
LABORATORY PROCEDURE

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This procedure:

- Defines a laboratory
- Details the procedures that should be followed to safely manage a laboratory
- Details the procedures that should be followed when working in a laboratory
- Details the procedures that should be followed when you cease work in a laboratory

INTRODUCTION

Many NERC staff carry out work in laboratories. This document provides an overview of the procedures that should be followed in order to safely manage work in a laboratory and those that are needed to work safely in a laboratory.

The nature of laboratory use across NERC is quite variable. Here a laboratory is defined as any place of work where substances (which may include biological materials, chemicals, electronics, rocks, sediments etc.) are used in the context of analytical or experimental studies or during manufacture or assembly of equipment. It therefore covers conventional chemical or biological laboratories or facilities, sample preparation rooms and electronics laboratories. In some cases it may also cover aquaria, herbaria, garages and workshops etc.

Each laboratory must have a single manager appointed to oversee the running of it. Each laboratory must have a local code of practice which gives a description of the function of the laboratory and details the specific hazards present and the activities normally carried out in it. It must also describe the emergency evacuation procedure associated with the laboratory. The code of practice may also list restrictions on use, maintenance arrangements and waste disposal practice. The code of practice for an individual laboratory may be subsumed into an overall code of practice covering all laboratories on a single site.

Anyone carrying out work in a laboratory must be familiar with its code of practice and also carry out the appropriate risk assessments on the particular piece of work that they are undertaking. On completion of their work all hazardous material must be safely disposed of and the laboratory must be left in a safe condition. Subsequent users of a laboratory should never be faced with a legacy of abandoned and potentially hazardous material or equipment.

All accidents, incidents and near misses must be reported to the local
accident reporting system.

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Abbreviations:

LEV – Local Exhaust Ventilation

PAT – Portable Appliance Test

PPE – Personal Protective Equipment

RPA – Radiological Protection Advisor – Appointed by NERC, currently the NRPB

RPS – Radiological Protection Supervisor – A local site appointment

Acknowledgements: this procedure is based on material produced by Jonathan Shanklin, who referenced a number of University web sites. In particular the forms are amended from material on the University of Bristol Chemistry Department site.

It is the responsibility of management to carry out risk assessments, risk management and the development of Safe Systems of Work.

Management involvement

Senior management should decide which work areas are to be classed as laboratories. They should ensure that there is a Code of Practice for each such laboratory within their remit. This Code of Practice may include sections on safe working arrangements, potential hazards and waste disposal. It must include a section describing the emergency evacuation procedure. Senior Management should appoint a laboratory manager who will oversee safe working in the laboratory. Unannounced outline tours of inspection should take place at least once a year, with follow-up full tours for any areas found wanting. Membership of these tour panels should be from the local Health & Safety committee.

User involvement. The users of a laboratory should read and follow the Code of Practice. Where they can see possible safety improvements they should inform their line manager and agree changes in the Code of Practice.

Authorisation. No laboratory work should take place until a full project risk assessment has been submitted and signed. When completed, the work should be signed off.

Record actions. Full records should be kept with project work files. These may include risk assessments and Control Of Substances Hazardous to Health Regulations (COSHH) forms, details of any routine monitoring that is carried out (for example tests on fume cupboards) and details of any decontamination procedures that have been necessary.

Development of local procedures. It is recognised that NERC laboratories do not match a 'one size fits all' pattern and so this procedure has been designed to offer NERC-wide general guidance. It can be used to form the basis for specifically tailored local procedures. Development of such local procedures is encouraged and the NERC Safety Management Group welcome copies for review.

Encourage and monitor feedback. No set of procedures is perfect and all staff should be encouraged to suggest improvements to these and local procedures and Codes of Practice.

