

Safety Handbook and Requirements

NDE Group

Mechanical Engineering Department, Imperial College London

The conduct of all members of the Department, whether staff, students or visitors, where it concerns the health and safety of themselves or others, is governed by the Health and Safety at Work Act 1974. All members of the Department are responsible for the health and safety of themselves and everyone else.

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1. HEALTH AND SAFETY

1.1 Reporting of Accidents and Dangerous Occurrences

All incidents that are considered dangerous, whether or not these cause injury, **must** be reported to your Supervisor and the Technician Head of Division (THoD, Phil Wilson, tel: 47127) who will report to the Departmental Safety Officer (DSO, Ian Wright) as soon as possible after the event.

1.2 First Aid Treatment

During Working Hours:

In the case of injury the nearest “first aider” should be contacted – please see local lists on lab noticeboards under a green heading (changed every two months) - **OR** telephone the Health Centre (extension 49375 / 49376).

Out of Hours:

Between 6 p.m. and 8 a.m. and at all times at weekends, first aid assistance can be obtained by contacting the Sheffield Security desk, extension 58920.

In Emergency (Police/Fire/Ambulance) contact Security: PHONE 4444
(give details of emergency, your exact location, telephone number & name)

1.3 Blood Spillage

In the event of a spillage of blood **do not attempt to clean it up**; contact a first aider who will be aware of the correct procedure.

1.4 Eating, Drinking and Smoking in Laboratories

Eating, drinking and smoking in the laboratories and workshops is prohibited. Smoking is prohibited in the College.

1.5 Drinking Water

There is a special supply for drinking water. All drinking fountains and taps marked 'Drinking Water' which are situated in most cloakrooms and some corridors, supply potable water.

Do not drink the water supplied to the laboratories

2 INDUCTION PROCEDURES FOR NEW MEMBERS OF THE DIVISION

On arrival in the Dynamics/NDE Division, all new staff, students and academic visitors are given copies of the College Safety Policy Statement and the Departmental Safety Policy which they are required to read before being allowed to start work.

All new students and lab-active RAs are required to attend the Department's safety course which is usually held in October.

2.1 Dynamics & NDE Laboratory Managers

The primary regulators of safety in the Division are the Laboratory Managers. These are currently as follows:

Frederic Cegla	NDE Laboratory Manager	223	48096
Christoph Schwingshackl	Dynamics Laboratory Manager	101	41920

In addition, matters of safety within Dynamics & NDE are dealt with by:

Philip Wilson	Technician Head of Division	47081
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For further assistance with safety issues please contact:

Ian Wright	Departmental Safety Officer	47043
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3 REGULATIONS

3.1 Registration of Experimental Work

ALL EXPERIMENTAL WORK MUST BE REGISTERED
with the relevant laboratory manager

3.1.1 Choice, Purchase and Manufacture of Equipment

You are required by law to use equipment that is safe for the use intended only. The onus is on you to ensure that you comply with this requirement. If in doubt as to the suitability of the equipment you propose to use, check with your supervisor or with someone with the necessary specialised knowledge.

The following guidelines may assist you.

- i) Equipment bought from a reputable manufacturer can usually be assumed to be safe to use for the purposes for which the manufacturer intended it. If you wish to use it for other purposes, first check with the manufacturer as to the advisability of this or, otherwise, with someone with the necessary specialist knowledge, for example, the THoD.

- ii) Equipment formally ordered from workshops within the College (whether mechanical, electrical *etc.*) may be assumed to be safe for the purposes specified on the drawings you provide. They will exercise the necessary quality control to ensure that it conforms to the 'fitness for purpose' requirement. Note, however, that if they consider the design unsafe, they will refuse to make it.
- iii) Equipment made either by other workshops, or technicians working in their own time or by small outside jobbing firms should be assumed not to have received the necessary quality control and should not be assumed to be safe without further investigation. It is your responsibility and your supervisor's to ensure that this investigation is carried out.

3.1.2 Planning, construction and testing of experimental apparatus – Pre-Registration of Experimental Work

Pre-registration with the laboratory manager of experimental work is necessary where apparatus is being constructed. Information must be provided concerning the planned construction phase and the intended experiments. Sufficient detail is required concerning the proposed work to enable the laboratory manager, the THoD and in certain cases the DSO to decide whether a referee is needed to give advice.

