

## NERC HEALTH & SAFETY PROCEDURE NUMBER: 12

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### RISK ASSESSMENT AND RISK MANAGEMENT

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*NOTE: THIS UPDATED VERSION HAS BEEN SUBSTANTIALLY RE-WRITTEN FROM THE PREVIOUS VERSION ALTHOUGH IT RETAINS SIMILAR DEFINITIONS & PROCESSES*

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## 1. SCOPE

This document lays down principles for 'general' risk assessment within NERC. It also describes the means of identifying suitable measures, precautions and controls (sometimes termed 'barriers') for managing risk arising out of this assessment process. The term 'risk' is used here in its restricted health and safety sense. It does not cover more detailed risk assessments required for certain defined specialist activities for which there may be a specific recommended method, hence the use of the description 'general' risk assessment. This document is aimed at Safety, Health, Welfare and Environment Advisors but should also be of use to anyone writing a risk assessment.

## 2. DEFINITION OF RISK

2.1 The concepts of hazard and risk are quite different but the terms are commonly confused.

A **HAZARD** is something with the potential to cause harm (this can include a chemical effect, electric shock, fall from a height, trapped by moving plant or machinery). Inherent in this harm is the severity in terms of what damage / injury it may cause and how many people it affects. This is also sometimes termed 'consequence'

A **RISK** is the likelihood of that potential harm from the hazard being realised.

2.2 Hazard assessment for a work process is straightforward consisting of compiling a list of possible effects, even if there is little or no chance of that effect being manifest. Controlling all possible hazards is not an achievable, practical, realistic or worthwhile objective and could involve considerable wasted effort and expenditure. Many potential hazards will never actually occur; others may arise but will not cause any harm under normal working conditions.

2.3 Risk assessment is more worthwhile, meaningful and detailed, requiring careful thought about how the work will be done and the chances of a problem occurring. If something does go wrong, careful risk assessment can provide methods of preventing or reducing the consequences to an **acceptable** level. The acceptable level of risk is never zero as this is unrealistic (all life involves some risk) and in practice impossible to achieve unless you avoid that activity altogether. An acceptable, or 'tolerable', level is the willingness to live with those risks in order to secure certain benefits in the confidence that they are properly controlled. The Health and Safety Executive (HSE – the UK mainland regulators for health and safety) publish a useful document "Principles of Sensible Risk Assessment" that provides guidance (see Appendix H).

2.4 The extent of risk in an activity depends on:

- the potential severity of the harm e.g. serious accident or adverse health effect
- the number of people who may be affected / exposed
- the likelihood of the harm occurring

### 3. RISK ASSESSMENT

3.1 Risk Assessment is a process to identify the **potential hazards** arising from a work activity and the **likelihood of harm** resulting from those hazards, then putting the two together to estimate the **risk** involved in the activity. If risk levels are considered unacceptable, the assessment will identify **measures, precautions or controls**, be these new or improved, that will reduce the risks to acceptable levels, so far as is reasonably practicable. The risk assessment process should then go on to ensure those precautions are approved / accepted and signed off by both the line manager(s) and assessor(s). New or revised assessments must be brought to the attention of the staff involved and implemented, including any necessary training. They must also be reviewed and re-assessed as appropriate. The assessment may identify **improvements in existing arrangements** that need to be implemented, either before work starts or at a later stage. Actions to ensure these are put in place must be followed up with responsibilities assigned, targets set and progress towards implementation tracked. If an improvement is required **before the work can start**, checks should be made to **ensure they are in place**.

3.2 **Precautions** specified by a risk assessment should **match** and be appropriate (**proportionate**) to the **inherent level of risk** involved. Precautions that are too onerous relative to the risk involved are likely to be ignored and shortcuts taken. This could lead to an overall reduction in safety compared with a more proportionate assessment. Likewise, specifying too low a level of precaution relative to the risk will lead to inadequacies, unacceptable levels of residual risk and potentially an unacceptable likelihood of harm. In addition, any precautions applied should not have a knock-on effect of actually increasing the overall level of risk i.e. protect against one risk but create another more serious one.

Risk assessment decisions should always be taken in an informed, rational and structured manner.

3.3 Not all risk assessments strictly need to be recorded or written down, only those where there are **significant conclusions** requiring implementation of additional precautions. The problem is that without recording the process, even where the risk is deemed low and no further precautions are required, there is no evidence that the risk assessment process has been undertaken.

3.4 The main aim of the Risk Assessment process is to **rank the risks** and **help prioritise** those activities which require the most urgent attention, with the most effort going towards controlling the highest risks first. Part of this process will also be justifying the acceptability of work going ahead with a residual level of risk that cannot be reduced further with all reasonably practicable measures in place. It may be the case that in certain circumstances the benefits of undertaking the work cannot justify the risks involved and the potential for harm to the staff. In such cases the work should not be allowed to go ahead.

3.5 As a matter of principle, even very severe risks can usually be adequately controlled, provided a high enough level of precautions is put in place. However, the problem is often that the costs and burdens of implementing such very high levels of precautions can be extremely severe, time consuming and restrictive. This may place such restrictions on undertaking the work itself that it cannot be implemented within the available resources and makes the work not worth progressing.

3.6 The implementation of the precautions (the **significant conclusions**) arising from the risk assessment need to be **incorporated** into the **work processes and instructions**, which forms the basis of risk management. This may be done by a **Safe System of Work (SSW)** – see Appendices A, E and F - which defines how the job is done in a manner which provides an acceptable level of the health and safety for the staff involved and anyone else who might be affected by the activity. Safe systems of work may have many other titles such as **Method Statement, Code of Practice, Safe Operating Procedure** (although SOP may also have a quality connotation as a Standard Operating Procedure which may or may not include safety aspects), **Safe Working Procedure (SWP), Local Rules, Standing Instructions, Model Rules** etc.