Senior management

Senior management is responsible for:

- ensuring that a competent laboratory manager is appointed for each laboratory on site
- supporting the laboratory manager by exercising disciplinary procedures if necessary
- authorising risk assessments
- auditing that the procedures listed here are being followed

Line manager

The line manager is responsible for:

- training and supervision of laboratory users
- informing laboratory users of risks and their control measures
- carrying out general risk assessments
- ensuring that risk assessments are reviewed
- disciplining staff if correct procedures are not followed

Laboratory manager

The laboratory manager is responsible for:

- ensuring that the laboratory has an up to date Code of Practice
- ensuring that workers using the laboratory follow the Code of Practice
- ensuring that the correct PPE is available and used
- ensuring that safety data sheets are available for all substances used in the laboratory
- ensuring that COSHH risk assessments are kept and are available for all applicable processes that are followed in the laboratory
- advising on the risk assessments for any experiments that are to be carried out in the laboratory
- ensuring that the risk assessments for any experiments that are carried out in the laboratory are available
- signing off completed experiments
- ensuring that the laboratory is kept tidy

Laboratory users

Laboratory users are responsible for:

- reading and abiding by the laboratory Code of Practice
- checking the safety data sheets for all substances that they use
- carrying out the risk assessment for their experiments in conjunction with their line manager
- carrying out their experiment in line with the risk assessment
- ensuring that they wear the correct PPE at all times
- leaving the laboratory in a safe condition on completion of their work

Management:

Putting science before safety “You must complete this research so that the paper can be published. We’ll worry about safety later.” Remedy – Message that safety is more important must come from the top.

Poor procedures in place No laboratory manager appointed or management do not support the laboratory manager. Remedy – Appoint a laboratory manager. Senior managers must support the laboratory manager and if necessary take disciplinary action against persistent offenders.

MAKE SURE THE MESSAGE IS CONVINCING, CONSISTENT AND ENFORCED

Staff:

Failure to comply with Code of Practice “I know what I’m doing and it’s perfectly safe.” “We’ve always done it like this.” “The science is more important than safety.” Not wearing PPE. Remedy – The message is that doing it properly and safely saves time and results in better science in the long run. Senior managers must support the laboratory manager and if necessary take disciplinary action against persistent offenders.

Poor housekeeping Chemicals are poorly stored. Sharps are not correctly disposed of. Electrical appliances are not tested. Remedy – Carry out further training. When complete, carry out unannounced tours of inspection.

System:

An unused laboratory is not necessarily safe “We haven’t used this laboratory for months, so there can’t be a hazard.” Example - An incident in September 2002 led to an accidental chlorine gas release in a NERC laboratory. Boiler descaler and treated sea-water were mixed in an external drainage sump and this generated chlorine gas. The gas travelled back from the sump and entered several lightly used laboratories through u-bends in sinks and drains, which had dried up, as they had not been used over the summer. Remedy – Ensure that there is a management procedure for laboratories not in use, so that all safety devices are regularly checked.

Correct storage is important “We are storing our flammables in a fridge.” Warning - Not all fridges are equal. A spark proof fridge/freezer is essential for storage of flammables. Some substances need to be maintained at constant temperature and many consumer fridges employ considerable temperature cycling for defrosting.

Management:

The management of safety in laboratories requires:

- Clear lines of responsibility
- The setting of priorities and goals
- Commitment to provide facilities and equipment required for safety
- Provision of accredited training where a need is identified
- Documentary evidence that tasks have been identified and assessed for risk of personal injury
- Written Safe Systems of Work for all tasks involving significant risk
- Signed agreements between management and staff to work to the Code of Practice
- Records of the agreements and agreed dates of revision
- Agreed monitoring and auditing systems
- Provision for staff feedback and 'whistle blowing'

Monitoring:

The monitoring of safety in laboratories requires:

- Documentation of the management system
- Written records of the process of production of Safe Systems of Work
- Documentation of management follow-up after introduction of such systems
- The recording of accidents, incidents, near misses, illness and fatigue
- Documentation of actions taken as a result of follow-up and accident reporting
- Assessment of safety attitudes amongst staff
- Documentation of training undertaken
- Maintenance of equipment
- Assessment through unannounced inspections

Auditing:

The auditing of safety in laboratories requires:

- Checking that the above documentation is in place
- Checking that codes of practice are followed
- Certifying that training is adequate and where appropriate, accredited
- Assessing management and staff attitudes by interview