If hazardous substances will be used during the construction phase then a COSHH Risk Assessment Form must be completed.

3.1.3 Lab Safety Form

All users who will work in laboratories must complete a 'NDE Lab Safety Rules' form. Details must be given of the hazards, e.g. electrical, pressure, and flammable solvents, which might be encountered. Both the research worker(s) and the supervisor must sign the document and the supervisor must ensure that the research worker has had relevant safety instruction and information. It will then be inspected by the THoD, who may recommend changes that are considered necessary to improve safety.

The registration is complete only when the NDE Lab Safety Rules form has been signed by the THoD, Phil Wilson.

Work on completed rigs or experimental work using existing rigs or commercial equipment must be registered with the laboratory manager, who will ensure that the user has been adequately trained and that a record of this training is kept. "COSHH forms" must be updated each time the experimental work changes.

<p style="text-align: center;">Registration forms and COSHH forms are available from the THoD, Phil Wilson</p>

3.2 College Safety Regulations

The College Safety Policy covers all areas of health and safety that might affect those that work or study in the College. Associated with the Safety Policy are Codes of Practice which detail the restrictions and requirements which research workers must obey when working with lasers, radiation or biological materials, amongst other things. Full details can be obtained by reading the relevant Codes of Practice, which can be found in the College Health and Safety Manual available on the Imperial Spectrum website.

3.2.1 Work involving Lasers

All lasers must be registered and the Head of Department must approve all laser users. Any work involving the use of lasers is governed by the College Laser Code of Practice (refer to the Imperial Spectrum website, Policy Document PC-15) and must be registered with the Departmental Laser Safety Supervisor, Professor A M Taylor, room 606, extension 47042, email a.m.taylor@imperial.ac.uk. Dr Christoph Schwingshackl is responsible for laser safety in lab 101.

3.3 Annual Registration of Laboratories, Workshops, etc.: Safety Check Certificates

The DSO, in addition to the Dynamics & NDE Laboratory Managers and Dynamics & NDE Heads of Division, carry out spot checks on all parts of the Department each term. Some faults are correctable on site, others require notification to the Heads of Division. Where necessary the DSO will apply a 'Stop Notice' with 7 days to correct the fault.

All laboratories, workshops, terminal rooms, lecture theatres and multiple occupancy rooms must be registered using the "Safety Check Certificate". The Certificate is used as a method of ensuring that the standards of safety within an area are regularly reviewed. All equipment must be electrically tested, all experiments must be registered with the laboratory manager and all COSHH assessments must be up-to-date. Guidance on good housekeeping practices is included and information must be given about types of fume cupboards, warning signs and the protective clothing that is available.

Failure to rectify any faults can result in the area being closed by the Laboratory Manager or the THoD until the relevant modifications have been carried out.

3.4 Control of Substances Hazardous to Health Regulations 1999 (COSHH)

3.4.1 Risk Assessments

The COSHH Regulations 1999 are concerned with the control of exposure to substances in the workplace, which are deemed hazardous to health. The regulations require, amongst other things, that risk assessments be carried out on any hazardous substance before it is used in any job or activity. Risk assessments must be renewed annually or whenever the risk changes, whichever is the shorter period. The Department and Dynamics & NDE Division require all COSHH assessments to be renewed at the end of each calendar year.

Guidance on how to carry out risk assessments is given in the Department's "Notes on the Control of Substances Hazardous to Health (COSHH) Regulations 1988", a copy of which is available for consultation in the Library.

Substances that are covered by the regulations are:

- 1) All substances specified by the Chemicals (Hazard Information and Packaging for Supply) Regulations 1994 (CHIPS) as dangerous to supply, i.e. very toxic, toxic, harmful, corrosive or irritant.
- 2) Any substance for which the Health and Safety Commission (HSC) has approved a Maximum Exposure Limit (MEL) or Occupational Exposure Standard (OES). MEL and OES values are listed in the current edition of "EH40 - Occupational Exposure Limits". An MEL must not be exceeded under any circumstances.
- 3) Biological agents.
- 4) Dust, of any kind, in sufficient quantities.
- 5) Any substance not included above but which is considered to be hazardous to health. Consult the material safety datasheet (MSDS).

