event of a breakage. Spilt mercury should be collected up immediately.

Hydrofluoric acid (abbv. HF): Think very carefully before working with HF. **THE USE OF HF OUTSIDE OF NORMAL WORKING HOURS IS STRICTLY FORBIDDEN**. At concentrations above 1M (2%) in water, HF can cause very painful burns, which may not be apparent for some hours. Before beginning any work with HF, a detailed **Risk Assessment Standard Operating Procedure - Experimental method Form,** p. 33 of this document, must be completed and countersigned by the School Safety Advisor/Supervisor.

All research workers intending to work with HF must undergo specialized training which is run in the School of Chemical Sciences by Damien McGuirk ext. 5111. The use of hydrofluoric acid should be avoided as much as is practically possible. Find alternative reagents where applicable!

Chemical Incompatibilities - A general summary

Acid + Alkali	= Heat
Acid + Hypochlorite	= Toxic Gas
Acid + Metal	= Toxic Gas/Flammable Gas
Acid + Cyanide/Sulphide	= Toxic gas
Oxidising agent + Organic Solvent	= Fire
Reducing agent + Organic Solvent	= Fire
Water Reactive + most things	= Fire

The list of chemical incompatibilities is not fully comprehensive. Consultation of individual MSDS for reagents can provide updated information in this regard.

Biological Safety

Risk Assessment

In accordance with guidelines and codes of practice for the handling of chemical agents, as laid down by the Safety, Health and Welfare at Work Act- 2005, (and enforced by the Health and Safety Authority of Ireland see http://publications.hsa.ie/index.asp?locID=7&docID=-1 for more details), a risk assessment must be carried out on all biological agents before they are used. In the case of undergraduate teaching laboratories, this will be carried out by members of academic staff and technical staff, in conjunction with undergraduate students where necessary. In the case of postgraduate/post doctorate research staff, such risk assessments will be carried out using the **Risk Assessment Standard Operating Procedures - Experimental Method** form p.33 of this document. The form will be filed out by the student in conjunction with his/her supervisor, the S.S.A. and the relevant technical staff member.

Biological Training

All personnel in contact with biohazards or conducting research on biological substances should undertake the Safelabs module run by the Faculty of Science and Health. They should also assess other training relevant requirements in conjunction with their supervisors.

Personal Protection Equipment (PPE)

All personnel working with Hazardous Substances should wear suitable Personal Protection Equipment and be fully trained to use the PPE correctly.

Biological Material Storage

Biomaterials and biohazards must be stored in designated and appropriately labelled fridges/freezers. This refrigeration equipment should be calibrated annually as per EPA requirements.

Biological Material Disposal

The School of Mechanical and Manufacturing Engineering disposes of biohazard materials, such as animal carcases (whole/part), according to the procedures developed by the Biology Resource Unit (BRU) in Dublin City University – "Standard Operating Procedure-Disposal of Carcasses". Should you have biological material to dispose of contact the Biological Resource Unit. BRU staff can be contacted by email at bru@dcu.ie and by telephone at ext. 5313 and ext. 8882. The "Standard Operating Procedure-Disposal of Carcasses" procedure is included in **Appendix 5**.

DCU Sharps policy

The DCU Sharps policy is detailed in **Appendix 6**. Examples of Sharps include needles, scalpels, razors, lancets, contaminated broken glass, guidewires, and sharp tips of intravenous giving sets, stitches cutters or any other disposable sharp instrument or item.

Cryogenic Safety

Refrigerators and freezers: **Refrigerators/freezers must not to be used as 'dumps' for various chemical or biological substances.** Make sure all vessels/containers placed in a fridge for cooling are tightly sealed in a way that will not leak when cold. **All vessels/containers must be clearly labelled. Label with pencil, detailing name of researcher, date, substance etc**. Most commercial refrigerators and freezers are not flameproofed and a leak of flammable vapours can cause an explosion. All such refrigerators must therefore have their thermostat wired externally before they are used in the laboratory-or purchase spark proof models. Check the contents frequently and discard unwanted samples/chemicals.

NEVER PUT FOOD IN A REFRIGERATOR WITH CHEMICALS. NEVER PUT UNLABELLED CHEMCIALS/BIOLOGICAL SUBSTANCES IN A FRIDGE/FREEZER.

Liquid N_2/ Solid CO_2: These substances can cause freeze-burns. Equipment cooled outside by liquid N_2 but open to air will allow liquid O_2 to form INSIDE which can create a dangerous pressure rise or give an explosion with flammable material. ONLY USE LIQUID NITROGEN TO COOL SEALED OR EVACUATED SYSTEMS. Wear the correct protective gloves when handling these cryogenic substances. If you do not have access to a pair of cryogenic gloves, contact S.S.A. or relevant technical staff.

See standard **Risk Assessment #12 "Handling, Transportation and Storage of Liquid Nitrogen and other Cryogenic materials" – Appendix 2**

Radiation and Laser Safety

Do not start any work involving radioactivity or high energy radiation (>10 keV) without first consulting the DCU Radiation Protection Supervisor (currently Dr. Rosaleen Devery ext.5406) or work with lasers without first consulting the relevant academic and technical staff members. The S.S.A. will advise. See standard **Risk Assessment #6 Laser work in the laboratory - Appendix 2**

Noise

Changes in sounds are often a first indication that something is amiss with equipment or machinery. Make every effort to keep background noises from pumps, shakers, compressed air jets, etc. at as low a level as possible for the comfort of everyone and so that you can hear when something is going wrong, e.g. fire alarm, equipment malfunction, verbal call for assistance etc. Excessively loud radios/stereo units are also not allowed for the same reasons. **Loud personal stereo equipment, which use earphones in both ears, MP3 players etc. should not be used in the research and teaching laboratories of the School of Mechanical and Manufacturing Engineering.**

Working outside normal university hours/lone working

There are special risks from working in a laboratory or workshop in the School of Mechanical and Manufacturing Engineering outside normal working hours (9 a.m. – 5.15 p.m. Monday to Friday) as help may not be to hand in the event of an accident. To address this issue, the School of Mechanical and Manufacturing Engineering categorises Out of Hours activities according to the DCU Out of Hours policy, see **Appendix 4** or http://www4.dcu.ie/safety/pdfs/outofhours.pdf

Pregnancy

Certain chemicals and radiation pose a greater than normal danger to an expectant woman and to her unborn child. Under the Safety, Health, and Welfare at Work Act-2005, **if you become pregnant and you are working with chemical, biological, or radioactive agents**, **you must inform the Health and Safety office Ext. 8678 immediately,** and complete a preliminary 'pregnancy at work' risk assessment form which can be found at . **http://www.dcu.ie/safety/pregnancy_lab.shtml.** For further information/advice on pregnancy and the workplace contact the University safety officer Eileen Tully-ext. 8896.

Tidiness and finishing research work in the School

The prospect that you and your co-workers stay safe will be increased if you all keep your working environment reasonably tidy, free of obstacles underfoot or trailing wires or tubes. Double-check before you do anything in a laboratory or workshop. If you are not sure, stop and think, or ask for advice.

All research workers are required to make safe their workspaces, on finishing work within the School. This includes tidying work area, cleaning glassware, disposal of chemical waste etc.

For finishing postgraduate workers in the School, the form **MME RES 1** must be completed. Failure to do so will result in that **postgraduate not being allowed to graduate.** See p. 45 of this handbook or http://www.dcu.ie/mechanical_engineering/health_safety.shtml

Reporting Accidents and Incidents

If there is a dangerous incident/accident in the School, it has to be reported IMMEDIATELY to any member of technical staff/S.S.A. A report on the injury/incident **must** (in accordance with current Safety, Health and Welfare Act 2005) be completed by those person(s) directly involved, or by that person involved in the post incident investigation. using the **DCU INJURY/INCIDENT REPORT FORM*** http://www.dcu.ie/safety/index.shtml. The completed form is then forwarded to Eileen Tully c/o Health and Safety Office so that ways can be suggested of avoiding a re-occurrence of the event. In very serious cases, the Government Health and Safety Authority (H.S.A.) will be informed by the University Safety Officer. **Incidents** are defined as unplanned events in which no one was hurt but which either had the potential to cause injury or did cause damage to apparatus, equipment or the building. **Accidents** are defined as events in which someone gets injured/fatally injured.

*Consult any member of technical staff, or first aiders.

School of Mechanical and Manufacturing Engineering Safety Forms

The following pages contain all the forms (in hard copy) associated with Health and Safety for use within the School of Mechanical and Manufacturing Engineering, for example, COSHH, Authorisation for the Purchase/Use of Hazardous Substances, Risk Assessment form, Final Year Project Hazard Review form, Safety Declaration form etc. Any queries should be referred to the School Safety Advisor.

Electronic versions of all these forms are also available at
http://www.dcu.ie/mechanical_engineering/health_safety.shtml

DCU SCHOOL OF MECHANICAL AND MANUFACTURING ENGINEERING SAFETY DECLARATION FORM FOR RESEARCH WORKERS

THIS FORM MUST BE COMPLETED BY ALL RESEARCH WORKERS (POSTGRADUATES, POSTDOCTORAL, AND VISITING WORKERS) BEFORE WORK COMMENCES. THIS FORM IS ALSO USED AS PART OF SAFETY INDUCTION FOR ALL NEW RESEARCHERS IN THE SCHOOL.

This form should be completed jointly by postgraduate, postdoctoral or visiting research worker, and the appropriate academic research supervisor. This form must then be reviewed and countersigned by the School Safety Advisor. The form will be held by the School Safety Advisor.

- Equipment used by a research worker during the course of his/her research must be risk assessed.
- Experimental procedures that a research worker will be carrying out during the course of his/her research work must be risk assessed.
- Guidance for undertaking a Risk Assessment is given in the School Safety Statement. If in doubt please contact the School Safety Advisor.

Name of research Project Supervisor:

Name of research worker*:

Lab/ Room No.:

*Status: postgraduate, postdoctoral or visitor (delete as appropriate)

Project title/Research area .....

Give a brief description of the type of research work to be undertaken.

By signing this safety declaration form, I understand the following:

- I have read the **DCU School of Mechanical and Manufacturing Engineering Safety Induction Information Leaflet for postgraduate and postdoctoral researchers.** I am aware of the School of Mechanical and Manufacturing Engineering Safety Statement and Handbook.
- I will seek advice from my research colleagues, my project supervisor, school safety advisor, or technical staff where appropriate, if I am in doubt about any safety matter relating to my work.
- I have a duty of care to comply with University and School safety procedures at all times during the course of my research.
- I will carry out Risk Assessments and develop Standard Operating Procedures as required during the course of my work within the School of Mechanical and Manufacturing Engineering, Dublin City University.

- If my work requires the use of chemicals or biomaterials I will consult the relevant Material safety Data Sheets (MSDS) and carry out any relevant COSHH or biohazard assessments. In addition I will become familiar with the relevant University policies for correct disposal of chemicals and biomaterials.
- If I intend to work Outside hours, I will do so as per the **University Policy for Lone /Out of hours work, see http://www4.dcu.ie/safety/out_of_hours.shtml**

Signature of the research worker.....
Date:

For the project supervisor:
I have discussed in detail the nature of the research work with the research worker. I am fully aware that the research worker will consult with me on matters pertaining to his/her safety at all times. I will also consult with the School Safety Advisor, or technical staff where appropriate on matters pertaining to my research worker's personal safety.

Signature of project supervisor……
Date:

For the School Safety Advisor (S.S.A.)
I reviewed the above Safety Declaration Form for the research worker and, on behalf of the Head of School, allow him/her to start research work in the School of Mechanical and Manufacturing Engineering DCU.

Signature of the School Safety Advisor.....……
Date:

Safety Questionnaire- This questionnaire must be filled out as part of your safety declaration form.

What is your main priority in the event of discovering a fire or hearing a fire alarm sound?
Ans:

What is the basic personal protective equipment you are obliged to wear when working in a research laboratory?
Ans:

In an emergency, who should you contact inside normal working hours?
Ans:

In an emergency, who should you contact outside normal working hours? Detail phone number.
Ans:

What School Safety form must be filled out when you are finishing up research work in the School and you wish tograduate?
Ans:

What form must be filled out when you wish to order a new chemical?
Ans:

What government act enshrines safety in the workplace?
Ans:

Who has ultimate responsibility for safety in the School of Mechanical and Manufacturing?
Ans:

Who can you seek advice from on safety matters in the School of Mechanical and Manufacturing Engineering?
Ans:

Risk Assessment Form (for inclusion in Master template)

Equipment / Lab Risk Assessments - School of Mechanical & Manufacturing Engineering

For advice on completing Risk assessments please see the School of Mechanical and Manufacturing Engineering Safety Handbook and the HSA Guidelines on Risk Assessments and Safety Statements:
http://www.hsa.ie/eng/Publications_and_Forms/Publications/Safety_and_Health_Management/Guidelines_on_Risk_Assessments_and_Safety_Statements.pdf
When using any research equipment students should, in conjunction with their supervisors;
1) Assess the need for Personal Protective Equipment (PPE). If it has been determined that PPE is required for certain activities it must be worn when undertaking those activities.
2) Develop Standard Operating Procedures (SOP) for their experimental/research work. Student should have a copy of SOP to hand when undertaking experimental/research work.
3) Should be aware of storage and disposal procedures for biomaterials and chemicals

Date	Assessment By	Location	Location/ Equipment/ Work Activity/ Operation	Occupational Hazards Identified: Effect	Risk L/M/H	Control/Preventive Measures in place	Staff / PG OOH Category	UG OOH Category	Further Controls required / comments	Further action	SOP/PPE required (Y/N)

DCU SCHOOL OF MECHANICAL AND MANUFACTURING ENGINEERING

Risk Assessment Standard Operating Procedures - EXPERIMENTAL METHOD FORM

This form should be completed when the research worker intends to carry out specialised operations/procedures. These specialised operations/procedures will pertain specifically to the researcher's individual research work, e.g. operating a piece of specialised equipment or carrying out a special procedure, where there are inherent safety risks to that research worker. This risk assessment form should be filled out in close consultation with the research worker's project supervisor and the completed risk assessment(s) submitted to the S.S.A. for review.

- Additional Risk Assessment –Standard Operating Procedures Experimental Method can be made during the course of the research worker's project as they are required, again in close consultation with the project supervisor.
- Submit all completed risk assessments to the S.S.A. for review. Completed risk assessment forms will be filed by the Safety Advisor alongside the research worker's Safety Declaration Form.

Fill out the risk assessment data as follows:

Specialized operation/procedure being assessed (give specific details):	
Risk Category Rating (High/Medium/Low):	
Known or expected hazards associated with the activity:	

Precautions to be taken to reduce the level of risk:	
Training prerequisite:	
Risk remaining:	
Emergency procedures:	
Detail references if any:	

For the research worker and project supervisor:
We have carried out a risk assessment for the above operation/procedure.

Signature of research worker: **Date:**

Signature of project supervisor: **Date:**

For the School Safety Advisor:
I have reviewed the above risk assessment and found same to adequately comply with the safety guidelines.

Signature of School Safety Advisor: **Date:**

School of Mechanical and Manufacturing Engineering

Control of Substances Hazardous to Health (C.O.S.H.H.) form

(also known as Hazardous Substance Assessment Form *abbv*. H.S.A.F)

This form should be completed by the research worker and then reviewed by the researcher's Supervisor (or a competent Assessor). For help in the completion of this section, see the School of Mechanical and Manufacturing Safety Handbook, http://www.dcu.ie/mechanical_engineering/health_safety.shtml. Please enter all data requested. Most of the information required will be found on the Material Safety Data Sheet (MSDS) for that reagent. No chemical should be in use for research/experimental purposes without a completed COSHH form.