NERC PROCEDURE	REGULATION
Safety in Manual handling of loads, Number 8.	Manual Handling Operations Regulations (1992)
Control of Substances Hazardous to Health	Control of Substances Hazardous to Health Regulations (COSHH) (1999)
Personal Protective Equipment	Personal Protective Equipment Regulations (2002)
Use of Display Screen Equipment, Number 2.	Health & Safety (Display Screen Equipment) Regulations (1992)
Risk assessment and Risk Management and High Potential Risk Groups in Risk Assessment, Number 9	Management of Health & Safety at Work Regulations (1999)
Use and Maintenance of Work Equipment	Provision and Use of Work Equipment Regulations (1998) Electricity at Work Regulations (1989)
Noise, Number 27.	Noise at Work Regulations (1989)
Fire	Fire Precautions (Workplaces) Regulations (1997)
Use of pressure vessels	Transportable Pressure Vessel Regulations (2001)
Use of Genetically Modified Organisms	Genetically Modified Organisms (Contained Use) Regulations (2000)
Accident Reporting and Investigation, Number 20	

Laboratory Clearance: **Chemicals**

- Ensure that all containers of chemicals are labelled with their chemical name (not just a sample code) and are securely closed.
- Empty and clean and, if necessary, return to Stores all beakers, flasks, evaporating dishes and other glassware.
- Check refrigerators, freezers, fume hoods and bench tops as well as cupboards for chemicals.
- Give particular attention to shared storage areas.

If chemicals are useful, then responsibility for them can be transferred to another person who is willing to accept the responsibility and who has indicated such willingness in writing. If no such person can be found, dispose of the material in the proper way.

Prepare for disposal all chemicals that are not to be removed or that are not accepted by another person. Detailed instructions for this are given in the Code of Practice "Disposal of Chemical Waste". UN approved containers are available through the Local Safety Adviser and if the quantity of chemicals to be cleared is large, contact the Safety Adviser at an early stage. The process of disposal can take some time, so begin the procedure some weeks before departure from the laboratory. Complete the actual removal of the chemicals before the laboratory is vacated.

- Clean and tidy up your work area.
- Complete the Clearance Check List including the appropriate signatures.
- Inform your Line Manager and/or the Head of Section when the laboratory has been cleared and record his/her approval.

Laboratory Clearance: **Micro-organisms and Cultures**

- Ensure that all containers of micro-organisms are properly labelled and secure.
- Decontaminate waste material by autoclaving or chemical disinfection and dispose of properly. Refer to the Code of Practice "Biological Hazards and Immunisation".
- Clean and disinfect glassware, incubators, drying or curing ovens, refrigerators and freezers.
- Where necessary fumigate rooms and microbiological cabinets.
- If samples are to be saved then responsibility for them can be transferred to another person who is willing to accept the responsibility and who has indicated such a willingness in writing. If no such person can be found, dispose of the material in the proper way.
- Clean and tidy up your work area including the removal of any redundant biohazard signs.
- Complete the Clearance Check List including the appropriate signatures.
- Inform your Line Manager and/or Head of Section when the laboratory has been cleared and record his/her approval.

Laboratory Clearance: **Radioactive Material**

- In normal operation, radioactive materials are carefully recorded and disposed of regularly. Carefully label and make secure any remaining material e.g. stock vials, sealed sources etc. Ensure that each item has an associated Stock Card. If it does not, start one.
 - Dispose of Waste material according to the procedures outlined in the Code of Practice "Work with Ionising Radiation". Advice and assistance can be obtained from the local Radiation Protection Supervisor (RPS). As radioactive materials are disposed of, Stock Cards must be signed off and sent to the RPS in the normal way. Problems can be created when visiting workers bring radioactive material to the site and leave behind their waste.
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- If samples are to be saved then responsibility for them can be transferred to another person who is willing to accept the responsibility and who has indicated such willingness in writing. If no such person can be found, dispose of the material in the proper way. Record such transfers and disposals on the appropriate Stock Card.
 - It is especially important that radioactive material is not abandoned by departing research groups. This can have serious and costly consequences. If material is to be left, inform the RPS and the Safety Advisor in writing and obtain their permission to do so also in writing.
 - Check for contamination and if necessary decontaminate, clean and tidy up the work area. Where radioactive materials have been held and used and the laboratory is to revert to non-radioactive use, the RPS must confirm in writing that the laboratory has been adequately cleared and decontaminated.
 - Complete the Clearance Check List including the appropriate signatures.
 - Inform your Line Manager and/or Head of Section when the laboratory has been cleared and record his/her approval.