Substances that *are hazardous solely because* they are flammable, explosive or asphyxiates are not required to be assessed under COSHH, but see note **4.4** below. If you are using acetone only, then you are covered by the general COSHH assessment held by the THoD.

3.5 The Pressure Systems & Transportable Gas Containers Regs. (1989)

These regulations govern the use of all pressurised equipment with the exception of certain low-hazard situations. The regulations apply to:

- Any vessel that is constructed with a permanent outlet to the atmosphere and which could become a pressure vessel if that outlet were obstructed.
- Any system of pipework containing steam (at any pressure).
- Any pressurised system of pipework containing a "relevant fluid". A relevant fluid is defined as:
 - a) a gas at a pressure in excess of 0.5 bar above atmospheric pressure.
 - b) a liquid which would have a vapour pressure greater than 0.5 bar above atmospheric pressure when in equilibrium with its vapour at either the actual temperatures of the liquid or 17.5 Celsius.
 - c) a gas dissolved under pressure in a solvent contained in a porous substance at ambient temperature, which could be released from the solvent without application of heat.

Note that a pressurised system containing only hydraulic oil or a similar liquid is exempt from the regulations whatever the pressure. The regulations are concerned only with gaseous, or at least partly gaseous, systems.

If your pressurised system will contain (a) steam or (b) have a product of pressure (in bars above atmospheric) and volume (in litres) exceeding 250 bar litre, you must consult the THoD, Mr Phil Wilson, who will arrange for the relevant vessels to be tested and recorded.

For further details see Imperial's Guidance Note 027: 'Safe Handling, Use and Storage of Compressed Gases January 2002' is available on the Imperial Spectrum website, Health and Safety.

3.6 The Electricity at Work Regulations 1989

All electrical equipment and plant in the Department is subject to regular testing and inspection as required by the Electricity at Work Regulations 1989. For further details see Imperial's Guidance Note 019: Electrical Testing – PAT (January 2001) is available on the Imperial Spectrum website, Health and Safety.

Electrical equipment in laboratories and other areas covered by a Laboratory Safety Check Certificate is normally inspected annually. All portable equipment, e.g. drills, must be tested every six months.

Electrical equipment in all other areas in the Department, e.g. offices, which are not subject to an annual safety inspection, will be tested by arrangement between Mr LeRoy Grey, the Department's Electrical Tester and the Technician Head of Division. An Electrical Testing Certificate will be completed.

Testing equipment and advice can be obtained from the Electronics Workshop (Vim Patel). The responsibility for ensuring that the annual departmental check has taken place lies with:

1. Laboratory Managers - for laboratories.
2. Academic Staff - for their offices and those of their students and RAs.

3.7 Display Screen Equipment Regulations 1992

These Regulations require employers to carry out assessments of the risks to the health and safety of designated users of display screen equipment as a consequence of using such equipment. Mrs Fabienne LaPerche, Display Screen Co-ordinator and the DSO will inspect and make recommendations. Users are entitled to free eye and eyesight tests, on request, and free spectacles, if required.

More information is available on the Imperial Spectrum website, Health and Safety Manual: A Short Guide for Staff and Students, Workplace safety, VDUs.

3.8 Manual Handling Regulations 1992

The aim of these Regulations is to reduce the amount of damage caused to people at work by incorrect manual handling. Before carrying out manual handling, task assessments should be made and, if possible, mechanical handling equipment should be used instead. Students are not allowed to collect their own gas bottles – contact the THoD or a technician. All the technicians are trained in manual handling and transport of gas bottles.

More information is available on the Imperial Spectrum website, Health and Safety Manual: A Short Guide for Staff and Students, Workplace safety, Lifting and manual handling and Guidance Note 020: Summary of Health and Safety Legislation.

3.9 Noise at Work Regulations 1989

These Regulations are designed to ensure that any excessive noise is controlled and that workers wear suitable personal protective equipment above certain noise levels.

If you believe that the environment in which you are working is excessively noisy, contact the THoD who will arrange to have a sound survey carried out.