3.7 The risk assessment process of weighing risks against benefits and suitable precautions is a **natural process** for everyone (even when we don't realise we are doing it e.g. when crossing the road). The risk assessment process should not need so much effort and resource that it inhibits the work process. However, if inherent risks are high and the consequences of failure are catastrophic then detailed written procedures and onerous precautions will be required regardless of effort.

## 4. RISK ASSESSMENT PROCESS

4.1 The HSE defines 5 steps to Risk Assessment which are:

- Look for the hazards
- Decide who might be harmed, and how
- Evaluate the risks arising from the hazards and decide whether existing precautions are adequate or more should be done
- Record your findings
- Review your assessment from time to time and revise if necessary

4.2 Risk assessment is at the core of risk management systems and is central to the '**Planning and Implementing**' stage of POPMAR under the HSG65 Safety Management System which NERC follows (or the '**Doing**' stage of the Plan/Do/Check/Act version).

4.3 Risk Assessments need to be carried out before new tasks are started. They will be **reviewed** after first use and then again periodically as experience is gained to check if they are still valid, with the risks shown to be controlled and the precautions adequate and workable (as well as reasonably practicable). Changes in law or improvements in technology and working practices must also be taken into account to ensure the risk assessment has not rendered insufficient or out of date.

4.4 Risk Assessments will be conducted by members of staff who are trained and competent in this process and preferably have direct experience of undertaking the sorts of tasks that are being

assessed. It is essential that all relevant staff are involved, including specialists, support workers and maintenance / engineering staff where necessary, and contribute their skills and knowledge to make the risk assessment relevant, comprehensive, applicable and that conclusions are reached which are acceptable, understood and may be followed by all staff involved.

4.5 The HSE 5-step approach, although easy to understand, is possibly an over-simplified approach. In reality far more steps will be involved in a Risk Assessment process and these include:

- Considering the **entire work activity** and the justification for its conduct
- Drawing up an activity list and breaking down each activity into its **tasks / elements / steps**
- Identifying the **hazards** involved in each step (including who may be affected and how)
- Considering the **likelihood of the hazards occurring under the actual conditions of work**
- Evaluating the **risk involved** (this is often the risk without any additional controls in place – the **inherent risk** – which could also be termed ‘raw’ risk)
- Identifying suitable controls to **adequately control risk**, applying the **risk control hierarchy** (see Appendix A, section 8.2)
- Re-evaluate (quantify) the risk with proposed **controls** in place (the **residual** or consequent **risk**)
- If the residual risk is still unacceptable and not adequately controlled, identifying **alternative, better or additional controls**
- When satisfied that risk can be adequately controlled, implementing those controls, setting **actions and targets for completion**, especially if improvements in existing arrangements are required
- **Recording significant findings** and writing a ‘SSW’
- **Accepting**, authorising approving agreeing risk assessment and **signing** it off
- Checking all precautions have been **implemented** and are in place **before work starts**, including **training of staff**
- Monitoring results and periodically **reviewing** working methods in the light of experience and changes / improvements, updating the SSW as necessary

4.6 A **generic risk assessment** may be defined as a single assessment or SSW that is suitable for an activity performed regularly in a similar manner across different locations. Its main benefit is that it avoids repeating the same risk assessment many times when the level of risk and applicable precautions will be identical. The output is a set of standard controls and precautions that apply to those similar activities, provided they are undertaken in a similar way and under similar conditions on each occasion. It is important that, when applying a generic risk assessment, consideration is given to there being any factors which make the generic risk assessment inappropriate and if a detailed specific / individual risk assessment for that activity or task is required. Sometimes a number of generic risk assessments for individual tasks may be combined to form an overall specific risk assessment for an activity. This may be particularly useful in some experimental environments when, on each occasion an activity is undertaken, it is liable to involve combining different elements of work in different ways. This **avoids repetition** in the risk assessment process and the chances of **different assessors reaching different conclusions for identical tasks**. Sometimes a generic risk assessment can be supplemented by location / single activity specific information on precautions so that it contains the benefits of a specific risk assessment without needing to repeat all of the risk assessment exercise.

4.7 The HSE in their report on the Glenridding Beck incident, indicate a risk assessment structure which may usefully be applied to some work within NERC, especially fieldwork. This involving a three tier risk assessment process consisting of:

- i) A **generic risk assessment** covering the risks inherent in the activity and general principle and controls that must be followed for that activity wherever it is undertaken.
- ii) A **specific risk assessment** for the location and circumstances of the individual activity being performed under that generic assessment, covering the particular risks associated with that site or the way in which the work must be done on that occasion.

- iii) A **‘dynamic’ risk assessment** that is made at the time and location of undertaking the activity and takes into account the actual risks and the changes in the working conditions or fitness of staff involved that need to be catered for. Also, it can address issues that may arise and possible courses of action (including any ‘cut-offs’ identified in the generic / specific assessment) that may arise which were not possible to fully address in the specific risk assessment.

The HSE also point out that any risk assessment process must include **contingency** (‘emergency’) **arrangements** for foreseeable problems should things go wrong.

