

Responsible research

Managing health and safety in research: guidance for the not-for-profit sector



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Forum

IOSH regularly commissions research to strengthen the evidence base for health and safety management. We are therefore pleased to support the Universities Safety and Health Association in publishing and hosting this guide to responsible research, developed not just for occupational safety and health researchers, but research teams working in every discipline.

'Responsible research' joins IOSH's range of authoritative, free guidance, available at [iosh.com/health-and-safety-professionals/improve-your-knowledge/resources/](https://www.iosh.com/health-and-safety-professionals/improve-your-knowledge/resources/).

Responsible research: managing health and safety in research

This guide aims to help anyone who needs to ensure good health and safety performance in a research environment. It provides heads of department, principal investigators and researchers with:

- examples of responsibilities and management approaches
- advice on safety culture and risk assessment
- case studies showing key issues that need to be considered.

The Universities and Colleges Employers Association and the Universities Safety and Health Association have worked with the Institution of Occupational Safety and Health, the Medical Research Council and others to produce useful guidance that covers a wide range of research fields.

This second edition includes feedback from members of Universities Safety and Health Association, University Chemical Safety Forum and the Institute of Safety in Technology and Research.

Responsible research is designed primarily for researchers in the UK, but the principle of following the 'Plan-do-check-review' cycle when managing health and safety in a research environment is universal.

Explore our research at [iosh.com/research](https://www.iosh.com/research)

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Forewords

This document is the latest in a series produced by and for people working in the higher education sector. As with previous documents, it is produced in a partnership between the Universities and Colleges Employers Association and the Universities Safety and Health Association. This time, due to the broad nature of the research, allied not-for-profit health and safety associations and the Medical Research Council have also collaborated on the project.

The guidance has been updated and in addition to the excellent content in the previous version, the guidance now includes: links to USHA Leadership and Management Standards (for HEIs), responsibilities towards PhD students, research project management frameworks, researcher wellbeing and travel risk assessment.

Each organisation will decide how they apply this guidance. However, we hope it will be of particular use to heads of department, principal investigators and research supervisors.

The case studies are designed to show the key issues that need to be considered in particular fields of research, and show best practice in the sector with regards to responsible research.

I recommend this guidance to you, and I am confident that if followed it will support you to deliver research that is both safe and ethical.

Mike Parker

Chair, Health and Safety Committee Universities and Colleges Employers Association
Chair of the Board

This guidance updates the Health and Safety Executive (HSE) Education Schools Advisory Committee (ESAC) guidance issued in 2000: Managing health and safety aspects of research in higher and further education and the previous version of this guidance issued in 2012.

The landscape for research safety is evolving to new levels, with the welfare of researchers both whilst operating on premises and which travelling and collecting field data being high on organisational priorities. Embedding the ethical and safety processes together also further enhances the collective responsibility employers and research bodies have towards their stakeholders.

The reviewing panel reflected these changes and ensured the guidance aligned with the USHA Leadership and Management Standard, along with a number of useful case studies reflecting best practice in safety in research.

We hope this document will be used to promote best practice in all areas of research and that more case studies will be added to complement those contained within the guidance.

Scott Trim

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NB: Portions of this document were originally produced as part of the HSC document Managing health and safety aspects of research in higher and further education and therefore are subject to Crown copyright. The content of Responsible research is in line with advice from the HSE – for more details go to www.hse.gov.uk/managing/index.htm.

1 Introduction

Research is about investigating new avenues of knowledge, and this carries an unavoidable element of the unknown. The outcome of research work can be uncertain or can differ from what was originally predicted.

Health and safety legislation applies just as much to research as it does to any other area of industry. Despite the inherent elements of uncertainty, it is possible for research workers to innovate without exposing themselves or others to unnecessary health and safety related risks. Sensible management systems, together with suitable practical training for those involved, are essential to providing a framework in which people can work safely.

This guidance was written for higher education institutes and research councils engaged in research. However, all organisations involved in research work in the not-for-profit sector, such as further education establishments, research charities and the National Health Service, may find it useful in helping to understand their responsibilities under health and safety law, and providing a basis for good practice.

2 Management and responsibilities

It's important to set out the responsibilities for health and safety in a college, university or research organisation. Health and safety law in the UK places responsibilities on employers, employees and third parties, and everyone in the organisation needs to know who is responsible for what.

For Higher Education Institutions (HEIs) and Universities, there is detailed Leadership Guidance published by USHA, available [here](http://www.usha.org.uk/wp-content/uploads/2023/10/USHA-Leadership-and-Management-of-Health-and-Safety-in-HEIs211828575.11.pdf). The roles and responsibilities below are complementary to the contents of that guidance: www.usha.org.uk/wp-content/uploads/2023/10/USHA-Leadership-and-Management-of-Health-and-Safety-in-HEIs211828575.11.pdf

This standard describes principles and practices which managers in any HEI will need to apply in order to demonstrate good health and safety management. It also reflects a common model for central health and safety professionals with local safety appointments within each function. However individual HEIs may have different arrangements for the provision of competent health and safety advice.

All researchers (including PhD students) in a research establishment must:

- take responsibility for their own health and safety and ensure that they don't

compromise the health and safety of others by the things they do or fail to do

- work safely and efficiently
- follow the organisation's policy, guidance and safe systems of work
- attend training and put it into practice in the workplace
- risk-assess, or assist with the risk assessment of their work
- use protective equipment as recommended
- not change research or other work protocols without first discussing the change with their manager and specialist safety advisers as appropriate
- report incidents that have resulted in, or could have resulted in, injury or damage
- assist in the investigation of accidents with the aim of introducing preventative measures
- report unsafe conditions or actions
- work co-operatively to improve health and safety standards and performance.

The executive structure – the layers of management between the top of the organisation and the people doing the research activities – will vary with each research organisation, as will individual responsibilities for health and safety at each level.



Figure 1: Typical line management structure in a college, university or research organisation

Vice Chancellor (VC), Chief Executive Officer (CEO) or board

The VC/CEO is ultimately responsible for:

- the health, safety and welfare of all those involved in research or providing research support
- the health and safety of visitors to establishments under their control or anyone who may be affected by the organisation's activities
- setting the organisation's health and safety policy, which should:
 - identify the organisation's intentions, responsibilities and arrangements for managing and monitoring health and safety, identifying how competent health and safety advice will be obtained and show that health and safety will be adequately resourced
 - state how effective methods of consultation, co-operation and assurance of competence will be achieved for researchers, visiting workers, students etc.

Directors of research and heads of school

Directors and heads should ensure that:

- health and safety policies, guidance and arrangements relevant to the expected risks in the research or work area are in place – remember that directors are also employees and are owed the same duty of care as all research staff
- their school or directorate's health and safety objectives are planned
- comprehensive risk management, identification and control programmes are in place, indicating how higher risk activities such as research involving hazardous equipment or substances, lone working or fieldwork will be managed
- reports on health and safety performance are fed back to the VC/CEO at agreed intervals
- individual responsibilities for health and safety are allocated appropriately and performance is reviewed as part of the annual appraisal
- the composition of general or specific health and safety committees or special interest groups is established and trades union representatives are consulted on health and safety matters
- systems are in place for identifying training needs and providing appropriate training and supervision for research staff and others in the workplace
- the general and specific health and safety arrangements for contractors, visiting workers and visitors are explicit and communicated effectively

- appropriate permits and licences are obtained before the research, and records of authorisation, training, incidents and maintenance are kept
- appropriate planned, preventative maintenance regimes are in place
- policy and guidance details how health and safety management will be monitored using appraisal, reporting arrangements, inspection, health surveillance, incident and work-related ill health reports, incident type analysis and audit
- the sanctions for not following organisational and school or directorate policy or codes of practice are made clear to all.

Programme leader/research leader

The programme or research leader is responsible to the head of school or director of research for the safe and legal conduct of research under their remit. This responsibility cannot be delegated. As with all people working in the research environment, the programme leader is responsible for their own safety and the safety of others who may be affected by their unsafe acts or omissions. Programme leaders should ensure that:

- they employ competent researchers, training needs are assessed and training is available, both in general health and safety issues (such as risk assessment) and specific techniques or situations where there is significant risk (such as the use of lasers or conducting research in the community)
- special permission or licensing arrangements required for the work are in place
- appropriate supervision is available for researchers and research support workers, depending on the risk of the activity and the age and experience of the individual
- programmes of work have been risk-assessed and the health and safety of researchers and others will not adversely be affected by known or emerging risks
- individual responsibilities for health and safety are allocated appropriately and performance is reviewed as part of the annual appraisal. Only principal investigators meeting the required standards are allowed to supervise PhD students
- consideration is given to the health and safety management, training and communication arrangements for researchers with disabilities or for those whose first language isn't English
- robust emergency plans are in place for the workplace and research activities which pose high safety risks

- they are made aware of reported incidents and near misses and will ensure that appropriate actions are taken to prevent a recurrence
- they are informed about the outcome of safety performance measures such as inspections, safety tours, health surveillance, compliance with risk control systems and safe systems of work, training events attended, work- related injury and ill-health figures
- they take the appropriate actions recommended by audit findings of non-conformance
- they set an example by their own behaviour and are prepared to take action if health and safety is compromised by the things their researchers do or fail to do.

Principal investigators (PIs)

PIs are generally experts in their field of research and are expected to have up-to-date knowledge about the risks associated with their research area. They are responsible to the programme leader and the director or head of school for the health and safety of their researchers and others who may be affected by the research activities.

PIs should:

- be aware of the legal requirements for their area of research and be able to identify and manage the risks in their field of work
- ensure that all people under their direction have adequate information about the risks and risk controls that apply to their work, and that relevant training and supervision arrangements are in place
- ensure their research supervisors and post-doctoral researchers are trained in risk assessment techniques and are competent to supervise others in their research activity
- monitor workplace safety compliance and draw their manager's attention to deficiencies in health and safety management, such as unsafe acts or conditions, failure to follow safe systems of work, a lack of planned maintenance or inadequate facilities
- enforce health and safety standards and codes of practice and set a good example to their research staff and others in the workplace.

Post-doctoral researchers/research supervisors

Post-doctoral researchers and research supervisors should be competent in the research area and aware of the risks inherent in the techniques, equipment and methods they use. They should be trained to:

- carry out risk assessments and communicate information on risks and control measures to their researchers and others affected by the research
- understand the institution's policies, procedures and committee structures
- be effective supervisors – supportive, good at coaching and mentoring, excellent role models and take appropriate actions when made aware of health and safety management failures
- contribute to the investigation of accidents and near misses that have affected their research teams
- use safe laboratory and work practices and safe systems of work and reinforce the importance of good housekeeping and occupational hygiene.

Although post-doctoral researchers may be given day-to-day responsibility for ensuring that research is carried out without causing unacceptable risks to health and safety, the overall health and safety responsibility flows through the line management chain and ultimately rests with the VC/CEO of the organisation.

Project students and trainee researchers

Trainee researchers can't be assumed to be aware of the health and safety risks of the research or workplace and must be trained and supervised until they are competent to work without direct supervision.

Research support workers

It's important to establish the risks the research poses to the health and safety of research support staff and others who may be affected in the organisation. As with researchers, responsibility for the health and safety of employees flows up the line management chain to the VC or CEO of the employing organisation. The risks the research activity could present to cleaners, maintenance staff, engineers, technicians and so on must be assessed and adequate risk control measures put in place before the research project starts. Research support workers must be informed about relevant risks,

associated risk control measures and their personal responsibility for health and safety.

They should also be competent to discharge their duties without causing harm to themselves or others.

The Health and Safety at Work etc. Act 1974 (“HSWA”) draws a statutory distinction between the duty owed to employees and the duty owed to non-employees. ‘Employee’ is then defined within the Act as an individual who works under a contract of employment.

The split works well in many industries, who will typically draw the line between employees and contractors or visitors. However, academia includes Post Graduate Research (“PGR”) students. These individuals will work under the instruction of an institution, with their work product belonging to it, but they will not often benefit from a contract of employment; they have traditionally been treated as a student when dealing with matters of training, induction and health and safety support.

The position adopted here is focused only on the management of health and safety responsibilities. Nothing here should be taken to infer that the relationship a PGR has with their institution is one of an employee or worker, as defined within the Employment Rights Act 1996, or that a recommendation in this regard is being made.

What is the underlying intention?

Whilst revised HSE guidance has been published to deal with some of these ‘blurred’ challenges, we do not expect a change in the law any time soon. Institutions therefore need to determine what is appropriate, and we hope that this position statement provides a suitable way forward; to treat PGRs as equivalent to employees for the purposes of health and safety management arrangements, specifically with regard to:

- induction
- training
- access to equipment etc.

Before delving into the minutiae of legislation, we should reflect on the aims of health and safety regulation; to create safe environments for all, regardless of any status: employment, worker, student or other.

¹ Are you an employee: Workers’ health and safety (hse.gov.uk)

² Regulation 2, Personal Protective Equipment at Work Regulations 1992

³ Personal protective equipment (PPE) at work regulations from 6 April 2022 (hse.gov.uk)

Whilst this position statement is cognisant of the legal duties involved, we do not ignore the basic moral duty to ensure the safety of those that come into contact with our institutions. This should drive the solution arrived at, and perhaps encourage us to adopt the widest approach to any health and safety duty when any ‘grey’ area is encountered.

Nor should the likelihood be ignored that, in civil cases, universities are likely to be held vicariously liable for the act or omissions of their PGR students, carried out whilst in the course of the role.

What about workers?

We take guidance from the current approach of the Health and Safety Executive to dealing with ‘workers’. The overarching message is clear: *“All workers are entitled to work in environments where risks to their health and safety are properly controlled. Under health and safety law, the primary responsibility for this is down to employers.”*¹

In April 2022, the Personal Protective Equipment at Work Regulations 1992 were amended to remove the reference to ‘employee’ and replace it with a reference to ‘worker’. The definition of worker includes an individual who has entered into or works under *“any contract, whether express or implied... whereby the individual undertakes to do or perform personally any work or services for another party...”*²

The HSE recognises that there may be workers and employees in the same location, and that: *“you need to ensure that there is no difference in the way PPE is provided to your workers... This means assessing the risk and ensuring suitable PPE is provided, when needed, to all people that fall under the definition of worker.”*³

The changes are representative of the broader approach encouraged within this position statement.

Building on the approach to non-employees

Section 3 HSWA imposes a duty on institutions to ensure (so far as reasonably practicable) that they do not expose non-employees to risks to their health and safety. This duty is often cited as a legal justification for suitable contractor management, as well as considering the safety of campus visitors.

But we may take this duty further; primarily relying on the accepted view that the Section 3 duty extends to higher education institutions taking steps to ensure that students are not exposed to risks to their health and safety. If we develop this theme, keeping students safe (particularly in research environments) is somewhat reliant on providing a suitably competent and resourced support framework, including PGRs, who often provide a significant amount of 'in person' oversight and supervision.

It must therefore follow that one way of meeting Section 3 HSWA duty would be the provision of properly trained and well-supported PGRs who, for the purpose of health and safety, are provided with equivalent access to the same support and resources that are provided to employees.

What is the downside?

If PGRs are treated as equivalent to employees for the purposes of health and safety management they will likely be subject to greater inductions, further training, and enhanced supervision. This will come at a cost, which to an extent will be determined by the relevant discipline and environment; but we suggest not an unjustifiable one given the costs associated with getting health and safety wrong. The relevant regulatory bodies are unlikely to make any distinction on the basis of the contractual relationship in the event that they found a material breach or incident occurred.

