



Trinity College Dublin

Coláiste na Tríonóide, Baile Átha Cliath

The University of Dublin

SCHOOL OF CHEMISTRY

SAFETY STATEMENT

2015

SECTION	CONTENTS	PAGE
1	Safety Structures Personnel, Safety Committee, Area Responsibilities, Safety Audits	2
2	Hazards Nature of Hazards, Sources of Safety Data, Regulations for Students and Staff, Risk Assessment Procedures	5
3	Fire Safety Fire Alarm System and Fire Drills, Fire Extinguishers and Fire Blankets, Action in the event of Fire, Liaison with Dublin Fire Brigade, Use of Refrigerators	8
4	Supervision of Students Supervision of Undergraduate Students, Supervision of Postgraduate Students and of Postdoctoral Workers	10
5	Working Hours Normal Working Hours, Night and Weekend Working	11
6	Accidents and Incidents Mandatory Reporting of Accidents	12
7	Visitors to the School Safety of Visitors	12
8	Cleaners, Maintenance staff and Contractors	13
9	Workshops Glassworking Shop	14
10	Stores Chemicals Store	18
11	Training Safety Training of Attendants and Trainee Technician	18
12	First Aid Action in the Event of Emergency, Locations of First Aid Boxes, Responsibility for Maintenance of First Aid Boxes, First Aid Training	20
13	Waste Disposal Disposal of Hazardous Solvent Waste, Disposal of Hazardous Solid Chemical Waste, Disposal of Contaminated Glassware and Sharps	21
14	Miscellaneous Labelling of Chemicals, Chemical Spillages, Mercury Vapour, Fume Cupboards, Gas Cylinders	22
15	Appendices	23

THIS SAFETY STATEMENT IS DATED OCTOBER 2015 AND REPLACES ALL EARLIER SAFETY STATEMENTS.

SECTION 1

SAFETY STRUCTURES

(A) PERSONNEL

The Head of the School, ***Professor S.M. Draper***, is responsible for safety in the School of Chemistry. She will appoint another member of the staff of the School to act in her absence, and a record of the name of this acting Head of School will be retained in the office of the School.

The Safety Officer of the School is ***Prof. M.E. Bridge***. He has executive responsibility for safety and reports to the Head of School. He is supported by ***Ms. T. A. McDonnell*** (Chief Technician), by ***Prof. R. Baker*** (Deputy Safety Officer) and by ***Mr. P. Brien***. Ms. McDonnell is responsible for those aspects of safety which concern work carried out in the School by cleaners, plumbers, electricians and all other workers who are not directly employed by the School. In the event that Ms. McDonnell is absent from the School, her safety functions will be performed by ***Mr. P. Brien***

The Radiological Protection Supervisor is ***Dr B Twamley***. Dr Twamley is responsible for the control of radiochemicals in the School subject to the requirements of the College Radiation Safety Officer, ***Dr. G. Gunning***. Dr Twamley is also responsible for the X-ray equipment which is under the control of the School.

The College Biohazard Safety Officer is ***Prof. F. Falkiner***. The handling of biohazardous materials is carried out subject to his requirements.

The College Hazardous Chemicals Officer is ***Dr M.E. Bridge***. The handling and disposal of hazardous chemicals throughout the College is carried out in consultation (as necessary) with Dr Bridge.

The College Safety Officer is ***Mr. Tom Merriman***. The School Safety Officer and the Chief Technician liaise closely with Mr. Merriman on safety matters.

The College Fire Safety Officer is ***Mr. Karl Flynn***. The School Safety Officer and the Chief Technician liaise closely with Mr. Flynn on Fire Safety matters.

(B) SAFETY COMMITTEE

The Safety Committee of the School of Chemistry consists of at least two (2) members from each of the three following groups:

Academic Staff
Technical Staff
Postgraduate Students

In the event that any laboratories in the School are temporarily occupied by representatives of commercial or other organisations then one (1) representative from each of these laboratories shall sit on the School Safety Committee.

The Safety Committee shall discuss all matters of safety relating to the School and any annexes thereto and shall advise the Head of School accordingly. It shall meet at least once per semester. During the summer vacation meetings will only be held following a request to its Secretary. The Secretary to the Safety Committee shall keep Minutes of its meetings, which will be filed in the School office.

The composition of the **Safety Committee** is as follows:

Dr M.E. Bridge	Academic, School Safety Officer (Chairman)
Dr. R. Baker	Deputy Safety Officer
Dr. B. Twamley	Radiological Protection Supervisor
Ms. T. A. McDonnell	Chief Technical Officer I
Prof S. M. Draper	Head of School
Mr. P. Brien	Chief Technical Officer II
Ms. M. Brown	Postgraduate Student
Mr. B. Irwin	Postgraduate Student
Mr. P. O'Sullivan	Postgraduate Student
Prof. Y. Gun'Ko	Academic
Prof. I. Rozas	Academic
Dr. E. Scanlan	Academic
Dr. S. Boyce	School Administrator (Secretary to the Committee)

(C) TEACHING AND RESEARCH LABORATORIES AND COMMON FACILITIES

Individual members of the School have particular responsibility for safety matters in certain **laboratories, workshops** and other areas as follows:

Area	Room	Responsible person
Chemistry Building:		
Old JF lab	0.50	J. O' Brien
NMR room	0.40	J. O' Brien
Old mechanical workshop/ inst room	0.13	Y. Gunko
ground floor research lab	0.14	P. Colavita/E. Scanlan
Mezzanine floor labs	1.14- 1.17	M. E. G. Lyons
1st floor res lab	1.20	Room Vacant
1st floor res lab	1.26	M.E.G. Lyons
Computational Laboratory	2.8b	G. Watson
Top floor Lab	2.10	Room Vacant
Electronics Workshop	1.2	Room Vacant
East End 4 Cocker Lab	-	P. Brien
Extensions		
Physical Lab	1.3	P. Colavita
Inorganic Lab	1.3b	R. Baker
Organic Lab	1.8	Room Vacant
SNIAMS:		
Chemical stores	0.28	F. Cowzer
Research Lab	1.29	W. Schmitt
Organic Research Lab	1.16	Room Vacant
Physchem research Lab	2.14 2.16	R. Evans
Physchem teaching Lab	2.27	P. Greene
Metallo-supramolecular chem res. Lab	2.23	S.M. Draper
Inorganic Meterials res. Lab	3.20	S.M. Draper
Inorganic res. Lab	3.32	Y. Gunko
X-Ray diffractometer room	0.5	B. Twamley
Glassblowing workshop	2.10	J. Kelly
TBSI		
B3.06	3.06	J. O'Brien
B3.07	3.07	J. O'Brien

B2.44	2.44	D. Grayson
B2.45	2.45	D. Grayson
B2.18	2.18	B. Twamley
6.35	6.35	A. MacDonald
7.16	7.16	I. Rozas
7.19	7.19	M. Southern/E. Scanlan
7.20	7.20	S. Connon
7.21	7.21	T. Gunnlaugsson
7.22	7.22	T. Gunnlaugsson
7.23	7.23	M. Senge

The above does not diminish in any way the general responsibility which all who work in the School have for their offices, minor laboratories, computer and spectrometer rooms, and other areas.

(D) SAFETY AUDIT

The School Safety Officer will arrange an annual Safety Audit of the school. This will normally be conducted during the long vacation. A report on the audit will be submitted to the School Executive during Michaelmas Term.

SECTION 2

HAZARDS

(A) NATURE OF HAZARDS

The School of Chemistry is acutely aware that it is a hazardous environment for those who enter it. The main **hazards** are as follows:

Poisoning due to chemicals in whatever form

Burns due to chemicals, fire, hot apparatus, etc.

Explosions due to chemical reactions, fires or pressurised apparatus

Mechanical Injury due to the use of machinery, the lifting or falling of heavy objects, etc.

Electric Shock due to contact with high-voltage sources and equipment

Eye Injuries due to contact with chemicals or exposure to ultra-violet radiation

All of the above may lead to **serious physical injury** or to **death**.

The School is aware that chemicals which were previously believed to be relatively harmless are now known or suspected to be dangerous. The

consequences of exposure to chemical agents can appear long after the exposure has taken place. Accordingly, care will be taken with the manipulation of *all* chemicals, with special care being taken in dealing with those known to be highly toxic.

Persons whose research or other work involves the use of especially harmful materials, including such items as scheduled carcinogens, mutagens, teratogens, radioactive substances, and human materials will be *obliged* to attend a consultation with **Dr. D. McGrath** of the College Health Service.

All other members of the School *may*, if they so wish, also attend a consultation with Dr. McGrath.

(B) SOURCES OF SAFETY DATA AND INFORMATION

The School requires Materials Safety Data Sheets (MSDS) to be supplied, as appropriate, with chemicals that are purchased. These forms will be retained by **Mr. F. Cowzer** in the Chemical Stores where they may be consulted as necessary.

The School keeps available the current editions of the following safety texts:

Hazards in the Chemical Laboratory (Royal Society of Chemistry)

The Sigma-Aldrich Library of Chemical Safety Data (Aldrich Chemical Company)

Handbook of Reactive Chemical Hazards (Butterworths)

Safety Science for Technicians (Longmans)

Prudent Practices for Disposal of Chemicals From Laboratories (American Chemical Society)

Prudent Practices for Handling Hazardous Chemicals in Laboratories (American Chemical Society)

Destruction of Hazardous Chemicals in the Laboratory (Wiley)

Handbook of Poisoning (Appleton and Lange)

The above, together with a variety of other texts on safety, toxicology and the safe handling and disposal of chemicals are kept available in Room 2.5 of the Chemistry Building.

In addition, the College Library keeps the following periodicals:

Chemical Hazards in Industry (Royal Society of Chemistry)

Laboratory Hazards Bulletin (Royal Society of Chemistry)

In the event that further information on a particular compound is considered to be necessary either or both of the following, which are available through the School of Pharmacy, may be employed:

The Registry of Toxic Effects of Chemical Substances

Various computer-based systems detailing toxic hazards.

Further sources of information that may be employed include:

The computerised data-banks operated at Liberty Hall

The computerised data-banks available on-line by telephone through the College Library.

(C) REGULATIONS FOR STUDENTS AND STAFF

1. UNDERGRADUATE STUDENTS

The School will ensure that its undergraduate students have been provided with a copy of the Faculty of Engineering, Mathematics and Science "*Health and Safety Code of Practice*" booklet for undergraduates. This is now made available online by the Faculty Office. The information given therein will be reinforced and augmented by specific instructions on safety given both verbally at pre-practical lectures and in writing in the sheets and manuals giving the procedures and protocols for the laboratory experiments which are being performed.

The School requires that *all* incoming Freshman students have reviewed the online safety presentation appropriate to them (Senior or Junior Freshman), have completed the accompanying online quiz, and have signed the declaration to the effect that they have read, understood and will abide by the requirements detailed therein, and with set of Faculty regulations which has been individually provided to them in the form of the Faculty of Engineering, Mathematics and Science "*Health and Safety Code of Practice*" booklet. This process must be completed before the students will be admitted to laboratory classes in the School.