Standard Laboratory Personal Protective Equipment (PPE): Safety glasses, White Coat, and appropriate gloves are basic requirements for the use of hazardous substances. Access to a properly functioning fumehood must also be considered when using hazardous substances.

Section A

Before completing this form, make sure you are using the safest material possible for the intended experiment or project. Read all sections of the MSDS before completing this form.

1	Name of Staff member/ Research worker	
2	School/Research Centre	
3	Name of Research worker's supervisor Name of staff member's Head of School/ Centre	
4	Location of research worker (room number)	
5	Location of storage area of substance (room number)	
6	Hazardous Substance Name and proposed quantity for use (**See note 1**)	
7	Brief description of proposed use for this substance, including frequency of use.	
8	Hazards Identification (**See note 2**)	

	List the Risk/ Hazard Statements “R” or “H” phrases (See section 2 of MSDS)	
9	Hazards Identification contd. List the Safety/ Precautionary Statements “S” or “P” phrases (See section 2 of MSDS)	
10	Material Incompatibilities (See Section 10 of MSDS – stability and reactivity)	
11	List basic first aid measures if exposed to the substance (See section 4 of MSDS – first aid measures)	
12	How will you dispose of waste generated? Consider the following points: - Unused chemical - The waste generated using this substance - Need to segregate waste streams? - Where will this waste be stored (Check local practice within your school/ centre or school safety representative.).	
13	What precautions will be taken to eliminate the inhalation risks specified in the MSDS for this substance, e.g. PPE, fumehood, breathing apparatus? (See Section 8 of MSDS for exposure controls)	
14	**If the substance is a known carcinogen, teratogen, or mutagen, then sections 15 – 23, must be completed.**	

Section B

15	What measures are in place to minimise	

	exposure?	
16	Are additional warning signs required to minimise risks to other users (e.g. pregnant researchers etc)	
17	Are storage and labelling provisions adequate?	
18	Does the working area require further demarcation?	
19	Is further PPE required? e.g. dust mask, respirator, etc	
20	Is health surveillance recommended? If so, do not proceed with experiment or purchase the reagent. Consult with your supervisor.	
21	Is the risk in using this substance acceptable? Yes or No (If 'No' do not complete this assessment without further consultation)	
22	Any other details	

By completing this assessment, the research worker acknowledges the risks associated with using this substance and will take all necessary steps to ensure that this assessment is followed at all times when using this substance.

Date: **Signature of Research worker:**

Date: **Signature of Supervisor:**

Standard emergency procedures to be followed when using this substance

Spill

In the event of a spill, LEAVE THE AREA IMMEDIATELY. !

LOCK ACCESS DOOR TO AREA WHERE POSSIBLE AND DISPLAY A 'DO NOT ENTER!!' BARRIER SIGN ON THE LABORATORY DOOR.

Inform technical staff inside normal university working hours, or inform security staff/fire services outside normal university working hours.

Event of fire

Activate fire alarm. Evacuate work area. Inform the fire wardens, security or technical staff as appropriate.

Waste disposal

Consult procedures described in safety regulations for the given faculty school/research centre or check local practice within your school/ centre or school safety representative

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Note 1: Order the minimum quantity required for the experiment regardless of the discounts offered by vendor for larger quantities. The cost of waste disposal for unused material far outweighs the savings for buying in bulk.

See section 11 for available toxicological information

Note 2: See section 2 of MSDS and note the **H**azard/ **P**recautionary statements **or** the **R**isk and **S**afety phrases.

Copy and paste the appropriate pictogram into section 8 of the HSAF form.

Global Harmonisation System for the labelling of chemical agents

The Global Harmonisation System for the labelling of chemical agents will come into effect as from December 2010. What this means for users is that there will be a 'crossover' period between the older system for the safety classification of chemical reagents (R and S phrases), and the newer G.H.S. system. Full implementation of the new G.H.S. system will be effective by June 2015.

School of Mechanical & Manufacturing Engineering

Authorisation for the Purchase or Use of Hazardous Substances

This form is intended to provide authorisation from the student's supervisor for the purchase or use of hazardous substances within the School of Mechanical and Manufacturing Engineering and to help in the identification of relevant safety precautions when dealing with such substances.
Please complete the form and attach the relevant Materials Safety Data Sheet (MSDS). This form should be returned to the technician who will purchase the material.

Student Name:	**Period:**
Supervisor/Staff User:	**Location of Storage:**
Technician:	**Location of Use:**
Name of Hazardous substance:	
Have you read and assessed the COSHH form (Y/N)?	
Have you conducted a Risk Assessment (Y/N)?	

Outline the main risks involved in the use of such substances

Describe the control methods and equipment that are required to handle the substance safely including protective clothing

Outline emergency or first aid procedures in the event of an accident

Outline the end-of use procedures for safe disposal of the material

Student signature: _____ **Date:** _____

Print name: _____

Supervisor/Staff User signature: _____ **Date:** _____

Print name: _____

Technician signature: _____ **Date:** _____

Print name: _____

A copy of this form when completed should be submitted to Liam Domican for review by the school safety committee

End of Life Sign-off
When use of the material and correct disposal is completed this section must be signed off by the student, supervisor and technician.

Student signature: _____ **Date:** _____

Print name: _____

Supervisor/Staff User signature: _____ **Date:** _____

Print name: _____

Technician signature: _____ **Date:** _____

Print name: _____

FYP Hazard Evaluation Form

This form must be completed before undertaking any project work in the School. It must be prepared by the student and reviewed by the supervisor & technical staff before a copy is submitted to the School Safety Committee through Liam Domican. The Safety Committee will periodically review the hazard sheets for the following purposes:

- To ensure that there is a safe plan for carrying out essential project work
- To ensure the correct Out-of-Hours designation is assigned to the location in which the project is undertaken
- To maintain a list of activities in the school and safest known methods
- To ascertain the location of potential hazards within the school when assisting the emergency services

A copy of this statement must be available, at all times, near the project itself. Where multiple locations are associated with a project, a hazard review of the equipment in that location will suffice.

This form must be attached to your report at the end of the project.

Project Title:			Student Name:
Supervisor:	Technical Staff:	Location:	Period:

Date	Assessment By	Location	Equipment/ Work Activity	Occupational Hazards Identified: Consequences (L/M/H)	Likelihood of occurrence (L/M/H)	Control/Preventive Measures in place	Staff / PG OOH Category	UG OOH Category	Further Controls required / comments	Further action	SOP/PPE required (Y/N)

Student signature: _____

Date: _____

Supervisor signature: _____

Date: _____

Technician signature(s): _____

_____

Date: _____

OVERNIGHT REACTION FORM

ROOM NUMBER: Researcher name (Block capitals):

Date:

I have carried out this experiment previously (Yes/No):

If NO, I am fully aware of the safety hazards in performing this reaction through consultation with my supervisor, and performing COSHH or special risk assessments as applicable.

Researcher signature:

List the name, quantity and CAS number of reagents used in this reaction (Do not write formulae!!):

Name of project supervisor:

Supervisor signature (only necessary for undergraduate students):

Contact telephone numbers in case of emergency:

Emergency shut off procedures:

Research student/worker finishing up form (MME_Res1)

This form can be obtained from the school office/chief technical officer and should be completed by the postgraduate research student and signed by the relevant people below and a copy submitted to the School of Mechanical and Manufacturing Engineering Safety Advisor. The laboratory/room and facilities used should be left clean, tidy and safe on completion of research work within the School of Mechanical and Manufacturing Engineering.

Researcher Name:

Date:

PLEASE TICK RELEVANT BOX BELOW:

RESEARCHER CHECKLIST	**Yes**	**No**
Is the bench-space clean, cleared and left in a safe manner?		
Have the under-bench units been cleaned and left in a safe manner?		
Have the drawers been cleared and cleaned and left in a safe manner?		
Donate any remaining chemicals/biomaterials to your colleagues/supervisor?		
Have you removed and disposed of your chemical waste in the correct manner?		
Have you tidied your fume-hood workspace in a safe and correct Manner?		
Have you returned your PC and software?		
Have you cleared data stored on instruments/computers etc.?		
Have you cleaned equipment used in these areas?		
Have you returned keys/swipe cards for the building, laboratory, lockers etc.?		
Have you removed books, papers and manuals?		

Laboratory room number/s used:

I understand that the forms relating to the examination of my thesis will not be presented to the appropriate Faculty Board for Research degrees, until such time as this form is signed by ALL persons indicated below, in the order given.

Researcher: **Signature:**

Supervisor: **Signature:**

School Safety Advisor: **Signature:**

Chief Technical Officer: **Signature:**

N.B. Signatures signify that all procedures required have been fully complied with.

A copy of this completed form should be given to the school safety advisor AND TO THE SCHOOL OFFICE

NO RESEARCHER WILL BE ALLOWED GRADUATE WITHOUT FIRST COMPLETING THIS FORM.

Standard 'In-House' Risk Assessment Notes for Common Activities and Substances

The School of Chemical Sciences previously risk assessed certain laboratory procedures which are, or have been performed, by researchers in the school on a day to day basis. These examples of risk assessments are provided for consultation purposes and researchers are encouraged to follow same as a matter of best practice.

A comprehensive list of **standard Risk assessments, which may be relevant to the School of Mechanical and Manufacturing Engineering, can be found in Appendix 2.** If you will be doing any hazardous activities or that are not covered by any of the standard forms, a **Risk Assessment Standard Operating Procedures-Experimental Method Form** will need to be completed. See Appendix 1 of this Safety handbook for notes for making a risk assessment of an experimental method.

Equipment

- Risk Assessment #1 Use of Fume Hoods
- Risk Assessment #2 Use of Glassware
- Risk Assessment #3 Use of Standard Electrical Equipment
- Risk Assessment #4 Transport and Use of Compressed Gas Cylinders
- Risk Assessment #5 Use of high power Microwave and Radio frequency power supplies
- Risk Assessment #6 Laser Work in a Laboratory
- Risk Assessment #7 Use of Reduced Pressure or Vacuum
- Risk Assessment #8 Visual Display Equipment
- Risk Assessment #9 Use of Ultra-Violet Light Sources
- Risk Assessment #10 Use of Laboratory Heating Equipment
- Risk Assessment #11 General Office Work
- Risk Assessment #12 Handling, Transportation and Storage of Liquid Nitrogen and other Cryogenic Material

Chemicals and Materials

- Risk Assessment #13 Use, Handling and Clean-Up Procedures for Mercury
- Risk Assessment #14 Use of Hydrofluoric Acid

HAZARDOUS PROPERTY PHRASES

(These phrases will be displayed on reagent container/transport box.)

"Explosive": substances and preparations which may explode under the effect of flame or which are more sensitive to shocks or friction than dinitrobenzene.

"Oxidizing": substances and preparations which exhibit highly exothermic reactions when in contact with other substances, particularly flammable substances.

"Highly flammable":
liquid substances and preparations having a flash point below 21 °C (including extremely flammable liquids), or substances and preparations which may become hot and finally catch fire in contact with air at ambient temperature without any application of energy, or solid substances and preparations which may readily catch fire after brief contact with a source of ignition and which continue to burn or to be consumed after removal of the source of ignition, or gaseous substances and preparations which are flammable in air at normal pressure, or substances and preparations, which, in contact with water or damp air, evolve highly flammable gases in dangerous quantities.

"Flammable": liquid substances and preparations having a flash point equal to or greater than 21°C and less than or equal to 55°C.

"Irritant": non-corrosive substances and preparations, which, through immediate, prolonged or repeated contact with the skin or mucous membrane, can cause inflammation.

"Harmful": substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may involve limited health risks.

"Toxic": substances and preparations (including very toxic substances and preparations) which, if they are inhaled or ingested or if they penetrate the skin, may involve serious, acute or chronic health risks and even death.

"Carcinogenic": substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may induce cancer or increase its incidence.

"Corrosive": substances and preparations which may destroy living tissue on contact.

"**Infectious":** substances containing viable microorganisms or their toxins, which are known or reliably believed to cause disease in man or other living organisms.

"Teratogenic": substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may induce non-hereditary congenital malformations or increase their incidence.

"Mutagenic": substances and preparations which, if they are inhaled or ingested or if they penetrate the skin, may induce hereditary genetic defects or increase their incidence.

Substances and preparations, which release toxic or very toxic gases in contact with water, air or an acid.

Substances and preparations capable by any means, after disposal, of yielding another substance, e.g. a leachate, which possesses any of the characteristics listed above.

"Ecotoxic": substances and preparations, which present or may present immediate or delayed risks for one or more sectors of the environment.

NOTES FOR COMPLETING A RISK ASSESSMENT-EXPERIMENTAL METHOD

Hazards and Risks

"Hazard" and "risk" are words which are synonymous in common use but in the technical jargon of Safety Management have different meanings:- the hazard presented by a substance or activity is its potential to do harm (rock-climbing is a hazardous activity) and risk from a substance or activity is the likelihood that it will cause harm in the circumstances of actual use (rock-climbing may be of low risk if the proper equipment is used and the rules are followed).

The aim of making a "risk assessment" is to identify the hazards associated with an activity, to assess the seriousness of these hazards and to formulate systems of work, training or other methods to reduce the associated risks to a minimum or at least to an acceptable level. This procedure has to be carried out by someone who is experienced and fully familiar with the activity.

Example- Risk assessment for 'Crossing The Road'

The steps involved in making a risk assessment can be illustrated by a simple example i.e. the activity of crossing the road.

Activity or operation:
Crossing the road

Hazards
Possibility of injury or death from collision with motor vehicle. (The level of risk may be high or low depending on whether the road is a busy dual carriageway or a quiet country lane or on the age/physical ability of the person crossing the road.)

Measures to reduce the level of risk
Look both ways and cross only when clear.
Use a Zebra or Pelican crossing.
Introduce traffic calming measures etc.

Training
Consult the "Safe Cross Code".
Read the Rules of the Road.

Emergency Action
Call Emergency Services, give First Aid, etc.

Level of risk remaining

Provided the above measures are followed the risk of injury is low however any accident that does occur may be serious. Even with training, competence should not be assumed especially with young children who should always be overseen by an older person.

References

"The Rules of the Road" published by the Irish Road Safety Council etc etc.

Risk Assessments

A number of standard **'in-house' Risk Assessments** have already been completed covering some of the more common tasks and pieces of equipment used in the School of Chemical Sciences and these have been included for example/consultation purposes - see **Appendix 2** of this handbook (and suggestions for other topics or indeed written risk assessments are always welcome). Note that it remains the responsibility of individual Supervisors/Advisors to check the correctness and appropriateness of these risk assessments especially with regard to the level of skill and competence of the researcher.

The task required of all Advisors/Supervisors is, using the above as a guide, to look carefully at the research work for which they are responsible and to use their best judgement to identify procedures that fall within the High/Medium and Low Risk Categories and to determine the appropriate OOH category for Staff/Postgraduate and Undergraduates. If risk assessments do not exist for these procedures then they must be written using the **Risk Assessment** and **Risk Assessment Standard Operating Procedure – Experimental Method** forms.

COSHH Assessments

Please see the separate notes (**Appendix 1**-this handbook) for making a COSHH assessment.

Postgraduate/Visiting worker induction

In house postgraduate induction will be run for new researchers in the School when they start work, and is coordinated by School Safety Advisor and is run in conjunction with the Chief Technical Officer.

To address safety aspects of the multi-discipline approaches used in many of the research activities carried out in the University, the **SAFELAB** postgraduate programme has been created by the Faculty of Science and Health..
See http://www.dcu.ie/science_and_health/safety_info.shtml

Dates for these sessions will be announced by e-mail. **It is a requirement for new researchers, whose work will involve the use of chemicals or biological materials or other relevant areas of research, to attend these SAFELAB seminars.**

WORKSHOP POLICY

Workshop Safety (Overview)

Accidents when working with mechanical equipment, particularly workshop equipment used to machine metals, plastics, etc, may have consequences which range from a minor cut to the loss of a finger, hand or eye.