## 5. LEGAL BACKGROUND TO RISK ASSESSMENT

5.1 The over-reaching legal requirement for risk assessment of all work activities is made by the **Management of Health & Safety at Work Regulations 1999 (MHSWR)** which require that:

Every employer shall make a suitable and sufficient assessment of:

- the risks to health and safety of employees ... whilst at work
- the risks to health and safety of persons not in employment arising out of, or in connection with, the conduct of their undertaking

and to review that risk assessment if:

- there is reason to suspect it is no longer valid
- there has been a significant change to the matters to which it relates.

The MHSWR also make reference to need for specific risk assessments for young persons and new, or expectant, mothers (see NERC Procedure No 9 on ‘High Potential Risk Groups in Risk Assessment’ - [http://www.nerc.ac.uk/about/work/policy/safety/documents/procedure\\_highrisk.pdf](http://www.nerc.ac.uk/about/work/policy/safety/documents/procedure_highrisk.pdf) ).

5.2 Where the employer has more than 5 employees, they must record the significant findings of the risk assessment and any group of employees identified as being especially at risk. Although in theory this means NERC does not have to write down every risk assessment, unless there are significant conclusions, without some record there is no evidence to show that a risk has been considered and discounted as not being relevant or at such a low level it is not worthy of further attention. The general risk assessment form (see Appendix 1) suggested in this document allows a simple record to be kept and also demonstrates how the risks were ranked, hence prioritised.

5.3 A risk assessment under the MHSWR (apart from for young persons and pregnant / new mothers) may be termed a ‘general’ risk assessment in that it should consider all risks that may arise from the work so requiring a systematic general examination of the effect of their undertaking, work activities and condition of their premises / workplace.

5.4 However, there are also specific regulations which cover the risks arising from particular types of equipment, substance, hazard or work and these may also make a requirement for additional risk assessment.

A list of other Health and Safety Regulations which require additional risk assessment (or ‘assessment of suitability’ matched against the risks identified from the general risk assessment) is:

- Health and Safety (First Aid) Regulations 1981 (assessment of ‘need’)
- Health and Safety (Display Screen Equipment) Regulations 1992
- Manual Handling Operations Regulations 1992
- Personal Protective Equipment Regulations 1992 (assessment of ‘suitability’)
- Confined Spaces Regulations 1997
- Diving at Work Regulations 1997
- Provision and Use of Work Equipment Regulations 1998 (assessment of ‘suitability’)

- Lifting Operations and Lifting Equipment Regulations 1998
- Ionising Radiations Regulations 1999
- Management of Health and Safety at Work Regulations 1999 (amended)
- Pressure Systems Safety Regulations 2000
- Genetically Modified Organisms (Contained Use) Regulations 2000 (amended)
- Control of Lead at Work Regulations 2002
- Dangerous Substances and Explosive Atmospheres Regulations 2002 (amended)
- Control of Substances Hazardous to Health Regulations 2002 (amended)
- Work at Height Regulations 2005
- Control of Vibration at Work Regulations 2005
- Control of Noise at Work Regulations 2005
- Regulatory Reform (Fire Safety) Order 2005
- Control of Artificial Optical Radiation at Work Regulations 2010
- Control of Asbestos at Work Regulations 2012

*[Note: every effort has been made to give a comprehensive list, but there may be omissions].*

It is normally considered (and accepted under the ACoP) that, where a specific risk assessment is made to meet the requirement of one of these sets of Regulations, this will meet the need for assessing that risk under the MHSWR i.e. there is no need to do a second risk assessment.

5.4 As a matter of principle, it is best that a risk assessment process attempts to identify or cover all the relevant risks involved in an activity, i.e. is 'holistic', rather than treating each risk separately and having multiple risk assessments for a single activity. However, this is not always possible, especially in a research environment where work is constantly evolving and involves undertaking similar tasks but in different combinations and in different environments. Therefore, an overall risk assessment for a single activity involving a number of different tasks and hazards may be composed by combining separate risk assessments which use different methodologies.

5.5 The approach given in this document in order to meet the legal duty under the MHSWR is for a wide-ranging consideration of all risks (a 'walk-through' assessment – see Appendix A). This means there is a summary document which records all the hazards and risks considered. Further assessment may conclude that many of these may be considered irrelevant or very low risk, but they have been noted in the summary document. The risks can then be ranked and priority given to the most serious requiring detailed, specific assessment. Where the risks are low and the precautions simple, the summary document should suffice. However, where the controls are more onerous, the process should go on to develop a detailed risk assessment leading to a SSW (see Appendices E and F).

5.6 Types of risk requiring a special, specific or detailed risk assessment using methods that are not covered by this document but by other more specific NERC Procedures / Guidance include:

- Manual handling
- Work with hazardous substances (e.g. chemical agents, biological agents, radioactive materials)
- Display Screen Equipment
- High risk groups i.e. young persons and new and expectant mothers
- Overseas work
- Road risk
- Noise
- Vibration
- Fire
- Lone working
- Cryogenics
- Field work
- Work equipment

## 6. GENERAL PRINCIPLES OF PREVENTION

The MHSWR include in their Schedule 1 the general principles of prevention for implementing preventive and protective measures. These are not in the form of a hierarchy but describe the approach on which the desired safety management and application of suitable controls need to be based. They are however, closely related to the hierarchies used to select the most desirable controls, which are described in Appendix A.