Incoming undergraduate students who enter the School at Sophister level (usually through the ECTS system) do not normally receive the Science Faculty "*Health and Safety Code of Practice*" booklet at Registration. Instead, they are instructed in the safety regulations of the School and receive a copy of the School's internal safety handbook "*Safety is Your Business*".

The School requires that these students must sign a declaration to the effect that they have read, understood and will abide by the regulations contained therein. This signed declaration is filed in the School office.

Copies of typical School regulations, of the booklet "*Safety is Your Business*" and of the Faculty of Engineering, Mathematics and Science "*Health and Safety Code of Practice*" booklet are appended to this Safety Statement. All students entering the Junior Sophister year of any course within the School (i.e. Chemistry; Medicinal Chemistry; Chemistry with Molecular Modelling; Nanoscience, Physics and Chemistry of Advanced Materials) are **required** to attend a one-day safety workshop organised by the School Safety Officer, during Freshers week.

2. POSTGRADUATE STUDENTS, STAFF AND TECHNICIANS

The term "postgraduate student" is taken in what follows to include all students carrying out research, including students from other countries who may not have graduated from their own universities.

The School supplies to each of the above a copy of the internal safety handbook "***Safety is Your Business***". This manual details good practice in the School. The School requires that these persons must sign the declaration to the effect that they have read, understood and will abide by the regulations contained there the handbook. This signed declaration is filed in the School office.

Academic and senior technical staff are, by virtue of their extensive prior training, considered to already possess a significant body of knowledge regarding safety and good laboratory practice. Junior technical staff newly recruited to the School will receive both general and specific training in safety matters from their immediate superiors, especially in the first year of their employment (*cf.* **Section 11** below). Technical staff who are required to take charge of particular teaching laboratories where advanced undergraduate experiments or operations are carried out will receive training in the methodology of, and any risks associated with, these experiments or operations from whichever member of the academic staff has responsibility for the class in question.

All first-year postgraduate students, whether graduates of Trinity College or not, are *required* to attend a mandatory course on safety procedures within the School of Chemistry at an early stage of the first term of their registration, unless they have attended this course during their Senior Sophister year. This course is given by the School Safety Officer. New postgraduate students are additionally *required* to attend a course on fire safety. This is given by the College Safety Officer and includes a practical element wherein various types of fire extinguisher are used on a real fire.

Students who fail to attend both of these courses will be prohibited from carrying out research in the School laboratories until such time as they have complied with this regulation. Furthermore, students who fail to attend the course on fire safety will not be permitted to act as laboratory Demonstrators to undergraduate students. A record of satisfactory attendance by individual students at these safety courses is kept by the School Postgraduate Coordinator ***Professor D. Mac Donail***.

(D) RISK ASSESSMENT PROCEDURES

All members of the academic and technical staffs, all postdoctoral researchers, all postgraduate students and all final year undergraduate students *must* complete separate Risk Assessment Forms (attached) in respect of *each* experiment or operation which is to be conducted *before* commencing that experiment or operation. **No** experiment may be left unattended, even for a short time, unless this possibility is explicitly covered in the risk assessment. This Risk Assessment Form must be signed by the experimenter and *must* be countersigned by the PI/supervisor. Further Risk Assessment Forms must be completed whenever any experiment is to be repeated on a greater scale or with variation of the original

protocol. Risk Assessment Forms for Freshman and Junior Sophister students are completed by the academic and teaching staff responsible for each laboratory class. Completed Risk Assessment Forms are kept on file in the School Office, and/or in accessible electronic form. In addition, the staff member responsible for each laboratory will ensure that there is an inventory for each laboratory, and a Chemical Agents Risk Assessments for all hazardous substances in the laboratory. These shall be maintained in legislation-compliant form.

SECTION 3

FIRE SAFETY

(A) FIRE ALARM SYSTEM AND FIRE DRILLS

The School is provided with a sophisticated, automatic fire alarm system that protects all secondary means of escape and which is tested regularly by the College's Buildings Office. The fire alarm can be manually triggered from any of the several break-glass alarm boxes which are placed in various strategic areas of the School. The locations of the various heat sensors, smoke sensors, fire hoses and exit signs are shown on the lists and plans attached. The East End 4 Cocker Laboratories have a similar fire alarm system which is part of the system servicing the EE4 building as a whole.

Fire drills are held twice during each calendar year and are attended by the Fire Safety Officer Mr. Karl Flynn, by the College Safety Officer Mr. Tom Merriman and by members of the College **security staff**. Drills are held without prior warning and during working hours when the building houses large numbers of staff, postgraduate students and undergraduate students. When the alarm is sounded, all persons in the Chemistry Building are required to leave as quickly as possible by the nearest exit and to assemble at Asszembly Point D (the "Flat Iron"). Persons in the EE4 building are required to assemble at an appropriate location, currently the Assembly place E, between the Lloyd and Hamilton Buildings. Security Staff check the entirity of each building for defaulters before the all-clear is given. Persons working in the SNIAMS building are required to assemble at an appropriate location, currently the Flat Iron. In TBSI, the assembly points are in Sandwith Street and Cumberland Street. A written record of each fire drill is maintained, indicating the date, the approximate number of persons evacuated from the building, and the time taken for complete evacuation.

(B) FIRE EXTINGUISHERS AND FIRE BLANKETS

Three different types of fire extinguisher are commonly available in the School and EE4 laboratories at appropriate locations. These include the following:

CO₂ extinguishers which are suitable for fires involving burning liquids such as organic solvents, and for use on electrical fires and fires which involve papers or rubbish. These extinguishers are *never* used on fires which involve metal hydrides or metals such as sodium, lithium or magnesium.