Great care is therefore required on the part of all machine operators to avoid either personal injury or injury to colleagues nearby. The immediate responsibility for the health and safety of all users of the mechanical workshop facilities rests with the Senior Technician in charge of the workshop area. However, every person has a duty to ensure that work is carried out in a safe manner and without foreseeable risk to the health and safety of either themselves or other persons.

Policy on the use of Workshop equipment

As required under Health & Safety at Work legislation, it is the policy of the School of Mechanical and Manufacturing Engineering Workshop to restrict the use of the equipment within the workshop to authorised personnel, as defined in the Workshop Safety Statement, only. This permits the use of low risk tooling, under supervision of properly trained staff, while high risk equipment must be operated by qualified personnel.

While most work will be carried out under the normal workshop jobs system, minor work may be carried out on a casual basis. In these instances, to ensure the safety of all involved the following steps must be undertaken.

- All visitors (i.e. anyone who is not a School Technician) to the Workshop must report immediately to the Technician office. If the technician you need to meet is operating a machine please wait patiently for a break in the work before approaching. Make your approach known as carefully as possible with due care to your own and others safety.
- At all times a Workshop technician must be informed of the task **before** it is started. In the case of small/quick tasks that require only hand tools, the Workshop Technician may permit the individual to perform the task themselves if it is safe to do so. Any task requiring the use of machinery **must only** be performed by an authorised person as defined in the Workshop Safety Statement.
- For all other tasks the Workshop operates a job tracking system. This, in brief, requires a drawing to be submitted to the Workshop Technician office where a workshop technician will be allocated to complete the task.

Unauthorised personnel will not be allowed to use workshop equipment. It is the responsibility of all staff to enforce this regulation.

General

In association with this activity including rotating machine parts, oil spillages, unsafe lifting equipment, chemical and flammable liquids and manual handling of heavy loads the following must be taken into consideration;

- All workshop staff should be trained in the manual handling of loads, and should implement this training at all times.
- Being able to recognize irritant substances is vital and should be studied along with the effects of dermatitis and inhalation.
- Safety Glasses and Safety Boots should be worn when operating workshop equipment.
- Replace unused stock neatly without protruding into passageways.
- Wear gloves if using degreasing solvents.
- Dispose of refuse from wastebaskets.
- Sprinkle oil soak granules on oil spills.
- Personal protective equipment (PPE) should be worn at all times while ensuring that long hair is tied back neatly.
- All safety notices should be studied upon entering the workshop.

Eye Damage

The workshop environment has many hazards potentially damaging to the fragile and vulnerable eye. Unless effective protective measures are taken, eyes are constantly at risk from mechanical, chemical and radiation hazards. Even the slightest injury is likely to impair vision.

- Metal splinters can be ejected at high speed when striking hardened steel (e.g. bearings, masonry nails) or burred tool heads with hardened hammer face. Always wear goggles.
- Use soft metal drift (e.g. brass, copper) between workpiece and hammer where possible.
- Wear Safety Glasses for protection against ejection of particles when using Drills, Lathes, Grinding wheels, Angle grinders, Welding.

Maintenance

All items of equipment, including, hand-held power tools and hand tools, must be properly and regularly maintained and serviced, and a record of all such maintenance and servicing, where applicable, should be kept. Tools must be kept sound and in good condition, edges of cutting tools must be sharp and kept covered when not in use, and any defects in tools and equipment should be reported immediately to the senior technician. All tools must be returned to their proper storage areas after use.

Work Environment

In the mechanical workshop, the working area must be kept clean and tidy and the floor must be kept clear of all obstructions and be free from oil and swarf. Machine beds, tables and slideways must be clear of tools and materials, and chuck keys removed, before the machine is started up.
All machines must be maintained in a clean and efficient working condition. Accumulated swarf should be regularly removed so as not to become a hazard, and the machine should be brushed down after each use. Rags and cloths must be kept well away from rotating work pieces and tools. Extract ventilation hoods on machines used for dry machining, and other operations where dust is produced, should be connected to an efficient filtered exhaust system.
Overcrowding leads to accidents and must be avoided. Non-slip mats should be used in front of machines where necessary, and machines should be sensibly placed to avoid overcrowding and suitably anchored to ensure stability and to prevent vibration. Lighting and ventilation should always be suitable for the work in hand.

- All defects must be attended to immediately.
- Emergency exits to be kept clear.
- Eating, smoking and Drinking are forbidden in the workshop. Smoking is forbidden in all parts of the School.

This is the responsibility of all workshop users.

Electrical Safety

On all electrical equipment, watch for signs of wear on the cable and insulation problems where it connects to the plug or equipment. If it looks less than perfect, it must be attended to before any further use. Do not bring old equipment into use without first having it checked for safety.

Tidiness and commonsense

The prospect that you and your co-workers stay safe will be increased if you keep your working environment reasonably tidy and free of obstructions. Take a moment to stop and think or ask for assistance if necessary.

All users are required to make safe their workspaces, on finishing work, within the workshop. This includes tidying work area, cleaning down, and disposal of waste material.

Emergencies

Normal Working Hours are from 9 a.m. to 5.15 p.m. Monday to Friday.
Precautions:

- Know at least two routes from the workshops to a Fire Exit.

Know the location of:

- Telephones
- First Aid Boxes
- Fire Extinguishers
- Fire Alarm Points

And how to switch off gas, water, electrical power etc. in the workshops.

Compressed Air

A compressed air supply must be treated with respect. It must never be used for cleaning purposes (blowing dust or swarf from clothing, skin, glassware or machinery) or for ventilation purposes. A jet of compressed air directed onto the body may introduce air into the bloodstream, produce blindness or other eye injuries or cause a burst eardrum. All compressed air lines should be fitted with safety nozzles of a type approved by the Health & Safety Executive and then may be used only under the following conditions:

- The operator and anyone else in the immediate vicinity must wear eye protection.
- They must be used only with the lowest air pressure possible.
- They must only be used for the removal of swarf from blind holes where no other means are available for the removal of such swarf.
- A compressed air supply must never be connected to a sealed container or be used to pressurise a sealed vessel, other than certified air receivers.

Safety Notice / Signage etc.

School rules for safe workshop practice must be strictly adhered to. Smoking, eating and drinking are prohibited in the mechanical workshop. Notice should be posted in workshop area.

Safety warning notices must be fixed near to or on machines to indicate any special hazards, any precautions to be taken, and the type of protective clothing or equipment to be used.

Personnel Protective Equipment/Clothing (PPE/PPC)

Suitable protective clothing and equipment must be worn, not only by machine operators, but also by any other persons in the vicinity who could foreseeable be at risk.

Long hair, ties, jewellery and clothing must never be allowed to hang loose, since any of these items can easily become entangled in the moving parts of equipment, and hence cause serious injury.

Training

The basic principle to bear in mind when considering safe operation of equipment is that operators are suitably qualified and experienced.

Before using any piece of machinery or other workshop equipment, the prospective user must have received adequate instruction in its method of operation, and on the health and safety precautions, as necessary.

Trainee workshop personnel must be fully supervised until judged by their training supervisor to be competent to work on their own on a particular item of equipment.

The importance of using common sense and not taking shortcuts must be impressed on all workshop users.

Guards / Access Control

If equipment has exposed moving parts which could be a source of danger, steps must be taken to ensure these parts are effectively guarded, to eliminate, or satisfactorily reduce, danger. All machines must be fitted with guards and/or other safety devices to an appropriate standard during the time that the machines are in use. Such safeguards must be of suitably sound design and adequate strength.

The stationary and moving parts of each machine must be properly secure, and rotating parts should be balanced, if necessary. Operating speeds must never exceed those recommended by the machine tool manufacturer
If for any reason whatsoever, conventional guarding is impracticable, some other means of equally effective temporary guarding must be employed.

In some circumstances, it may be necessary to paint mechanical equipment in such a way as to highlight dangerous points.

Housekeeping

Good housekeeping is a fundamental principle of accident prevention and aids the promotion of good health. A tidy workshop is safer than an untidy one and reflects management's and employee's concern for safety. The following should be reviewed in a workshop environment.

- Keep work benches tidy.
- Requisition shelves, racking, tool holders where necessary.
- Tidy up trailing cables and hoses.
- Do not leave wrenches or other tools lying on a machine. They may fall and cause an injury.
- Use absorbent granules to remove oil spills from floor – not sawdust.
- Store waste oil in sealed metal drums – not open plastic containers.
- Remove door wedge trip hazards from offices.

Risk assessment

Workshop equipment will be classified into the following categories:

A. Equipment which requires specialised knowledge and experience for its safe operation, on which unsupervised work is not permitted. Operation only by qualified and experienced personnel.
B. Equipment which requires specialised knowledge and experience for its safe operation, on which supervised work is permitted.
C. Equipment which requires the operator to receive basic instruction from qualified and competent personnel before commencing unsupervised use.

Equipment Name or Type	Category
Bridgeport CNC Mill	A
XYZ Semi Automatic Mill	A
Proturn Semi Automatic Lathe	A
Bridgeport Manual Mill	A
Harrison Manual Lathe	A
ARD Electro Discharge Machine	A
Jones + Shipman Surface Grinder	A
Cincinnati Hawk CNC Lathe	A
Cincinnati Dart CNC Mill	A
Mechtronic Laser	A
Welding Equipment	A
Pedestal Grinder	A
Klaeger & Muller Saw	B
Startrite Band Saw	B
B T Rolatruc	B
Quantum bench mounted drill	B
Stands Pedestal Drill	B
Morgan Rushworth Guillotine	B
Co-Ordinate Measuring Machine	B
Injection Moulder	B
Morgan Rushworth Bender	C
Belt Sander	C
Guyson Shotblast	C
Broaching Machine	C
Fly Press	C

Milling (A)
Milling machines, whether manual, semi automatic or automatic should only be used by suitably qualified and experienced personnel.

Turning (A)
Lathes, whether manual, semi automatic or automatic should only be used by suitably qualified and experienced personnel.

The lathe operator should ensure that the work piece is always securely clamped without excessive unsupported overhang. Any part of a stock bar which projects beyond the head stock of a lathe must be guarded, unless it is in such a position as to be safe to every person in the workshop.

Grinding (A)
These are rotating wheels use for sharpening chisels and tools and are found in every workshop. There are many documented cases where operators have experienced crushed hands due to the tool being pulled down into the downrunning nip between the wheel and the rest. The following measures should be taken.

Grinding should only be carried out by suitably qualified and experienced personnel.
Abrasive wheels must be mounted and dressed only by suitably experienced personnel. Eye protection must be worn during all grinding operations.

The wheel guard should always be in position and should be properly adjusted before the wheel is run or dressed.
A means of starting and stopping the wheel should be clearly indicated and within easy reach of the operator.

Abrasive wheels must be stored with extreme care in suitable racks or bins, and must be inspected for damage before being mounted on the machine spindle. If a wheel sounds cracked when tapped, it must not be used. Under no circumstances should the spindle speed exceed the manufacturer's recommended speed marked on the wheel. The maximum working spindle speed must be displayed on a notice mounted on the machine.

Welding (A)

Welding should only be carried out by suitably qualified and experienced personnel. The main hazards from welding are fire, explosion, fumes, burns, radiation and electric shock. The most common accident type is leaking of oxygen from a defective hose connection into an enclosed workroom. Weld splatter falling onto the operator's overalls can ignite spontaneously in the enriched atmosphere.

Appropriate protective clothing, in the form of heat-resistant gloves (non-asbestos), fire-resistant overalls or aprons and fire-resistant footwear, all to approved specification, must be worn at all times. Full face shields, conforming to EN379, BS1542, must be worn at all times by persons exposed to unshielded arc. Failure to wear suitable eye protection will result in an extremely painful condition of the eyes, which may result in partial or total blindness. Contact lenses must never be worn by persons in close proximity to welding arcs, even while wearing eye protection.

All skin should be covered to prevent exposure to high levels of UV light.
UV absorbing curtains or screens to EN168 should enclose the welding operation in order to prevent accidental exposure to arc by other personnel.

All types of welding and brazing produce some degree of toxic fumes and it is necessary to ensure adequate ventilation of each working area, and the operator should take every precaution to avoid breathing these fumes. Personnel using welding equipment must acquaint themselves with all materials to be welded (MSDS) to ensure that they will not be producing hazardous fumes etc. that the ventilation system cannot safely handle. Consideration must be given to specific fire precautions during welding or brazing operations. Such operations should never be undertaken close to areas containing flammable liquids, vapours or dusts. Before commencing any welding operations, make sure that an appropriate fire extinguisher (CO_2) is readily accessible.
All gas bottles must be installed and used vertically, chained to a wall rack or secured in a welding trolley. Flash back arrestors must be fitted on both the acetylene and oxygen supplies, to prevent explosions from blowbacks. Cylinders, regulators, hoses, nozzles and guns, should be regularly inspected and leak tested using soap/water solution. Users of gas welding equipment should be acquainted with the particular hazards associated with both acetylene and oxygen cylinders, particularly the necessity of keeping all oxygen equipment free from oil and grease. Valve keys must be kept in position on each cylinder at all times to facilitate immediate shut off in the event of a malfunction.

TIG (GTAW) and MIG welding processes use inert gases to shield the arc from atmosphere. To prevent risk of asphyxiation, these processes should never be carried out in an enclosed space, and there should be adequate ventilation to ensure removal of inert gas from the area.

In addition to the general precautions applicable to all welding processes, all insulation and earthing arrangements must be maintained to a high standard, regularly checked, and defective equipment taken out of service until repaired. Arc welding must not be carried out in damp or wet surroundings, and the operator's hands and clothing must be kept dry.

Refer to Guidance Note, MS15: "Welding", available from Health & Safety Executive (UK) and "Health & Safety in Welding & Allied Processes" – The Welding Institute.

Laser Cutting / Welding (A)

Laser operations should only be carried out by suitably qualified and experienced personnel.
Suitable eye protection must be worn.
All laser operations produce some degree of toxic fumes and it is necessary to ensure adequate ventilation of the working area.
All gas bottles must be installed and used vertically and chained to a wall rack.

Drilling M/C (B)

It is vital that all safety considerations are reviewed when bench and pedestal drilling machines are being used. This is especially essential if the rotating spindle is unguarded. Rotating spindles can entangle loose clothing, gloves or long hair. The eyes are also exposed to ejected metal chips and liquid coolant. The following should be reviewed:

- Safety Glasses should be worn at all times.
- A telescopic guard should be installed.
- Safety gloves should NOT be worn (risk of entanglement)
- Ensure that the workpiece is securely clamped.
- Loose clothing should NOT be worn.

Hand tools (B)

The essentially portable nature of these tools renders their effective guarding very difficult, and though many are now in common DIY use, it is vital that their associated hazards must not be underestimated. Care must be taken to fit and properly adjust safety guards where these are practicable. Hand-held power tools should only be used under the supervision of a suitably qualified and experienced technician.

Mechanical and electrical defects should be dealt with immediately, and a tool, which is defective in any way, should be withdrawn immediately from service, preferably disabled, and should be made unavailable until repairs have been made.

Some portable tools such as grinders are extremely hazardous, and must only be operated by a suitably qualified and experienced technician, who is fully aware of the dangers and the necessary safety precautions. Care and attention must be given to any trailing leads from portable power tools.

Lifting Equipment (A/B)

Forklift trucks must be operated only by Mechanical engineering personnel.
The safe working load (SWL), must be clearly marked on each item of lifting equipment, and these limits must never be exceeded under any circumstances. No lifting equipment with any visible defect should be used at any time. When lifting large weights, the load should be lifted initially only a few inches from the floor, to check the safe condition of the lifting apparatus and the security of slings, etc, before the full lifting operation is commenced.