The general principles of prevention are as follows:

- If possible, **avoid the risk** altogether – do the work using a different method which involves less intrinsic hazard
- **Evaluate the risks** which cannot be avoided and identify suitable precautions to adequately control that risk via a risk assessment process
- **Combat risks at source** rather than taking palliative measures
- **Adapt the work to the requirements of the individual** (consulting those affected) with regard to the design of workplaces, selecting work equipment, PPE and working methods. Aim to alleviate monotonous work or work at a predetermined rate and to increase control of workers over the work they are responsible for
- **Take advantage of technological and technical progress** to offer opportunities for improved working and safer working methods i.e. **replace the dangerous by non-dangerous or less dangerous**
- Implement risk control systems that form a **coherent overall prevention policy** and progressively reduce risks that cannot be prevented or avoided. Develop a coherent overall approach which covers *technology, organisation of work, working conditions, social relationships and the influence of factors relating to the working environment*
- Give priority to measures which protect the whole workplace and everyone who works there so gives the greatest benefit i.e. **collective protection measures over individual protective measures**
- Ensure that workers and other persons present within the workplace understand what they must do i.e. **give appropriate instructions** on safe working methods.

In addition, the organisation should promote an approach and attitude which creates a **positive health and safety culture** with avoidance, prevention and reduction of risks given a priority which is recognised at all levels of staff and management.

## 7. OPERATIONAL PROCEDURE

7.1 It is the responsibility of the manager responsible for a piece of work to ensure it has been subjected to a suitable and sufficient risk assessment. Whilst managers do not necessarily have to undertake the assessment themselves, they must ensure a suitably qualified and competent person (or persons) carries out a risk assessment on their behalf. The responsible line manager must sign off the risk assessment that has been done on their behalf to show they accept (authorise or agree) its conclusions and consider the precautions specified to be adequate in controlling that risk to an acceptable level.

7.2 The risk assessment leads on to risk management methods and the development of a SSW (see Appendices E and F). Whilst appointed competent safety personnel such as Safety Advisors can, and will, provide assistance, it is not their responsibility to carry out the risk assessment nor necessarily to approve or sign it although any comments they may make must be taken into account. Detailed advice on how to conduct a general risk assessment is given in Appendix A. Suggested forms that can be used or adapted / incorporated into local arrangements may also be found in Appendix A.

**Management must:**

- Ensure that **all work has been subject to risk assessment** by a suitably experienced, competent and trained assessor, who preferably has experience of undertaking that work or work of a similar nature, and involving all relevant staff
- Where necessary, **identify and appoint a co-ordinator** to cover a specific type of risk assessment for a particular area, section, activity or operation.
- **Where additional control measures are required** to be put in place before the work starts, appoint / **assign a responsible person**, set a timetable for putting those measures into place and ensure this has been done before the work starts.
- **Check that the record of the assessments is accurately documented** with the significant conclusions and actions identified.
- **Bring the risk assessment to the attention of all staff involved** in such a manner that they understand the need for, and how to, follow its requirements, ensuring that training and other information is given where applicable
- **Provide health surveillance, occupational health checks or biological monitoring** where necessary to check that the precautions are adequate to control the risk e.g. below any relevant prescribed legal limits
- Consider if **occupational hygiene monitoring** is required to check that the precautions are adequate to control exposure to a hazardous material/condition e.g. to below any relevant prescribed limits
- **Identify other key persons or departments** who need to be involved / appraised and make sure they are provided with relevant information about the precautions, especially when large or complex projects are involved. This is particularly important when staff from more than one group are involved or when collaborating with organisations outside the Research Council
- **Share the risk assessments with other employers / contractors / visitors** etc. who may need to know about its controls and their implementation or may be affected by or interfere with its application.

#### Acceptance (Authorisation / Authorisation / Agreement) and recording of actions:

- Risk assessments **must be accepted** by the responsible manager as adequately controlling the risks involved in the work they cover. "Sign-off" and authorising the assessment is an important function for managers and shows they have met their responsibilities.

#### Encourage and monitor feedback:

- **Monitor** the assessment and the control measures.
- Carry out **regular checks, inspections and reviews** (ideally annually) to ensure that the assessment is still valid.
- **Record** when assessment has been reviewed, archiving former risk assessments for at least five years after they have been superseded.

## 8. ROLES AND RESPONSIBILITIES

**8.1 Senior Managers:** Senior managers, which include programme managers, section heads, heads of station as well as Directors, have overall responsibility for Health & Safety across all operations under their control. They must ensure that:

- There are adequate and appropriate mechanisms to support line managers in ensuring that risk assessments are completed and any precautions identified as being necessary to adequately control risks are put in place
- Ensuring risk assessments are reviewed
- Ensuring proper monitoring of the risk assessment process
- Ensuring that very serious risks are included in the Centre (or NERC corporate) Risk Register

**8.2 Managers:** Managers are responsible for ensuring that all actions described in section 6 have been carried out.



- All work activities involving any risk that they are responsible for have been considered and assessed for risk assessments are completed and recorded for all tasks within the scope of their areas of management (note: managers do not have to undertake risk assessments themselves but can appoint a suitable, competent person to do this on their behalf but they must satisfy themselves that a suitable and sufficient risk assessment has been done)
- Suitable precautions to adequately control that risk are identified and implemented where necessary, with a SSW generated and followed where appropriate.
- All necessary staff have been involved in drawing up / commenting on the risk assessment, including (where necessary) specialists or external experts.
- Risk assessments are accepted (or authorised / approved / agreed) and 'signed off' as being adequate
- Significant risks identified in the risk assessment are given priority in order of their ranking
- The risk assessments are brought to the attention of all staff involved in or affected by that activity.
- Adequate supervision and management control is in place to ensure they are followed
- The adequacy of precautions is monitored e.g. by checks / inspections or if there are any incidents, near misses or injuries arising from the work
- Risk assessments are reviewed, preferably annually or when significant changes / developments in techniques, personnel or location take place or there are occurrences that indicate inadequate control.
- Project leaders and supervisors are aware of their responsibilities and understand the requirements of the risk assessment

### 8.3 Competent persons:

**8.3.1 Risk Assessors:** can be managers at all levels or other suitably competent staff appointed to assist line managers in discharging their responsibilities. Risk assessors who are not senior or line managers carry no legal responsibility additional to that of any other member of staff for the outcomes of their assessments.