When broken down into its constituent parts, we do not believe the additional costs to be extravagant, and in most cases will simply require further time investment (to attend training, etc.). The vast majority of safety content will have already been created for employees, and therefore, we cannot see any unreasonable cost associated with extending the offering to PGRs.

By accepting PGRs as having equivalent needs to 'employees' for the purpose of health and safety management, we may arguably broaden the Section 2 HSWA duty owed by an institution, by potentially increasing the members of that group. However, in practical terms, this means very little. Other duties will apply (Section 3 HSWA as a clear example) that mean PGRs cannot be ignored for health and safety purposes in any event.

Where do we go from here?

The approach from regulators, and the court of public opinion, is that those providing services to institutions should benefit from a similar level of care for their health, safety and welfare as employees.

Institutions need to accept that academia will be held in the same regard as any other workplace if things go wrong – legally, financially and reputationally. Universities are now significant organisations with turnovers in the hundreds of millions; the provision of health and safety resources (and the reasonableness of it) has to be judged in this context.

As a 'moral' position, it has to be right that the systems and support we make available to our employees are offered to those who also perform services under our instruction; regardless of any payment or contractual arrangements. Organisations that publicly express a desire to ensure good health and safety management will struggle to provide a counter-argument.

What are the benefits?

If we accept the enhanced duty, as some organisations already do, then a number of benefits follow:

- any distinction between employees and PGRs, for the purposes of health and safety management is lost; policies and procedures (including such matters as inductions) relating to H&S can be simplified;
- employees and PGRs working in the learning environment will have the capacity and ability to exhibit the same standard of care for health, safety and welfare;
- reporting of health and safety performance for an organisation will be more accurate; the cohort of often overlooked PGRs will be included within the assessment of H&S performance; and
- as PGRs move to new roles, or leave the organisation, they will move with the inherited health and safety skill-set that will serve them well for future positions.



Reasonable foreseeability

A reasonably foreseeable risk is one that, if realised, could result in injury or damage, and which could be predicted by a reasonable person with the necessary skills and knowledge.

Legal courts dealing with health and safety cases have to determine whether an unplanned incident was reasonably foreseeable. Employers must seek to identify and evaluate foreseeable risks.

This is not always as easy to judge as it first seems; issues of 'strict liability' can complicate some cases, and case law has evolved to help determine what is reasonably foreseeable. For instance, frivolous acts which result in injury or damage, by employees that have been appropriately trained and provided with the correct equipment, and where the employer has no expectation that the employee would act in this way, would not normally be considered foreseeable.

3 Using a management system approach to manage health and safety in research

Health and safety legislation in the UK

The Health and Safety at Work etc Act 1974 (also referred to as HASAW or HSW) is the primary piece of legislation covering occupational health and safety in the United Kingdom.

Statutory instruments (generally regulations) are the secondary type of legislation made under specific Acts of Parliament. These include the requirement to address the risks posed by working with dangerous substances, equipment, noise, ionising radiation and so on. Most of this legislation is 'goal-setting' – it sets out the standard to be achieved and leaves it up to the duty holder to decide how to do this. Regulations are generally accompanied by codes of practice or guidance, which can be used to help direct the research organisation towards compliance.

The HSW Act and associated regulations are criminal laws. Therefore a breach of health and safety legislation is generally a criminal offence that carries penalties including fines, imprisonment and a range of 'orders' such as community, compensation, remedial action and disqualification.

The HSE is the independent regulator of occupational health and safety legislation in the UK. It initiates or recommends enforcement action against employers who breach their statutory health and safety duties.

Additionally, an employee who is harmed at work may make a civil claim for compensation against their employer. An employer has a legal duty to protect the health and safety of their employees at work (so far as is reasonably practicable) and to abide by the statutes governing occupational health and safety. If they fail in these duties they may be liable to a claim for damages by the person who has been harmed or suffered loss.



'Absolute', 'so far as is practicable' and 'so far as is reasonably practicable' responsibilities

The HSW Act and other safety legislation impose certain duties and responsibilities on employers and duty holders with respect to the health, safety and welfare of their employees and others who may be affected by their activity.

Some of these duties are 'absolute' and must be complied with, such as the duty of employers to "undertake a suitable and sufficient risk assessment" of work-related risks. But some are qualified by the phrases 'so far as is practicable' and 'so far as is reasonably practicable'. The meanings of these phrases have been established by case law.

To carry out a duty 'so far as is reasonably practicable' means that the degree of risk in a particular environment or activity can be balanced against the time, trouble, cost and physical difficulty of taking measures to avoid the risk. The greater the risk, the greater the rigour that may be expected to control it.

The duty to take reasonably practicable measures is one of the most widespread requirements in modern UK health and safety law. One example

can be seen in Section 13 of the Workplace (Health, Safety and Welfare) Regulations 1992, where it states that reasonably practicable measures should be put in place to stop people falling or being struck by falling objects in the workplace.

'So far as is practicable', without the word 'reasonably', implies a stricter standard. This duty embraces whatever is technically possible in light of the knowledge that the duty holder had, should have had, or had access to at that time (ignorance is no defence). The cost, time and trouble involved must not be taken into account. Again referring to the risks of falls, Section 13 of the Workplace Regulations goes on to stipulate: "So far as is practicable, every tank, pit or structure where there is a risk of a person in the workplace falling into a dangerous substance in the tank, pit or structure, shall be securely covered or fenced." Duties to prevent falls from height in general are covered by the Work at Height Regulations 2005.

For most research sectors, the risk control measures required from the employer are 'reasonably practicable'.

The Management of Health and Safety at Work Regulations 1999 require employers to have suitable arrangements in place for "the effective planning, organisation, control, monitoring and review" of their risk identification and control systems. At the time of publication there is an approved code of practice and guidance supporting the Regulations, which recommends that these arrangements are incorporated into an overall organisational health and safety management system. This is also the approach recommended by the HSE document Successful health and safety management (HSG65).

The case studies in this guidance illustrate how to manage health and safety in various research environments, based on the 'Plan-do-check-review' management system framework.

In a system intended to manage the health and safety aspects of a research project, this means putting in place organisational health and safety policy and guidance and:

- planning the health and safety arrangements for the activity – **Plan**
- implementing the planned health and safety controls and carrying out the activity – **Do**
- checking that the arrangements and controls put in place to stop injury, damage and ill health are working as planned – **Check**
- reviewing the activity to ensure that the health and safety arrangements were adequate and proportionate and then feeding any changes into the next research activity – **Review**.

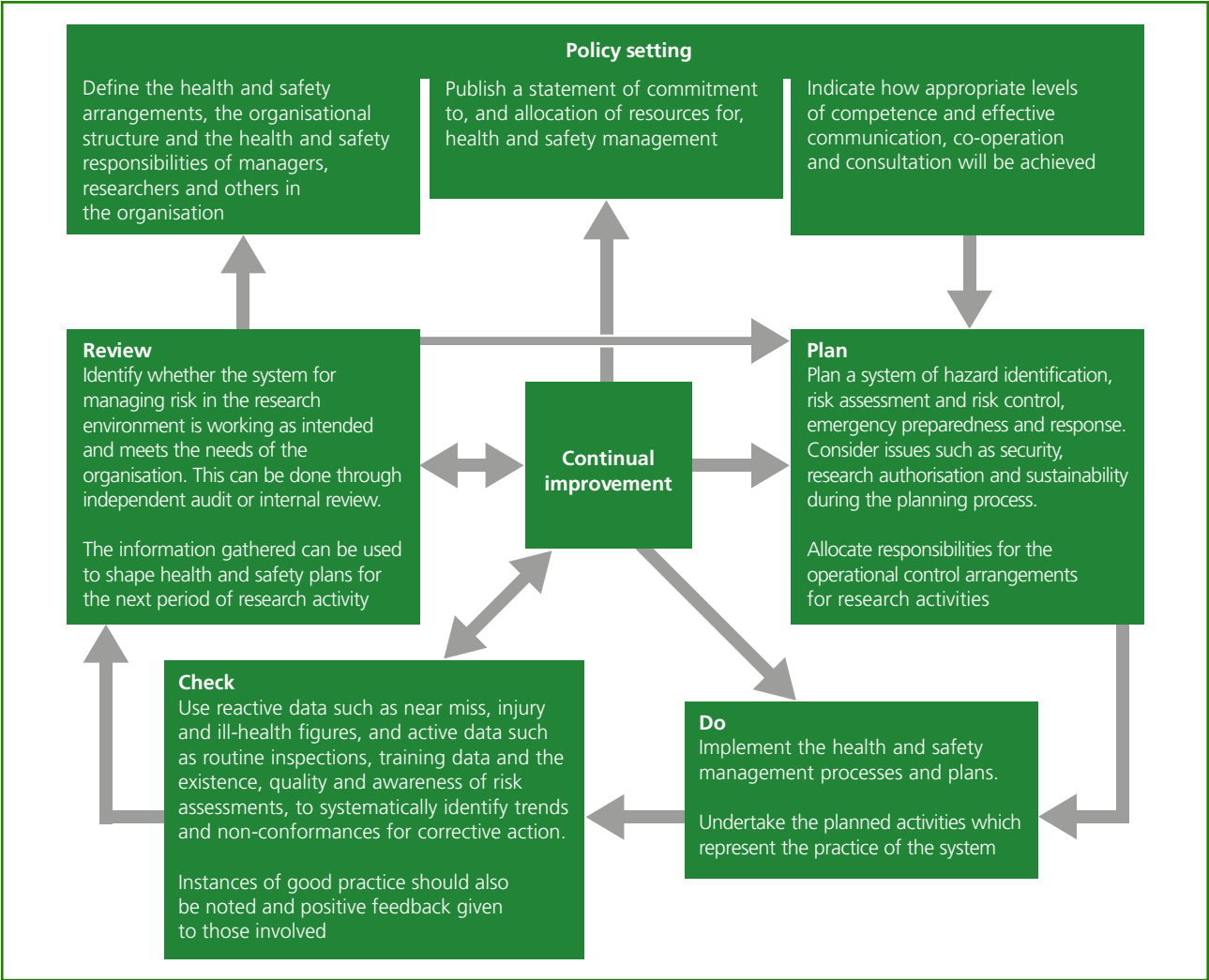


Figure 2: A health and safety management system based on the ‘Plan-do-check-review’ framework

Research project management framework – the gateways

Research work will vary in scale and type, ranging from literature exploration to clinical trials. Adopting project management principles to research work ensures the robust management of research activity. The following table provides a research project

management framework with key gateways that seeks to help researchers develop, plan, and progress their research work from concept to completion. It identifies the key activities to consider, as appropriate at each stage, along with the relevant stakeholders.

		Pre-Project	Initiation	Delivery	Post-Project
Activity		- Develop the Project Brief for the research work. - Identify what approval processes will be required e.g. research governance, ethics, human tissue, biological safety etc. - Identify what H&S risks might be involved, draft early risk assessments based on previous research etc. - Identify any resource requirements e.g. work location, equipment - Staffing requirements – with clear roles and responsibilities - Competency requirements - Training requirements - Budget draft - Procurement - Communications plan	- Finalisation and agreement of plan with PI - Finalisation of timescales of project plan/ programme - Confirm roles and responsibilities - Confirm reporting processes on progress with PI - Finalisation and confirmation of committee approvals - Finalisation of risk assessments and implementation of control measures - Resource requirements agreed and in place, to include staff - Training identified and programme in place - Budget agreed - Procurement processes complete - Communications plan	- Commencement of project work - Ensuring that risk assessment in place and regularly reviewed as work progresses and new risks may emerge - Regular status updates - Monitoring of work and timescales - Regular meetings with PI - Document repositories remain updated	- Capture lessons learned - Disposal of equipment, chemicals etc. - Management of transition into next phase where required
	Accountable	PI	PI	PI	PI
	Responsible	Research Student	Research Student	Research Student	Research Student
	Involved	PI, Research Student, Finance, H&S, Procurement, academic/technical staff etc...	PI, Research Student, Finance, H&S Procurement academic/technical staff etc...	PI, Research Student, academic/technical staff involved in work	Stakeholders from earlier gateways
	Consulted	Committees, H&S, Ethics, GDPR	Committees, H&S, Ethics, GDPR	Committees, H&S, Ethics, GDPR	Committees from earlier gateways

Accountable	Those who are ultimately accountable for the correct and thorough completion of the deliverable or task, and the one to whom Responsible is Accountable. Typically, there must be only one Accountable specified for each task or deliverable.
Responsible	Those who do the work to achieve a task. There is typically one person identified as Responsible for a deliverable or task. The Project Manager is usually Responsible for the project, Project Team members are Responsible for particular deliverables or tasks.
Involved	Those who work with Responsible on deliverables or tasks.
Consulted	Those who are not directly involved but provide inputs and whose opinions are sought



Security

Research often involves the use of materials, equipment, data or processes which could be harmful to people or the environment if access to them was not controlled, or if the organisation did not have measures in place to prevent their escape or loss.

Organisations undertaking research must plan and deploy security arrangements that will prevent accidental access, loss or escape and the deliberate misappropriation of research materials etc.

Safety legislation and guidance may give direction on the security required for specific research activities and some research is governed by notification, authorisation, permitting or licensing schemes. For example, researchers are not allowed to buy drug precursors or chemical weapon precursors unless their organisation has the appropriate Home Office licence; counter-terrorism officers will visit organisations planning work with high risk biological or radioactive materials to make

sure security is adequate before the research can proceed.

Security measures and the authorisation or permission required for the research project should be determined at the planning stage. The project risk assessment should consider whether the general security arrangements are enough or if more needs to be done.

The UK environment agencies*, the Department for Environment, Food and Rural Affairs (Defra: www.defra.gov.uk), the Home Office (www.homeoffice.gov.uk), the HSE (www.hse.gov.uk) and the National Counter Terrorism Security Office (NaCTSO: www.nactso.gov.uk) are all involved in various aspects of security in research, and the relevant agency should be contacted if the researcher needs security advice. The HSE's role is limited to advising on matters relating to restricting access to prevent inadvertent exposure or loss of sensitive materials.

*There are three environment agencies in the UK: the Environment Agency (www.environment-agency.gov.uk), the Northern Ireland Environment Agency (www.daera-ni.gov.uk) and the Scottish Environment Protection Agency (www.sepa.org.uk).



Specialist advisors and safety committees

Many research projects need specific permits, approvals or authorisation before they can proceed. Specialist advisers in a range of disciplines can advise on how to meet the requirements of regulators and enforcing authorities, and how to conduct the research with the risks controlled so far as is reasonably practicable.

The requirement to have access to specialist advisers, as well as the responsibilities and duties of these advisers, may be detailed in safety guidance or regulation. For example, the guidance supporting the Genetically Modified Organisms Regulations states that organisations conducting research involving genetically modified organisms (GMOs) should appoint a competent person, such as a 'Biological safety officer' to advise on the notification requirements, containment and safe use of the organisms. Research organisations must

consult with a 'Radiation protection adviser' if they need advice on complying with the Ionising Radiation Regulations 1999 or if the activity of the radioactive substances used exceeds certain levels.

In many research organisations, projects involving the use of GMOs or radioactive substances are approved by specialist safety committees, with the specialist adviser giving their expert opinion on the particular risks inherent in the project and what risk controls or authorisation, permits etc are required before the research can proceed. In addition to radiation protection advisers and biological safety advisers, research organisations may employ or have access to the services of specialist advisers for research involving such things as lasers, chemicals, human tissues or the transport of dangerous goods.