Moving or attempting to move objects in the wrong way is the cause of a large number of minor and more serious disabling injuries every year. The observance of a few common sense rules for lifting and carrying could reduce greatly the effect of incorrect manual handling techniques.

Manual Handling

Bad handling is the cause of many workshop accidents ranging from back strain to death by crushing. Heavy loads can be very dangerous if not properly handled, but with the right equipment and correct procedure they can be handled with safety. The following should be considered.

- Ensure that guidelines involving manual handling are fully researched and understood.
- Wear gloves and safety footwear (steel toe capped shoes etc…)
- Check for sharp edges before carrying out any manual work.
- Assess size, shape, weight and centre of gravity to determine if help is required.
- Use mechanical assistance if in doubt.
- Do not tilt 45 gal. oil or fuel drums manually. Use proprietary drum truck with clamps.

Appendix 1

COSHH ASSESSMENTS
(also abbv. HSAF)

C.O.S.H.H. (Control Of Substances Hazardous to Health), is basically an assessment that a user carries out on a chemical agent before use in his/her area of work, based on information contained in a Material Safety Data Sheet (MSDS). This information guides the user in how he/she controls the use of the reagent in his/her laboratory. COSHH has to be made to establish the actual risk of working with chemicals and substances involved in the laboratory. The aims of COSHH are to make the user and his/her Supervisor aware of the risks to health from a reagent and to the health of those working in the vicinity of the reagent, of proper handling of dangerous substances/chemical agents. The COSHH assessment for the work of any student (undergraduate or postgraduate), for any member of the technical staff and for postdoctorals, visitors and academic staff who work with chemicals, must be made by same in so far as is reasonably practical to do so, and reviewed by a competent person e.g. academic staff member, post doctorate staff member, technical staff, safety advisor. Nevertheless, collaboration and consultation are key elements of COSHH - it is risks to the health of the user that are being assessed. Indeed, Advisors/Supervisors to research students and postdoctoral assistants will expect active participation in the assessment as part of the educational process.

The Basis of a COSHH Assessment

Why fill out a C.O.S.H.H. form?:

- To demonstrate to the academic project supervisor/ that the researcher has (a) read the **M**aterial **S**afety **D**ata **S**heet (M.S.D.S.) for a chemical agent, and that (b) he/she understand the relevant safety implications they need to be aware of, when using that chemical agent.
- To have a record of the above, both for the user and the School.
- To have a reference, for yourself and your colleagues working in close proximity, to the safety procedures that need to be taken in the event of an accident or fire while working with this chemical.
- To ensure that the legal requirements for disposal of a chemical are referenced and fully understood and adhered to.

These assessments are extremely relevant when ordering reagents or obtaining reagents from the chemical stores located at room X1-61. Examples where COSHH is extremely relevant is as follows:

a. carcinogen; that is a substances which is in the Health and Safety Executive category R45 "may cause cancer" or which is described in other reliable sources as a cancer suspect agent or which you or your Supervisor/Advisor know to be in a class of compounds some of which have already been described as cancer suspect agents.

b. highly toxic, very toxic or poison; substances which are described in Safety Literature as highly toxic or very toxic or as poisons, must be considered carefully and will require a Special Assessment if they are volatile or dusty so they could be inhaled or if they can be readily absorbed from solution through the skin.

c. explosive; this term would cover any endothermic compounds which can detonate, e.g. many solid or gaseous diazo compounds, some compounds containing nitro, nitroso or other groups which make oxygen available to carbon or hydrogen in the compound, or solutions which contain fuel/oxidant mixtures, e.g silver perchlorate (perchlorates have caused many accidents and all work with solid perchlorates, perchlorates in organic media, or with perchloric acid except in <4M aqueous solution, requires elaborate safety precautions).

d. normally pyrophoric; this would definitely include silane or phosphine or potassium metal. Substances like lithium aluminium hydride which can be pyrophoric, are frequently handled without catching fire.

NOTE: Perform reactions using these compounds on small scales as much as possible!!!!!

All COSHH assessments generated by each research worker are done so electronically using the format as shown on P. 50-51 and will be stored on computer database in the chemical stores. No chemical reagent will be issued to any research worker without properly completed COSHH.

COSHH Assessments must be made for all chemicals ordered after 1st December 1998
Resources for making COSHH assessments, in addition to this Handbook (see page for example of COSHH) are as follows:

Guide to filling out the actual COSHH form:

- The first step in completing any COSHH form is to first examine the MSDS (Material Safety Data Sheet) for that compound. The best source for MSDS is the internet at http://www.sigmaaldrich.com/.
  (Choose **Ireland** as your country-if prompted).

- Follow the LOGIN link at the top right hand side of the page and enter USER NAME: **dcuchemistry** and PASSWORD: **chemistry2011***. (***Note:** **You only need to do this step if you wish to get accurate pricing information!.)**
- You should now be on the Aldrich product search page, the search engine box being located at the top right hand side of the web page. Into this search engine box simply type the name of the reagent of interest/sigma aldritch catalogue number,/CAS number etc. Then click **SEARCH.**
  The search may yield a number of catalogue numbers which relate to different grades/manufacturer of your chosen reagent, but the MSDS for each will be identical. Point and click at the MSDS link (marked in red, with the letters MSDS) for the reagent you are interested in.
- The MSDS for the reagent should now be displayed on your screen. Scroll down to get the relevant information as required by the COSHH form, copies of which are available in the laboratory, or online at http://www.dcu.ie/chemistry/policy_documents_safety.shtml
-

Read the MSDS for your reagent off the screen and use the pertinent safety data to fill out your blank COSHH form for same. It should be noted that as from December 2010, regulations for the new Global

harmonistion/Labelling* classification of reagents has now come into effect. What you should see is that safety data will be displayed with the old Risk and Safety phrases/pictograms etc. (as per old EC directive 67/548/EEC), or the new Hazard and Precautionary safety phrases/pictograms etc. (as per new EC directive 1272/2008). You can use either conventions when filling out the relevant info. on your COSHH form. Please also note that the format of the MSDS will change in accordance with Global Harmonisation*, and Risk and Safety phrases/numbers will be fully replaced by Precautionary and Hazard phrases/numbers by 2016.

(* See http://www.sigmaaldrich.com/safety-center/globally-harmonized.html)

No reagent will be issued without presentation of completed and signed COSHH form!!!!

Completion and Submission of COSHH.

Upon completion of the form, save a copy of the completed COSHH form to a personal PC as a *.doc file.. The standard file name should be named in the following format:

Firstname Surname : Chemical name*.doc

Once the file has been saved it must then be attached to an e-mail to the academic supervisor for review and approval. This is done so that both parties can review the cosh together.

After supervisor has reviewed COSHH he/she in turn emails the approved COSHH*.doc to COSHH@dcu.ie.

COSHH@dcu.ie is the email address that is used by technical staff to download approved COSHH forms and keep records for stores and information purposes. It also lets technical staff know that the researcher has done the COSHH for a given chemical agent, and that the chemical agent can be issued for chemistry stores to the researcher.

Supplementary information for aiding with COSHH assessments.

- Also see: http://en.wikipedia.org/wiki/Risk_and_Safety_Statements
- The chemical reagent container itself can contain the same information..
- **In house material safety data sheets**: It should be noted that it is not necessary to complete COSHH for commonly used laboratory substances i.e. Silica, magnesium sulphate, deuterated, solvents, mineral acids/bases etc.. A copy of the common In house Material Safety data sheets is available in every research lab or can also be viewed at http://www.dcu.ie/chemistry/policy_documents_safety.shtml or **Appendix 11 of this handbook,** and this is for researchers reference purposes.

Appendix 2

STANDARD 'IN-HOUSE' RISK ASSESSMENTS

The following list is by no means complete and is updated as the need for additional assessments arises. The following list of risk assessments are those which are commonly used by researchers/technical staff in the School, on a daily basis.

RISK ASSESSMENT #1: USE OF FUME HOODS

Risk Category C

The fumehood is probably the most important piece of protective equipment in the laboratory. Those in the School of Chemistry are built-in ducted fumehoods that vent to the outside through outlets on the roof. The draught in all fumehoods is routinely tested with the front sash open 500 mm and the cupboards are labeled with a fumehood velocity, depending on the flow that is found.

- Category A and B fumehoods have sufficient draught to be used safely with most gases or vapours.
- Category C cupboards are safe to use with care but it would unwise to expect them to cope fully with a massive release of a dangerous gas or vapour.
- Category D fumehoods should be used only for the release of tiny quantities of toxic substances or for the storage of toxic substances in fairly leak-tight containers.
- **Any COSHH assessment must consider the use of fumehoods as a standard safety procedure.**

Hazards

While fumehoods are designed to protect the user against hazards from other sources *e.g.* from toxic or obnoxious material or from flammable materials such as solvents, their misuse can lead to them affording less protection than expected or being hazards in their own right.

- The effectiveness of a fumehood is much reduced if they are open too wide or cluttered with apparatus which interferes with the smooth flow of air or are clogged with dirt around the vents at the back of the cupboard.
- Fumehood fans are susceptible to failure. This means that the draft also fails leaving the hood effectively useless.
- The front sash of most of the School of Chemistry fumehoods is made up of a very heavy sheet of glass. Accidents have occurred when the sash cords have broken allowing the front to crash down.

Precautions

- Keep the interiors of fumehoods tidy and ensure that the rear vents are not blocked and are free from a build-up of clutter and excess reagent materials.
- Keep the front sash down as far down as is comfortable while working and closed when not actively working.
- Do not put your head into the fumehood whilst working.
- To detect and be warned of any fan failure, pin up a strip of tissue or some other visible indicator of air flow (more modern fumehoods have built in air flow warning devices).
- All fumehoods are serviced by an external contractor (who liaises with DCU estates office) twice a year.

Emergency Procedures

Fan failure

- Most fumehoods are part of a bank of hoods vented by a single fan. If the flow fails in one hood it will have failed in others. This failure may also be accompanied by an audible alarm warning. Inform technical staff if this has occurred.

Sash Cord Failure

- Stop work, place a warning notice, and inform any member of technical staff.
- NEVER WORK IN A FUMEHOOD WITH A BROKEN SASHCORD.
- DO NOT ATTEMPT TO LOWER A SASH WITH A BROKEN CORD BY YOUR SELF.
- Inform other users and any member of technical staff as soon as possible.

Training Requirements

Although the use of fumehoods is part of the training of most Undergraduate Chemists, newcomers to the School of Chemical Sciences should be instructed in the specific local rules.

Level of Risk Remaining

Slight if the outlined procedures are followed.

RISK ASSESSMENT #2: USE OF GLASSWARE

Risk Category D

Hazards

- Cuts from damaged or broken glass
- Cuts from flying glass due to explosion, implosion following pressurisation, evacuation, mechanical shock or stress
- Cuts from forcing plastic tubing, teats or rubber bungs onto glass tubing, pipettes or condensers that break.
- Cuts from broken glass and sharp items e.g.. Pasteur pipettes disposed in ordinary waste bins.
- Burns from heated glass
- Poisoning following cuts by contaminated glassware.
- Glassware injuries are the commonest from of injury in the School.

Precautions

- Before use, check that all glassware is free from cracks, flaws or scratches that may cause it to fail in use.
- Have damaged glassware repaired or dispose of it in the "Broken Glass" bin. Do not use the ordinary waste bins. Use a brush and dustpan to clear up broken glass. Be especially careful when clearing broken glass from a sink where water can make sharp edges invisible. Use tongs to pick out pieces. Broken glass containers are available from the stores, room X1-64.
- Dispose of glass "sharps" in the proper ECOSAFE containers and not in the ordinary waste bins. ECOSAFE containers are available from the stores, room X1-64.
- When fitting tubing to glassware, lubricate the glass with water or silicone/vacuum grease. In the case of fitting plastic tubing, render the tubing soft by brief immersion in hot water, before fitting. Do not use excessive force. Do not exert force in a direction that will make the glass snap. Think about where the sharp edge of the glass might go if it does break and arrange your grip accordingly. Wrap the glass in a towel or thick layers of paper tissue. When removing tubing, use a scalpel to carefully cut off tubing that does not yield to gentle pressure, and exercise usual precautions when handling same.
- Take care with hot glass (which looks the same as cool glass). When working with hot glass e.g. (making glass tlc spotters etc.,) place hot glass where no one can accidentally come into contact with it before it has cooled. Use heat resistant gloves as required.
- **Joints and stoppers.** Lubricate ground glass connections with a thin layer of silicon grease before assembling, and disassemble same after use. Do not stopper hot flasks or containers. If a stopper seizes, do not reheat the container to remove it. Consult any member of technical staff if in doubt.
- **Vacuum or pressure use.** Glassware subjected to either pressure or vacuum should be carefully inspected for flaws before use.
    - **Pressure:** Use only special glassware rated well above the pressure to be used. See the separate Risk Assessment appropriate to the task for other details of shielding and procedure.
    - **Vacuum:** For glassware under vacuum, volumes of 1 liter or larger should be enclosed in insulation tape or plastic mesh to restrain fragments in the event of implosion. This applies to equipment such as vacuum storage bulbs, rotary evaporators, vacuum desiccators etc. See the Risk Assessments "Use of Reduced Pressure or Vacuum".
- **Washing.** Detergents are the normal means of cleaning glassware. However, in the case of glassware badly contaminated with reagent residues, a pre-wash with solvent/dilute acids or bases may be more appropriate. In the case of glassware being contaminated with lachrymator/noxious smelling reagents, pre-wash in a fumehood with a suitable solvent and allow that glassware to air dry in the fumehood. The washings can then be transferred to a suitable waste receptacle. Beware of fire risk if using solvents to clean or dry glassware. **Under no circumstances should glassware contaminated with these reagents be washed outside a fumehood.**

Under no circumstances should you endanger glassware cleaning staff by submitting glassware for cleaning that is badly contaminated with reagent residues. For more detailed instruction on cleaning glassware see Risk Assessment –Appendix 5 of this handbook.

Seek advice from technical staff if in doubt about glassware cleaning. More aggressive reagents may be employed such as the use of chromic acid. if so, such use must be addressed with a thorough **Risk Assessment- Experimental Method. (See P. this handbook)**

Avoid using concentrated acid baths to clean glassware as much as possible. If using acid/alkali baths is the only solution to washing glassware, use in small quantities and ensure proper secondary containment for these baths. Again the use of such baths must be addressed with a thorough **Risk Assessment- Experimental Method. (See P. this handbook)**

Training

The safe use of glassware is part of Undergraduate training.

Remaining Risk

Cuts from broken glass or the misuse of glass remain amongst the commonest form of injury in the School of Chemical Sciences. Great care is always required.

Emergency Procedures

Always treat cut and burns immediately. Apart from very minor injuries, call for First Aid treatment. In the event of serious injury, follow the procedure "Aiding an Injured Person" described in the School of Chemical Sciences Safety Handbook.

RISK ASSESSMENT #3: USE OF STANDARD ELECTRICAL EQUIPMENT

Risk Category C

Laboratory supply of mains electricity is *via* individual socket outlets which may be 3-pbase 415 V, 50 Hz, or single-phase 240 V, 50 Hz. Office supplies are normally 240 V, 50 Hz. Most electrical equipment operates on 240 V, 50 Hz.
A very wide range of electrically powered equipment is found in the laboratory including fluid and vacuum pumps, lasers, power supplies, electrophoresis and electrochemical apparatus. X-ray equipment, stirrers, hot plates, ovens both conventional and microwave and computers, printers and VDU equipment. In the office, there are, amongst other things, computer equipment, FAX machines and photocopiers. In the lecture theatres there are overhead and slide projectors. In fact, everyone in the School of Chemistry is exposed at some time to electrical equipment.