Class D extinguishers which are suitable for use on fires which involve metals such as sodium and other alkali metals, magnesium and other alkaline earth metals, metal alkyls and metal hydrides.

Dry powder extinguishers which are suitable for fires involving burning liquids or electrical equipment.

Fire blankets (which do not contain asbestos-based materials) are available in all laboratories.

A list showing the locations of the extinguishers in the School is appended. Regular inspection, renewal and servicing of the extinguishers is carried out by Diskin Fire Protection Ltd. under the direction of the College Buildings Office.

Any person who has used one of the School's fire extinguishers, even for a very short time, must report the fact to the Chief Technical Officer immediately so that it can be fully recharged or replaced. Additionally, an Accident/Incident Report Form (see **Section 6** below) must be completed in respect of each such use of any fire extinguisher, and submitted to the School Safety Officer, who in turn will report this to the College Fire Safety Officer.

(C) ACTION IN THE EVENT OF FIRE

If any member of the School discovers a fire the following actions will be taken.

The person discovering the fire will:

- (1) *briefly* attempt to extinguish the fire using appropriate means *provided* that to do so does not compromise their personal safety,
- (2) activate the fire alarm,
- (3) *leave the building* and call for further help.

(D) LIASON WITH DUBLIN FIRE BRIGADE

The School recognises the special hazards that its use of compressed gases presents to fire-fighters from the Fire Brigade. The School will seek to reduce these as follows:

- (1) It will pursue, as far as is practicable, a policy of piping in gases rather than keeping gas cylinders on the premises.
- (2) It will keep records of the main hazards relating to cylinders of compressed gases in each area of the building. These will be sent to the Fire Brigade and will also be available in a locked box situated on the outside wall of the building to the right hand side of the entrance door facing Lincoln Place. The keys to the padlock on this box (which can be forcibly opened by the Fire Brigade in the event of an emergency) will be kept in the following locations: the

School's Safety Officer's office, the Chief Technician's office and the Chief Steward's office.

The School also recognises the general hazards that the large number of different chemical substances within it presents to the Fire Brigade. A copy of the building Plan showing the degree of hazard (classified as High, Medium or Low) in each area will be kept in the front hallway of the School.

(E) USE OF REFRIGERATORS AND FREEZERS

No flammable liquids, solids or gases will be stored in any refrigerator or freezer unless the thermostatic control has been moved to the exterior casing of the unit so that ignition inside the cabinet cannot be caused by this means. Additionally, the interior light of any refrigerator or freezer used for the above purpose will be removed for the same reason.

SECTION 4

SUPERVISION OF STUDENTS

(A) SUPERVISION OF UNDERGRADUATE STUDENTS

The School considers the supervision of undergraduate laboratory work to be a most important aspect of safety.

Students in their final year may be permitted to work in the laboratory without an academic staff member or graduate demonstrator present provided that the mandatory Risk Assessment procedures have been carried out, but *only* under the supervision of a fully qualified member of the technical staff, *or* when there is at least one other final year student present in the laboratory. Such work will *not* take place outside the period 0900 - 1700 hr, Monday to Friday.

Students in their third year will generally be working under the supervision of a member of the academic staff, or of a senior demonstrator. They may be permitted to work in the laboratory without an academic staff member or postgraduate demonstrator present, but then *only* under the supervision of a fully qualified member of the technical staff. Such work will *not* take place outside the period 0900-1700 hr, Monday to Friday.

All other undergraduate students will carry out work in classes supervised by an academic staff member (or Senior Demonstrator appointed to supervise that class) together with one or more postgraduate demonstrators who will be instructed by the staff member. All staff and demonstrators who are supervising practical work will keep a constant watch for any behaviour which might lead to an accident.

No student will be permitted in the laboratory without wearing a laboratory coat of approved type and without wearing eye protection.

(B) SUPERVISION OF POSTGRADUATE STUDENTS AND POSTDOCTORAL WORKERS

A list of postgraduate students and postdoctoral workers and of their supervisors/Pis will be kept in the School Office.

It is the responsibility of the supervisor/PI to oversee the laboratory work of each of their students and postdoctoral workers, and to ensure that the experiments performed and the operations carried out conform to acknowledged standards of safety. Whenever each student or postdoctoral worker commences a different experiment or operation they will be required to complete a Risk Assessment Form outlining the risks involved in the procedure and the control measures required (*cf.* **2D** above).

All research supervisors must appoint a deputy to act in their absence. The name of such a deputy must be communicated to the research group. A list of these deputies will be kept in the School Office.

SECTION 5

WORKING HOURS

(A) NORMAL WORKING HOURS

The normal working hours for the School are 0800-1800, Monday to Friday. Outside these times, including all day on Saturdays, Sundays and Public Holidays, access to:-

- (i) the Chemistry Building is via the front door, which is on the College swipe-card system.
- (ii) SNIAM is restricted to keyholders for the building.
- (iii) the Lloyd Institute is via the main door which is on the College swipe-card system.
- (iv) TBSI is on the College swipe-card system.

(B) NIGHT AND WEEKEND WORKING

The School will maintain a "night book". This book will be signed by all academic staff members, postdoctoral workers, postgraduate students and others who are in the School outside the hours 0800-1800 from Monday to Friday, or at any time on a Saturday, Sunday or public holiday. There are three "night books", one kept in the front hallway of the Chemistry Building, one in the entrance hall to SNIAMS and one at the entry desk in TBSI. **Persons working outside normal hours are also required to "sign out" on leaving the school.**

No academic staff member, postdoctoral worker or postgraduate student will be permitted to carry out experimental or technical work of any kind in the School at any time outside normal working hours unless there is another person close by *who is aware of their presence* so that they can summon assistance in the event of an accident. The name of this other person must be entered in the night book.