Emergency planning and business continuity

By law, emergency plans must be put in place for research activities where failures or dangerous incidents present a significant risk to researchers, research support workers, maintenance workers and other building users, if not already addressed by the organisation's general emergency plans.

Some statutes contain an explicit requirement for a contingency plan. For example, the Ionising Radiation Regulations 1999 require the development of a contingency plan to secure, so far as is reasonably practicable, the restriction of exposure to ionising radiation and the health and safety of people who may be affected by such an incident. The plan should be documented within the local rules.

It's also good research practice to make sure contingency plans are in place to prevent emergencies or other unplanned events resulting in research sample or data loss. Several universities have experienced catastrophic events such as major fires and floods that have caused irrecoverable loss of data, samples, artefacts and materials, and signalled the end of particular research projects.

Contingency arrangements such as alarms, emergency generators and off site data and sample storage can help ameliorate potential loss.



Research involving nanotechnology

Nanotechnology is a term for the research, development or use of physical substances with at least one characteristic dimension of 1–100 nm. These can be defined as nanomaterials and their properties may differ from those of the same materials with micron- or mm- scale dimensions. Nanomaterials such as nanotubes, nanodevices, nanowires and nanoparticles can be physically and chemically manipulated for specific applications and are used in a variety of research environments.

Research into the properties of nanomaterials has indicated that some may cause hazardous physical effects when inhaled or ingested. However, the extent of the risk they pose to human health has not been fully established.

The HSE recommends a precautionary approach when working with nanomaterials, meeting the

legislative requirements of the Control of Substances Hazardous to Health Regulations (human health risk assessment and control) and, where appropriate, the Dangerous and Explosive Atmospheres Regulations. Many approaches to identifying and controlling nanotechnology risks are presented in the HSE document, Risk management of carbon nanotubes, which is available on the HSE website, www.hse.gov.uk/nanotechnology.

The UK Nanotechnology Safety Forum has worked with the HSE, the Environment Agency and the Institute of Occupational Medicine to produce Working safely with nanomaterials in research and development (www.iom-world.org/media/1863/uknsg-guidance-working-safely-with-nanomaterials-2nd-edition.pdf), which offers unified safety guidance.



Working with sources of optical radiation

The Control of Artificial Optical Radiation (AOR) at Work Regulations 2010 require employers to protect the eyes and skin of researchers and others in the research establishment from exposure to hazardous sources of artificial optical radiation.

AOR includes light emitted from all artificial sources in all its forms such as ultraviolet (UV), infrared and laser beams, but excludes sunlight.

Hazardous light sources likely to be present in research environments are UV transilluminators, fluorescence systems and Class 3B and Class 4 lasers, as defined in British Standard BS EN 60825-1. Many other artificial light sources can cause harm,

and some sources which are not normally hazardous can cause eye and skin damage if not used properly.

The law requires that hazardous optical radiation risks to the skin and eyes of researchers is controlled to as low a level as is reasonably practicable.

Further guidance on the regulations, their requirements and practical control measures can be found in the Guidance for employers on the Control of Artificial Optical Radiation at Work Regulations 2010, available on the HSE website (www.hse.gov.uk).



Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013

Under these Regulations, specified injuries, diseases and dangerous occurrences must be reported to the HSE within a defined time. The most common reports will be for anyone who is injured in connection with work and is absent from work or can't carry out their normal duties for more than seven days (not including the day of injury).

Certain occupationally-acquired diseases must also be notified – this does not include minor common infections that circulate in the community.

Dangerous occurrences that require reporting are rare in the research community but would include incidents which have – or could have – resulted in the release or escape of a substance such as a chemical or biological agent likely to cause severe human harm.

4 Safety culture

The safety culture of an organisation depends on the collective output of the health and safety related beliefs, attitudes and behaviours of the people within it. In a research organisation, the attitudes and behaviours of senior managers are particularly influential.

A positive safety culture expects and allows people to behave safely because it is the correct thing to do; it is the normal way of operating within the organisation. Safe behaviour is one visible output of such a culture. This is important in a research environment, since a lot of research is done outside normal working hours when daytime levels of supervision and support are unlikely to be available. Research supervisors need to be able to rely on their researchers to be mindful of their own safety, for example by following research protocols and safe systems of work, wearing personal protective equipment and using safety equipment properly, whether or not their supervisor is present.

A research report and guidance document published by IOSH (Safety culture, advice and performance and introduction to organisational culture) identify some elements that underpin a positive safety culture. In a university or other research organisation, these include:

A comprehensive health and safety policy

This should be drawn up in consultation with staff representatives and endorsed by the executive body of the organisation, senior management, heads of school and research directors. The policy should include:

- allocated responsibilities and clear arrangements
- a high level of visibility from senior managers with respect to support for health and safety
- a health and safety committee chaired by a member of the executive group
- a 'just' reporting system
- a commitment to learn from incidents, audits and performance reviews and to make any changes required for the ongoing improvement of health and safety management.
- Leading by example

- Principal investigators, team leaders and supervisors use safe work practices and take action when health and safety is compromised by researchers' actions or omissions.
- Good safety performance is recognised and rewarded.
- Project proposals consider health, safety and environmental requirements at the planning stage.
- Where necessary, specialist safety advisers are consulted and inform research project proposals.

Practicable guidance and work systems

In a positive culture, guidance and work systems set out how the research should be carried out and how to act in emergencies. In particular:

- researchers have the opportunity to contribute to the development of safe systems of work and appropriate risk control measures
- researchers are made aware of the importance of reporting accidents, near misses and dangerous occurrences
- reporting systems are easy to use and those reporting incidents are not punished for occasional slips and lapses
- it is recognised that accidents and near misses can be used as learning opportunities and can signpost that more training is required or that systems of work should be modified.

Supporting safe research

- Recruitment, selection, training and awareness processes and programmes employ and develop safe researchers.
- Researchers have the knowledge, skills, tools and equipment to work safely.
- Researchers appreciate why safe working is important and understand what sanctions are in place for those who work negligently and compromise health and safety.
- Researchers and their supervisors have access to specialist help and advice.



Researcher Development Framework

The Researcher Development Framework (RDF: <https://vitae.ac.uk/wp-content/uploads/2025/01/Researcher-Development-Framework-RDF-Vitae-4.pdf>) is a tool for planning, promoting and supporting the personal, professional and career development of researchers in higher education. It articulates the knowledge, behaviours and attributes of researchers and encourages them to realise their potential.

The RDF is structured in four domains encompassing the knowledge, intellectual abilities, techniques and professional standards needed to do research. It includes the personal qualities, knowledge and skills required to work with others and ensure the research has a wider impact. Each domain contains three sub-domains with associated descriptions of different aspects of being a researcher.

The 'Research governance and organisation' domain details the knowledge of standards and professionalism needed to do effective research, including:

- health and safety
- ethics
- principles and sustainability
- legal requirements
- intellectual property rights and copyright
- respect and confidentiality
- attribution and co-authorship
- appropriate practice
- research strategy
- project planning
- delivery
- risk management.

5 Competence

An individual's competence can be described as the combination of training, skills, experience and knowledge. Other factors, such as attitude and physical ability can also affect someone's competence and ability to work safely.

Competence is initially assessed at the recruitment stage (i.e., by reviewing the candidates' suitability for a role) and must be considered in other non-contractual appointments such as volunteers or nominations. Following appointment, a process of induction should normally take place which is likely to include an assessment of the individual against the competency criteria established. This should also take place where the candidate moves to a new work environment or team within the same organisation.

HEIs will often have core competencies (such as around fire safety or cyber security) which may be addressed through a range of mandatory training. This may be complemented with other faculty/departmental programmes designed to ensure that the desired level of competence is achieved for all staff working within that unit.

Once competence requirements for activities have been determined, competency can be assessed by a trainer and can be either by written, oral or practical assessment and the date of assessment recorded. In many cases, particularly in the use of equipment or machinery, it may be appropriate to develop a competency framework using the process outlined below. This process provides a competency pathway and maps an individual's progression from Operator to Trainer as illustrated below.

Competency levels	Learning outcomes
Basic understanding This is the initial stage of learning, and raising of awareness of legal requirements.	To understand key theories and principles at a basic level. At this level the individual will have a basic awareness of the subject matter.
Supervised user Focuses on the practical application of health and safety principles helping individuals to apply health and safety concepts to their specific working environment.	To demonstrate a broad understanding of key theories and principles through practical applications and the use of H&S concepts in specific environments. To be able to transfer skills into the work place. At this level the individual will be able to undertake subject matter activities under supervision only. This is 'hands on' training while being supervised and trained until the trainer is confident the appropriate practical skills and other knowledge have been achieved.
Competent User Focuses on the practical application of health and safety principles in specific subject matters which require professional and technical understanding and application.	To demonstrate in-depth, specialist knowledge and mastery of techniques relevant to the discipline. To demonstrate a sophisticated understanding of H&S concepts, information and techniques a specific discipline or process. At this level the individual will be able to undertake subject matter activities unsupervised and can supervise others.
Trainer Able To Train Others and assess competency.	To be able to convey safety knowledge to others and stimulate action. Being able to convey H&S principles in a flexible way accordingly to the skills and aptitude of the trainee. At this level the individual will be able to train others in the specific subject matter, including: 1 Have experience to be able to identify potential high risk situations and explain why the appropriate control measures are in place to reduce risks. 2 Be able to explain the associated emergency procedures. 3 Demonstrate appropriate safe practices associated with the technique, process or equipment to the trainee.

6 Work pressure

Recognising the work pressures researchers are exposed to is an important feature of health and safety management in the research environment.

Researchers generally have to work irregular hours, often without the support of colleagues. Programme leaders and principal investigators also have to meet publication and research proposal deadlines and may spend a lot of time looking for funding for their research. Research grants are usually given for a specified amount of time, and this may cause anxiety to grant-funded researchers as they reach the end of a project. Researchers are more mobile than other staff, as they gain experience and qualifications and move to other research projects and organisations. High-quality research is usually international and this may involve extensive travel and work with researchers for whom English is not their first language. Additionally, research programmes are subject to external quality assessments which can determine future support or funding allocations.

Research organisations should have mechanisms in place to identify and manage cases of work-related stress. The culture of the organisation should also allow researchers who feel they are under too much pressure to access help and support without fearing detriment to their career.

Mental health strongly affects our daily lives, through the ability to do the things we need and want to, including work, study, getting on with people and looking after ourselves and others. Differing situations may cause changes to mental health. Knowing how to support and improve mental health will help prevent problems developing. Mental health has a potent influence on physical health, learning, productivity and relationships.

In the research environment, as in other workplaces, a range of factors can impact individuals' mental health. The pressure to publish and win grants in highly competitive environments; lack of support and job control; job insecurity (real and perceived); and work/life conflict can all have an effect.

Following the *Thriving at Work: the Stevenson/Farmer review of mental health and employers* in 2017, (www.gov.uk/government/publications/thriving-at-work-a-review-of-mental-health-and-employers) in addition to the impacts of

the COVID-19 pandemic on mental wellbeing, both awareness and action on the importance of protecting employees' mental health has grown significantly. Indeed, the HSE states that by implementing their *Management Standards* (<https://www.hse.gov.uk/stress/standards>) or an equivalent in tackling work-related stress, employers will be meeting many of the 'core standards' referred to in the Stevenson-Farmer report.

For the Higher Education environment, where demand for mental health support services particularly amongst students has seen a sharp increase in recent years, Universities have increased and prioritised action around mental health and wellbeing. This usually includes mechanisms such as an active wellbeing strategy and action plans for employees and students, organisational and departmental stress risk assessments, as well as regular pulse surveys, monitoring and reviewing of sickness absence data and other sources of information.

With the introduction of the international standard ISO 45003:2021, this structured framework can assist organisations identify and address areas that can negatively impact employee's mental health. This standard on psychological health and safety at work can be used as guidance to support ISO 45001. The standard addresses many areas that can contribute to work-related stress and adversely impact mental health including: how work is organised (eg job demands, workload and work pace); social factors at work (eg supervision and support); and work environment, equipment and hazardous tasks (eg workplace conditions). It defines what psychosocial hazards are, how to identify the hazards and offers actions that can be taken to help manage and improve well-being. Through engagement with the framework, organisations are enabled to implement wellbeing interventions which will contribute to a supportive working environment, improved organisational resilience and inclusivity and a positive health and safety culture.

In the research environment, when considering risks related to the research activity, those impacting mental health and wellbeing must be suitably managed.

As often with research, travel overseas is involved and travel can be stressful, not just in

the planning stages but also during the journey itself, as well as adapting to a new environment on arrival. Consideration of mental wellbeing during travel is as important as physical health.

The NHS mentions certain contributory risk factors that can negatively impact mental wellbeing when travelling. In addition to these, researchers will also have the additional demands of managing the research activity, which may contribute to poor mental health.

All research involves efficient planning, which should include a thorough documented assessment of reasonably foreseeable hazards, risks and control measures. Through this identification

and preparedness process, the risks should be reduced as far as is reasonably practicable and the likelihood of experiencing poor health and wellbeing managed. Typical control measures may include regular communications with their line manager or supervisor; sufficient time allocated to the research; previous related experience and training in the area of research being conducted, so psychological distress can quickly be identified in participants; taking regular welfare breaks; having the tools and knowledge available to self-identify poor mental health and access support mechanisms. In the case of the participant, the ability to stop their involvement promptly if required and to have planned response measures in place.

7 Risk assessment

All research tasks and projects should be evaluated for foreseeable health and safety risks before the work starts. The employer must then ensure that significant risks are recorded and that reasonably practicable risk control measures have been put in place.

These control measures should be built into systems of work and research protocols. Risk assessments should be carried out by competent people.

The process of risk assessment is no different in research than in any other job although may range from cutting edge research or projects with frequent changes and unknown outcomes. For many social science research projects the risks will not be specialist in nature and general guidance on risk assessment, which can be found in HSE publications, will help identify sensible precautions.

However, in the case of practical research which might involve hazardous substances, equipment or processes, you might need to consider less well-known hazards, especially where new materials and processes are being used. Programme leaders, PIs, research supervisors and their teams might be the only people who know the work well enough to make valid judgments about risk, and should be prepared to justify their conclusions.

Where risk in a research project is unavoidable, a hierarchy of risk control solutions should be considered:

- Can less hazardous materials, equipment or processes be used?
- Can risks be mitigated at source using engineering controls such as equipment guards and interlocks? What collective protective measures can be put in place?
- Can suitable systems of work be designed, specifying what is required in terms of training, rules, procedures and supervision?
- What individual protective measures are required, such as personal protective equipment, prophylaxis or health surveillance?

Carrying out initial risk assessments before committing to the project will help determine whether existing resources and facilities are enough to provide any necessary safeguards. If essential systems or facilities such as interlocked access to rooms with lasers or a Class III microbiological safety cabinet are required to control risks, then the project can't start until these are in place. If existing resources can't provide essential safety features, then the project must be altered accordingly.

Risk assessments should also consider the skills and experience of project team members. If some team members are yet to be recruited, the desired skills and competences will help inform the recruitment process and any training needs. The risk assessment will also inform the development of research guidance and safe systems of work, and the risks and controls identified should be incorporated into research work protocols.