Hazards

- Electric shock is the effect produced on the body and particularly on the nervous system by an electrical current passing through it. The effect depends on the current strength which itself depends on the voltage and body resistance *i.e.* path length and surface resistance of skin (which is much reduced when wet). Death can be the result of the normal voltage of 240 V causing currents of greater than 30 mA to flow through the body for more than 40 ms. Minor shocks may also cause injury following involuntary muscle contraction.
- Burns caused by the passage of heavy currents through the body or by direct contact with an electrically heated surface.
- Explosion and fire caused by electrical sparks, short circuits or overload heating, old wiring in the presence of flammable material.
- Injury from microwave and radio-frequency sources and from induction heating equipment.

Precautions

These precautions are not meant to be exhaustive or to cover aspects of repair or construction of electrical equipment, but to cover everyday use in the laboratory and office. In general, all electrical work must be carried out by adequately qualified personnel ie. Estates office personnel, registered electrical contractors, electronics technical staff etc..

Plugs and fuses

- **Do not use plugs that are cracked or broken. Check that cable is not damaged before plugging in the appliance. If in doubt, consult any member of technical staff. DO NOT ATTEMPT TO REPAIR SUCH ITEMS YOURSELF!**
- **If you suspect that a fuse is blown in the appliance,. consult any member of technical staff. DO NOT ATTEMPT TO REPAIR SUCH ITEMS YOURSELF!**

Cabling

- Ensure that the cable is in good condition and free from breaks in the insulation. Cable must be sufficiently robust to withstand the wear and tear of laboratory or office use and fully waterproof where water may come within the vicinity of the apparatus, or protected by ELCB shut off control in the event of same occurring.
- Cables must not be run across the floor in such a way as to cause a tripping hazard or to be susceptible to damage from passing traffic. If it is necessary to run cables across walkways, cover them with cable protectors. If in doubt, consult any member of technical staff.

Extensions

- Do not ‘daisy-chain’ extension leads. Kettles, microwaves and heaters that have higher power demands must not be used on such an extension but must be fed from an installed socket point. If in doubt, consult any member of technical staff.

Mains/Emergency Trip Switch

Make sure you know where the main switch is so that you can turn off power in an emergency. Also know the location of the emergency trip switches in your laboratory. These are small wall mounted or bench mounted box units (yellow in colour), with a red button on same. If such trip switches are used in an emergency, contact any member of technical staff .

Use

- No apparatus with exposed mains terminals should ever be used.
- Do not use ordinary electrical equipment in the vicinity of flammable or explosive gases. Ordinary electrical equipment could be a source of ignition.
- Likewise do not use laboratory electrical equipment where it has come in contact with water e.g. heating mantles. There are ELCB breakers installed in the school which will switch off socket power in the event of this occurring, but it is still important to note that water, by its conductive nature, may cause a dangerous short circuit, particularly on exposed instrumentation.
- Never switch on equipment that has had liquid spilt on it until the equipment has been tested by any member of technical staff. Tell anyone to whom you take the equipment for testing what has happened or post warning notice on same- detailing date, fault, DO NOT USE etc..

Repairs

- Do not attempt to repair electrical equipment. Consult technical staff.
- Ensure that the equipment is disconnected from the main power.
- If in doubt, send equipment to manufacturer for repair, or service by a qualified person e.g. Registered electrician.
- In the event of power not working at sockets, consult estates office.

Testing

Before embarking on more sophisticated electrical work such as building your own equipment you should read reference advice on "Electrical Safety" paying particular attention to the regulations regarding the proper insulation of conductors and the earthing of apparatus. Custom built apparatus will be subject to a detailed Risk Assessment Experimental Method where necessary. Consult with members of technical staff if necessary.

Training

The use of electrical equipment is part of the day to day routine for every person. However, in the case of electrical work this must be carried out by qualified electricans who have been trained in this area. The Faculty of Science and Health also runs an electrical safety module as part of it’s SAFELAB programme (see ref.)

Risk Remaining

Mains electricity will always remain a potentially lethal hazard if mishandled. Following the precautions outlined above, the risk remaining should be minimal.

Emergency Procedure

Electric Shock.

- Switch off the power before touching the injured person. Follow the procedure given in the School of Chemical Sciences Safety Handbook under "Coping with an Emergency".

Fire.

- Follow the procedures given in the School of Chemical Sciences Safety Handbook. Never use water on an electrical fire.

References

A very comprehensive review of basic electrical safety is found on the faculty website:
http://www.dcu.ie/science_and_health/safety_info_pres.shtml

RISK ASSESSMENT #4: THE TRANSPORT AND USE OF COMPRESSED GAS CYLINDERS

Risk Category C

Hazards

- Pressurised gas cylinders are very heavy and unstable objects and as such can present considerable danger to those handling them.
- They contain gas which may be toxic, asphyxiating or flammable, and are at high pressure.
- Apart from the chemical risk from these gases, serious physical damage can be caused by exposure to the full force of escaping gas.
- Gas cylinder valves are very robust but a broken valve can turn a cylinder into a lethal projectile.
- Gas pressure regulators are much less robust and if damaged may allow the rapid escape of gas.

Risk

For an untrained person, the most probable source of injury is from incorrect fitting of the pressure regulator allowing the escape of gas (likely) or from a falling cylinder (unlikely). Resulting injuries may be moderate to severe.

Who is likely to be injured?

A falling cylinder or exposure to high pressure gas is likely to injure only the user of the cylinder however if equipment is blown apart by excessive pressure or toxic or asphyxiating gases escape the damage may be widespread within a laboratory or beyond. All cylinders are handled and fitted by members of technical staff alone, hence this risk assessment will apply mainly to technical staff alone.

Control Measures

Operating Precautions

- Ensure that the cylinder contains the expected gas (check the label).
- Transport the cylinder on a cylinder trolley (preferably the three wheeled variety) .
- Make sure the cylinder is firmly secured in an approved location.
- **NO GAS CYLINDER SHOULD EVER BE LEFT FREESTANDING**.
- Check the Pressure Regulator before installing on a gas cylinder. Is it designed for the gas cylinder being installed? Check the pressure rating. Is it capable of coping with the pressure in the cylinder?
- Never use oil or grease especially on an Oxygen cylinder: - the oil or grease may ignite – likewise for Teflon tape.
- When a cylinder is turned on ensure there are no leaks. Check cylinder and valve for leaks using an appropriate leak detector e.g. “CRC Leak Finder” available from BOC gases Ltd. http://www.boconline.ie/
- Turn the regulator to zero before opening the valve at the spindle and when finished, close the valve at the spindle.
- **NEVER** transport a cylinder with its regulator in place.

Remaining Risks

These should be slight if the precautions outlined above are followed.

Emergency Procedures

- Escape of gas: If the gas escape is large follow the procedure describes in the School of Chemical Sciences Safety Handbook for the escape of toxic material: remember even an inert gas can kill by asphyxiation. For small non-toxic leaks, inform a member of staff, ventilate, evacuate, seal and secure the room.
- Falling cylinder: If a cylinder falls over, NEVER attempt to catch it. It is much too heavy and will cause serious injury. It is also very robust and is unlikely to be damaged although it may make a loud noise. Do not attempt to upright it by yourself. Get assistance.

References

A very useful resource for safety and handling of gases/gas cylinders is available form:
http://www.boconline.ie/

Refer also to the Risk Assessment: Use of Flammable, Explosive or Toxic Gases

RISK ASSESSMENT #5: USE OF HIGH POWER MICROWAVE AND RADIO-FREQUENCY POWER SUPPLIES

Risk Category C

Activity being assessed:

Use of high power Microwave (MW) and Radio Frequency (RF) power supplies, for plasma generation, heating, *etc.*

Hazards

i. Biological heating and cooking (!) effects of MW and RF radiation, especially to eyes *(e.g.* cataract formation), and other soft tissues.
ii. Electric shock and burns (these may be different from, and far more serious, than the types of burns caused by conventional electrical supplies).
iii. High temperatures associated with high power equipment.

Precautions

Ensure equipment is properly:

i. Screened and shielded. Use an emission monitor to check that emitted MW power is <5mW cm^2 @ 5 cm. For RF emission, a good rule of thumb is if any LED or LCD displays in the lab start flickering they are being affected by excessive RF output, and the power supply or leads need more shielding. Note that at this level of interference, other sensitive electronic equipment may be adversely affected - with corresponding safety implications. For example, mass flow controllers that are monitoring (toxic, explosive...) gases are particularly susceptible to RFI, and can give incorrect readings or be fully open/off without the user being aware of this.
ii. Cooled. If water-cooling is used, ensure water connections are fitted correctly with no chance of leakage onto the power supply.
iii. Earthed. The casing of all power supplies must be earthed, and all electrical leads must be shielded with coaxial cable.
iv All specific operations with equipment should have a **Risk Assessment- Experimental Method** carried out as required. In the case of microwave apparatus, a portable microwave detector may also be used to check integrity of the apparatus.

Training Requirements

Training by an experienced person is essential.

Risk Remaining

The handling of MW and RF power supplies will always have some degree of risk and constant vigilance is required in their use. A **Risk Assessment - Experimental Method Form,** may need to be carried out before such apparatus is to be used.

Emergency Procedures

Shut off power supply; seek medical aid if necessary.

RISK ASSESSMENT #6: LASER WORK IN A LABORATORY

Known or Expected Hazards

- **Eyes: The entry of even a very weak laser beam into the eye can cause partial or complete loss of sight in that eye. The risk is present even for stray reflections off optical surfaces and it is such stray reflections that have caused serious incidents in the past**
- **Skin: Ultra-Violet lasers can burn and induce cancer (as for sunburn). The more powerful lasers of any wavelength can burn the skin.**
- **Most primary lasers use high currents and voltages internally so following the manufacturer's instructions for any maintenance procedures is important**

Measures to reduce the level of risk

- Use the lowest laser *output* possible.
- Wear laser-blocking goggles.
- Clearly designate and restrict access to the laser area (particularly anywhere in the line of sight) to laser trained personnel. Laser should be sited appropriately, and safety lock outs for power supply/vacuum/water should also be in place.
- Ensure laser beams (including stray reflections) constrained to one level (well below eye level).
- Remove all reflective surfaces from laser area (including wristwatch faces and similar objects); securely mount all optics.
- Follow proper procedures when aligning laser beams.
- The Faculty Laser Safety Officer must be notified of all class 2 and above lasers.
- Maintenance work on lasers should only be carried out by external contractors/service technicians.

Training Prerequisite

Laser work, except with class 1 lasers, is in risk category B, so NO LASER WORK WITH CLASS 2 AND ABOVE LASERS MAY BE UNDERTAKEN UNTIL THE WORKER IS SUITABLY TRAINED. All users of class 3 lasers and above must be registered with the DCU Laser Safety Officer before starting work. The faculty Laser Safety Advisor can advise on the training required appropriate to the proposed laser use. He/she can also advise on the class of any laser if the worker is unsure.

Level of Risk Remaining

It is not possible to remove the risk entirely for some laser work, but the risk is low if the taught procedures are followed.

Emergency Action

Switch off laser; seek medical advice if eye damage is known or suspected.

References

See SAFELAB MODULE 2- **Laser safety** at:
http://www.dcu.ie/science_and_health/safety_info_pres.shtml

RISK ASSESSMENT #7: USE OF REDUCED PRESSURE OR VACUUM

Risk Category C

Glassware

Hazards

Implosion and flying glass leading to cuts and lacerations. Any piece of glassware under vacuum *e.g.* rotary evaporators, vacuum desiccators, Schlenk lines and storage bulbs on vacuum lines have the potential to do harm following implosion.

The energy imparted to flying fragments is directly proportional to the volume of the glass vessel evacuated. It follows that the potential to do harm is also directly proportional to the volume of the glass vessel and a rotary evaporator with its associated flasks is a greater hazard than a small Schlenk tube.

It is a common misconception that so called "high vacuum" (typically 10^{-3} mbars or better) systems present a significantly greater hazard than everyday vacuums produced by *e.g.* a water pump (around 30 mbars). These may differ by four orders of magnitude but the forces to which the glassware is subjected is essentially the same *i.e.*

- High Vacuum, 99.999% of atmospheric pressure.
- Water Pump, 97% of atmospheric pressure.

Precautions

- Lab coats and glasses should be worn. In certain circumstances *e.g.* when introducing liquid nitrogen or other cryogenic material or when warming storage tubes from low temperature, cryogenic gloves and/or faceshield, should be worn. Also consult in House **Risk Assessment #18-Use of Cryogenic Materials.**
- Use only glassware that is suitable. Ideally thick walled glassware > 5mm thick is suitable for vacuum applications.
- Check that glassware is free from chips, cracks or flaws that would make it unsafe to use. Particular care should be taken to spot any ‘star’ cracks in vacuum glassware.
- Volumes of 1 liter or larger should be enclosed in tape or plastic mesh to restrain fragments in case of implosion. Schlenk lines and tubes are generally of small volume and are quite robust in nature and do not require extra protection in the shape of tape or plastic mesh.

Metal Vacuum Systems

Hazards

There are fewer hazards in handling metal vacuum systems due to the very unlikely risk of implosion.

House Vacuum

Water, solvents or corrosive gases should not be allowed to pass into the building vacuum system, as much as possible. When a potential for such a problem exists, a trap must be inserted between the apparatus and the vacuum inlet. The house vacuum system is maintained and serviced through the estates office.

Pumps

Hazards

Vacuum pumps are of various kinds. The most common are oil rotary pumps and oil (or more rarely mercury) diffusion pumps of glass or metal. Turbomolecular pumps are also used but apart from being electrical equipment, these present little danger being totally enclosed.

- Vacuum pumps are electrically powered apparatus.
- Belt driven rotary pumps present danger of entrapment in the moving belt and pulley wheels.
- The exhaust of rotary pumps may be contaminated chemically but will also contain an oil mist from the pump itself.
- There is a danger of explosion if the exhausts of rotary pumps that are pumping large volumes of air or other gas are blocked or obstructed.
- Diffusion pumps are heated to boil the pumping liquid and so present a risk of burns.

Precautions

- The usual precautions must be taken when using electrical equipment.
- Rotary pumps must have belt guards to prevent entrapment.
- A trap (either a cold trap or molecular sieve) should be used between system and pump to prevent contaminants reaching the pump oil or being exhausted into the laboratory.
- The exhausts of rotary pumps must be free from obstruction.
- Exhaust lines must be vented to a fume hood by tubing of large enough cross section not to cause obstruction.
- Where possible mercury diffusion pumps should be replaced by oil versions. Mercury pumps must have secondary containment.
- The boilers of diffusion pumps must be shielded to prevent burns by contact.
- Diffusion pump fluids may be subject to a COSHH Assessment.

Pump Maintenance, Changing Oil

Pump maintenance including oil changes may be carried out by users themselves or by a member of the technical staff assigned that duty. Pumps should carry a sticker indicating date when oil changed and when next due.

Hazards

Pump oil possibly contaminated with solvents, mercury, corrosive or obnoxious substances.

Precautions

- As far as possible, pump oil should be drained with the pump in a fume hood.
- Wear gloves and a lab coat.
- If there is any suspicion of contamination, treat the oil as hazardous waste.
- Waste oil should normally be taken to the technician in charge of pump maintenance for disposal.
- Pumps left for service by technical staff should bear a warning about possible oil contaminants.

Pressure Gauges

Hazards

Vacuum pressure gauges are mainly of two kinds *i.e.* the manometer or McLeod Gauge type, which are made of glass and contain mercury or some other liquid, and electrical devices, which measure pressure dependent properties such as thermal conductivity or ionisation current.

- Danger from glass apparatus and possibly mercury.
- Electrical equipment.

Precautions

- Glassware gauges should be treated as indicated above under "Glassware".
- Secondary containment must be used around systems that contain mercury.
- Where possible, mercury should be replaced by some other less hazardous fluid.
- Alternative manometer fluids may be subject to a COSHH Assessment.
- The usual precautions must be taken when using electrical equipment.