The only circumstances in which those other than academic staff members, postdoctoral workers and graduate students will be permitted to be in the School outside the above hours are as follows:

- (1) Persons attending evening lectures
- (2) Security Staff
- (3) Domestic Staff
- (4) Maintenance Staff

Persons in categories (1), (2) and (3) above need not sign the night book.

The School of Chemistry views breach of the rules on night and weekend working as serious offences, for which the following penalties shall apply.

1. **First Offence.** Formal interview, with a warning, from the Head of School or his/her nominee.
2. **Second Offence.** Withdrawal of late working privileges for a fixed period of at least one week. Restoration will be dependent on a written undertaking (countersigned by the supervisor in the case of postgraduate students) to obey rules in future. Breach of these conditions will be treated as a third offence.
3. **Third (and subsequent) offences.** Exclusion from the School premises outside of normal working hours for a fixed period of at least one month, and until an undertaking (as at 2) is received.

These penalties are minimum sanctions, which may be increased in serious cases.

SECTION 6

ACCIDENTS AND INCIDENTS

All accidents and incidents must be reported using the official College Accident/Incident Form (attached). The person reporting the accident or incident will complete Part A of this Form, and the School's Safety Officer or his/her deputy will complete Part B. The Form will then be transmitted to the College Safety Officer. Copies will be retained in the School Office.

The School's Safety Officer will investigate any accident or incident the cause of which is not readily apparent, and will prepare and submit to the Head of School a report on the matter. Copies of all such reports will be kept in the School Office.

In the event of any personal injury arising as a result of an accident or incident, standard College procedures in respect of attendance at the Student Health Centre or removal to a hospital by ambulance will be followed.

SECTION 7

VISITORS TO THE SCHOOL

Any member of staff or any student who brings a visitor into the Chemistry Building or into any of its associated facilities will ensure that the visitor has been informed of any special risks associated with the laboratory, room or office that is being visited.

No visitor who is not technically qualified will be left unattended in any laboratory or store.

Casual visitors to the School will normally go to the School Office in the first instance.

Transition year school students who may be temporarily attached to the School will be classified as visitors.

All visitors must comply with the School's regulations regarding the wearing of laboratory coats and approved eye protection whenever they are in an area where experimental work is being carried out.

SECTION 8

CLEANERS, MAINTENANCE STAFF AND CONTRACTORS

(A) CLEANERS

The College will employ cleaners for the routine cleaning of the School.

Instructions for cleaners are to be found in the Science Faculty Safety Manual, Appendix 2.

Whenever a new cleaner is sent to the School they will report to the Chief Technical Officer (Ms. T. McDonnell) before commencing work. She will instruct the cleaner about the special hazards pertaining to his or her allocated work area. In particular, she will instruct the cleaners that:

- (1) They must use the gloves and protective clothing provided.
- (2) They must exercise due care when emptying bins in laboratories in case any harmful material has been improperly placed in the bin. Should a cleaner have any reason to believe that anything harmful is present in a bin *it should be left there* and the technical staff or laboratory supervisor should be requested to arrange for its disposal.
- (3) Cleaners must not approach any chemical spills. Such spills should be reported without delay to an appropriate person in the immediate area or to the Chief Technical Officer.

(B) MAINTENANCE STAFF

The College, through the Buildings Office, will employ maintenance staff such as painters, plumbers, electricians, etc., who will carry out routine maintenance within the School.

Instructions for maintenance staff are to be found in the Science Faculty Safety Manual, Appendix 3.

Maintenance staffs employed internally on a permanent basis by the Buildings Office are distinguished from external contractors in that they are generally familiar with the layout of the School. Nevertheless, all maintenance staff needing to carry out any work within the Chemistry building or on its roofs (especially in

the vicinity of fume hood exhaust stacks) must liaise with the Chief Technical Officer before commencing work.

Maintenance staff who need to enter laboratories where experimental work is being carried out must first seek permission from the person in charge of the laboratory, and must wear appropriate eye protection when working there.

(C) CONTRACTORS

The College, through the Buildings Office, will occasionally employ external contractors who will be engaged to carry out special tasks within the School.

The School recognises that such external contractors may have had no experience of working within a hazardous laboratory environment, and that they are likely to be completely ignorant of the special risks associated with a chemical laboratory.

All such contractors must receive detailed instructions from the Chief Technical Officer and/or the School Safety Officer *before* commencing any work within the Chemistry Building or on any part of its external fabric, or on or within any of the Stores associated with the School.

Contractors' staff who need to enter laboratories where experimental work is being carried out must additionally seek permission from the person in charge of the laboratory, and must wear appropriate eye protection when working there.

SECTION 9

WORKSHOP

This Section should be read in conjunction with the Faculty of Engineering, Mathematics and Science Safety Manual, Section 15.1.

The School of Chemistry employs one technical officer, who is not directly concerned with chemistry, i.e.:

Mr. J. Kelly Glassblowing workshop

Mr. Kelly is in charge of his work area under the overall direction of the Chief Technical Officer. The Chief Technical Officer will ensure that any such technical officers are trained in the correct use of any equipment or techniques which are not covered in their basic training as technicians. Technical staff will be responsible for the maintenance of good order in their respective work areas, and will report any matters of concern relating to safety to the Chief Technical Officer. Their joint representative at the Chemistry School Safety Committee will be ***Mr. P. Brien***.