#### Risk assessors shall:

- Attend a risk assessment training course, (this is one element of the NERC Safety Management in a Research Environment [SMRE] course), or a comparable course and keep up to date with developments in risk management
- Formally record the risk assessment, and bring the assessment to the attention of the relevant manager for their consideration, acceptance and approval
- Assess significant risks arising from the foreseeable hazards inherent in the work activities and prioritise them so they can be dealt with in rank order according to their level of risk.
- Recommend appropriate control measures (following the NERC risk control hierarchy) to the manager responsible, in order to reduce or eliminate the risks identified.
- Monitor the effectiveness of risk control measures
- Where there is reason to suspect that the original findings of the assessments are no longer valid or that the control measures are not achieving the desired results, re-initiate the risk assessment
- Recommend appropriate additional or alternative control measures / improvements to the line manager responsible.
- Review the risk assessments where there have been significant changes to the work operations or staff conducting the tasks (see NERC Procedure on High Potential Risk Groups) - record findings and recommend appropriate additional or alternative control measures to the line manager responsible.
- Review the risk assessments on an agreed regular basis and monitor the effectiveness of the specified control measures, recommending actions as appropriate to the manager responsible.

**8.3.2 Health and Safety Advisors:** are not responsible for carrying out risk assessments. The Health and Safety Advisors will:

- Assist in carrying out risk assessments and where required will recommend suitable preventative

- and protective risk control measures
- Monitor and advise on the overall degree of compliance with statutory provisions concerning risk assessments

**8.3.3 Other specialist staff:** other specialists may need to be involved in the risk assessment process where they provide expertise or insight that is not within the normal team. These specialists could include occupational health specialists, occupational hygienists, radiation protection staff, biosafety staff, engineers, dangerous good safety advisors and experts from a competent external body. Their role is to assist in carrying out risk assessments or comment on them, provide an expert opinion and, where required, to recommend suitable preventative and protective risk control measures

## **8.4 Individual Members of Staff**

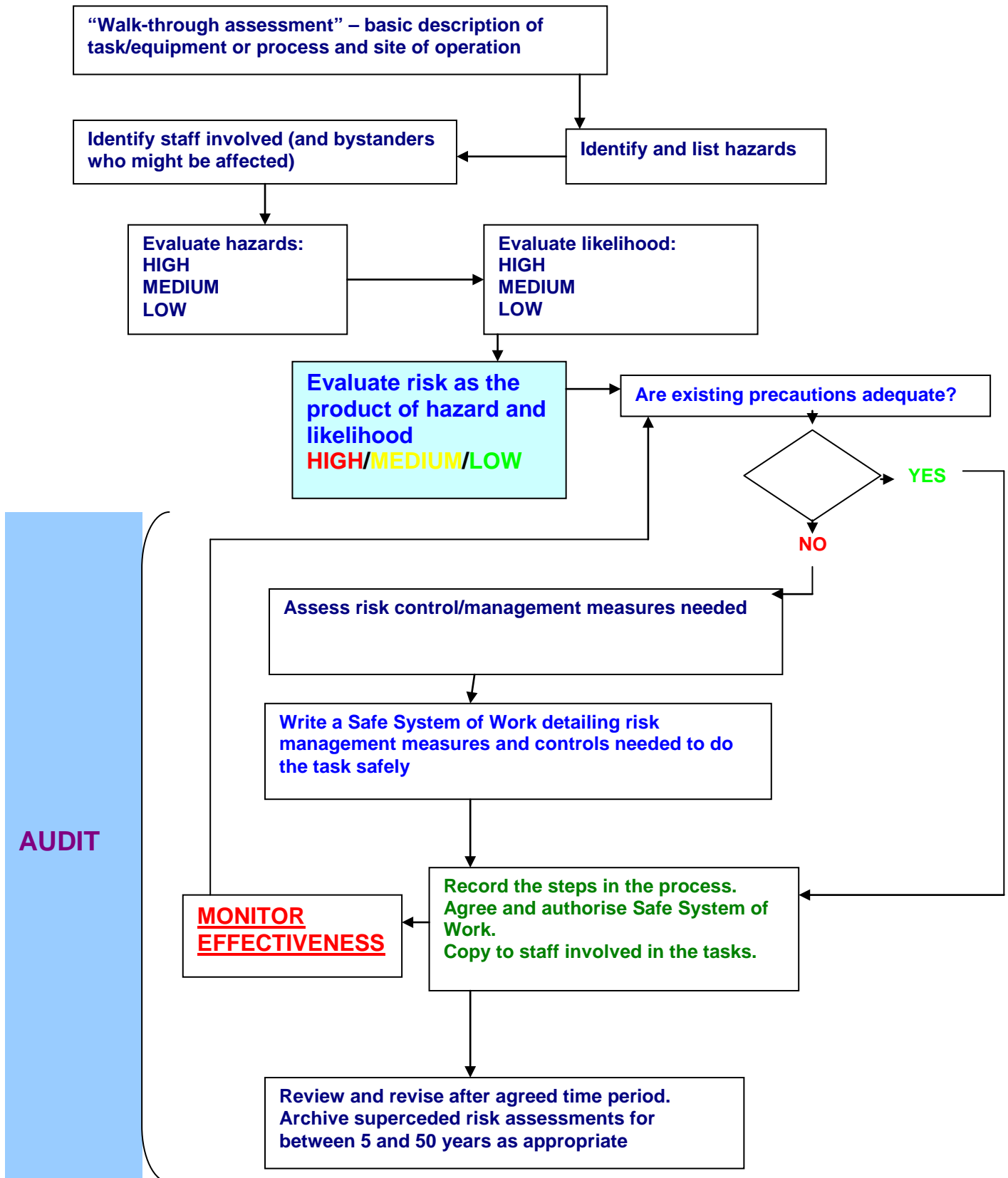
8.4.1 Employees have duties under Sections 7 & 8 of the Health and Safety at Work etc. Act 1974 (HaSaWA). These employee duties include:

- Taking care of their own safety and the safety of others affected by their acts or omissions
- Co-operating with the employer to enable duties or requirements to be performed or complied with
- Not intentionally or recklessly interfere with anything provided in the interests of health, safety or welfare

8.4.2 Employees, as required by various regulations and s7 of the HaSaWA are expected to:

- Co-operate and participate in the carrying out of the risk assessment process
- Follow the significant conclusions of risk assessments adhering to any measures, controls or procedures identified to reduce the risks of an activity or task
- Use any machinery, equipment, dangerous substance, transport equipment means of production or safety device provided in accordance with training and instructions
- Make proper use of PPE
- Inform their line manager of any shortcomings in the protection arrangements for health and safety (hence report if they believe the controls under a risk assessment are not sufficient to adequately control risk)
- Inform management of imminent / serious danger

# Risk assessment and risk management – SYSTEM DIAGRAM



## 9 WHAT MIGHT GO WRONG? – possible sources of system and individual failure

### Management:

**The “Piper-Alpha syndrome”:** The system is perfect in theory but everyone is operating it simply to conform with the law. There is no safety culture because there is no ownership of or commitment to the safety systems. **Remedy** – leadership by management example, involvement of staff in the assessment and operation of safety systems.

**Failure to identify all relevant hazards:** Inadequate coverage of tasks, equipment or processes on sites **Remedy** – Monitor Section/Group leaders with regular inspection

**Underestimation of risk:** The tendency to minimise perception of risk in order to get the job done (scientists may be tempted to deliberately ignore or underestimate obvious risks in order to complete their work). **Remedy** – Monitor effectiveness of control measures. Checking on justification. Assessments should consider all possibilities. Involvement of ‘independent’ or expert assessors. Health & safety must take its correct place and be considered at least equal to other considerations such as satisfactory completion within time and budget.

**Overestimate of staff capabilities:** If staff for a particular activity are drawn from a “high potential risk group” there may be difficulties in competing the job. **Remedy** – See NERC Procedure Number 9: High Potential Risk Groups - [http://www.nerc.ac.uk/about/work/policy/safety/documents/procedure\\_highrisk.pdf](http://www.nerc.ac.uk/about/work/policy/safety/documents/procedure_highrisk.pdf) .

**Poor quality risk assessment:** **Remedy** – Better training and supervision of risk assessors. Improve the attitudes of risk assessors through more effective involvement of line management.

**Lack of means of implementation:** although the risk assessment requires certain controls or improvements, for other reasons such as time, effort or cost, these are not fully implemented yet work goes ahead. **Remedy** - Ensure management has checked on actions and implementation of controls before work goes ahead.

### Staff:

**Failure to comply with Safe Systems of Work ...** or cutting corners to get the job done. **Remedy** – The message is ‘the apparent short-term saving of time could be very expensive in injury time’. In extreme cases, it is a disciplinary offence in NERC if safety instructions are not followed.

HSE have identified common pitfalls in risk assessment which are given in Appendix G.

**MAKE SURE THE MESSAGE IS CONVINCING, CONSISTENT AND ENFORCED**

## 10 REFERENCES

1. INDG163(rev3) HSE Leaflet ‘Five steps to risk assessment’  
<http://www.hse.gov.uk/pubns/indg163.pdf>
2. HS(G)65 HSE Guidance Book ‘Successful health and safety management’  
<http://www.hse.gov.uk/pubns/books/hsg65.htm>
3. L21 Approved Code of Practice and Guidance ‘Management of Health and Safety at Work - Management of Health and Safety at Work Regulations 1999’ 2<sup>nd</sup> Edition 2000 ISBN 0717624889  
(note: this is the old version that has been withdrawn and not currently replaced)
4. HSE Research Report RR151 - Good practice and pitfalls in risk assessment  
<http://www.hse.gov.uk/research/rrpdf/rr151.pdf>
5. HSE Principles of sensible risk management, <http://www.hse.gov.uk/risk/principlespoints.htm>

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## APPENDIX A: GENERAL RISK ASSESSMENT GUIDANCE

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### A SUGGESTED METHOD FOR EFFECTIVE GENERAL RISK ASSESSMENT

A risk assessment involves identifying the possible hazards associated with work activities arising out of NERC operations. It considers the likelihood of harm from those hazards occurring under the conditions of use; evaluates how well the risks involved are controlled; takes into account the existing precautions together with their effectiveness and specifies any additional precautions necessary to adequately control the risk.

#### PRACTICAL STEPS FOR EFFECTIVE RISK ASSESSMENT:

##### I. Walk Through Assessment

'Walk-throughs' are intended to establish initial priorities - the identification and prioritisation of significant risks to ensure these are adequately controlled.