Consult the Library for the HSC 1989 Regulations, Approved Code of Practice / Health and Safety Commission.

More information is available on the Imperial Spectrum website, Health and Safety Manual: A Short Guide for Staff and Students, Workplace safety and Noise; Machinery and Guidance Note 020: Summary of Health and Safety Legislation.

3.10 Provision and Use of Work Equipment Regulations 1998

These regulations are aimed at safeguarding the health and safety of employees from hazards arising from the provision and use of work equipment. Training is given in the safe use and maintenance of equipment and what to do if things go wrong. Suitable guarding for mechanical hazards and protection against other dangers are in use. Phil Wilson, Technician Head of Division, can advise on individual lab problems to do with the guarding of machinery. Refer to the Imperial Spectrum website, Health and Safety Manual; Laboratory and workshop safety, Machinery, and Guidance Note 020: Summary of Health and Safety Legislation.

4 LABORATORY PRACTICE

4.1 Emergency Access to Laboratories

The doors to the laboratories should be left unlocked when users are working inside. Keys to the doors into all laboratories are held in the office of the THoD.

4.2 “Housekeeping”

A tidy laboratory is much safer than one full of clutter; good housekeeping is essential for a safe environment. Keep passageways clear. Fire doors should not be locked, bolted or obstructed. Electrical cables should be off the floor, and cable ducting should be used where necessary. Laboratory doors should be left unlocked when users are working inside.

No person may carry out hazardous work in a laboratory without a second person being within call.

4.3 Security

Regrettably thefts do occur in College from time to time. Please do not bring valuables to College if at all possible. Always make sure your room is locked when you leave it, even for a short time and restrict access to those working in the lab. Lock away wallets, handbags etc if you are leaving your room.

4.4 Storage of Flammable Liquids

There are legal requirements governing the storage of flammable liquids; some of the more important points are as follows:

4.4.1 Limits of Quantity

The COSHH assessments restrict amount of flammable liquids kept in store. The cost of the disposal of excess liquids will be met by the Division and this is considerable. Any operations involving the storage or use of large quantities of flammable liquids should be discussed with the Technical Head of Division.

4.4.2 Type of Storage

By law containers of flammable liquids of greater than 500 ml capacity must be stored in approved, fire resisting storage cabinets or cupboards when not in use. The cupboard should be suitably labelled. Signage is examined by College Safety Unit, Ian Gillett, in general. Flammable liquids may be stored in fume cupboards only if they are contained in a suitable steel cabinet.

4.4.3 Where to Store

Flammable liquid storage cabinets should not be sited in those parts of the laboratory where there is a high rate of movement of personnel. They should also be

sited away from gas cylinders and ignition sources, e.g. naked flames and high temperature surfaces.

All flammable substances should be kept apart from oxidising agents.

4.5 Use of Gas Cylinders

All cylinders should be secured, individually, to a rigid support using an appropriate clamp. Always keep the number of gas cylinders in the laboratory to a minimum and return empty or unwanted cylinders to the Stores.

Keep cylinders away from stocks of flammable liquids and ignition sources.

Do not clamp cylinders to the front of a fume-cupboard as they restrict the airflow, invalidating the classification of the cupboard.

After use, always close the *valves* and depressurise the *regulator*. Be especially careful when using oxygen cylinders and make sure that the regulator is in the unpressurised position before opening the cylinder valve. Several explosions have occurred as a result of perforation of the regulator diaphragm, when opening oxygen cylinders with the regulator in the pressurised position.

For guidance on the use, handling and storage of gas cylinders refer to the Imperial Spectrum website, Health and Safety, Guidance Note 027: 'Safe Handling, Use and Storage of Compressed Gases (January 2002)'. Refer also to the British Oxygen Company's book "Safe under Pressure", which is available in the Library.

4.6 Liquid Nitrogen

All liquid nitrogen users must be aware of the properties and hazards and be fully trained in the local departmental procedures for usage, storage and transportation before they engage in handling the substance. Refer to the Imperial Spectrum website, Health and Safety, Guidance Note 015: 'Storage, Use and Transportation of Liquid Nitrogen within College Premises (September 2000, revised January 2004)'.