Information and training

The HSE defines training as “helping people to learn how to do something, telling people what they should or should not do, or simply giving them information”.

Health and safety law requires that employers provide whatever information and training is needed to ensure, so far as is reasonably practicable, the health and safety of their employees. Research organisations have a duty to ensure that researchers, whether or not they are employees, have sufficient information and training to be able to do their research competently and without increasing risks to their own or others' health and safety.

The skills required for particular tasks or duties should be assessed before recruitment and efforts should be made to employ or contract suitable people. Once researchers have been appointed, their manager or supervisor should assess their capabilities, training, knowledge and experience, and ensure that the demands of the job don't exceed their ability to do their work without creating unacceptable risks to themselves and others.

Training needs analysis should be repeated at regular intervals and when new techniques or equipment are introduced. Refresher training should be provided where appropriate.

Where gaps in knowledge or competence are identified, training and awareness programmes should be put in place and, if training is identified as a risk control measure, it should be compulsory for the researcher to attend. Managers or supervisors should be informed if their researcher fails to attend training, and make sure those who have received training put it into practice in the workplace.

It's important to record all training and information given to researchers. The delivery and receipt of information, formal training and on-the-job training should be signed off by both trainer and trainee. Records of all training should be kept with the researcher's personal file and should be accessible to their manager.

PIs and supervisors need to take responsibility for all assessments associated with their projects, but they may occasionally need to ask research workers to risk-assess some aspects of the work. The research supervisor or PI should check that the researchers doing this have been trained in risk assessment practice and that the assessments have been done to a satisfactory standard.

In some fast-changing research environments, dynamic risk assessment and risk control solutions may be required. Dynamic risk assessment is a continuous process of identifying hazards and evaluating risks as they come up, taking appropriate actions to eliminate or reduce the risk. The researcher continually monitors and reviews the changing circumstances in the research environment. The actions taken should be documented to improve overall knowledge of risk and risk controls in similar projects.

The risk assessment will also help establish what sort of personal protective equipment is required, and whether specific occupational health arrangements should be in place, for example interventions such as vaccination, or health monitoring and surveillance, such as regular respiratory function tests.

An important part of risk control in research is that buildings, rooms, equipment etc used during the research should be designed and maintained to ensure they don't compromise health and safety. The planned, preventive maintenance of general plant and specialist equipment is an essential feature of a safe research environment and should be considered at the design and procurement stage of research planning and resourcing.



Occupational health (OH)

OH is about how work and the work environment can affect an employee's health, and how an employee's health can affect their ability to do the job.

An OH service can provide expert advice on the need for specific health controls in work that poses a risk to health – for example work in clinical environments, laboratories, workshops, with research animals or overseas fieldwork. These controls include health screening to assess fitness for work, vaccinations, and periodic health surveillance during work. An OH service will also provide advice on suitable methods for assessment

and detection of health risks and can undertake any medical screening or surveillance required.

The OH provider should be able to advise on specific legal requirements for medical certification or health surveillance of staff engaged in certain work activities, such as researchers or other staff who are designated as 'classified workers' under the Ionising Radiation Regulations 1999.

Advice on health precautions for those with pre-existing conditions or disabilities that may make them unusually susceptible to work-related illness or injury can also be obtained from the OH provider.



Occupational hygiene

Occupational hygienists use science and engineering to assist in the prevention of ill health caused by the work environment, specialising in the assessment and control of risks to health from workplace exposure to hazards. Hygienists help employers and employees to understand these risks and minimise or eliminate them.

With good occupational hygiene science and practice, some occupational health risks can be eliminated and others brought under control. In certain instances, some level of exposure will

remain and occupational hygiene techniques can be used to either verify that they are below a safe exposure level (ie that current control measures are adequate) or to indicate the level of exposure experienced.

Occupational hygienists may be able to advise on a range of health risks in the workplace, including chemical hazards, physical hazards such as heat, cold, noise or ergonomics, psychological hazards, and new and emerging technologies such as nano and green technologies.



Hazardous waste

Hazardous waste is defined and listed in the Waste Framework Directive 75/442/EEC, as amended by 91/156/EEC.

The list classifies wastes according to what they are and how they were produced, providing codes for all wastes including hazardous waste. Known as 'EWC codes', they can be found in the European Waste Catalogue, available on the Environment Agency's website. The UK environment agencies produce technical guidance, in a document called WM2, on the interpretation of the definition and classification of hazardous waste. WM2 (www.environment-agency.gov.uk/business/topics/waste/32200.aspx) puts waste into one of three categories:

- 1** Always hazardous – absolute entry (red)
- 2** Never hazardous
- 3** May or may not be hazardous, depending on concentration – mirror entry (blue).

Any waste regarded as 'dangerous' (ie having a risk phrase and possessing any of the hazardous properties H1–H15) should be considered as potentially hazardous and the requirement for special arrangements for its disposal should be assessed.

For most chemical substances used in research, the available disposal routes will depend on the final concentration of the hazardous substance in the waste – which means that most are 'mirror entries' in WM2.

For waste consisting of substances with one or more of the hazardous properties H1–H15, the maximum concentration allowed to be disposed of through normal routes is listed in the guidance document WM2. Your local water company or authority will advise what types of waste are permitted to be discharged via drain. All waste that contains substances above the threshold concentration for each type of hazard must be disposed of by licensed waste contractors.



Research Ethics

Regulation 3 of the Management of Health and Safety Regulations 1999 says the following:

Every employer shall make a suitable and sufficient assessment of:

- (a) the risks to the health and safety of his employees to which they are exposed whilst they are at work; and*
- (b) the risks to the health and safety of persons not in his employment arising out of or in connection with the conduct by him of his undertaking,*

This regulatory requirement, and the arrangements in place to ensure that this is met, is usually outlined in HEI's health and safety management system (in the risk assessment policy/ guidance or similar).

Where there is no suitable and sufficient risk assessment already in place for the proposed research activity, a risk assessment (referring to others if required) will need to be produced.

It is possible that certain types of activities will already be covered by existing risk assessments

(i.e. some Departments will have risk assessments in place already for work with certain types of lab equipment or some on-campus activities).

Research Ethics Committees within HEIs also often require that a verification of the health and safety risks to the researcher and the research participants has been considered, i.e. that suitable and sufficient risk assessments have been completed by a competent person (i.e. by the researcher, approved by the supervisor/PI) and that there may be specific checks of content of those risk assessments in place for certain types of activities (i.e. research involving human participants).

As such, it can often be advantageous to complete risk assessments in advance of seeking research ethics approval, providing additional assurances where these are sought. Organisation's research ethics bodies and health and safety practitioners should work together to provide clear and simple guidance to researchers that meet the requirements of both.

Research risk assessments should consider and specify what happens at the end of projects and procedures, such as arrangements for waste disposal and decommissioning equipment or controlled areas.

Once a risk assessment has been completed, its findings, and associated risk control systems, should be communicated to all those involved in the project. Researchers and research support workers should be informed about the hazards and risks they may be exposed to and how they can work safely. It's important to establish that the proposed control measures are practicable and don't increase risk elsewhere in the research or establishment. Risk assessments should be monitored, reviewed and revised at specified intervals or after an accident or near miss. They should also be revised to capture any new risks after significant changes to the research task, equipment, techniques etc.

The risk assessment process can be used to identify, evaluate and control more than health and safety risks.

Research Councils UK has published its *Policy and code of conduct on the governance of good research conduct* (www.rcuk.ac.uk/documents/reviews/grc/goodresearchconductcode.pdf), which sets out the safety and other potential research risks that must be addressed such as conduct, ethics, integrity and data management.

Risk assessment records should be kept for at least three years after being superseded or after work has stopped.

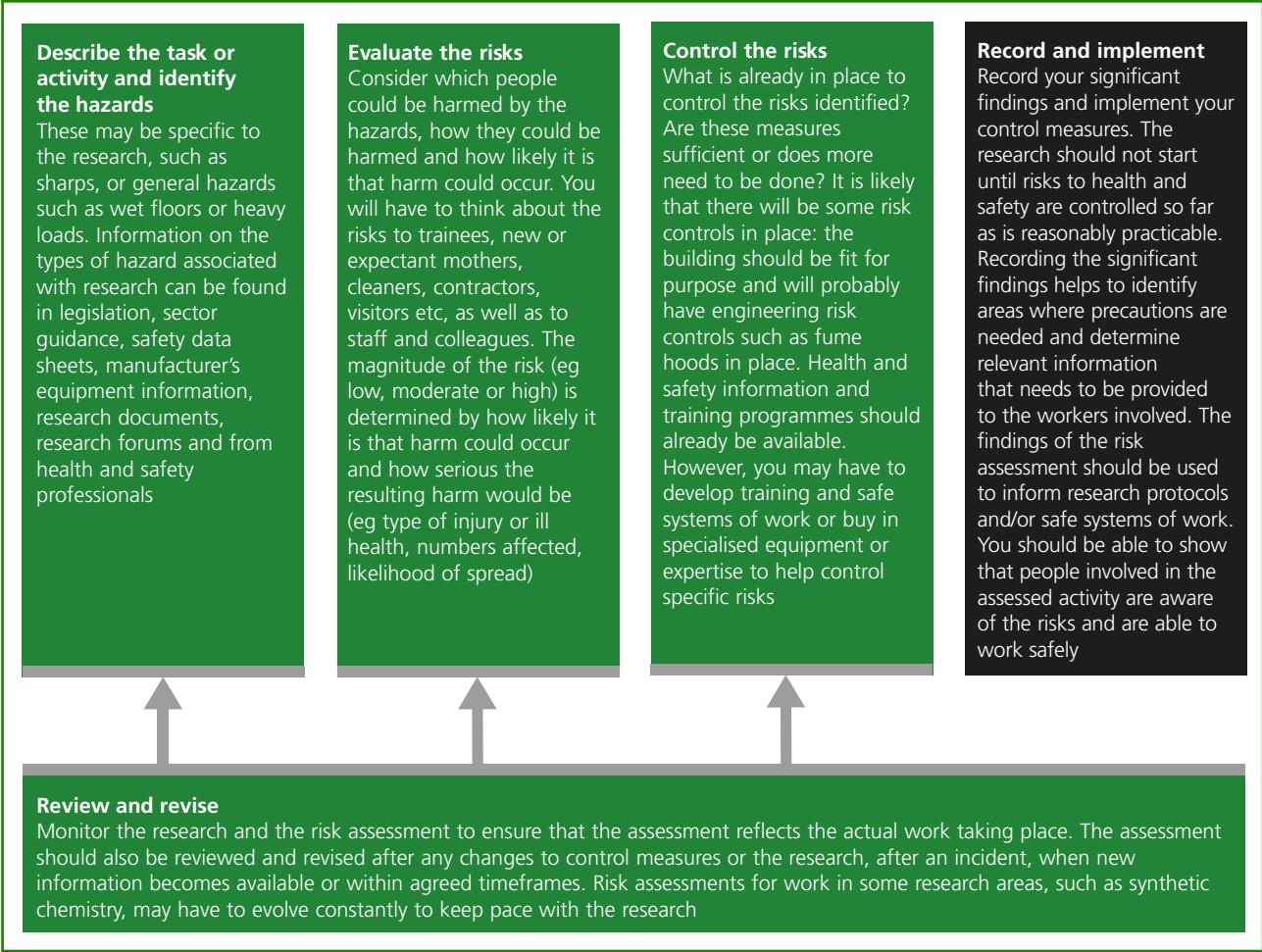


Figure 3: The risk assessment process

8 Travel risk assessments

If researchers have an existing medical condition that may affect fitness to undertake overseas travel, discussions with their GP should take place. Confirmation of whether they are fit to travel and, if applicable, what precautions may be needed to ensure their health whilst away.

It should be noted that access to medical support may be poor in some countries or remote locations. Typically, advice can be sought from the organisation's Occupational Health provider. This may include health surveillance and screening requirements identified and undertaken.

A requirement to confirm the researcher is medically fit to travel is a pre-requisite of insurers providing cover.

Vaccinations, medication or taking specific precautions to provide protection from health risks prevalent in the country or area to be visited may be required.

General travel advice and health information for people travelling abroad from the UK can be found via the NHS fit for travel information. In addition, various other sources referenced below (in Section 13) will help identify specific precautions required

For those travelling who have their own medication, a copy of prescription and the generic names for the drugs should be taken. Some countries may prohibit certain drugs being brought in. All medicines should be kept in their original, labelled container and an accompanying GP's letter should be taken as proof of need, with sufficient supplies taken.

9 Working with partner organisations

The Management of Health and Safety at Work Regulations 1999 require that where two or more employers share a workplace (either on a permanent or temporary basis), all involved have to co-operate and co-ordinate their activities to ensure that all health and safety obligations are met. Any agreement made should also be communicated in good time to all employers. This applies whether the premises are owned or leased by either party.

The employer always retains primary responsibility for ensuring the safety of their staff (and, where applicable their students) irrespective of where they are working. However, many higher education organisations work closely with a variety of other organisations and there are situations where staff and students, including Honorary staff, work at other Universities or other organisations such as NHS premises, research institutions or research councils and commercial entities (e.g. start-ups and spin out companies). This work will often include sharing facilities (space) and equipment.

These situations would normally require a formal Memorandum of Understanding (MoU) to be in place together with detailed supporting arrangements that define exactly which party has responsibility for all aspects of the premises and activities carried out within. It is important that this is formally recorded. There may also be other documents such as leases, contracts or Service Level Agreements (SLAs) which have a legal standing.

The arrangements outlined in any MoU document are intended to clarify working relationships and responsibilities for health and safety in these circumstances. These guidelines apply primarily to situations where different employers share a workplace. In the University sector, detailed written arrangements would be expected to include a selection of the following subjects:

- Work with biological agents, including genetically modified organisms.
- Work with ionising radiation.
- Work with artificial optical radiation.
- Reporting of accidents and incidents.
- Provision of Occupational Health Services.
- Provision of first aid.

- Provision of health and safety training.
- Hosting and management of visitors.
- Management of shared laboratory equipment.
- Management and disposal of hazardous waste.
- Security Services
- Access Control and Permits-to-Work
- Dealing with Emergencies
- Health & Safety Audits, Visits and Inspections
- Health and Safety within Clinical Research and Development
- Maintenance and Testing of Safety Critical Infrastructure
- Management of Fire Safety
- Maintenance of Space Schedules
- Handover and Decommission of Space
- Management of Building and refurbishment projects
- Management of contractors
- Lone working
- Partner representation at safety committees (or other relevant management committees e.g. business continuity/disaster recovery)

In some instances, legislative requirements will drive the content of the arrangement and a simple table demonstrating who has responsibility will suffice. In others, it may be more complex and meetings between the relevant specialists of each organisation will be required to fully understand and iron out any issues. These arrangements should include reference to specific standard operating procedures, risk assessments, training records, local rules, codes of practice etc.

The arrangements must be reviewed when required and it is recommended this is annually. A list of relevant contacts and their contact details should also be maintained.

10 Commercialising research

The development of new research into the commercial world brings positive impact for communities, enhanced reputation for the organisation, potentially attracts more funding, and can facilitate inwards investment and an income stream in perpetuity.

The knowledge required to support research concepts transitioning across to commercial applications involves several professional disciplines and it is normal to find business support groups within an organisation dedicated to this. If not a specific team, there will be key senior roles leading research development, who will enable this and be responsible for oversight within the organisation. While the research activity is recognised as being part of the organisation's undertaking, it will be insured, coming under its policies and its finance management; however, as the transition begins there will be stages where a 'spin-out' activity or business concept will cross the organisation's controlled domain and require its own defined arrangements through contract or memorandum of understanding.