GLASSWORKING SHOP

The glassblowing workshop will be under the charge of **Mr. J. Kelly**, assisted by **Mr. Kieron Galvin**. No use will be made of the equipment under his control without his consent and unless he is satisfied that the person using it is competent to do so. From time to time, other members of the technical staff of the School of Chemistry may work, under the direct supervision of **Mr. J. Kelly**, in the glass workshop (this includes supervised use of Specialist equipment in the workshop) as part of their training in general techniques required to support the core activities of the School.

It is the policy of the Chemistry School that the glassblowing workshop will be adequately ventilated. The glassblowing workshop is equipped with an extensive system of hoods for the efficient extraction of fumes, and these will be used at all times when glassblowing is in operation. Mr. J. Kelly will use Drager tubes to perform periodic checks for the presence of harmful nitrous fumes.

It is the policy of the School of Chemistry that gases for use in the glassblowing workshop are supplied from cylinders placed outside the building. The pipe-work is fitted with the necessary non-return valves and flashback arrestors. This entire system together with its associated valves will be inspected at regular intervals by Mr. Kelly and any defects repaired before further use. The gas supply from the cylinders outside the building will be shut off at the end of each working day (or part of a day as appropriate). Correct operating pressures will be used at all times.

Whenever a glass-blowing operation is carried out in an area within the School but outside the glassblowing workshop the following precautions will be taken:

- * A non-return valve of approved design will always be fitted to the gas line.
- * Any vacuum in the apparatus to be worked on will be released before work commences.
- * The work area will properly ventilated by opening windows and turning on fume hoods.

The main **risks** in the workshop area include:

- (1) those associated with cuts from broken glass,
- (2) those associated with burns from hot glass,
- (3) those associated with explosions,
- (4) those associated with poisoning due to toxic fumes,
- (5) those associated with eye injuries caused by the light emitted during glassworking operations.

The **control measures that will be applied** include:

- * Prior to breaking, glass tubing will be scratched with a glass-cutting knife or with a file. On no account will the knife be used as a saw. Large-diameter glass tubing will be cut by the "hot rod" method or by using the glass cutting machine (see below).

* All glass will be thoroughly cleaned before use. In particular, care will be taken to remove all traces of solvents and of mercury.

* Eye protection will be worn at all times to protect the eyes from (a) harmful ultra-violet or visible light and (b) glass particles. Didymium safety glasses will be worn whenever work with borosilicate glass is being carried out. Dark welders' lenses will be used whenever work with high-silica glass is being carried out.

The workshop possesses a **glass-cutting machine**. This machine will be operated only by Mr. J. Kelly. He will ensure that:

- * he wears protective clothing and a full face shield,
- * the safety guard is in place,
- * the glass tubing is securely held,
- * the water supply is on,
- * all clothing is kept away from the cutting wheel,
- * the power is turned off whenever the cutting wheel is changed.

The workshop possesses a **glassblowing lathe**. This machine will be operated only by Mr. J. Kelly. He will ensure that:

- * the general precautions associated with use of the glass cutting machine (above) are adhered to,
- * the glass is securely clamped,
- * the chuck key is removed before the machine is switched on,
- * all materials, cylinders, etc., that might catch fire or explode owing to the extreme heat of the lathe will be kept well away from it.

The following precautions will be taken to prevent **hazards** arising from sources other than those set out above:

- * glassblowers **tapes** and similar materials will be free from asbestos,
- * **hydrofluoric acid** will not be used in the glassblowing workshop. When required, it will be used in a fume hood situated in a neighbouring laboratory,
- * food colouring will be added to **hydrofluoric acid** to assist in marking spillages,
- * protective clothing, gloves and glasses will be worn whenever **hydrofluoric acid** is being used,
- * any residues containing **hydrofluoric acid** will be properly labelled and stored safely prior to disposal by a recognised disposal contractor,

- * the filling of any apparatus with **mercury** will be carried out only on a suitable tray placed in a fume cupboard in a laboratory,
- * care will be taken to inspect the oil chambers of vacuum pumps for **mercury** deposits before any work is carried out on them,
- * **mercury** residues will be safely disposed of by standard methods.

SECTION 10

STORES

CHEMICAL STORE

The chemicals store of the School is located in the SNIAMS building. There is an associated administrative office. The person in charge of this store is Mr. F. Cowzer who reports to the Chief Technical Officer.

The following regulations apply so that the **risks** associated with this chemicals store are minimised:

- * No person may enter the store without the consent of Mr. Cowzer.
- * Cleaners will not enter the store, unless specially requested to do so.
- * No person may take any chemical or other item away from this store unless a completed requisition docket has been presented.
- * No person may take away a sample of a chemical or substance unless it is securely held in a container bearing an appropriate label, including hazard warnings where appropriate. Some older chemical samples held in the store do not carry hazard labels. All such samples will be treated as hazardous, and none will leave the store without hazard labels being affixed.
- * Certain items that are known to be highly toxic, carcinogenic, mutagenic or teratogenic will only be issued to postgraduate students or postdoctoral workers on production of a requisition that has been signed by the research supervisor/PI.
- * Certain items falling into the above categories (such as alkali metal cyanides, etc.) will always be kept in a locked steel cabinet within the store, and the quantities issued on receipt of a valid requisition will be recorded in a Poisons Book.

SECTION 11

TRAINING

SAFETY TRAINING OF ATTENDANTS AND TRAINEE TECHNICAL OFFICERS

When such staff are recruited into the School of Chemistry, Mr. P. Brien will point out to them the potential dangers and hazards of chemicals, and the great care and caution that is required when handling them. He will issue the following instructions to them:

Instructions for Attendants and Trainee Technicians

White coats and **safety glasses** must be worn at all times when working in the laboratories or preparation rooms, and when using dangerous chemicals. Hazard warning labels are provided on the containers of hazardous chemicals, *e.g.* Corrosive, Flammable, Toxic, Harmful, Oxidising, Irritant. It is very important to know how to recognise these categories of substances.