Users should check with the THoD to establish whether a risk assessment for the handling and use of liquid nitrogen has been completed for the laboratory in which they are working. If not, a risk assessment must be completed prior to starting any work using liquid nitrogen.

Pressurised vessels and dewars containing liquid nitrogen should not be accompanied in lifts. The THoD must be notified in advance and will arrange safe transport with the lift engineers. All the technicians are trained in manual handling.

Pressurised vessels and dewars should NOT be accompanied in lifts.

4.7 Waste Disposal

NO CHEMICALS MAY BE PUT INTO THE DRAINS OR PLACED IN THE DOMESTIC WASTE BINS.

It is ILLEGAL to dispose of organic solvents down the drains.

4.7.1 Waste Solvents

Waste solvents should be stored in special polythene containers marked either "Chlorinated" or "Non-Chlorinated". Empty containers can be obtained from the THoD. When full, the THoD should be contacted to arrange for the disposal of the containers. Waste solvents mixed with more than 10% water or acid should be stored in glass Winchester.

4.7.2 Waste or Unwanted Chemicals

These should be given to the Technician Head of Division who will arrange for them to be put in the Departmental Chemical Store or for their safe disposal.

4.7.3 Broken and Waste Glassware

DO NOT PUT GLASS OR SYRINGE NEEDLES IN THE DOMESTIC WASTE BINS.

'Sharps' *i.e.* syringes, scalpel blades, glassware that cannot be cleaned *etc.*, must be put in special waste containers that can be obtained from the THoD. When full, the THoD should be contacted to arrange for the disposal of the containers. Clean, broken glass may be placed in a clearly labelled box and left for the cleaners to take for re-cycling.

4.7.4. Chemical Spillages

In the event of a chemical spillage contact Technical Head of Division, Phil Wilson, 47127.

**ALL MERCURY SPILLAGES MUST BE PROPERLY DEALT WITH -
CONTACT THE THoD (PHIL WILSON)**

4.8 Overnight Running of Apparatus

Any experiment or piece of apparatus that is left running overnight must be notified to the laboratory manager. An 'Overnight Running' notice must be displayed near the apparatus indicating the shutdown procedure. Blank notices can be obtained from the Technician Head of Division, Phil Wilson.

4.9 Working Outside Normal College Hours

**NO ONE MAY CARRY OUT EXPERIMENTAL WORK ALONE UNLESS THE WORK HAS BEEN DECLARED NON-HAZARDOUS AND AUTHORISED BY HIS OR HER SUPERVISOR AND THE LABORATORY MANAGER.
A second person must be in the same laboratory at all times.**

Any out of hours work in the laboratories must be authorised by the user's supervisor and the laboratory manager. Forms are available from the THoD, Phil Wilson. A new form must be authorised for every day of out of hours working. The completed form must be displayed by the entrance to the relevant laboratory. The user must be accompanied by another person in the laboratory at all times.

For Lone Out of Hours Working Basic Guidelines, refer to the Imperial Spectrum website, Health and Safety Manual, Personal safety, Working alone and Guidance Note 023: Lone Working (June 2001).

Only personnel with a valid security pass, 'swipe card', may enter or leave the Department out of hours.

Access is available from 07.00 to 18.30 Monday to Friday. Outside these times and at weekends, access to the Department is *via* a swipe card. Everyone must leave the building by 23.00 hrs.

College Closure Periods: During the College closure periods at Christmas and Easter access is only allowed to members of the Department with a valid security pass.

No experimental work is allowed during College closure periods without the permission of the Technician Head of Division

4.10 Instruction in the Use of Fire Extinguishers

All technician staff are required to attend training in the use of fire extinguishers. Fire safety for laboratory users is covered in the Departmental safety lecture. Training courses for laboratory users in the use of fire extinguishers are available via the Safety Unit, see Imperial Spectrum website.

4.11 Reporting of Defects

Any building defects, e.g. broken lights, dangerous ceiling tiles, defective fume cupboards, dangerous floors, etc., should be reported immediately to the Technician Head of Division or direct to the Estates Helpdesk on extension 49000 or email Estates-help@imperial.ac.uk. The Estates Helpdesk service is for *building defects only* and not rig defects.

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