A 'walk through' exercise is a quick method of identifying the key activities and concerns associated with any area or project. The 'walk through' can be:

- An actual walk-through of an area, drawing up an inventory of activities undertaken
- A 'desk top exercise', identifying the key tasks that are undertaken
- A 'brainstorming' session with managers and staff contributing to descriptions of what is going on and where.

Part of the process includes asking and discussing the hazards with the staff involved.

##### 2. Task Identification

List the type of premises, the activities being carried out, including occasional and non-routine operations, and roughly break them down into their component parts, i.e. the steps or tasks involved in each activity, so they can be considered separately to identify the individual hazards. It is possible to undertake this in a slightly different manner and group the hazards together if there is likely to be repetition of individual hazards under different tasks, e.g. use of flammable solvents.

Using a basic understanding of the working structure of the site or location, consider the inter-actions and inter-dependencies of different activities and where they will be carried out.

Assessments are best conducted by a group, rather than by single individuals. The 'Risk Assessor' should be competent, suitably trained and knowledgeable. The assessor must be able to work well with the line manager responsible for the area under consideration. The 'Risk Assessment' Group can include staff, health and safety representatives and the H&S Advisor.

It will help to avoid confusion to break down the activities into logical 'chunks' relating to either specific buildings, offices, laboratories, particular plant or machinery, rather than attempting to cover everything in a single assessment.

The NERC Risk Assessment form may be helpful to capture the range of tasks and hazards that may be found, along with precautions.

##### 3. Hazard Identification

Having identified the main tasks involved in the activity being assessed, ideally by group effort, the next step will be to identify the hazards associated with each task. There are a number of ways of doing this: the first is by brainstorming within the group and it is here that the benefit of talking to the people who actually do the work comes into play. A second method is to use a checklist such as that

given in Appendix B. The advantage of brainstorming is that it is an open page; the disadvantage is that without a guide, significant hazards may be missed. With a checklist the problem may be that thinking is constrained by the list and people do not think 'outside the box'. It is important that assessors analyse all the possible adverse consequences and ask 'what could possibly be go wrong'. This must be tempered with reality but just because something has not happened before does not guarantee it will not happen in the future. In particular, it is important to consider what are termed 'High Impact (or Consequence), Low Frequency' events which may overall give a low risk score but if they do occur, may cause very serious damage. An event at a nuclear power station or the collapse of a building is an example of this.

A third hazard identification method is to use the **PEME (People, Equipment, Materials, Environment)** methodology (see Appendix C) to help identify hazards.

It is likely that a combination of these methods involving experts, specialists and others with experience of the activity and previous problems will need to be applied to identify all hazards

Hazards could be associated with:

- Machinery
- Equipment
- Tools
- Physical aspects of plant and premises
- Organisational procedures
- Job design
- Chemical/biological hazards
- Ergonomic problems
- Hazards to and from others involved e.g. members of the public, visiting scientists, contractors.

The methodology suggested here to assess and rank risks is a simple system, a basic form of quantified risk assessment. Use of a quantified risk assessment system is good for inexperienced assessors and allows an easy ranking of hazards and likelihoods within the assessment group. Its main drawback is that different people have different perceptions of risks and assign different values, although this is countered to some extent by doing it as a group and reaching a consensus. Different opinions between different groups are more of a problem as they may reach very different conclusions on the risks for the same activity.

This is best overcome by including experienced assessors in the team.

The system proposed here is assigning Low (1) / Medium (2) / High (3) for Hazard and the same for likelihood. This gives a 3 x 3 matrix with nine possible boxes or scores. This can be expanded into a 5 x 5 matrix which is acceptable but it makes it more difficult to assign scores and distinguish between the 25 boxes. Some schemes use a 10 x 10 matrix but this is pointless and does not necessarily give the improved discrimination between risks that it may apparently suggest. Whatever scheme is applied, the boxes are normally grouped to give risk levels. NERC aims for three groups of risk: Low / Medium / High. Some schemes add extra groupings above and below these risk groups such as 'trivial' and 'unacceptable' but these do not necessarily make the process clearer.

The recommended **hazard** rating scale for the severity / consequence of the hazard being realised under the conditions of use is:

**High (score 3) - Hazard capable of resulting in death, severe injury, illness or major loss (equipment or buildings)**

**Medium (score 2) - Hazard capable of resulting in injury / illness requiring absence from work or equipment damage**

**Low (score 1) - Hazard resulting in minor injury requiring first aid treatment. Minor consequential loss**

## 4. Evaluating Likelihood

It is far more difficult to estimate the likelihood of harm arising from a hazard than evaluate the hazard and some hazards will be impossible or very unlikely to occur under the conditions of use.

The most common rating system requires a subjective judgement based on all the information available. There are far more potential variables than for hazard:

- Who is doing the task?
- How experienced are the staff?
- Are there work pressures such as restricted time or opportunity?
- Is there long or extensive experience of doing the work so a good history is available
- What kind of relevant training and supervision do the staff have?
- How many times is the task performed?
- What is the reliability of equipment?
- How long does the work take (exposure)?
- Is there data on failure rates and accidents or near misses elsewhere?

One problem is how do you consider likelihood of something going wrong: is it with existing precautions in place or is it without any precautions? For the purposes of the exercise it is best to consider likelihood without any precautions in place but in reality it is very rare that no precautions are ever in place. However, understanding the inherent likelihood of something going wrong is important in assessing risk and assigning precautions.