Laboratory Clearance: **Mixed Hazard**

- For mixed hazard i.e. involving more than one of chemical, radioactive or biological materials, apply all of the appropriate procedures.
 - Complete the Clearance Check List including the appropriate signatures.
 - Inform your Line Manager and/or Head of Section when the laboratory has been cleared and record his/her approval.
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Laboratory Clearance: **Equipment**

- Remove from the laboratory and dispose of safely all unwanted or obsolete equipment. For larger pieces, obtain the advice and help of the Facilities Manager or site maintenance staff. Do not transfer refrigerators and freezers directly to waste without the removal of refrigerants and for other equipment, contaminating material such as mercury, oils and radioactive sources.
- Clean and decontaminate any equipment that is to be left (glassware, vacuum lines, exhaust lines, pump oil, filters, centrifuges etc). Supply custom built equipment with precise operating instructions and an operating risk assessment.
- When equipment is left, responsibility must be transferred to another person who is willing to accept the responsibility and has indicated such willingness in writing. Otherwise dispose of the equipment safely before the laboratory is vacated.
- Return gas cylinders to the Store.
- Clean and tidy up your work area.
- Complete the Clearance Check List including the appropriate signatures.
- Inform your Line Manager and/or Head of Section when the laboratory has been cleared and record his/her approval.

APPENDIX III: FORMS



Form 1: Laboratory Safety Inspection Checklist

Laboratory/room number:	Person in charge:	Date of inspection:
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		Please delete as applicable:	
Risk assessments	Is there a written Risk Assessment for all of the activities carried out in this area either from the generic set or specially written? If "No" which ones are lacking?	Yes	No
COSHH special assessments	Written COSHH assessments for all chemicals used which require it?	Yes	No
	Are Data sheets available?	Yes	No
Summary/comment:			

	Items:	Please tick as applicable			
		Good	Satisfactory	Unacceptable	Poor
Laboratory layout and general state					
	Equipment layout				
	Number of occupants/overcrowding				
	Ventilation				
	Lighting				
	Furniture				
	Food, temperature, chemical and biological material				
Offices/write up areas					
	Separation of work/write up areas				
	Number of occupants/overcrowding				
	Ventilation				
	Furniture				
	Lighting				
	Workstation assessments				
	Chemicals/Biological material, temperature				

Summary/comment:					
		Please tick as applicable			
	Items:	Good	Satisfactory	Unacceptable	Poor
Personal protective equipment					
	Lab coats (worn, clean?)				
	Safety glasses (available, worn?)				
	LEV (working, in test date?)				
Summary/comment:					
	State of:				
Housekeeping (Including storage and access)					
	Floors				
	Aisles				
	Exits				
	Ceilings				
	Benches				
	Fume-hoods				
	Fridges				
	Cupboards				
	Bins				
	Electrical Cabling				
	Shelves				
	Other equipment				
Summary/comment:					
Emergency Equipment					
	Fire Extinguishers				
	Fire Extinguisher training				
	Fire blankets				
	Fire exits				
	First aid box				
	First aider list				
	Eye wash				
	Emergency shower(s)				
	Spill kits				
	Laboratory hazards plan				
	Contact person				
	Telephone number				
	Notices				
	Emergency telephone numbers				

Summary/comment:					
		Please tick as applicable			
	Items:	Good	Satisfactory	Unacceptable	Poor
Chemicals					
	Amounts				
	Storage				
	Labelling				
	Bar-coding, Inventory				
Solvents/Flammable liquids					
	Amounts				
	Storage				
Waste solvent					
	Amounts				
	Location				
Summary/comment:					