Finding space to develop research

The focus of support is often initially around the mentoring of the individuals involved in how to take the steps either to market their concept or developing it into a company that can 'spin out' on its own. Finding a location for the research activity is a common challenge.

By the nature of research, the associated health and safety risk involved will vary considerably and the way in which the idea is developed can be office and laboratory based. Usually, it will come within the auspices of the organisation's undertaking and existing occupational health and safety arrangements. Common pathways for this being the use of space within a research team's existing area into 'incubate' ideas in development or in dedicated spaces on-site and off -site. If this space is controlled by a third party and/or sublet then advice will be required on reviewing that facility's health and safety management arrangements. Generally, office based space is less complicated with regard to the health and safety arrangements for occupants, but when research requires equipment on site and involves biological, chemical and radiation risks a higher degree of risk management applies.

Research team X was developing laser equipment applications; incubator space was located by the business support team without considering any associated risk from the research. The space was sublet and the management company did not request any detailed information about the research and how any risk would be managed. The researcher was off site and was not part of the organisation's normal management system for health and safety and therefore no review or audit of the space was being carried out. Significant risk was introduced to the space and the co-located companies and occupants were unaware. The business support team relocated the team to suitable laboratory space and they introduced a new process while mentoring teams to understand the hazards associated with their research and therefore, the needs of space were met properly. Legal arrangements were reviewed to ensure they addressed the management of space and equipment responsibilities in all types of space.

Competent advice and access to services

The organisation and the business teams require to recognise and implement systems to ensure health and safety will apply to the typical pathways for research to be commercialised. Working with your own business development team, recognise limitations of the advice available and ensure the correct access to occupational health and safety advice is given to review arrangements and how this will affect the staff, students and others involved.

Research idea X involved work in a co-located university/hospital site developing a new medical research approach. This approach was successfully 'spun out' into a new company delivering the medical tool and continuing its many applications through research. The company remained onsite, with dedicated commercial space, however no thought had been given to the staff's occupational health who moved to the commercial company and it was assumed being onsite meant all the same, services and advice were available. The company's staff were no longer automatically provided with occupational health or safety advice and health surveillance ceased to be accessible, albeit they continued to do similar work in a collocated space and require the same services and advice. This was addressed with general information for the

company and by working with the university's business support team, which included legal advice to ensure that health and safety became integral to their operational and risk management processes sitting alongside with financial, legal and business consideration.

11 Case studies

These case studies are examples of ‘good practice’ currently adopted in research organisations and should help guide you through the management of health and safety and risk in a variety of research areas. For the purpose of the case studies it is assumed that the research organisation has a comprehensive suite of health and safety-related policy and guidance in place.

The first case study is a risk assessment of a social science research project, where researchers are gathering data out in the community. Risk assessments are part of the ‘planning’ stage of the research project. The rest are set out to follow the health and safety management framework described earlier.

Case study 1

A risk assessment of a social science research project

Research activity

The ALICE (Adolescent Lifestyles in Central England) study is part of a project comparing young people’s lifestyles and health behaviours in different counties. Data collection will take place over a three month period and will be repeated after 12 months.

Pupils in S1–S3 in the first year of the study will complete a paper questionnaire in one study period describing their lifestyle and noting which of a random series of 50 films they have seen. Survey assistants will travel by pre-arranged transport to study locations from one of two pick-up points and will assist in taking consent and providing advice about the procedures around completing the questionnaire. In some instances, where the pupils need help, survey assistants will aid in the completion of questionnaires.

The hazards inherent in this research activity are associated with working out in the community, eg exposure to antisocial behaviour and lone working.

What are the risks?

The risks relevant to this research project are:

- travel-related incidents – low risk
- violence or aggression from subjects or others encountered during the data collection process – risk will vary with location and peer group interviewed

- psychological stress through exposure to verbal abuse, working in an unsafe environment, revelation of child protection issues – moderate risk (risk to researchers will be lower if they are experienced)
- fatigue as the result of travel, interview length, numbers interviewed at location – moderate risk
- musculoskeletal disorders from unsafe manual handling practices – low risk.

Who could be harmed?

The persons exposed to the risks are the interviewers and the adolescents interviewed (eg if they reveal child protection issues). With no risk controls in place this project would be moderate risk.

What risk controls are in place?

General controls

Training: defensive driving, lone working safety, dealing with violence and aggression, child protection issues and appropriate response, interview techniques and manual handling.

Emergency procedures are in place (via mobile phones and lone worker alarms and well-practiced procedures for lone-working emergencies) and the researchers will follow the health and safety emergency arrangements of the schools they visit.

Travel risk controls

Transport is arranged from the research unit but in the event of transport or other problems, assistants must be able to contact the day’s team leader and must have a list of telephone numbers and their mobile phone.

Case study 1 continued

Location risk controls

Fieldwork will be conducted in secondary schools during school hours. Out of hours the team members should wait in pairs at designated meeting points. Researchers are identified by uniforms and ID badges.

Study subject risk controls

The questionnaire asks questions about drinking and smoking among an under-age population. These are emotive topics and researchers must refer extremely emotional interviewees to the team leader. Interviewers should not visit schools attended by any subject known to them. Neither can they interview, nor access any information revealed by, such subjects. Researchers working with children and vulnerable adults have been trained in child protection issues and are CRB or equivalent checked.

Trauma risk controls

Instances or threats of violence and aggression will be reported to the team leader and to the head of the school.

Survey assistants are issued with lone worker alarms. Planned, rehearsed response measures are in place.

If any survey assistant has concerns about the child or their handling of the situation then it is their responsibility to discuss this with their team leader. The research group leader runs debrief sessions where researchers who have been exposed to traumatic or upsetting situations or information can discuss these issues with colleagues and the team leader.

Other identified risks

Manual handling risks – researchers are trained and use trolleys for shifting loads. Researchers with musculoskeletal problems are not allowed to lift or shift loads.

Residual risk

With these controls in place the project is assessed as low risk and no further risk controls are required for the research to proceed.

Record and implement controls

The risk assessment is recorded and the researchers are informed of the findings of the assessment. The training needs of the researchers are checked and relevant training is offered before the research study takes place.

Lone worker alarms are issued and researchers are reminded of the procedure for their use and the measures in place for responding to them.

Researchers are given the opportunity to clarify any of the issues raised by the risk assessment and the control measures associated with the research.

Risk assessment review

The risk assessment will be reviewed and revised:

- if the research project changes significantly
- following the occurrence of an unplanned incident during the project
- following the first set of data collection to ensure it has captured and mitigated all the significant risks attached to this project.
- If there were any incidents, note what corrective actions were taken – if necessary, amend research protocols accordingly.

Planned review date:



Case study 2

Research involving novel chemical substances

Research activity

Synthesis of novel Ergot Alkaloid for use in pharmacology study (subject to licensing under Home Office regulation of precursor chemicals in UK).

Plan

Consider any licence requirements or restrictions on procurement as a result of legislation.

Undertake a comprehensive risk assessment including assessments considering the Control of Substances Hazardous to Health (COSHH) requirements:

- consider the chemistry and apply fundamental chemical properties (eg exothermic acid-base reactions). Also consider mixtures at intermediate steps as well as separately
- assess the planned processes in order to consider safer alternatives or removing steps, eg the procurement of intermediates. Also consider applying administrative constraints, eg restricting lone working and/or access control
- consider the risks to others who may be affected by the research, eg cleaners and maintenance engineers
- consider what equipment and level of local exhaust ventilation (LEV) will be necessary and that the equipment is properly serviced and maintained
- consider whether researchers are appropriately trained in the techniques and safety equipment to be used in the research project and are competent to conduct dynamic risk assessments
- consider storage of materials, particularly to reduce the quantity of hazardous or dangerous materials kept in the laboratory to a minimum, in line with COSHH and regulatory guidance on dangerous substances and explosive atmospheres
- plan the provision of emergency equipment, instruction and training for researchers and others who will work in the local area (eg fire fighting, first aid, spillages).

Do

Ensure that:

- the risk controls identified by the risk assessment are put in place before the work starts
- adequate information and supervision is provided, either through technician level or laboratory manager depending on team
- access to hazardous substances and equipment is controlled
- researchers work in accordance with the experimental protocols and safe systems of work
- new or emerging risks are identified, evaluated and controlled, so far as is reasonably practicable
- adequate provision is made for disposal – consider quantities and concentrations
- any incidents and spillages are reported through the appropriate internal means.

Check

- Ensure that exposure controls are adequate, for example using air sampling (instantaneous/continuous as appropriate) and engaging health surveillance (see EH40).
- Practise emergency procedures. Consider what will happen to LEV used in the event of an emergency – will it continue to operate as normal, or will it shut down, or have a reduced flow, or deploy its fire dampers? Is LEV or other critical safety equipment on an uninterrupted power supply?
- Check waste streams and ensure that necessary arrangements are being followed.
- Review risk assessment periodically, after an unplanned event or before implementation of a new process.

Review

- Were the competencies and resources identified at the outset appropriate or sufficient?
- Were there any incidents? If so, what actions were implemented and will these be required in future? If this is the case, they should be written into the research protocols and standard operating procedures.



The Control of Substances Hazardous to Health Regulations 2002 (as amended)

This legislation, known as the COSHH Regulations (www.hse.gov.uk/coshh/index.htm), requires employers to prevent or otherwise control the exposure of their employees (and others at risk) to hazardous substances used or present in the workplace. There are various sorts of hazardous substances:

- chemicals and products containing chemicals
- fumes and vapours
- dusts and mists
- nanomaterials
- gases and asphyxiating gases
- biological agents.

The employer or responsible person has a duty to identify what substances are involved in work or the workplace and what sort of health hazard they represent. They should then carry out a risk assessment to determine whether exposure could occur, what the effects of that exposure could be on the people in the workplace and how exposure can be prevented or controlled.

The Regulations also require employers etc to make sure:

- the control measures they've put in place are used and that they continue to be effective
- they provide information, instruction and training for employees and others
- monitoring is carried out for hazardous substances
- health surveillance is provided for employees at risk of exposure to some substances
- there are plans in place to deal with emergencies.

More guidance on COSHH is available on the HSE website (www.hse.gov.uk).



Case study 3

Research involving hazardous biological agents

Research activity

A PhD student, who has never worked with highly infectious agents or at containment level 3, wants to travel to Pakistan to collect blood samples and skin biopsies potentially containing *Mycobacterium leprae* as part of their research into *Mycobacterium leprae* drug resistance. *Mycobacterium leprae* is categorised as Hazard Group 3 in the Advisory Committee on Dangerous Pathogens (ACDP) Approved list of biological agents (www.hse.gov.uk/pubns/misc208.pdf).

Plan

- Consider any licence and legislative requirements, such as ethics approval, from the Human Tissue Authority (HTA: www.hta.gov.uk). The HSE must be informed if this is the first time this biological agent has been used in the organisation. The Home Office must be informed if the biological agent is listed in Schedule 5 of the Anti Terrorism Crime and Security Act 2001. Defra must be informed if the organism is a specified animal pathogen.
- Undertake an overseas risk assessment prior to travel. Guidance on undertaking research activities overseas can be found in the document Guidance on health and safety in fieldwork (www.ucea.ac.uk/en/publications/index.cfm/guidance-on-health-and-safety-in-fieldwork).
- Arrange shipping of the biological samples back to the UK via your institute's recognised shipper.
- Consider the potential issues that could come up, eg if foetal calf serum is identified as being present in the sample media, then a Defra import licence may be required.
- Consider the laboratory and storage space requirements for the samples.
- Undertake comprehensive risk assessments for all techniques that are to be used.
- Seek occupational health advice prior to travel and before beginning work on these samples, eg Hepatitis B vaccination may be required.
- If samples are to be retained at the end of the study ensure that this requirement is included in the ethical approval application.
- Consider anonymised coding of samples if they are to be retained at the end of the study.
- Identify the health and safety information and level of training required by researchers involved in this project.

Do

Ensure that:

- the controls identified by the risk assessment are in place before the research project starts
- adequate training and supervision is provided for work in the containment level 2 or 3 laboratory
- clear protocols and/or standard operating procedures are provided for experimental work and that researchers are aware of these and know how to work safely
- samples are packaged according to International Air Travel Association guidelines and are registered under HTA as soon as they arrive
- the names of people working in the containment level 3 laboratory are recorded
- any incidents are reported through the appropriate internal means.

Check

- Practice emergency spill procedures for spills both inside and outside the microbiological safety cabinet (MSC).
- Make sure MSCs and other safety measures are working as planned each time they are used.
- For HTA check that appropriate records of disposal of samples are kept – number of samples disposed, disposal route used and the person responsible for the disposal.
- Check all project workers have appropriate knowledge of the code of practice for working at containment level 2 or 3.
- Check all project workers are aware of the procedures for decontaminating both the MSC and laboratory in the event of an emergency. If this is not contracted out then researchers should be competent to carry out the decontamination.

Review

- Review all risk assessments and codes of practice periodically, before any changes are made to experimental technique or following an unplanned event.
- Were there any incidents? If so, what actions were implemented and will these be required in the future? If this is the case, they should be written into the research protocols and standard operating procedures.



Biological agent hazard groups

The Control of Substances Hazardous to Health Regulations (www.hse.gov.uk/coshh/index.htm) set out the health and safety requirements for working with substances that are hazardous to health. Biological agents are classed as hazardous substances in the Regulations if they are capable of creating a human health risk.

The COSHH Regulations classify biological agents into one of four hazard groups (HGs) based on their ability to infect healthy humans, with HG1 agents being the least harmful and HG4 agents the most harmful.

The classification is based on whether:

- the agent is pathogenic for humans
- the agent is a hazard to employees
- the agent is transmissible to the community
- there is effective treatment or prophylaxis available.

More information on the classification of biological agents can be found in the Advisory Committee on Dangerous Pathogens publication The approved list of biological agents (www.hse.gov.uk/pubns/misc208.pdf). The relevant industry guidance is available from the HSE here: www.hse.gov.uk/biosafety/information.htm.

Guidance on using a management system approach to manage the risks of working with biological agents can be found in the CEN Workshop agreement laboratory biorisk management standard (internationalbiosafety.org/resources/biosafety-biosecurity/biorisk-management).



Notification of use of biological agents

The HSE expects all research establishments to notify it of their first use of any HG2, HG3 and HG4 biological agent. Notification of subsequent use of a few specific HG2 agents and all HG3 and HG4 biological agents is also required. Further information on notification to the HSE can be found at www.hse.gov.uk/forms/notification/cba1notes.htm.

Sites holding or intending to hold agents listed in Schedule 5 of the Anti Terrorism Crime and Security Act 2001 and the Security of Pathogens and Toxins (Exceptions to Dangerous Substances) Regulations 2002 must notify the Home Office. The Home Office will via the National Counter Terrorism Security Office (NaCTSO), organise a site visit by

the relevant Counter Terrorism Security Adviser (CTSA) who will conduct a survey and provide commensurate security advice and guidance. Qualifying sites must be able to demonstrate to the CTSA that they are operating securely before they are granted authority by NaCTSO on behalf of the Home Office. Further information on Home Office notification can be found at www.nactso.gov.uk/AreaOfRisks/PathogensToxins.aspx.