Training

The use of glassware under vacuum or reduced pressure is part of undergraduate chemistry training. For more advanced vacuum systems, a person competent and experienced in their use should instruct users.

Remaining Risk

This is slight if the precautions outlined above are followed. However, glass systems remain more dangerous than metal systems because of the possibility of implosion.

Emergency Procedures

In the event of injury or fire follow the procedures outlined in the School of Chemical Sciences Safety Handbook under "Coping with an Emergency".

References

See the associated Risk Assessments:

- Use of Glassware
- Handling, Transportation and Storage of Liquid Nitrogen and Other Cryogenics.
- Use, Handling and Clean-up Procedures for Mercury.

RISK ASSESSMENT #8 AND CHECKLIST: VISUAL DISPLAY EQUIPMENT

Risk Category C

Introduction

The **Display** Screen **Rules** apply to all **display screen equipment** fitted at **workstations** operated by **users. Display Screen Equipment (dse):** any alphanumeric or graphic display system including non-electronic systems such as microfiche readers.

Workstation: Computers, disk drives, modems, office furniture, *etc.* in the immediate work environment of the display screen equipment.

User: an employee who habitually uses dse for a significant part of his/her job. Thus a person may be classified as a user if some or all of the following circumstances apply:

a. The individual depends on the use of dse to do his/her job, there being no alternative means.
b. The individual has no discretion as to the use or non-use of the dse.
c. The individual needs particular skills in the use of dse.
d. The individual normally uses dse for continuous spells of an hour or more at a time.
e. The individual uses dse daily.
f. Fast transfer of information between the user and the screen is important
g. High levels of attention and concentration are demanded of the user.

It can be seen, especially with regards to items c), d), e) and g) that within the School of Chemical Sciences, there are Office Workers and Research Workers who fall within the definition of "user" and to whom the rule applies. Research Workers who can be defined as "users" are most likely, but not exclusively, to be found in the Physical/Analytical Section.

The Display Screen Rules require employers to carry out an assessment of workstations and to remedy any shortcomings that are identified. New workstations installed after 1st Dec. 1998 must meet the standards described below and it is advised that all existing workstations must be updated by 1st Dec. 1999.

Lighting, Glare and Reflection and Noise

These are general office specifications but apply also to workstations. The requirements are for adequate but not excessive lighting, avoidance of glare or reflection from windows and reasonable levels of noise. (For these and other requirements outlined below, more detailed specifications are contained in the University Code of Practice on Office Safety and VDU Use.)

Display Screen Equipment

The display screen itself must be able to be positioned and angled for comfortable viewing.

Chairs and Desks

Chairs should have a base with at least five castors (star wheeled) for stability and easy movement, should be able to swivel easily and be adjustable in height and in back support. Desks should have adequate surface area to

accommodate equipment and documents, manuals *etc.*, be of appropriate height and have sufficient leg/knee space.

Keyboards

The position of the keyboard on the desk should be such as to allow 100mm in front of the keyboard. Keys should be clearly marked.

Footrests

These may be appropriate depending on the physical stature of the user.

Floor

The floor covering should be such as to allow the wheels of the chair to move freely.

Hazards

- Repetitive Strain Injury (RSI) a musculo-skeletal disorder, the symptoms of which include pain, swollen soft tissue, restricted joint movement, loss of function and possible permanent disability. Users of keyboards who are not trained typists are more susceptible to such problems.
- Eye Strain: Evidence indicates that using dse is not associated with damage to the eyes or eyesight although uncorrected defects can increase the stress of working with such equipment.
- Fatigue and stress.

Precautions

- Avoidance of RSI. Good economically designed seating arrangements and posture when using the keyboard or mouse. Frequent breaks either resting the fingers and wrists or carrying out alternative work provided it does not involve the use of the joints in a manner similar to keyboard use. Further details are given in the Note of Guidance "Computer Related Repetitive Strain Injury" and in the University Code of Practice referenced below.
- Eye strain. If defective vision is suspected, users are entitled to vision screening and full eyesight test if necessary. If prescribed for VDU work, basic spectacles can be supplied but remain the property of the University.
- Fatigue and stress can be reduced by providing a sympathetic working environment. Computer programs should be as far as possible "user friendly" and allow for the recovery of errors. (It is recognised that this will not always be possible in research work but it should be a major consideration in office computing.)

Training

See http://www.dcu.ie/safety/office.shtml

RISK ASSESSMENT #9: USE OF ULTRAVIOLET LIGHT SOURCES

Risk Category C

Hazards

Two categories of hazard are involved in the use of UV lamps used in experiments: those inherent in the radiation itself and those associated with operation of the lamps. All radiation of wavelength shorter than 250 nm should be considered dangerous.

- Damage to eyes and skin caused by exposure to UV radiation.
- Burns caused by contact with a hot UV lamp.
- Fire ignited by hot UV lamp.
- Interaction of other nearby chemicals with UV radiation.
- Damage caused to apparatus placed close to UV lamp.

Precautions

Lab-coats, gloves and safety glasses or other appropriate eye/skin protection such as UV protective glasses or a UV protective face shield must be worn.
Sources of UV should as far as possible be contained in a closed radiation box.

Reactions using UV lamps

- An untrained person must never attempt these operations.
- A single person must never attempt these operations.
- These operations must never be attempted out of normal working hours.
- Use of UV lamps must be carried out in the vented cabinets provided in a suitable photochemistry laboratory.
- The vented cabinet doors must remain closed while the UV lamp is switched on.
- The vented cabinet must contain only the UV lamp and associated apparatus and chemicals. No other chemicals are to be stored in the vented cabinet and no other reactions are to be performed in the vented cabinet.
- Care must be taken with flammable solvents to avoid excessive heating.
- Flammable equipment *(e.g.* rubber tubing) must be positioned at least 10 cm away from the lamp.
- After the UV lamp is switched off, unless the reaction mixture requires immediate attention, the vented cabinet should remain closed for 30 minutes to allow the UV lamp to cool.

Visualisation using UV lamps

When using UV lamps for visualisation of TLC plates, treat with similar caution, although many of the above requirements obviously do not apply.

Training

Training in using uv lamps for specific apparati can be given by any member of technical or academic research staff competent in the use of same.

Level of Risk Remaining

Low if the above Precautions are followed. The risk remaining is of burns from hot equipment.

Emergency Procedures

Fire or injury: Follow the procedures outlined in the School of Chemical Sciences Safety Handbook under "Coping with an Emergency".

RISK ASSESSMENT #10: USE OF LABORATORY HEATING EQUIPMENT

Risk Category C

The equipment considered in this Risk Assessment includes laboratory ovens, Bunsen burners, heating plates and mantles, steam oil and sand baths and hot air guns *i.e.* temperatures up to 800°C. A separate Risk Assessment must cover the use of very high temperatures, furnaces, experimental rigs etc..

Hazards

Personal injury and burns from hot surfaces, liquids, vapours or flames.
Sources of ignition both from hot surfaces, liquids, flames, and from electrical components.

Precautions

Many heating appliances contain electrical elements (see the separate Risk Assessment Use of Standard Electrical Equipment). If any heating device becomes so worn or damaged that the heating element is exposed, then the device should be immediately taken out of service.
All heating devices (apart from steam baths) must be kept well away from flammable material.

Ovens

- With the exception of vacuum drying ovens, laboratory ovens rarely have any means of preventing the discharge of material volatilised within them. Thus it should be assumed that these substances will escape into the laboratory atmosphere but may also be present in sufficient concentration to form explosive mixtures within the oven itself. Venting the oven to an exhaust system may reduce this hazard.
- Ovens should not be used to dry any chemical sample that has even moderate volatility and might pose a hazard because of acute or chronic toxicity unless the oven is constantly vented to a safe exhaust.
- Glassware rinsed in solvent poses a danger of explosion if dried in a non-vented oven.

Bunsen Burners

- Bunsen burners are used less and less in laboratories. The naked flame is liable to set off the fire alarm system if set in the line of sight of a flame detector. If used, be careful to shield the flame from the detector.
- The naked flame is a particularly hazardous ignition source and must never be used near open containers of flammable liquid or in environments where appreciable concentrations of flammable vapour may be present.
- A Bunsen flame may be difficult to see in bright sunlight. Pull blinds to shade the flame.

Hot Plates, Heating Mantles

- Check the state of the heating element. If the covering is broken or worn do not use it. If water or other liquid has been spilled onto the element, have the equipment electrically checked before use.

Steam, Oil and Sand Baths

- Take extreme care to mount the baths in such a way that they cannot be overturned or that water cannot fall into an oil or sand bath causing hazardous splattering.
- **NOTE:!!Use only silicon oil for oil baths which has an effective range of -50 to 200 degrees C. (eg. Sigma Aldrich Cat no. 85409).- The use of liquid paraffin oil baths/mineral oil baths is not permitted in the School.**
- Remember oil expands in volume when heated: - do not overfill an oil bath
- Material heated in such a bath should be mounted in such a way that it can be quickly and easily removed from the bath in an emergency.

- Oil must not be overheated so that it smokes or decomposes or is in danger of ignition.
- Ensure proper labeling which identifies the oil and its safe working temperature.
- Pay attention to the following: -
  the size and location of the bath,
  operating temperature and temperature control devices,
  available ventilation,
  the method of cooling hot oil,
  storage of oil for reuse,
  proximity of water or chemicals.
- Steam baths present a danger of scalding from hot steam and care must be taken especially when mounting or removing reaction vessels.
- In all cases, when using such apparatus, proper protective equipment must be worn *i.e.* laboratory coat, safety glasses, and gloves.

Hot Air Guns

- Laboratory hot air guns contain an electrically heated element that typically glows red-hot. Also, the on-off switches and motors are rarely spark free. For these reasons, hot air guns present as serious an ignition hazard as a naked flame and must never be used near open containers of flammable liquid or in environments where appreciable concentrations of flammable vapour may be present *e.g.* over glassware rinsed in solvent.
- The air emerging from a heat gun is very hot indeed and is invisible and so the front end should be treated with all the respect due to a blowtorch.

Training requirement

The use of some of these heating devices *i.e.* steam baths, Bunsen burners, hot plates and heating mantles is part of Undergraduate training. In the remaining cases, training should be given by a competent person.

Level of Risk Remaining

With the proper training, the level of risk is low although constant vigilance is necessary to avoid injury and possibly serious burns.

Emergency Procedure

Personal injury, burns. Follow the procedure outlined in the School of Chemical Sciences Handbook under the heading "Aiding an Injured Person".

Fire or Explosion. Follow the procedure outlined in the School of Chemical Sciences Handbook under "Coping in an Emergency"

References

See the Risk Assessment. "Use of Standard Electrical Equipment".

RISK ASSESSMENT #11: GENERAL OFFICE WORK

Risk Category D

Hazards

Housekeeping.	Rubbish and temporary storage of material presenting a fire or tripping hazard.
Electrical.	Hazards due to electrical faults or from tripping on electrical cables.
Storage.	High or awkward shelves, unstable items.
Machinery.	Guillotines, staplers, scissors and other items with sharp edges.
Lifting.	Heavy or unstable objects.
VDE use.	Musculo-skeletal disorders from poor posture, poor arrangement of equipment and eye strain from poor lighting, incorrect spectacles, fatigue and stress.

Precautions

- Practice good housekeeping in the office especially with regard to walkways and fire exits.
- Electrical equipment, see the Risk Assessment Use of Standard Electrical Equipment. All portable electrical equipment (typewriters, computers, adding machines, desk lights *etc.)* must be tested from time to time and carry a sticker recording the test. Care must be taken that cables do not trail across walkways.
- Only one drawer of a filing cabinet should be open at one time so that it cannot topple over. Objects should not be stored on high or unstable shelving.
- Potentially dangerous machinery like guillotines or shredders must be properly guarded to prevent damage to fingers and hands. Extra care should be taken with sharp edges or points. Even the edge of paper can cut which is all the more painful from being unexpected.
- Take great care when lifting heavy or awkward items. See the University Code of Practice on Mechanical Safety for more advice.
- VDE use. See the Risk Assessment and Check List for Visual Display Equipment.

Training

Apart from general experience, office workers may require frequent update training in the use of office computer software.

Level of Risk Remaining

Slight but significant in the area of musculo-skeletal disorders due to improper posture or typing techniques in the use computing equipment.

Emergency Action

Refer to the section "Coping with an Emergency" in the School of Chemical Sciences Safety Handbook

References

http://www.dcu.ie/safety/office.shtml

RISK ASSESSMENT #12: HANDLING, TRANSPORTATION AND STORAGE OF LIQUID NITROGEN AND OTHER CRYOGENIC MATERIALS

Risk Category C

Properties: Liquid Helium

- Liquid Helium has a boiling point of –269 ^{0}C
- Volume of expansion liquid to gas (at 15°C, 1 atm.) = 748.0
- Realtive density (water) = 0.12
- Colourless, odourless liquid which manifests itself as white 'plumes' at room temperature.
- Known or expected hazards similar to that for liquid nitrogen.

Properties: Liquid Nitrogen

- Liquid Nitrogen has a boiling point of -195.8°C
- Volume of expansion liquid to gas (at 15°C, 1 atm.) = 682.1
- Sg = 0.808 (at -195.8°C).
- Density of liquid (normal boiling point, 1 atm.) = 0.807 g/cc
- Colourless, Odourless liquid similar in appearance to water.

Known or Expected Hazards

a) Temperature Related

- The extremely low temperature of the liquid can cause severe burn-like damage to the skin either by contact with the fluid, surfaces cooled by the fluid or evolving gases. The hazard level is comparable to that of handling boiling water.
- The low temperature of the vapour can cause damage to softer tissues *e.g.* eyes and lungs but may not affect the skin during short exposure.
- Skin can freeze and adhere to liquid nitrogen cooled surfaces causing tearing on removal.
- Soft materials *e.g.* rubber and plastics become brittle when cooled by liquid nitrogen and may shatter unexpectedly.
- Liquid oxygen may condense in containers of liquid nitrogen or vessels cooled by liquid nitrogen. This can be extremely hazardous because of the pressure rise on the slightest degree of warming above the boiling point of oxygen (-183^{0}C) and the possibility of explosive reaction with oxidisable material.
- Thermal stress damage can be caused to containers because of large, rapid changes of temperature.

b) Vapour Related

- Large volumes of nitrogen gas are evolved from small volumes of liquid nitrogen (x~700) and this can easily replace normal air in poorly ventilated areas leading to the danger of asphyxiation. It should be noted that oxygen normally constitutes 21% of air. Atmospheres containing less than 10% oxygen can result in brain damage and death (the reflex is triggered by excess carbon dioxide and not by shortage of oxygen), levels of 18% or less are dangerous and entry into regions with levels less than 20% is not recommended.
- Oxygen condensed into leaking containers can explode on heating following reheating or blockage with ice.

Operation

- Always use liquid nitrogen in a well-ventilated area, especially when filling a warm container or transfer tube or inserting a warm object. As potentially large volumes of nitrogen/helium gas can be evolved it is prohibited to travel in a lift with a <u>full</u> dewar of liquid nitrogen or helium, failure of the dewar or a large

spillage of cryogenic fluid could result in asphyxia in the confined area of a lift. When using service lifts to transport **full dewars** containing liquid nitrogen or liquid helium obey the warning signs as posted on the service lifts and use portable warning signs on dewars as provided by the technical staff. The term '**full dewar'** is specific to those dewars which are ~10-100litre in capacity, may be pressurized, and need to be moved by wheels. Place full dewars of cryogenic fluid in the service lift and then 'call' the lift to the floor required.

Do not travel in lifts with full dewars containing cryogenic fluids.