More accidents occur in laboratories through misuse of **mineral acids** (especially **sulfuric acid**) than through poor handling of any other class of liquid. Always use a fume cupboard, safety spectacles, protective clothing and protective rubber gloves when handling or dispensing mineral acids. **Always** add a mineral acid *to* water (A to W as in the alphabet) and not the other way around.

Always transport **Winchester bottles** using a properly designed carrier. *Never* lift a full Winchester bottle by the neck. When filling Winchester bottles, especially with solvents, leave room for expansion, *never* fill completely to the top.

When pouring **liquid nitrogen** always wear safety spectacles and gloves. If a domestic Dewar flask is being used, make sure that its outer surface has been taped. Never leave unused liquid nitrogen in a Dewar flask for any length of time, and never leave in a liquid nitrogen bath any vessel that is open to the atmosphere, so that dangerously explosive liquid oxygen cannot accumulate. If you notice a **blue colour** (due to liquid oxygen) in a Dewar flask which has contained liquid nitrogen, or in any vessel which has been cooled with liquid nitrogen, **do not touch it, and seek assistance immediately.**

Always use a proper cylinder trolley when transporting **cylinders of compressed gases**. During transport, the cylinder must be well secured in the trolley by a chain or other means. Cylinders placed at work stations or benches must be **secured** from falling over by the attachment of a strap or chain, and approved clamp. Cylinder valves must always be turned off when the gas is not being used.

The importance of proper **labelling** is often overlooked. All containers of chemicals whether temporary or permanent must be clearly labelled: hazard warning labels should be added if required (seek advice from more senior technical staff). All such labelling **must** be legislation compliant.

Only take limited amounts of **sodium** or **potassium** from the stock bottles. Have alcohol available for disposal of residues and for the cleaning of cutting equipment. Make sure that the sodium or potassium in any bottle is well covered with dry liquid paraffin or naphtha. You **must** be supervised by a senior technical officer the first time you handle sodium or potassium.

All **mercury** spillages must be handled safely by either sucking up all the mercury with the special apparatus provided or by treating the spillage area with dilute bromine water followed by sodium thiosulfate solution. Alternatively, the total spillage area can be treated with flowers of sulfur which should be left overnight and then brushed up for disposal.

When handling **flammable solvents**, use a fume hood if possible. Make sure that there are no naked flames or other sources of ignition in the vicinity first. Note that **diethyl ether** vapour is heavier than air and can flow off a bench and along a floor to a distant source of ignition.

Bunsen burners must never be left burning whenever a laboratory is unattended.

Make sure that you know the locations and functions of all **fire extinguishers**, **fire blankets** and **fire exits** in your work area.

Take great care whenever working with **glass**. Caution is required when heating or cutting glass tubing or rod. Always use a proper glass knife to pre-score the point at which you wish to cut. **Protect your hands** with gloves and a heavy cloth when snapping pre-scored tubing or rod. Never attempt to cut tubing that is more than 6 mm in diameter: take it to the glassblowing workshop for professional attention. Before inserting sections of glass tubing (or glass apparatus in general) into rubber bungs or into corks **make sure** that there are no jagged ends (round them in a flame if necessary), **use a lubricant** such as glycerol or Teepol, and **protect your hands with gloves and a heavy cloth**. Place all broken glass items into the special containers provided: do not use the ordinary bins.

Above all, if you are uncertain what to do speak with Mr. P. Brien first.

SECTION 12

FIRST AID

(A) ACTION IN THE EVENT OF AN EMERGENCY

It is the policy of the School that first aid will not take the place of professional treatment. In the case of injuries such as cuts or burns, the person injured will be accompanied to the College's Student Health Centre. For more serious injuries an ambulance will be summoned and medical assistance will be sought from neighbouring Schools, in particular from the Medical School Office, the Anatomy School, and the Dental Hospital. Additional assistance will be sought from any of the several members of the School who possess a qualification in First Aid (*cf.* **(D)** below).

(B) FIRST AID BOXES

It is the policy of the School that first aid boxes will be kept in all laboratories. These first aid boxes will be stocked with contents according to the official list issued by the secretary to the Science Faculty Safety Committee (appended). Whenever a first aid box is used, an Accident/Incident Report Form setting out the reasons why access to the box was required will be completed. Eye-wash bottles and ordinary sticking plasters will be kept on the *exterior* of each first aid box.

First aid boxes are located in the following areas:

Chemistry Building: 0.14, 1.20, 2.1 and 1.14 (mezzanine floor)

EED4/5: Cocker Lab.

SNIAAMS: 1.29, 1.16, 2.14 – 2.16, 2.27, 2.22, 3.2, 3.32, 2.10

T.B.S.I. B3.06, B3.07, B2.44, B2.45, 6.35, 7.16, 7.19, 7.23.

(C) MAINTENANCE OF FIRST AID BOXES

First aid boxes will be maintained by Martin Services Limited, Unit 11, Bluebell Business Park, Naas Road, Dublin 12. Personnel from the above Company will visit the School at intervals of not less than six (6) months, check that the contents of each box are in order, and replace missing or outdated items.

The School will carry a stock of commonly used first aid materials which will be employed to replace items necessarily used during the intervals between service visits from Martin Services Limited. These will be available from the Chief Technical Officer.