Defra must be informed if the organism is a specified animal pathogen. A Defra licence may be required for the importation of some animal-derived materials. Further information on notification and licensing is available at www.defra.gov.uk/animal-diseases/pathogens.



Case study 4

An engineering research project

Research activity

A request is made to investigate satellite propulsion systems using ionised gas. The project will entail working with a high vacuum chamber to simulate the space environment; high voltage equipment for ionisation and ion acceleration; and compressed gases including argon, xenon and hydrogen.

Plan

- Carry out a first pass high-level hazard analysis (preliminary hazard analysis) to identify the major hazard issues, eg:
 - high voltage equipment (if voltage potentials above 5 KV then ionising radiations regulations apply)
 - high vacuum systems (potential for vacuum chamber to become pressurised and become a pressure system)
 - asphyxiant gas explosive gas high noise levels.
- Assemble a team with appropriate cross-functional knowledge to scope an initial design concept and safety system. The safety system

should follow the risk control hierarchy of elimination, substitution, engineering controls, procedural controls, PPE (see section 5 for more detail). This is considered good practice and is a requirement of the COSHH Regulations.

- Undertake a detailed hazard analysis on the proposed design – consider using formalised methodologies such as failure mode and effects analysis (see ‘Hazard analysis techniques’ box for more detail). Modify the design accordingly.
- If purchasing new equipment, does it carry the appropriate CE marking?
- If equipment is in-house or a bespoke design, does it meet the essential safety requirements of the relevant legislation (eg directives on machinery, low voltage, pressure equipment, ATEX)? Consider assessment against appropriate harmonised standards, eg EN61010-1.
- Undertake a comprehensive risk assessment as required by regulation and organisational policy and guidance, considering hazardous and dangerous substances, ionising radiations, noise levels, electrical safety, pressure systems, ongoing maintenance requirements etc.

Case study 4 continued

- Consider storage of materials, particularly to reduce the quantity of hazardous or dangerous materials kept in the laboratory to a minimum, in line with COSHH and regulatory guidance on dangerous substances and explosive atmospheres. The outcome of the risk assessment may indicate that occupational health involvement is required, eg health surveillance, audiometry. (Note: this would be unlikely for this particular research project.)
- Consider what level of training and supervision will be required, taking into account the experience and competency levels of the people involved.
- Ensure that adequate emergency equipment and instruction and training is given to researchers and others that will work in the local area or who will provide support during emergencies (eg fire fighting involving high voltage and pressure systems).

Do

Ensure that:

- risk controls identified by the risk assessment are in place before the work starts
- equipment is purchased, built, installed and commissioned to appropriate specifications
- adequate provision is made for maintenance
- access to hazardous equipment is controlled
- adequate information and training is given and that appropriate levels of supervision are provided
- any incidents are reported through the appropriate internal means.

Check

- Confirm at appropriate intervals that equipment safety systems operate correctly.
- Check project workers have appropriate knowledge of equipment and safety systems.
- Check work is being carried out in accordance with the risk assessment and agreed protocols.
- Check that required maintenance is being carried out.
- Practise emergency procedures.
- Check risk assessment periodically, after an unplanned event or before implementation of a change to experimental protocol or equipment design.

Review

- Were the competencies and resources identified at the outset appropriate or sufficient?
- Were there any incidents? If so, what actions were implemented and will these be required in future? If this is the case, they should be written into the research protocols and standard operating procedures.



Hazard analysis techniques

There are several available techniques for hazard/risk analysis. These can be complementary and it might be necessary to use more than one of them. The basic principle is that the chain of events is analysed step by step.

Preliminary hazard analysis (PHA) can be used early in the development process to identify the hazards, hazardous situations and events that can cause harm when few of the details of the design are known.

Fault tree analysis (FTA) is especially useful early in the development stages of safety engineering, to identify and prioritise hazards and hazardous situations, and to analyse adverse events.

Failure mode and effects analysis (FMEA) and failure mode, effects and criticality analysis (FMECA) are techniques for systematic

identification of an effect or consequence of the failure of individual components. These techniques are more appropriate as the design matures.

Hazard and operability study (HAZOP) is typically used in the later stages of the development phase to verify and then optimise design concepts or changes.

For more detail see (knowledge.bsigroup.com):

- BS 8444-3, IEC 60300-3-9, Guide to risk analysis of technological systems
- BS EN 61025, Fault tree analysis (FTA)
- BS EN 60812, Procedure for failure mode and effects analysis (FMEA)
- BS IEC 61882, Hazard and operability studies (HAZOP studies) – application guide.



Case study 5

Research using unsealed radioactive sources

Research activity

In vitro assay for small molecule inhibition of recombinant viral RNA polymerase enzyme activity using a P33-labelled radioactive nucleotide triphosphate.

Plan

- Consider legislative requirements and their impact on how and where the procedure will be conducted.
- Conduct a comprehensive risk assessment – is use of radiation essential? Include COSHH and Environmental Agency considerations:
 - measure the reaction kinetics including the enzyme K_m in trial experiments; include measurements of waste stream partitioning
 - plan materials required – what format will be used; eg 12 well, 96 well or 384 well plates? what equipment will be needed, eg centrifuge, multichannel pipettes, plate washer? (all have potential for contamination)
 - how many compounds will be tested with how many repeat readings per compound? minimise reaction volumes compatible with reproducibility
 - add the radioisotope once and as the final step to a master reaction mix.
- Minimise exposure to radioactivity using the principles:
 - time distance shielding containment
 - ensure awareness of local rules
 - use of best available techniques (BAT) to minimise waste
 - trial runs using dye label to determine any unexpected potential for spillages, aerosol generation etc
 - frequent monitoring of self and designated work area before, during and after the procedure appropriate personal dosimetry.

Do

Ensure that:

- risk controls identified by the risk assessment are in place before the work starts
- researchers are competent and have had previous theoretical and practical instruction on correct and safe handling of radioisotopes, including minimising exposure, knowledge of waste streams and use of appropriate PPE
- proposed radioisotope usage and waste production is within the limits of the department/institute allowances laid down in the Environmental Permitting Regulations Permit for Open Sources
- radioisotope stock is stored securely in a locked fridge
- any spillages, accidents or incidents are dealt with according to the local rules.

Check

- Ensure that shielding is adequate and work is contained in trays.
- Rehearse emergency procedures in 'scenarios' to make sure contingency measures are adequate to deal with spillages.
- Check records of radioisotope use and contamination monitoring.

Review

- Are the protocols reproducible, can economies of scale be used?
- Do any aspects of the procedure require revision?
- Can the signal-to-noise ratio be maintained using less radioisotope?
- Review the risk assessment frequently, and revise following changes to the experimental protocol.
- If there were any incidents during the project, what actions were implemented? If they will be required in future, they should be written into the research protocols and standard operating procedures.



Radioactive substances: notification, registration and authorisation

If you intend to start work with radioactive substances for the first time, you will need to let the HSE know at least 28 days before you start work. Details on how to notify the HSE using Form IRR6 are on its website (www.hse.gov.uk/radiation/ionising/notification.htm). This is a requirement of the Ionising Radiation Regulations 2017 (IRR17).

Normally you will also need to have been granted certificates or permits of registration and/or authorisation under the Radioactive Substances Act 1993 or the Environmental Permitting (England and Wales) Regulations 2016 by the relevant UK environment agency. Your radiation protection adviser (RPA) will advise you on the planning, risk assessment and authorisation requirements of research involving radioactive substances.

For the purposes of work with ionising radiation, the regulators of radioactive substances are the Environment Agency (in England and Wales),

the Scottish Environment Protection Agency and the Northern Ireland Environment Agency. EPR10 exemption orders apply in England, and in Scotland/Northern Ireland as stand-alone legislation.

Otherwise RSA93 still applies in these two countries, where 'permits' are referred to as 'authorisations'.

The loss or theft of, or significant spills or releases of, radioactive materials must be reported to the relevant environment agency (and to the HSE if the amount of radioactive material released or spilled exceeds that in Schedule 7 of IRR17). Your RPA will advise on what levels of contamination or escape must be reported and to whom. Emergency response information, as well as other detailed guidance for the safe use of radioactive substances, should be written into your local rules.



Local rules

Under IRR17, radiation employers must carry out a risk assessment before beginning any activity involving work with radioactive substances. For any areas designated as controlled, they must prepare written local rules summarising the arrangements for controlling work with ionising radiations. Local rules may also be considered appropriate for

supervised areas, depending on the nature of the work carried out there. Where local rules apply, a radiation protection supervisor who is trained in the use of ionising radiation must be appointed to ensure that the arrangements set out in the rules are followed.



Case study 6

Research on genetically modified plants

Research activity

This project involves the development and application of transgenic technology to investigate the circadian clock in a cereal. Homologues of the well-characterised *Arabidopsis* circadian clock genes are present in the important cereal crop barley. The researchers propose to study and manipulate the circadian clock function in barley by the construction of transgenic plants with altered clock gene expression.

The project involves:

- transformation of barley embryos with *Agrobacterium* vectors
- tissue culture/regeneration of barley plants
- growth/characterisation/harvesting of plant tissue and seeds
- use of containment laboratories and glasshouse facilities.

Plan

- Conduct a comprehensive risk assessment to address all relevant issues concerning the construction and growth of transgenic plants.
- Consult organisational policies setting out the requirements of the Genetically Modified Organisms (Contained Use) Regulations 2014, the Environmental Protection Act 1990 and the Genetically Modified Organisms (Risk Assessment) (Records and Exemptions) Regulations 1996. The first two statutes give guidance on possible hazards, risks and risk control requirements. The last statute requires that a record of the project risk assessment is kept for 10 years.
 - Ensure the assessment addresses the safe use of substances hazardous to health and the potential environmental harm from genetically modified (GM) bacteria used to create the GM plants.
- Submit the risk assessment findings to the genetic modification safety committee for review and approval. If the genetically modified plant is likely to be more hazardous than the

parent then the HSE must be notified of the project and the notification fee paid.

- Identify suitable laboratory and greenhouse research work areas.
- Identify the knowledge and competences required by researchers to undertake this project safely. Ensure appropriate training is available if required.
- Identify safety-related information and levels of supervision required by researchers.
- Identify GM waste treatment requirements and disposal route.

Do

Ensure that:

- all appropriate controls and containment measures identified by the risk assessment to minimise the accidental release of transgenic seeds to the environment are in place before work starts:
 - the growth, drying and harvest of plants is carried out in the same facility
 - sticky mats are used to trap seeds
 - sealed containers are used to transport plant material and seeds
- supervisors are available if required by the risk assessment, after considering the researchers' experience
- the predicted lower fitness of the transgenic plants is observed in practice.

Check

Ensure that:

- containment measures for all stages of the project are in place and working
- researchers are familiar with the risk assessment, work procedures and incident reporting system, and emergency procedures
- incidents and near-misses are reported, including any accidental releases of plant material outside the greenhouse
- the sticky mats are changed at regular intervals
- the proposed waste disposal routes operate satisfactorily.

Case study 6 continued

Review

- Review the risk assessment frequently and revise it if failures in health and safety management are observed or reported.
- Revise procedures and controls following any changes to the experimental protocols.
- Review contingency arrangements at regular intervals.
- Review the safety management of the project when work is finished and establish whether any lessons can be learned and applied to future projects. If there were any incidents, you may need to amend the research protocols and standard operating procedures.



Genetically modified organisms

The Genetically Modified Organisms (Contained Use) Regulations 2014 require:

- risk assessment of activities involving genetically modified micro-organisms (GMMs) and activities involving organisms other than micro-organisms. All activities must be assessed for risk to humans and those involving GMMs assessed for risk to the environment
- the establishment of a genetic modification safety committee to advise the researcher or research organisation in relation to GM risk assessments
- classification of a project based on the risk of the activity, independent of its purpose. The classification is based on the four levels of containment for microbiological laboratories
- notification of all premises to the HSE before they are used for genetic modification activities for the first time
- individual activities of Class 2 (low risk) to Class 4 (high risk) to be notified to the competent authority (which the HSE administers). Consents

are issued for all Class 3 (medium risk) and Class 4 activities. Class 1 (no or negligible risk) activities don't need to be notified, although they are open to scrutiny by the HSE's specialist inspectors who enforce the regulations.

Activities involving GM animals and plants which are more hazardous to humans than the parental non modified organism must also be notified

- fees paid for the notification of premises for: first-time use
- class 2, 3 and 4 activities
- notified activities involving GM animals and plants
- the maintenance of a public register of GM premises and certain activities.

Further advice on research activities involving genetically modified organisms can be found in the SACGM Compendium of guidance (www.hse.gov.uk/biosafety/gmo/acgm/acgmcomp/index.htm).



Case study 7

Laser lab

Research activity

3D manipulation of cold atoms in several science chambers as part of the UK Atom Interferometer Observatory and Network (AION). AION's main objective is to implement a fresh approach to atom interferometry (with single-photon transitions) that provides a novel method of detecting dark matter with a new instrument, as well as major advantages for the observation of gravity waves (GW) in the long term. This new quantum technology provides a major opportunity to push measurements beyond the current sensitivity limits in fundamental physics applications, e.g. for GWs in the mid-frequency band, around 1Hz. The AION collaboration is the culmination of extensive community building and will put the UK at the forefront of this globally important venture.

This work required a new lab containing multiple class 3B and 4 lasers and associated systems. These are located on several beam distribution tables that are routed across the lab to separate science chambers where they target the cold atoms.

Plan

The new laboratory space required an existing area to be refurbished, and included incorporating an existing office space and kitchen into the lab area.

The design process had to consider the requirements of the Artificial Optical Radiation Regulations 2010 and apply the hierarchy of control to risks from the lasers – engineering, administrative and personal protective equipment (PPE).

The Laser Safety Officer was part of the design team to provide advice on solutions for engineering controls. Based on previous laser lab projects an allowance was made for laser safety engineering controls of up to 10% of the project budget.

Working with the researchers:

- 1 Identify the specifications of the lasers to be used and how the lasers are organised into separate systems.
- 2 Consider how each laser system can be completely enclosed during routine use.

- 3 Identify alignment requirements for each laser system.
- 4 Identify when access to the lasers will be required for servicing and maintenance of the laser system.

Do

Provide a laser risk assessment template that guides the laser users through the hierarchy of control. The emphasis is on engineering controls and less reliance on laser safety eyewear. The risk assessment provided:

- 1 Information on each laser power and wavelength (visible or non-visible).
- 2 Grouped the lasers into their respective systems as they would be set up in the lab.
- 3 Identified the risks if no controls were present.

Due to the potential risk of harm the following controls were identified during the design stage: Engineering controls that would be required during normal operation and during alignment and local maintenance operations. This included exclusion of reflective surfaces on lab furniture, door and table enclosure interlocks, table enclosures, armoured cables to deliver the laser light to the science chambers, enclosed boxes with top adjustment optics, computer software to tune down and reduce the laser powers and motorised mirror mounts and other optics.

Administrative controls included installing security control at the lab entry point so only authorised laser users have access, procedural controls such as aligning at lower power, no lone working for higher risk activities, completion of training associated with engineering controls, laser warning signage at entry points including wavelength indicators and an indication if any hazardous beam work was active, emergency procedures and use of the emergency stops, entry door interlocks and training of lab users.

Discuss and review with laser users how during the lab being set up the lasers can be put in place and manipulated safely.