- Only use containers or fittings (pipes, longs *etc.)* that have been designed specifically for use with cryogenic liquids as non-specialized equipment may crack or fail. In particular, do not use food type vacuum flasks as they can implode resulting in flying glass fragments.
- All glass Dewars must be protected against the possibility of flying glass fragments, arising from failure by mechanical or temperature stress damage, by sealing all exposed glass either in an insulated metal can or by wrapping with adhesive tape.
- Always fill warm dewars slowly to reduce temperature shock effects and to minimize splashing. Do not overpressure storage dewar when filling a globular dewar. Use the minimum pressure required to maintain a flow of liquid.
- Always make sure that containers of liquid nitrogen are suitably vented and unlikely to block due to ice formation.
- Beware of the formation of liquid oxygen in cold-traps that are open to air or the increase of liquid oxygen content in a flask of liquid nitrogen that has been cold for a long period. (Liquid oxygen has a blue water-like appearance). However, most liquid nitrogen containers are closed except for a small neck area and the nitrogen vapour issuing from the surface forms a barrier which keeps air away from the liquid thus preventing oxygen
- Avoid skin contact with either liquid nitrogen or items cooled by liquid nitrogen as serious burns may occur.
- Always wear approved Personal Protective Equipment especially safety glasses to protect against splashes, vapour, failure of glass apparatus resulting in implosion, brittle failure of items cooled by liquid nitrogen.

Personal Protective Equipment

- Face shield or safety glasses.
- Appropriate insulated gloving material when handling equipment that has been in contact with the liquid. *NB* there is dispute over the advisability of wearing gloves while handling liquid nitrogen because there is a belief that gloves could fill with liquid and therefore prolong hand contact, which would make burns more severe. If gloves are worn they should be loose fitting and easily removed.
- Lab coat or overalls are advisable to minimise skin contact, also, wear trousers *over* shoe/boot tops to prevent shoes filling in the event of a spillage.

Training

New users of liquid nitrogen should receive instruction in its use from experienced members of the academic or technical staff. Also see References.

Level of Risk Remaining

There remains a significant risk in using liquid nitrogen from the inadvertent condensation of oxygen into a closed system. It is recommended that whenever possible some other coolant is used *e.g.* solid carbon dioxide liquid traps or baths - the preferred liquids for such baths are iso-propanol or glycols. It is strongly recommended that such baths are used in preference to liquid nitrogen when long-term storage is envisaged.

Properties: Solid Carbon Dioxide

Sublimation point	-78.5°C
Melting point	-56.6°C
Volume of expansion solid to gas	~900

Hazards

Apart from being unable to condense oxygen, hazards associated with solid carbon dioxide are similar to those described for liquid nitrogen *i.e.* temperature related and vapour related. In operation, similar precautions should be taken against cold burns and asphyxiation.

Emergency Procedures

Temperature related

- For brief, localised contact with cold material - flush the area with water. (Water is used because of its high heat capacity.) Obtain First Aid assistance.
- More prolonged contact will require medical treatment. Call a First Aider.

Vapour related

- Following a large spillage of liquid nitrogen, evacuate the area and call for help. Follow the procedure outlined in the School of Chemical Sciences Safety Handbook for the escape of toxic material in the section "Coping with an Emergency".

References

See www.bocgases.ie

RISK ASSESSMENT #13: USE, HANDLING AND CLEAN-UP PROCEDURES FOR MERCURY

Risk Category C

Properties

Properties of Mercury:

Symbol	Hg
Atomic weight	200.59
Melting point	-38.7°C
Boiling point	356.8 °C
Physical state	heavy, silver liquid at room temperature

Hazards

Mercury is a poison that is readily absorbed through the respiratory tract or through unbroken skin. It acts as a cumulative poison since only small amounts of the element can be eliminated at a time. The present accepted threshold limit for Mercury in air is 0.05 mg m^3 (*NB.* air saturated with mercury vapour at 20°C exceeds the toxic limit by 100 times). High concentration of vapour may cause a metallic taste, nausea, abdominal pain, vomiting, diarrhoea and headache. Chronic effects from continual exposure to small concentrations can cause severe nervous disturbance, insomnia, loss of memory, irritability and depression. Loosening of teeth, dermatitis and kidney damage are possible in severe prolonged absorption.

Mercury can react with ammonia to produce an explosive solid. It can cause severe corrosion problems because of its ease in forming amalgams. Reacts violently with dry Bromine.

Operation

- Mercury must only be transported in small quantities in plastic **containers** (glass bottles are unsuitable because breakages will result in possible spillage over a large area).
- Always handle Mercury in a well-ventilated area and in a suitable plastic tray (mercury may react with a metal tray or may be absorbed into a porous tray *e.g.* wood). Do not breathe the vapour.
- Avoid skin contact, wearing disposable gloves would be advantageous. Wash hands thoroughly after using mercury, especially before eating, drinking or (worse) smoking, to avoid ingestion.
- Use secondary containment on all apparatus containing Mercury *e.g.* manometers, McLeod gauge. Mercury switches. Mercury diffusion pumps (generally phased out in favour of the safer oil diffusion pump). Take care with mercury in glass thermometers.

Emergency Procedures

Spillages

- Report and clear up all spillages immediately using the recommended methods and the equipment kept solely for this purpose. When spilled, Mercury breaks into many small droplets covering a large area, avoid spreading the contamination by restricting access to the spill area and only use the designated cleaning tools (*e.g.* brush, floor mop or dustpan) obtainable from the technician in charge or superintendent (*NB.* walking on contaminated area could mean that you transport the contamination home!).
- If mercury has spilled onto a hot surface (hotplate, mantle, heating element) evacuate the room, as high concentrations of vapour could be present. Report the fact to any member of technical staff.

Spillage Decontamination

NB. ***TO MINIMISE CONTAMINATION USE ONLY THE SPECIAL EQUIPMENT KEPT FOR MERCURY DECONTAMINATION AND DO NOT USE THAT EQUIPMENT FOR ANY OTHER PURPOSE***

Spillages should first be cleaned up as far as practicable by mechanical means, e.g. by either the special hand operated sucker, or, for larger spills, by using the vacuum trolley designed for the purpose. Areas that have been affected by fine droplets of mercury should be treated with a slurry composed of equal parts of slaked lime (calcium hydroxide) and flowers of sulphur mixed with enough water to make a yellow wash. The slurry is normally left in place for between 24-48 hours after which it is cleaned away by careful sweeping with a dustpan and brush prior to washing with water to remove all traces of the slurry, (often several washes).

Disposal of Waste

Dirty liquid mercury should be carefully transferred to a clearly labeled plastic container and given to any member of technical staff for disposal.

Slurry and contaminated items *e.g.* tissues and small bits of broken glass (thermometer) should be sealed in a suitable, clearly labeled container and given to any member of technical staff for disposal.

Level of Risk Remaining

This should be low if the procedures outlined here are followed.

References

- MSDS for Mercury.

RISK ASSESSMENT #14: USE OF HYDROFLUORIC ACID

Risk Category A

Hazards - CORROSIVE - TOXIC

- **Causes severe burns.**
- **Very toxic by inhalation, in contact with the skin and if swallowed.**

Hydrofluoric Acid has a number of properties that make handling particularly difficult.

- HF attacks glass, concrete, some metals and organic compounds.
- While HF gas is one of the most acidic gases known, aqueous HF is technically a weak acid. However the definition "weak" bears no relation to hydrofluoric acid's ability to damage living tissue with fluoride ions rapidly absorbed through the skin and able to migrate through and destroy tissue until they are eventually sequestered in the bones. HF damage causes long term excruciating pain and burns which are slow to heal. Burns around the fingertips are reputed to be particularly painful and may require the surgical removal of fingernails.
- Fluoride ions are both acutely and chronically toxic so that even 1% solutions of HF (or metal fluorides) must be handled with care. However, the ability of HF to carry fluoride ions through intact skin increases greatly with increasing concentration. Thus, *5%* (2.5M) HF can be handled with about the same level of care that is appropriate for handling 10M H_2SO_4. Above 10% (5M), the dangers of handling HF increases sharply and any contact with the skin for more than a few seconds can result in latent burns which may take hours before they start to cause pain. Manufacturers commonly supply HF as 48% (28M) solution and sometimes as 73% (44M). Handling HF of these concentrations is far more dangerous than handling any other common concentrated acids.

Precautions

IMPORTANT SAFETY NOTE!!!!: All research workers intending to use Hydrofluoric acid must inform the Head of School, S.S.A. and A.S.S.A. of their intention to do so. No research worker will be permitted to work with Hydrofluoric acid without first completing a special risk assessment of their operation for intended use which needs to be approved, and that a hydrofluoric acid training course run by the A.S.S.A. is completed by the research worker.

- Hydrofluoric Acid of >10% (5M) concentration must be stored in a cool, well-ventilated area in a screw capped hi-density polyethylene (or equivalent) container. It is inadvisable to keep such acid at all in a laboratory unless an appropriate detailed Special risk assessments and training is completed by each of the workers in the laboratory has been made.
- Reference should be made to an up to date Material Safety Data Sheet or Laboratory Safety Sheet.
- A detailed **Risk Assessment-Experimental Method (p.45-46 this book)** must be completed and approved by the SSA before any use is made of hydrofluoric acid. Even if only dilute (5%) acid is to be used, the assessment must define how the commercially available concentrated acid is to be diluted safely. (The main danger in this operation is spilling or splashing the concentrated acid or breathing HF fumes as only a little heat is evolved during dilution.)
- First aiders must be informed and emergency services as appropriate.
- Technical staff to be informed.
- **Procedures using hydrofluoric acid must never be attempted by an untrained person.**
- **Procedures using hydrofluoric acid must never be attempted out of normal working hours and it is strongly advised that procedures are restricted over the lunch period when trained First Aiders may not be available.**
- **Procedures using hydrofluoric acid must never be attempted by someone working alone.**
- All procedures must be carried out in a fume hood.

- It is strongly advised that procedures, which are new to the HF user, should be practiced as a "dry run" using water instead of hydrofluoric acid, and documented via risk assessment before involving the acid.
- Appropriate P.P.E. must be worn as per training.
    - Disposal-Use approporiate waste containers **as per training.**

Training

Training by a competent person is absolutely essential before this material is used.

Level of Risk Remaining

Constant vigilance is required in the use of these materials but risks should be low if the procedures outlined above are followed.

Emergency Procedures

As per Hydrofluoric acid training course.

References

- **School of Chemical Sciences safety awareness training programme for researchers**
- See any MSDS for HF.
- "Hazards in the Chemical Laboratory." ed. L. Bretherick, 4th Ed. RSC.

RISK ASSESSMENT #15: USE OF FURNACES

Risk Category C

The equipment considered in this Risk Assessment includes laboratory high temperatures, furnaces, experimental rigs etc.

Hazards

Personal injury and burns from hot surfaces, liquids, vapours or flames.
Sources of ignition both from hot surfaces, liquids, flames, and from electrical components.

Precautions

Many heating appliances contain electrical elements (see the separate Risk Assessment Use of Standard Electrical Equipment). If any heating device becomes so worn or damaged that the heating element is exposed, then the device should be immediately taken out of service.
All heating devices (apart from steam baths) must be kept well away from flammable material.

Furnaces
The School of Mechanical and Manufacturing Engineering uses high temperature furnaces for many processing methods.

- Proper PPE should be used at all times when using the School furnaces (e.g. aprons, goggles, heat resistant gloves, footwear covers etc.)
- Researchers should risk assess their working area and develop **a Risk Assessment Standard Operating Procedures - EXPERIMENTAL METHOD FORM** for **any** furnace work that they wish to undertake.
- Researchers should familiarize themselves with the location of first aid boxes and the first aid procedures for dealing with burns.
- Appropriate material handling equipment should be used when placing research materials into/removing research materials from the furnaces.

Training requirement

training should be given by a competent person.

Level of Risk Remaining

With the proper training, the level of risk is low although constant vigilance is necessary to avoid injury and possibly serious burns.

Emergency Procedure

Personal injury, burns. Follow the procedure outlined in the School of Mechanical and Manufacturing Engineering Handbook under the heading "Aiding an Injured Person".

Fire or Explosion. Follow the procedure outlined in the School of Mechanical and Manufacturing Engineering Handbook under "Coping in an Emergency"

References

See the Risk Assessment. "Use of Standard Electrical Equipment".

Appendix 3

Reference list of safety literature

A guide to Safety, Health and Welfare at Work (Pregnant Employees etc.) Regulations 1994- HSA

Radiation Protection Procedures Safety series No.38 - Int. Atomic agency

Toxicology and Biochemistry of Aromatic Hydrocarbons- H.W. Gerarde- Elsevier

Handbook of Reactive Chemical Hazards by L. Bretherick - Butterworths

Handbook of Laboratory Safety 2nd Edition CRC Press Inc.

Solvent Safety Sheets- H.Henning(Ed.)- Royal Society of Chemistry

Handbook of Toxic and Hazardous Chemicals and Carcinogens 2nd Ed. - M. Sittig.

Suspected Carcinogens- A sourcebook of the Toxic effects of Chemical Substances - E. Fairchild

Laboratory handbook of Toxic Agents- C.H. Gray

Patty's Industrial Hygiene and Toxicology Vo. 3a 2ND Ed., L.J. Cralley and L.V. Cralley

Hazardous Chemicals Data 1975, National Fire Protection Assoc.

Toxic Phosphorous Esters-Chemistry, Metabolism and Biological Effects- R.O'Brien

Laboratory Safety: Principles and Practices- Brinton M.Miller *et al.*

Fire Protection Guide on Hazardous Materials -9TH Ed. NFPA

Poisons and T.S.A. Guide 10th Ed. - The Pharmaceutical Press.

A Word of Warning-The quality chemical supplier's health ans safety information- Maurice Frankel

Laboratory Biosafety Manual 2nd Ed.- W.H.O. -Geneva

Safety with Cryogenic Fluids- M.G.Zabetakis- U.S.A. Dept. of the Interior

A Guide to Radiation Protection in the use of X-Ray Optics equipment- Science Reviews Ltd H&H Scientific Consultants Ltd.

Occupational Health and Safety Concepts- Chemical and Processing Hazards- Gordon R.C. Atherley

Drilling Machines: Guarding of Spindles and Attachments- Dept. of Employment (U.K.)

Controversial Chemicals A citizen's Guide- Ed. P. Kruus and I.M. Valeriote

Regulations for the Safe Transport of Radioactive Material- 1985 Ed.- I.A.E.A. Safety stds.

Dangerous Goods Regulations 35TH Ed.- I.A.T.A.

Guidelines on First-Aid at Places of Work- Health and Safety Authority

Various hardcopy publications from the H.S.A. of Ireland.

Appendix 4

DCU Policy and Procedures for Lone/Out of Hours Working

1. Definitions

1.1 This policy is designed to guide all staff and postgraduate students the School of Mechanical and Manufacturing Engineering of Dublin City University on the procedures required for lone or out of hours working.

NOTE: Unsupervised Out of Hours work by Undergraduate Students is strictly prohibited

1.2 Nothing in this policy shall supersede in whole or in part the duties of employers or employees under

(a) existing statutory provisions relevant to health, safety and welfare at work

(b) common law

(c) University Safety Statement

1.3 **Dublin City University strongly recommends that in the interest of health, safety and personal security, lone / out of hours work should only be undertaken when absolutely necessary and no other alternatives are available**

1.4 Lone working/out of hours working is defined as follows

Any Laboratory / Experimental work undertaken outside of 9am-5.15pm Monday – Friday

Any other work undertaken outside of 7am-10pm Monday – Friday and during the hours of 9am -6pm on Saturday, Sunday & Bank Holidays.

NOTE: All buildings must be vacated by 6pm on Saturdays, Sundays and Bank holidays when they will be subject to full lock up

NOTE: At Christmas & Easter the campus will close down for a specified number of days and access will only be granted under exceptional circumstances .