(D) FIRST AID TRAINING

It is the policy of the School to encourage selected members of the permanent staff and postgraduate students to attend official First Aid courses which lead to the award of a Certificate in Occupational First Aid.

SECTION 13

WASTE DISPOSAL

It is the policy of the School of Chemistry to act in a responsible manner with respect to the disposal of waste. Waste minimisation and the recycling of materials whenever this is appropriate are considered to be important elements in the overall management of chemical waste.

Certain types of waste that with careful handling are normally regarded as being non-hazardous will be disposed of *via* the sanitary sewer after dilution with copious quantities of water, or *via* the daily domestic dustbin collection operated by the College. Solvents which are essentially immiscible with water or which have such high vapour pressures that explosive atmospheres can be formed above their aqueous solutions will not be disposed of *via* the sanitary sewer system. Chlorinated solvents will never be disposed of in this way.

Uncontaminated (*i.e.*, chemically clean) broken glassware will be collected in designated rigid containers. When full, these will be sealed using adhesive tapes and disposed of *via* the domestic dustbin collection service.

All other types of waste are designated as hazardous wastes and are treated as described below.

(A) DISPOSAL OF HAZARDOUS SOLVENT WASTE

Solvent waste is collected in specially designated labelled containers which are located in all teaching and research laboratories. A clear distinction is drawn between waste which contains chlorinated solvent and that which does not. Different containers are provided for each category of solvent waste. Full containers are taken, with due precaution and with relevant accompanying documentation which accurately describes the nature of the waste, to the Hazardous Materials Facility where they are received by the person in charge, Mr.

Marcus Phelan or Mr. Colm Deevey Thereafter, the solvent wastes are handled in accord with the regulations pertaining to the operation of that Store, and are ultimately taken away for disposal by the designated contractor, MinChem Limited.

(B) DISPOSAL OF HAZARDOUS SOLID CHEMICAL WASTE

Hazardous solid waste is collected in appropriate labelled containers which are located in the relevant teaching or research laboratory. Different containers are used for each type of waste. When it is necessary to dispose of such solid waste, arrangements are made, in advance, with the person in charge of the Hazardous Materials Facility (Mr. Marcus Phelan/Colm Deevey) for its reception there. Appropriate documentation accurately describing the nature of the waste will be provided at that time. Thereafter the solid wastes are handled in accord with the regulations pertaining to the operation of that Store and are ultimately taken away for disposal by the designated contractor HMF.

(C) DISPOSAL OF CONTAMINATED GLASSWARE AND SHARPS

Glassware and metal (including hypodermic needles) which are contaminated with chemical residues will be disposed of in the specially marked bins or boxes which are provided in each laboratory. When full, these bins or boxes will be collected by a designated disposal company and taken away for incineration.

SECTION (14)

MISCELLANEOUS

(A) LABELLING OF CHEMICALS

The School recognises that the accurate labelling of containers of chemicals is of the utmost importance. The School will ensure that the containers of all chemicals, including synthetic samples, bear a label indicating their contents. Hazardous chemicals will be additionally marked with labels in accordance with legislative requirements which include the GSH system. Self-adhesive labels covering a wide range of hazards will be kept in the Chemical Stores and will be available through Mr. F. Cowzer.

(B) CHEMICAL SPILLS

Chemical spills will be dealt with according to the chart supplied by British Drug Houses which is available in most laboratories. Protective gloves and clothing will be worn by those cleaning up the spill, and breathing apparatus will be used if volatile toxic materials are present.

Breathing apparatus for emergency use only are located in Chemistry Building on the 1st floor corridor opposite the technical staff tearoom; in SNIAMS on the 2nd Floor outside the Physical Chemistry teaching lab and in the Cocker Lab. All use of this equipment must be reported immediately to the Chief Technical Officer.

(C) MERCURY VAPOUR

When mercury is accidentally spilled, any residues that cannot be mechanically collected will be chemically treated to avoid the dangers arising from mercury vapour in the atmosphere.

All vacuum pumps which used as backing pumps for mercury diffusion pumps will be vented to the outside of the building. All mercury-filled traps associated with vacuum lines or with pressurised inert gas lines will be vented to the atmosphere *via* an adequate trap containing elemental sulfur.

(D) FUME CUPBOARDS

The School of Chemistry recognises fully the importance of the use of fume cupboards for the manipulation of volatile toxic materials. All fume cupboards conform to BS 7258.

Fume cupboards will be tested at least once per year using an appropriate instrument such as a hot wire anemometer and a written record of the tests will be kept.

Fumehoods will be operated in accord with good practice. Each fumehood will be kept uncluttered, with adequate space between the equipment in the hood and the walls/door of the hood. Fumehoods are not designed to be used as storage space, and will not be so used if there is alternative space available. Where a fumehood *is* used temporarily for storage, ***no experimental work shall be done in the hood.***

(E) GAS CYLINDERS

The School of Chemistry recognises the particular hazard presented by cylinders of compressed gases. These hazards mainly relate to **fire**, to **explosion**, and to **injury** arising from the transport or falling over of large cylinders. The **control measures** that will be employed are generally outlined within **Section 11** above.

SECTION 15

APPENDICES

(A) "Safety is Your Business"

This is available at:

<http://chemistry.tcd.ie/assets/pdf/SafetyIsYourBusiness2015.pdf>

(B) Faculty Booklet and forms

These are now available online, as follows:

a. **Faculty Booklet:** <http://bit.ly/1NFWiah>

- a. [16_final.pdf](#) Forms for risk assessment, accident reports, gas cylinder movements etc are available from:
<http://chemistry.tcd.ie/safety/forms/>