Case study 7 continued

Check

- Laser interlock systems are operational, and work as required.
- The laser risk assessments are reviewed during the process of setting up the lab and that all optics to reduce need to access hazardous laser beams are in place before experimentation starts.
- The access control system is working to limit access to authorised workers.
- Get feedback from the laser users about the laser safety controls when the lab starts experiments and continually monitor the laser safety requirements.
- Laser safety eyewear checks and importance of suitable maintenance and management to prevent any damage.
- Ensure the required local lab inductions and laser training have been completed.

Act/review

- During set up of the lab complete visits with the users to provide advice as needed.
- Once experiments are set up and ready to start, complete a lab inspection and identify any further actions. The lab is then added to the annual inspection list for labs.
- Invite the key academics to future internal laser safety meetings.
- Discuss with the design team and end users' lessons learnt for future projects.
- Ensure all associated risk assessments are updated and reflect the engineering controls 'as built'.



Case study 8

Research involving human participants: a collaboration

Research

A Clinical Research Facility (CRF) hosts studies on human patients or healthy volunteers. The facility is located on one floor of a University building on a hospital site. The CRF space is paid for and managed by the NHS Trust. The users can be from the NHS or the university. From an organisational perspective the unit sits within the university and the Director is a university academic; in practical terms it falls under a division of the Trust and is staffed mainly by NHS employees.

The Principal Investigator (PI) of a clinical study must always be a medical professional and is responsible for safe conduct of the study. PIs who are university employees must have honorary contracts with the NHS.

Since two employers are involved, it is essential that all safety arrangements are in place and understood, regardless of which employer an individual works for. Patient safety in a clinical sense falls outside the scope of this case study, which considers the health and safety of employees, visitors, contractors and students. As an NHS-controlled facility the CRF falls under the NHS safety management system and policies, but when University staff work in the facility, the statutory duty to employees remains with the University.

Plan

- A Memorandum of Understanding (MoU) exists between the University and the Trust. This includes a set of Arrangements, setting out safety provisions including security, fire safety, incident reporting and provision of training. A Joint Safety Group, with representatives from both parties, ratifies these arrangements.
- Hazard identification and risk assessment for general activities falls under the NHS Trust. Risk assessment forms part of every study protocol.

- Safety guidance to researchers is provided by their own employer.
- Emergency preparedness and response is partly dictated by the premises. The CRF is in a University building, so the fire alarm system and response protocol are those of the University and are not the same as the hospital system. Therefore all facility users must complete the university's fire safety training.
- The operational arrangements are set out in an Operational Policy, User Guidelines and a set of Standard Operating Procedures (SOPs).

Do

- The day-to-day arrangements are implemented under the control of senior staff including the manager, lead nurse and QA & Governance Manager.
- Users must undergo an induction before they can run a study in the unit. This includes a University safety induction on their first day. Access to the unit is granted only when these inductions have been completed.

Check

- Safety walkround checks are undertaken within the unit.
- A safety meeting is held every six months, providing an opportunity to discuss non-conformances, incident data and incidences of good practice.

Review

- As part of an NHS Trust division, at organisational level the unit is subject to monitoring and review by the division.
- The MoU is reviewed regularly by both parties. The implementation of the Arrangements is reviewed to identify any improvements that may be needed.



Case study 9

Upgrading Animal Containment Level 2 facility for Animal Containment Level 3 (ACL3) research

Research

An existing room within a dedicated research animal facility is currently operating at Containment Level 2 and used for infection studies with Hazard Group 2 biological agents and Class 2 genetically modified micro-organisms. Infected animals (mice) are housed in sealed negative pressure individually ventilated cage rack systems. The research group carrying out this work are also carrying out *in vitro* CL3 studies (on a different site) and now wish to extend this work to *in vivo* studies.

Plan

- Identify all those who need to be involved in the project including the animal facility manager, manager of existing ACL2 room and staff working in that room, Health and Safety (including BSO), Estates and Facilities and researchers.
- Carry out gap analysis of current room specification against ACL3 requirements/guidance as set out in COSHH and ACDP guidance to identify where:
 - Room already meets requirements and/or where work is required to bring room up to CL3 standard
 - Further examination and testing is needed to establish whether room can meet specific requirements eg achieving pressure differential/inward airflow, is able to be sealed to permit fumigation, presence/absence of HEPA filters in room air ventilation system. This may require the input of external specialists eg to leak test the room
 - Additional and/or different safety equipment is needed eg microbiological safety cabinets, contained cage racks, autoclave and whether there is sufficient space for such equipment and also any testing and commissioning required
 - Training needs of staff who will undertake/manage *in vivo* work
- If work is required on or within the room, consider impact (noise, vibration, dust, maintenance of power/ventilation) on other areas in the facility.

- Identify the process flow of planned work ie how will the HG3 agent be transported from laboratory site to animal facility site and how will it move through this site from receipt to storage, to use and final disposal.
- Identify relevant safety documentation needed both internally and externally, leads to produce and timescales. This will include risk assessments for review by the organisational GMSC/BSC before relevant notification to HSE – could be a first use of HG3 under COSHH or significant change to existing Class 3 GM consent. Consider also requirements under the A(SP)A.

Do

- Schedule regular meetings to check on progress, allocate tasks as they arise and deal with any issues as a group.
- Carry out relevant training, ensuring that sufficient staff are trained to cover weekend working as well as planned and unexpected absences.
- Test and commission any new safety equipment in the room and services that supply the room. This should be done both on an individual basis and together ie room running as intended to check for any issues within the room and potentially any effects on other connected systems within the facility especially air handling. Testing of critical systems such as air handling should be carried over an agreed time span to confirm stable operating conditions at all times.
- Carry out room sealability test.
- Test means of fumigation both for MSCs and room using appropriate agent to be used or appropriate surrogate.
- Validate autoclave with representative loads and if used, validate disinfectants under in use and spillage conditions.
- Prepare and submit relevant documentation internally and externally.

Case study 9 continued

Check

- Step through all SOPs before final sign off to ensure procedures are easy to follow and that no key safety steps are missed/assumptions made.
- Confirm all safety equipment operates within expected parameters on a day-to-day basis. This includes pressure differentials, autoclave runs and face velocity tests on MSCs.
- Confirm and schedule statutory testing (autoclave, MSCs, sealability, DOP testing of HEPA filters) and any other PPM required in the laboratory.
- Confirm knowledge and understanding of all room users before work starts and on a regular basis eg by supervision and observation of work practices.
- Carry out emergency response exercises based on foreseeable events/incidents to test knowledge and understanding of all those who may be involved.

Review

- All risk assessments, codes of practice and standard operating procedures should be reviewed at least annually.
- All incidents and accidents should be reviewed for lessons learnt and to determine whether changes are needed to practices and procedures.
- All monitoring data eg room pressures, face velocity test should be reviewed regularly to identify any trends especially drift away from agreed parameters.



Case study 10

Construction Research Project

Research Activity

The project has been submitted to design and build a permanent wooden external seating area with pagoda and roof. It will be used for teaching and as a social space and is to be located on campus on an existing patio area adjacent to a two-storey university building. The patio is a thoroughfare for access and egress into the café for the building.

The project includes design and working with contractors to install.

Plan – Project Initiation and Planning Phase

- Prepare a project brief to outline the proposal – a project initiation document.
- Prepare a draft of the architectural plan to ascertain concept and identify initial hazards/risks.
- Identify key stakeholders to:
 - review and ensure any site limitations, structural design requirements e.g. the size of the space, loadings, height restrictions, power provision, location of services, groundworks, access requirements etc.
 - determine processes for procurement of contractors, design consultants etc.
 - determine HEI requirements for **construction work** project management processes and contractor management etc.
 - confirm budget and resource allocation
- Identify and confirm key roles to include project manager (*Researcher*) and those under CDM⁴:
 - Client (*the HEI through PI?*) whose role will include:
 - establishing and maintaining suitable arrangements for managing the project
 - ensuring sufficient time and resources are allowed for all stages of the project
 - providing any pre-construction information
 - ensuring that construction does not commence until principal contractor has prepared a construction phase plan
 - notifying the project to the HSE, if the project is **notifiable** – *this is where the construction phase:*

- lasts longer than 30 working days and have more than 20 workers working simultaneously at any point in the project; or
- involves more than 500-person days or shifts
- Principal Designer (*Researcher?*) who's role will include:
 - planning, managing, monitoring and coordinating the pre-construction phase of the project
 - ensuring that designers from the HEI are skilled, knowledgeable and experienced
 - ensuring that all designers identify, and attempt to eliminate or reduce, risks
 - ensuring that the designers provide information about the risks which cannot be satisfactorily addressed by their designs
 - identifying what is needed for the **pre-construction information**
 - preparing the **health and safety file**, to pass to the client at the end of construction.
- Designers (*Researcher and HEI staff?*) whose role will include:
 - ensuring that people allocated to their design team are skilled, knowledgeable and experienced and the organisation is capable
 - ensuring that any designers or contractors that are engaged are skilled, knowledgeable and experienced and the organisation is capable
 - eliminating or reducing safety and health risks to constructors, users, maintainers, repairers, commissioners, testers, cleaners, demolishers, etc. when preparing the design, taking into account the principles of prevention
 - providing information about the risks which cannot be satisfactorily addressed by their designs to the client, other designers and contractors.
- Principal Contractor (*external appointment*) who's role will include:
 - ensuring that people allocated to their team are skilled, knowledgeable and experienced and the organisation is capable

⁴ The Construction (Design and Management) Regulations 2015: CDM 2015

Case study 10 continued

- planning, managing, monitoring and co-ordinating the construction phase and ensure that other contractors manage their own work, including inspections and audits
- preparing, developing, communicate, implementing and amending the construction phase plan
- liaising with the principal designer for any design undertaken during the construction phase and provide information for the health and safety file.
- Contractors (*external appointment*) whose role will include:
 - ensuring that people allocated to their team are skilled, knowledgeable and experienced and the organisation is capable
 - ensuring that any designers or contractors that are engaged by them on the project are skilled, knowledgeable and experienced and the organisation is capable
 - communicating and co-operating with the client and designers
 - consulting with their workforce on health and safety matters and provide suitable inductions, information and training.
- Ensure the development of the project plan, with timescales from concept to handover – a gant chart is a useful tool for this.
- Ensure there are project meetings in place to align with the project plan e.g. concept, planning, 'kick off', delivery, completion and handover/lessons learned.
- Develop a communication plan – for engaging key projects stakeholders and more widely those impacted by the project work.

Do – Construction Phase

- On finalisation of the project plan and design ensure the identification and appointment of the principal contractor.
- With the principal contractor ensure review of the specific requirements and identify any alterations.
- Ensure the provision of information regarding the project, site and other relevant issues to the designers and contractors.

- Develop the *construction phased plan* (CPP).
- Ensure that the principal contractor has all the required risk assessments in place before the work starts.
- Ensure site management to include site boundaries and access/egress are in place.

Check – Performance Monitoring

- Ensure that the project progress is being monitored through the planned meetings and the setting of key performance requirements.
- Ensure that there are methods of quality control and the reporting of any accident/incidents through the appropriate internal means.
- Implement an appropriate audit programme to ensure on-site activity complies with the construction phase plan and associated risk assessments.
- Ensure that there is the development and completion of a health and safety file for the work in readiness for completion and handover.

Review – Completion and Lessons Learned

- Instigate a post-construction meeting to review and discuss the project – what went well and what could have been improved.
- Identify any items that didn't get accomplished and ensure that these are identified for completion where appropriate.
- Ensure that all the completion documentation and handover information has been issued.
- Record lessons learned to inform future project work.

Legislative Requirements and Definitions

The Construction (Design and Management) Regulations 2015: CDM 2015

- Main Duty Holders under CDM 2015:
- Client – Organisations or individuals for whom a construction project is carried out that is done as part of a business.
- Principal Contractor – appointed by the client to coordinate the construction phase of a project where it involves more than one contractor.
- Principal Designer – Designers appointed by the client in projects involving more than one contractor. They can be an organisation or an individual with sufficient knowledge, experience and ability to carry out the role.

Case study 10 continued

- Contractors – Those who carry out the actual construction work, contractors can be an individual or a company.
- Designers – Organisations or individuals who as part of a business, prepare or modify designs for a building, product or system relating to construction work.

The main guidance on CDM 2015 produced by the Health and Safety Executive (HSE) is L153, Managing health and safety in construction, which also contains the Regulations.

Industry guidance is available for the five duty holders under CDM 2015, plus one for the workers. These documents have been written by the Construction Industry Advisory Committee (CONIAC) and approved by the HSE. This guidance can be downloaded, free of charge, from the CITB website.

Definitions

Project is work involving a specific objective and includes construction, from initial design and planning to construction completion

Construction work is defined in CDM as: The carrying out of any building, civil engineering or engineering construction work and includes:

- the construction, alteration, conversion, fitting out, commissioning, renovation, repair, upkeep, redecoration or other maintenance (including cleaning which involves the use of water or an abrasive at high pressure or the use of corrosive or toxic substances), de-commissioning, demolition or dismantling of a structure;
- the preparation for an intended structure, including site clearance, exploration, investigation (but not site survey) and excavation (but not pre-construction archaeological investigations), and the clearance or preparation of the site or structure for use or occupation at its conclusion;
- the assembly on site of prefabricated elements to form a structure or the disassembly of prefabricated elements which, immediately before such disassembly, formed such a structure;

- the removal of a structure or of any product or waste resulting from demolition or dismantling of a structure or from disassembly on site of prefabricated elements which immediately before such disassembly formed such a structure; and
- the installation, commissioning, maintenance, repair or removal of mechanical, electrical, gas, compressed air, hydraulic, telecommunications, computer or similar services which are normally fixed within or to a structure, but does not include the exploration for, or extraction of, mineral resources, or preparatory activities carried out at a place where such exploration or extraction is carried out.

Design – A person is deemed to prepare a design where a design is prepared by a person under their control. In the context of the CDM regulations, the term designer encompasses anyone who:

- carries out design work
- prepares specifications
- prepares bills of quantities.

Pre-construction information – This is information about the project, site and other relevant issues to the designers and contractors on all projects. The pre-construction information may be discrete pieces of information in the form of drawings, reports, surveys, etc, either in electronic or hard copy format, with an index provided to all of the project team so that the information available is known to all. It will include:

- planned construction commencement and duration
- property access and egress during the work
- the details of existing and new electrical, gas, water and waste systems affected by the work
- ground conditions, if relevant
- details of the new installations designed
- any structural elements either added or disturbed by the work, including any temporary supports required etc.

Case study 10 continued

Health and Safety File – Is usually only required to be produced in projects with more than one contractor however, pre-existing HSFs will still need to be amended on projects with only one contractor. It will contain as-built plans and information, and also include:

- a brief description of the work carried out
- any hazards that have not been eliminated through the design and construction processes, and how they have been addressed
- key structural principles (e.g. bracing, sources of substantial stored energy – including pre or post-tensioned members) and safe working loads for floors and roofs
- hazardous materials used (e.g. lead paints and special coatings)
- information regarding the removal or dismantling of installed plant and equipment (e.g. any special arrangements for lifting such equipment) etc.