1.5 **The Following Risk Category Rating will apply to Lone / Out of Hours Working**

Category A Risk (Unacceptable)	**Activities to be carried out 9am – 5.15pm Mon – Fri only. Activity must not be done outside hours.**
Category B Risk (High)	Activities to be carried out only by experienced researchers with competent 'Buddy' in attendance. **Careful risk assessment of experimental method required. Final approval by School Safety Advisor required!**
Category C Risk (Medium)	Activities to be carried out by sufficiently competent researchers (may or may not require Buddy)
Category D Risk (Low)	Activities to be carried out by any postgraduate student / staff member (egg computer work)

2. Procedures

2.1 Based on an assessment of their experience and knowledge, each postgraduate student will be defined as competent for a range of activities outside normal working hours, provided each activity is risk assessed using individual Risk Assessment forms for the activities needed. This assessment will be completed by the postgraduate student's academic supervisor, and countersigned and approved by the School Safety Advisor-on behalf of the Head of School. These risk assessments will be kept on file by the School Safety Advisor

2.2 Staff members in individual Schools / Units / centers will be considered competent to engage in Category D activities. Staff members must be authorized by the School Safety Advisor/Head of School to engage in Category B & C activities out of hours.

2.3 The School Safety Advisor will also retain an up to date listing of all of those who have attended any 'Safety/Security' Induction.

2.4 Once an activity is risk assessed properly, and the user defined as competent, the **Approval Form for Out of Hours/Lone Working** form should be authorised by the School Safety Advisor. A listing of all those authorised for after hours access will be submitted via **email to Helpdesk Estates office C/O Susanne Corcoran, and Eileen Tully University safety officer,** by the School Safety Advisor in order to permit lone/out of hours working.

2.5 Security will hold the list of personnel approved for lone/out of hours working in each building. All authorized persons must log onto the 'Out of Hours' website http://www.dcu.ie/safety/safety.php3 immediately on entering the building or as soon as their work activity is defined as 'out of hours' according to the definitions contained in 1.4 above. All persons leaving the building must log off the 'Out of hours' website, thus notifying security that they are no longer in the building.
Note: Where in exceptional circumstances, web access is unavailable to the researcher he/she must check in with Security on x8990/5999 and similarly check out before he/she leaves the building.

Where the Fire alarm is activated in the building after hours, those evacuating the building must assemble at the building fire assembly point. Otherwise emergency services will assume that they are still in the building.

In order to ensure the safety and security of persons working in buildings 'out of hours', access to each building is strictly limited to those authorised by the School / Unit / Centre concerned. Authorised persons must not admit any other person to the building out of hours. Persons claiming to be authorised but without a swipe access card or key should be referred to Security for access.

2.6 Researchers or Staff members who in exceptional circumstances, due to the nature of their research work, require access during 'Lock-Up' must seek authorisation for such access from the Dean of Research/Head of School. The Dean of Research/Head of School will liaise with DCU Security to arrange such 'once-off' access.
Breaches of the above procedure will result in sanctions including revocation of out of hours access rights and normal university disciplinary procedures.

Approval Form for Out of Hours/Lone Working

This form is to be completed by the researcher/staff member requiring doing activities outside hours. This form must be reviewed and countersigned by Academic Supervisor/School Safety Advisor as appropriate School

Safety Advisor will retain same for record keeping purposes, and forward names via email to Eileen Tully, Susanne Corcoran (c/o Estates Helpdesk)

Approved Name			
School / Unit			
Category of Staff Member / Postgrad			
Locations where work will be conducted (*room nos)*		DCU Contact Extn:	
Listing of Authorised Activities* **(*Each proposed outside hours activity must be risk assessed using a Risk Assessment Form for Lone/Out of Hours Work)**		Outside Hours Risk Category Rating	**Buddy Req'd Y/N**
User note :			
The following activities are strictly forbidden outside hours in the School of Chemical Sciences-Designated Risk Category A:			
1. Work with Hydrofluoric Acid			
2. Work with explosive substances eg. Picric acid			
3. Work with cyanide salts eg. Sodium Cyanide			
4. Work with pyrophoric agents.			
Individual risk assessments completed Yes/No??		Date	
Signature of staff/postgraduate member seeking outside hrs access		Date	
Signature of Academic supervisor		Date	
Signature of School Safety Advisor		Date	
School Safety advisor note:	Retain this form as part of the postgraduate researcher's safety records. Email approved names to Susanne Corcoran, c/o Estates office, and Eileen Tully.		

Risk Assessment Form for Lone / Out of Hours Work

This form(s) should be completed by a competent assessor for **any** procedure/system of work to be carried out 'out of hours' by any staff member, postgraduate, postdoctoral worker or visitor. This form(s) should be completed and submitted to the School Safety Advisor together with an **APPROVAL FORM FOR OUT OF HOURS /LONE WORKING..**

Activity being Assessed	
Name of Assessor And Room Location.	
Known or expected hazards associated with the activity (note also particular hazards if any due to lone working)	
Measures to be taken to reduce the level of risk (i.e. controls/safety measures-detail same))	
Maximum possible harm with controls in place	
Training / Competence Required- Yes/No? (If 'yes' consult supervisor/School Safety Advisor)	
Category of Risk Assigned (see under 'definitions' in the outside hours policy	
Competent 'Buddy' Required Yes/No?? ? (If yes consult supervisor/School Safety Advisor)	
Emergency Action to be taken 'out of hours'	**In the event of chemical spillage- Evacuate work area. Lock doors. Post warning signs. Inform security Ext. 5999 detailing name and room number Inform members of technical staff at earliest opportunity.**
	In the event of personal injury- inform security Ext 5999 detailing name and room number.
	In the event of fire, <u>evacuate building immediately</u>- inform security ext. 5999

Appendix 5

Researchers intending to work with humans or animals should check with the Research Ethics Committee at **http://www.dcu.ie/research/research_ethics.shtml** to ensure that all research involving human or animal subjects is carried out in accordance with the law and acceptable ethical standards.

Standard Operating Procedure-Disposal of Carcasses

DCU	**DUBLIN CITY UNIVERSITY**	Standard Operating Procedure-Disposal of Organs/Tissues Issue Date: 11/06/2013 Revision No: 1

1.0 Application

1.1 This procedure is applicable to all persons wishing to dispose of organs or tissue which are used in research outside of the BRU. This may involve many schools and centres within DCU.

2.0 Responsibility

2.1 It is the responsibility of all users to store and dispose of carcasses, organs and tissues in an appropriate manner outlined in the procedure below

3.0 Storage of carcasses, tissues or organs

3.1 On completion of the research place the carcass, tissue and/or organ directly into a designated plastic bag in a -20°C freezer in accordance to DCU Biosafety policy. **Only the carcass, no paper tissue, petri dishes, foil etc, should be disposed of**.

3.2. If GMM had been administered during the course of the research, or the animal/tissue/organ was a GMO then it should be placed in a separate bag within the freezer. These must be autoclaved at 121°C for 20 mins by the technical staff prior to being placed in rigid yellow bins with black lids for incineration. These bins are stored in the -20°C freezer, with a biohazard label on it, prior to transport off campus by a registered disposal company.

3.3. Complete a record to include the following:

Date Species
Details Purpose

Licensee/user

4.0 Disposal of carcasses, tissues or organs

4.1. This clinical waste is removed by a licenced disposal company periodically during the year. This is co-ordinated by BRU technical staff. BRU staff will contact any research group when such a collection is taking place to see if the research group wishes to dispose of waste at that time.

4.2. Should a research group wish to have waste removed, and has not been contact by BRU technical staff, they must e-mail 'bru@dcu.ie' to arrange such a collection.

4.3. On the agreed date for collection the research group/school/centre wishing to dispose of the waste must transfer only the carcasses/tissue/organs from the -20°C freezer to a 30L rigid yellow bin with black lid. The bin must be sealed. The appropriate bins can be obtained through the BRU.

4.4. The waste must be brought to the BRU technical staff at a location and time, agreed by both parties in e-mail, for collection by the licenced company. The waste will be accompanied by all required documentation. This documentation will be prepared by BRU technical staff

Approvals:	**Written By:** Gillian O'Meara **Date:** 11/06/2013	**Approved By:** Michael Burke **Date:** 11/06/2013 **Revision Date:** 11/06/2014

Note: This document may be updated before the revision date. These updates will be notified to staff .

Appendix 6

The Management of Inoculation (Sharps) Injury or Blood Borne Pathogen Exposure Policy

This policy applies to ALL sharps injuries where any hazardous substance (including, toxins, chemicals and human pathogens) is involved.

Working Title: Sharps Injury Policy including bites and splashes

PURPOSE:

To outline the procedure and guidelines to be followed in the event of an inoculation (sharps) injury or blood borne pathogen exposure

SCOPE: All DCU Staff, Researchers and Students

1. POLICY STATEMENT:

The aim of this policy is to prevent the acquisition of blood borne infections by the recipient following an inoculation (sharps) injury or blood borne pathogen exposure.

2. DEFINITION(S)

Inoculation – The penetration of the skin by a sharp object such as a needle, glass or scalpel blade.

Splash- Blood, body fluid or blood-contaminated liquid splashed into the eye, mouth or onto the skin surface that has an open cut or abrasion.

Bite or scratch- Any bite or scratch that breaks the skin.

Recipient- The member of staff or person suffering the injury.

Donor- The source of the blood/body fluid

3. PROCEDURE:

Every effort should be made to prevent and avoid an inoculation (sharps) injury or exposure to contaminated material (Appendix A). However, in the event of such an exposure, the following protocol must be followed;

First Aid

Immediate first aid must be carried out following injury sustained as follows:

Inoculation (Sharps) Injury:

- Encourage gentle free bleeding of the wound under running water. The wound should not be sucked.
- Wash the wound thoroughly under running water (or use appropriate cleanser where specified). A nail brush should not be used.
- Cover the wound with a waterproof dressing.
- Report incident to Manager/ Supervisor
- Attend the accident and emergency department of the nearest hospital; Mater/Beaumont.

- Document incident on DCU Injury/Incident Report Form with Manager/Supervisor.

Mucocutaneous Exposure (Eyes, Mouth, Mucous membranes):

- Wash the affected area with copious amounts of water.
- Report incident to Manager/ Supervisor
- Attend the accident and emergency department of the nearest hospital; Mater/Beaumont
- Document incident on DCU Injury/Incident Report Form with Manager/Supervisor.

Eye Splash:

- Irrigate the affected eye with copious amounts of saline or water
- Contact lense wearers should irrigate as above before and after removal..
- Report incident to Manager/ Supervisor
- Attend the accident and emergency department of the nearest hospital ; Mater /Beaumont
- Document incident on DCU Injury/Incident Report Form with Manager/Supervisor.

4. Responsibilities

Staff / Researchers
It is the responsibility of all staff and students including researchers and medical professionals within DCU to:

- To dispose of sharps/glass safely into designated sharps container
- To dispose of needle and syringe as single unit into nearest sharps container (for 'Hamilton' type syringes, dispose of needle only)
- To use designated procedure tray for carrying sharps
- Never to recap, bend, break or manipulate used needles
- To report sharps injuries immediately
- To follow the procedures contained within this policy (in particular attendance at hospital accident and emergency department)
- To attend follow up appointment with DCU Health Risk Management Specialist

Manager/Supervisor
It is the responsibility of the staff member/researcher's Manager/Supervisor:

- To provide training in management of sharps and sharps injuries to all staff and students who may be exposed to sharps / occupational blood borne viruses.
- To provide appropriate sharps disposal facilities.
- To ensure that this policy is implemented in all situations where a sharps injury occurs.
- To organise referral of the recipient to the accident and emergency department of the nearest hospital ;Mater/Beaumont
- To record the incident on the DCU Injury/Incident Report Form
- To inform the Health and Safety Office for recipient follow-up.

Health & Safety Officer
It is the responsibility of the Health and Safety Office

- To refer all reported sharps injuries to the DCU Health Risk Management Specialist for follow up.

Health Risk Management Specialist
It is the responsibility of the Health Risk Management Specialist

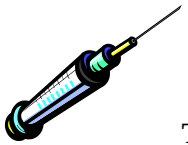
- To review hospital discharge letter with the recipient and close out the incident

References

DCU Vaccination Policy **http://www.dcu.ie/safety/pdfs/vacination_policy.pdf**

Guidance from US CDC **http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5409a1.htm**
http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5011a1.htm

Guidance for Clinical Health Care Workers: Protection against infection with Blood-Borne Viruses. Recommendations of the Expert Advisory Group on AIDS and the Advisory Group on Hepatitis. UK Health Departments, (March 1998)



The Management of Sharps

Sharps

A Sharp is categorised as any object that has been (or potentially been) used in the diagnosis, treatment or prevention of disease, or the transfer of any chemical/ biological reagent and that is likely to cause a puncture, wound or cut to the skin. Examples include needles, scalpels, razors, lancets, contaminated broken glass, guidewires, and sharp tips of intravenous giving sets, stitches cutters or any other disposable sharp instrument or item.

Sharps instruments frequently cause injury to health care workers and are a major cause of transmission of blood-borne pathogen infections (e.g. hepatitis). It is important that all staff and students within DCU including researchers and medical professionals are familiar with the correct management of sharps to prevent injury to oneself or colleague.

The following steps outline the correct management of sharps:

- Ensure correct assembly of sharps container
- Sign and date label on sharps container
- Never carry needles or sharps by hand or in pockets
- Use designated procedure tray for carrying sharps and ensure the tray is clean after use
- Never recap, bend, break or manipulate used needles
- Dispose of needle and syringe as single unit into nearest sharps container
- Place used syringes, needles and other sharp items in designated sharps container i.e.
- Yellow sharps containers with blue trim for disposal of sharps including: needles, syringes, scalpels, sharp tips of I.V. sets, slides, blood stained or contaminated glass, stitch cutters, guidewires/trochars and Razors
- Yellow sharps containers with purple trim for disposal of needles, syringes, sharp items, cartridges and broken glass which have been used for the administration of cytotoxic drugs

These designated sharps containers should be wall mounted or off the floor
Never place needle and syringe into already full sharps container
Once the sharps container has reached 3/4 full, close and lock lid and apply designated tag for traceability
Sign and date sharps container when locked
Leave locked sharps container in designated area at point of origin for collection
Report any problems with the sharps container to the supplier

Those generating sharps materials are responsible for their safe storage and disposal.

Sharps Injury/Occupational Blood Exposure

EMERGENCY ACTION FLOWCHART

IF YOU HAVE EXPERIENCED A SHARPS INJURY OR OCCUPATIONAL BLOOD EXPOSURE DURING THE COURSE OF YOUR WORK, IMMEDIATELY TAKE THE FOLLOWING STEPS

STEP 1 – IMMEDIATE FIRST AID

Deep prick/Inoculation:
Encourage the blood to flow out by squeezing the wound
Do not suck the puncture wound
Wash/cleanse wound with soap and water or an antibacterial wash (or specified cleansing agent)
Do not use nailbrush
Cover wound with a band-aid
Skin Exposure:
Wash affected area with copious amounts of water/specified agent
Eye Splash:
If wearing contact lenses remove them immediately
Irrigate/wash affected eye with copious amounts of water or eyewash

STEP 2 – REPORTING

Report to Manager/Supervisor
Attend for urgent medical treatment at your nearest hospital accident and emergency department (Mater / Beaumont). It is important that treatment is started as soon as possible after the incident
Manager/Supervisor to complete the DCU Injury/Incident Report Form

STEP 3 – FOLLOW UP AND COUNSELLING

Referral by H&S Office to DCU Health Risk Management Specialist
Appropriate counselling and follow up with DCU Health Risk Management Specialist and Infectious Diseases Consultant as required
Further blood testing if indicated