Electrical Equipment	Please delete as applicable		Comments
PAT Testing <50%, >50%			
Failed/untested equipment in use	Yes	No	
Non-complaint custom equipment	Yes	No	
Visual checks:			
Lack of strain relief	Yes	No	
Damaged main leads	Yes	No	
Damaged mains plugs	Yes	No	
Mains distribution panels:			
Unsecured	Yes	No	
Poorly positioned	Yes	No	
Daisy chained	Yes	No	
Mains extension cables/adaptors:			
240v mains adaptors in use	Yes	No	
Cables too long	Yes	No	
Unprotected floor trailing cables	Yes	No	
Summary/comments:			

Other Laboratory equipment	Comments
Lasers (registered, shielded, warning)	
UV sources (shielded, warnings)	
Microwave sources (shielded, warnings)	
Centrifuges (tested)	
Pressure vessels including autoclaves (registered, tested)	
Vacuum pumps (vented, guarded)	
Fume-hoods (tested)	
Water lines (firm, secure)	
Gas cylinders (secure, well sited) Regulators (suitable, registered, in date, marked) Gas lines (suitable, inspected)	
X-ray sources	
Radioactive sources: Sealed Open	
Ovens	
Trolleys (suitable, safe)	
VDU workstations (see checklist in procedure number 2: Use of Display Screen Equipment)	
Other	
Summary/comments:	
Laboratory/office occupants safety concerns:	
Overall summary/comments:	
Revisit required?	
Signed:	

Form 2: Laboratory Clearance Checklist

Name of researcher:	Laboratories/Work areas:
<p align="center">Chemicals</p> <ul style="list-style-type: none"> • Search out and evaluate all chemicals and label all containers. • Transfer responsibility to: • Name (print): • Prepare chemical waste for disposal • Clean glassware, refrigerators, ovens etc • Clean working area • Sign out 	<p align="center">Micro-organisms and cultures</p> <ul style="list-style-type: none"> • Label and secure material • Autoclave waste • Clean glassware, incubators, ovens, refrigerators • Transfer responsibility for material to: • Name (print): • Decontaminate and clean the working area • Sign out
<p align="center">Radioactive material</p> <ul style="list-style-type: none"> • Label and secure material. Check for stock cards • Dispose of waste. Update stock cards • Transfer responsibility for material to: • Name (print): • Update stock cards • Departing group leaving material inform RPA and safety adviser in writing. Permission obtained in writing (copy attached) • Clean and decontaminate the working area. Approval of RPA obtained (copy attached) 	<p align="center">Mixed hazard material</p> <ul style="list-style-type: none"> • Complete the appropriate clearing and decontamination procedures outlined above.
	<p align="center">Equipment</p> <ul style="list-style-type: none"> • Unwanted equipment decontaminated and cleared to waste. • Equipment to be left transferred to: • Name (print): • Custom equipment instructions to: • Name (print): • Custom equipment instructions and risk assessment • Gas cylinders to store • Clean the working area • Sign out
<p align="center">All clearing procedures have been completed.</p> <p>Signature Researcher: Date: Signature Laboratory Manager/Line Manager/Head of Section: Date:</p>	

The following is a list of some topics on which training may be required by laboratory users and managers:

- COSHH
- Ionising and non-ionising radiation
- Biohazards
- Use of fume cupboards
- Use of biological safety cabinets
- Use of chemicals
- Gas safety
- Manual handling
- Use of lasers
- Use of cryogenic gases
- Fire safety

Line managers may identify other areas in which training is required.

Health & Safety Executive web pages

<http://www.hse.gov.uk/index>

Royal Society of Chemistry Environment, web page

<http://www.rsc.org/>

University of Bristol School of Chemistry safety web page

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

Trades Union Council Health & Safety web page:

<http://www.tuc.org.uk/workplace-issues/health-and-safety>

Prospect Health & Safety web page:

http://www.prospect.org.uk/advice_and_services/health_and_safety/

European H&S Agency web page: <https://osha.europa.eu/en>

Oxford University Department of Physical Chemistry web page:

<http://physchem.ox.ac.uk/>

University of Edinburgh Health & Safety web pages:

<http://www.inf.ed.ac.uk/safety/policy/labsafety.html>