Construction Phased Plan (CPP) – The plan is a health and safety monitoring document which contains the arrangements, site rules and specific measures required when work involves risks. The information recorded in the CPP should be specific to the work being completed and it should take into consideration observations from the pre-construction information plan. CPP should contain the details below, along with any other

information relevant to the specific project it is being drafted for, e.g. it will include:

- the name of the contractor the plan is being prepared for.
- the client's name and address.
- the principal designer's contact information.
- the principal contractor's details.
- description of the project for example:
 - location of the project
 - timescales, including key dates
 - nature of the work
- details of site management arrangements, such as site meetings and safety
- information relating to the management of work including:
 - considerations for workers and the public, for example during access to and egress from the site
 - site rules – e.g. emergency procedures and specific safety arrangements
 - welfare facilities – personal hygiene facilities must be in place before work can start
 - site inductions
 - emergency arrangements, including first aid and fire safety procedure.

12 Glossary

Here, you'll find explanations of some terms, acronyms, agencies and legislation used in research, followed by a list of the sources used in this document (section 8).

ACDP

The Advisory Committee on Dangerous Pathogens advises the Health and Safety Executive and government departments in England, Wales, Scotland and Northern Ireland on all aspects of the hazards and risks to workers and others from exposure to pathogens.

ATEX

ATEX is the name commonly given to the two European directives for controlling explosive atmospheres. The ATEX Workplace Directive specifies minimum requirements for improving the health and safety protection of workers potentially at risk from explosive atmospheres. The ATEX Equipment Directive sets standards for equipment and protective systems intended for use in potentially explosive atmospheres.

AURPO

The Association of University Radiation Protection Officers is a professional organisation. Its members come mainly from universities and similar establishments involved in training undergraduates and graduates in science, engineering and medicine. Its principal aim is to increase knowledge and understanding of radiation protection through the promotion and interchange of information. AURPO is consulted by a number of government and other organisations responsible for drafting new legislation on various matters relating to all aspects of radiation protection.

Best available techniques

Best available techniques (BAT) – known in Scotland and Northern Ireland as best practicable means (BPM) – entails using the best methods possible to reduce discharges of non-radioactive pollutants under Integrated Pollution Control (IPC) Regulations. Under Environment Agency Radioactive Substances

Regulation, the application of BAT is key to the optimisation requirement in the management of the generation and disposal of radioactive waste, in order to keep radiological impacts on people 'as low as reasonably achievable'.

British Occupational Hygiene Society

The BOHS is both a learned society and the only professional society representing qualified occupational hygienists in the UK. Through the Faculty of Occupational Hygiene, it sets professional standards and is the UK examining board for qualifications in occupational hygiene.

CE marking

A CE mark is required for all new products that are subject to one or more of the European product safety directives. It is a visible sign that the product's manufacturer is declaring conformity with all of the directives relating to that product. Second-hand products to which the directives apply brought in from countries outside the EU, and existing products which have been so extensively modified as to seem as new, must also be marked before use.

Competent person

A 'competent person' is someone who has the necessary training, knowledge, experience, expertise and/or other qualities to complete their allotted task safely and effectively.

Containment

The containment of biological agents refers to the sum of the building/laboratory, procedural and management arrangements in place to minimise the risk of infection to people working with the agents or to others (within or outside the workplace) who could become exposed to them.

Containment level

The level of containment selected for working with various biological agents depends on risk, but the minimum should be directly related to the agent's hazard group (HG). For example, Level 2 containment measures would be the minimum requirements selected for work with HG2 biological agents.

COSHH

The Control of Substances Hazardous to Health Regulations 2002 set out the statutory requirements and responsibilities of employers and employees who either work with substances that are, or could be, hazardous to health; or who could be exposed to such substances in a work context. Duties are also placed on employers to ensure that members of the public and third parties are not exposed to harmful substances used in or generated by their work processes.

Criminal Records Bureau

The Criminal Records Bureau helps employers in England and Wales make safer recruitment decisions. A number of roles, especially those involving children or vulnerable adults, require a criminal record check.

CTSA

Counter-Terrorism Security Advisers (CTSAs) are located within police forces and are responsible for providing specialist advice about protective security measures to local organisations. Their work is co-ordinated by the National Security Counter-Terrorism Office (NaCTSO).

CTSAs are responsible for undertaking security risk assessments of laboratories holding radioactive sources, precursor chemicals and stocks of specified biological agents and toxins. They have the power to demand improvements to security arrangements in these areas.

Defra

The Department for Environment, Food and Rural Affairs (Defra) is a government department in the UK. It makes policy and legislation, and works with others to deliver policies in areas such as food, farming and fisheries; animal health and welfare; environmental protection and pollution control. Defra works directly in England and collaborates with the devolved administrations in Wales, Scotland and Northern Ireland.

Disclosure Scotland

Disclosure Scotland is an executive agency of the Scottish Government. A disclosure is a document containing impartial and confidential criminal history information held by the police and government departments which can be used by employers to make safer recruitment decisions. It is the Scottish equivalent of the CRB check. In Northern Ireland the process is called 'Access Northern Ireland'.

DSEAR

The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) require employers to control the risks to safety from fire and explosions associated with the use or holdings of certain 'dangerous' substances.

EN61010-1:2001

These are the safety requirements for electrical equipment for measurement, control and laboratory use. EN61010-1:2001 specifies general safety requirements for electrical equipment intended for professional, industrial process and educational use. It applies to four main groups of equipment: electrical test and measurement equipment; electrical control equipment; electrical laboratory equipment; and accessories for use with the above.

Genetic modification

According to the SACGM Compendium of guidance, a genetically modified organism is defined as an organism (with the exception of humans) in which "the genetic material has been altered in a way that does not occur naturally by mating and/or natural recombination" using "recombinant nucleic acid techniques involving the formation of new combinations of genetic material by the insertion of nucleic acid molecules, produced by whatever means outside an organism, into any virus, bacterial plasmid or other vector system and their incorporation into a host organism in which they do not naturally occur but in which they are capable of continued propagation".

Hazardous waste

Waste is classified as hazardous if it possesses one or more of the 15 hazardous properties listed in the UK environment agencies' publication Interpretation of the definition and classification of hazardous waste (technical guidance WM2). Organisations that produce, transport or receive hazardous waste are regulated by the Hazardous Waste Regulations.

Health and Safety Executive

The HSE is an independent regulator that acts in the public interest to reduce work-related death and serious injury across Great Britain's workplaces.

HTA

The Human Tissue Authority is a watchdog that supports public confidence by licensing organisations that store and use human tissue for purposes such as research, patient treatment, post-mortem examination, teaching and public exhibitions.

IATA

The International Air Transport Association is an international trade body that publishes a range of guidance relating to the transport of dangerous goods, animals and infectious substances.

Ionising radiations

Ionising radiations occur as either electromagnetic rays (such as X-rays and gamma rays) or particles (such as alpha and beta particles). Many areas of research use sealed and unsealed radioactive sources. The health and safety aspects of working with radioactive substances are addressed by the Ionising Radiations Regulations 2017 (enforced by the HSE). Legal requirements relating to the protection of the environment from radioactive substances are set out under the terms of the Radioactive Substances Act 1993 and in the Environmental Permitting (England and Wales) Regulations 2016. The protection of the environment from radioactive materials is enforced by the various UK environment agencies.

LEV

Local exhaust ventilation, often called dust or fume extraction, is used to protect employees and others from airborne contaminants at work.

Low Voltage Directive

The LVD 2006/95/EC covers electrical equipment between 50 and 1,000 volts for alternating current and equipment between 75 and 1,500 volts for direct current. For most electrical equipment, the health aspects of emissions of electromagnetic fields are also under the domain of the Low Voltage Directive.

Machinery Directive

Directive 2006/42/EC applies to machinery, lifting accessories such as slings and chains, and safety components. A machine is defined as "an assembly of linked parts or components, at least one of which moves". The associated Regulations are enforced by the HSE for machinery used in the workplace, and the Trading Standards Service for machinery used at home. Penalties for non-compliant machinery can be severe.

Microbiological safety cabinet

A microbiological safety cabinet (MSC) is a ventilated enclosure intended to protect the user and the environment from aerosols generated when handling biological agents or material that may contain such agents. MSCs are not normally designed to contain radioactive, toxic or corrosive substances. There are three types of cabinet:

- 1 class I:** a cabinet with a front aperture through which the operator can carry out manipulations inside. It is constructed so that the operator is protected
- 2 class II:** a cabinet with a front aperture similar to the class I cabinet, but constructed so that both the worker and product are protected
- 3 class III:** a cabinet in which the working area is totally enclosed providing maximum protection for the operator, the work and the environment.

Noise at work

The Control of Noise at Work Regulations 2005 require employers to prevent or reduce risks to health and safety from exposure to noise at work. Employees have duties under the Regulations too.

Non-ionising radiation

Non-ionising radiation (NIR) is the term used to describe the part of the electromagnetic spectrum covering two main regions, namely optical radiation (ultraviolet (UV), visible and infrared) and electromagnetic fields (EMFs – power frequencies, microwaves and radio frequencies). UV lights and lasers can present optical radiation hazards in a research environment and their use is controlled by the Control of Artificial Optical Radiation at Work Regulations 2010.

PPE

Personal protective equipment (PPE) includes safety helmets, gloves, eye protection, high-visibility clothing, safety footwear and safety harnesses. The legal requirements relating to the use and provision of PPE in the workplace are set out in the Personal Protective Equipment at Work Regulations 1992, as amended.

Precursor chemical licensing

The effective control of chemicals used in the illicit manufacture of narcotic drugs and psychotropic substances is an important tool in combating drug trafficking. These chemicals, known as ‘precursors’, also have legitimate commercial uses as they are legally used in a wide variety of industrial processes and consumer products, such as medicines, flavourings and fragrances. Organisations which use precursor chemicals need to be licensed or registered with the Home Office. Applications are subject to fees. The Home Office produces a wall chart which lists the substances covered by licensing requirements.

Pressure equipment and systems Pressure systems can range from steam-generating commercial coffee machines to large boilers. Legal requirements relating to the use of pressure systems and pressure equipment are set out in the Pressure Systems Safety Regulations 2000, the Pressure Equipment Regulations 2016 and the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009.

RCUK

Research Councils UK is the strategic partnership of the UK’s seven research councils, which invest in research in a range of academic disciplines: medical and biological sciences, astronomy, physics, chemistry and engineering, social sciences, economics, environmental sciences and the arts and humanities.

Strict liability

Strict liability, sometimes called absolute liability, is the legal responsibility for damages or injury, even if the person found strictly liable was not at fault or negligent – ie they had no guilty intent. Strict liability has been applied to holding an employer liable for the wrongful acts of their employees.

UCEA

The Universities and Colleges Employers Association (UCEA) represents UK higher education institutions and provides advice and guidance to them on employment, reward and human resources practice.

UCSF

The University Chemical Safety Forum (UCSF) is a professional group of health and safety practitioners working in the higher education sector who advise on working with chemicals and hazardous materials. They have produced a UCSF chemical security document.

USHA

The Universities Safety and Health Association (USHA) is an organisation for the promotion of safety and health in higher education. Membership is primarily open to higher education institutions, both in the UK and from further afield. Membership is also available to research institutions and related organisations on request.

Vitae

Vitae is the UK organisation championing the personal, professional and career development of doctoral researchers and research staff in higher education institutions and research institutes.

WM2

Technical guidance document WM2 is a guide to the interpretation of the definition and classification of hazardous waste and is available on any of the UK’s environmental agency websites.

13 Further reading and sources of information

Access Northern Ireland:

www.dojni.gov.uk/accessni

Approved list of biological agents:

www.hse.gov.uk/pubns/misc208.pdf

Biological agents: managing the risks in laboratories and healthcare premises:

www.hse.gov.uk/biosafety/assets/docs/management-containment-labs.pdf

International Federation of Biosafety Organisations

internationalbiosafety.org/resources/biosafety-biosecurity/biorisk-management/

Control of Substances Hazardous to Health:

www.hse.gov.uk/coshh/index.htm

Defra:

www.defra.gov.uk

Disclosure Scotland:

www.disclosurescotland.co.uk/what-is-disclosure

EH40/2005 Workplace exposure limits HSE:

www.hse.gov.uk/pubns/priced/eh40.pdf

Environment Agency

www.environment-agency.gov.uk

European Commission:

https://commission.europa.eu/index_en

European Committee for Electro-technical Standardisation:

www.cenelec.eu/index.html

Guidance for employers on the Control of Artificial Optical Radiation at Work Regulations (AOR) 2010:

www.hse.gov.uk/radiation/nonionising/employers-aor.pdf

Guidance on health and safety in fieldwork:

www.usha.org.uk/guidance-documents

Health protection: Infectious diseases

www.gov.uk/government/collections/infectious-diseases-detailed-information

Home Office:

www.homeoffice.gov.uk

HSE:

www.hse.gov.uk

HSE Ionising Radiations Regulations notification page:

www.hse.gov.uk/radiation/ionising/notification.htm

HSE Stress Management Standards

www.hse.gov.uk/stress/standards/

Human Tissue Authority:

www.hta.gov.uk

International Air Transport Association:

www.iata.org

MASTA Travel Health

masta-travel-health.com

National Counter Terrorism Security Office:

www.nactso.gov.uk/Default.aspx

NHS Applying for healthcare cover abroad (GHIC and EHIC)

www.nhs.uk/using-the-nhs/healthcare-abroad/apply-for-a-free-uk-global-health-insurance-card-ghic/

NHS Fit for Travel Mental Health Guidance

www.fitfortravel.nhs.uk/advice/general-travel-health-advice/mental-health-and-travel

Northern Ireland Environment Agency:

www.daera-ni.gov.uk

UKRI policy and guidance on the governance of good research practice:

www.ukri.org/councils/esrc/guidance-for-applicants/research-ethics-guidance/our-policy-and-guidelines-for-good-research-conduct/

Introduction to organisational culture – Institution of Occupational safety and Health:

iosh.com/health-and-safety-professionals/improve-your-knowledge/resources

Researcher Development Framework Vitae:

<https://vitae.ac.uk/vitae-researcher-development-framework>

SACGM Compendium of guidance:

www.hse.gov.uk/biosafety/gmo/acgm/acgmcomp/index.htm

Safety culture, advice and performance – Institution of Occupational Safety and Health:

iosh.com/health-and-safety-professionals/improve-your-knowledge/resources/

Scottish Environment Protection Agency:

www.sepa.org.uk

Thriving at Work: the Stevenson/Farmer review on mental health and employers

www.gov.uk/government/publications/thriving-at-work-a-review-of-mental-health-and-employers

Travel Health Pro (NaTHNaC)

travelhealthpro.org.uk

Universities and Colleges Employers Association:

www.ucea.ac.uk

Universities Safety and Health Association:

usha.org.uk

University Chemical Safety Forum:

<https://chemsaf.net>

Working safely with nanomaterials in research and development:

www.iom-world.org/media/1863/uknsg-guidance-working-safely-with-nanomaterials-2nd-edition.pdf

About IOSH

The Institution of Occupational Safety and Health (IOSH) is a global Chartered body. The largest membership organisation for health and safety professionals worldwide. We connect our members with resources, guidance, events, and training, and we're the voice of our profession, campaigning on issues that affect millions of working people.

As a qualifications Awarding Organisation, a developer of training, and an advocate for positive transformation, we seek to build excellence in our profession, drive action from everyone who can influence occupational safety and health standards and ensure that protecting people is at the heart of sustainability.

IOSH was founded in 1945 and is a registered charity with international NGO status.

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Founded 1945
Incorporated by Royal Charter 2003
Registered charity in England and Wales No. 1096790
Registered charity in Scotland No. SC043254