The recommended **likelihood** rating scale is:

**High (score 3) - Likely to occur imminently - hazard exists permanently - e.g. fire**

**Medium (score 2) - Likely to occur in time - hazard exists intermittently or the hazardous operation occurs occasionally**

**Low (score 1) - May occur in time - hazard exists infrequently and there is a low expectation of occurrence.**

## 5. Quantifying the risk of injury or other loss

Risk is the product of the scores for Hazard and Likelihood, which in a 3 x 3 scheme is from 1 to 9 with four possible scores of 1, 3, 6 or 9. It should be noted that not all the resultant scores hence risks are necessarily equal, even if they have the same numerical value. A 3 obtained from a very serious hazard that occurs only infrequently is not the same as a 3 obtained by a trivial injury that is likely to occur frequently. One may possibly kill you (even if it only occurs once) whereas the other is possibly just an irritation, yet they have the same score. This is the major drawback of the numerical system and with such a simple matrix no means of 'weighting' different boxes is possible. In other words, although it appears so, the matrix and its conclusions should not necessarily be viewed as being symmetrical with all the same colours / scores being equal; high hazard consequences are liable to be more serious than high likelihood.

Do not be beguiled by the numbers, they mean nothing on their own, it is the information and evidence gathered during the course of the process that matters and the way in which they can concentrate the mind and rank the risks.

The **numbers are an easy way of prioritising the actions required** to control the risks identified. The possible **risk scores** are tabulated below:

<b><u>RISK =</u></b> <b><u>HAZARD X LIKELIHOOD</u></b>	<b>HAZARD</b> <b>LOW (1)</b>	<b>HAZARD</b> <b>MEDIUM (2)</b>	<b>HAZARD</b> <b>HIGH (3)</b>
<b>LIKELIHOOD</b> <b>HIGH (3)</b>	<b>3</b> <b>MEDIUM</b>	<b>6</b> <b>HIGH*</b>	<b>9</b> <b>HIGH</b>
<b>LIKELIHOOD</b> <b>MEDIUM (2)</b>	<b>2</b> <b>LOW</b>	<b>4</b> <b>MEDIUM</b>	<b>6</b> <b>HIGH*</b>
<b>LIKELIHOOD</b> <b>LOW (1)</b>	<b>1</b> <b>LOW</b>	<b>2</b> <b>LOW</b>	<b>3</b> <b>MEDIUM</b>

\* The 'high' risk score of 6 given by **high likelihood x medium hazard** is not quite the same as the 6 score given by **high hazard x medium likelihood**, which is more serious risk.

## 6. Non-quantified (qualitative) risk assessment methods

The HSE do not actually recommend the use of quantitative risk assessment for general risk assessments. In NERC's opinion the use of the above quantitative method is useful, especially for inexperienced risk assessors until they have become very experienced, as it allows a clear ranking of the hazards, even if the absolute numbers differ between assessors. In any case, no matter what the absolute numbers suggest, it is always necessary to classify the risks into groups or categories and it is difficult to distinguish between more than three levels of risk - High / Medium / Low (except for the 'do nothing' or 'do not do' options which can be considered sub-sets of Low and High).

Very experienced risk assessors may miss out the quantitative step and move straight to risk categorisation except they must record their reasoning, methodology and other aspects they have taken into consideration in reaching their conclusion and be certain to rank their risks. This should not be used as a shortcut which avoids writing – it must use the same rigour as quantitative methods and possibly be calibrated by reference to competent persons or specialists in the field being assessed.

## 7. Actions required at different risk levels

### Low Risk

The risk is acceptable with very little further action required. Information, instruction and training may be given to staff together with simple procedural and technical controls.

### Medium Risk

Further precautions should be applied but work may go ahead if justified with all reasonably practicable measures implemented. This level of risk may have to be accepted (especially if hazard is considered high) but attempts to reduce the risk should be made. A programme for future improvements to reduce risk to low should be identified, planned, actioned and monitored.

### High risk

Work should not go ahead. Remove risk by elimination or substitution with safer method. If the work is vital and the risk can be justified, it should be subject to senior management approval. It may only proceed subject to a detailed risk assessment under a comprehensive 'safe system of work' or SSW.



It will probably need to include using highly experienced staff, stringent / failsafe precautions, careful training, back-up systems, careful preparation and practice, extensive emergency precautions, highly reliable systems/ equipment and strict supervision.

Appendix B gives guidance on what a SSW looks like, together with a checklist at Appendix C.

A suggested outline 'walkthrough' risk assessment form is given below in 13 and is useful for training and initial risk assessment purposes. For 'low' or trivial risks that are not worthy of further attention its completion may be all that is necessary to demonstrate that all risks have been considered.

## 8. Assigning Precautions

### 8.1 Deciding if current procedures are adequate to control risks.

Consider the risk rating without any precautions in place (inherent risk). Then identify the control measures that will be implemented to establish if the controls reduce the residual risk to an acceptable level. In most cases, especially with existing workplaces and work activities, the existing control measures that are in place will be adequate. If the task is entirely new, more care is required. If additional controls are considered necessary to reduce risk further, these should be added and a re-assessment performed to give assurance that the residual risk is now at an acceptable level.

**It should be noted that the Hazards involved in a task are normally an inherent property of the way the work is undertaken so it is very difficult to reduce the level of hazard without changing the way the work is undertaken. Most controls are aimed at reducing the likelihood of the hazard occurring.**

Not all controls are equal and some are more preferred and reliable than others. Approaches which **control the hazard at source** and lead to a **safe place of work** are preferred to those that lead to a **safe person**. Alternatively, **collective precautions** that protect all persons liable to be exposed to the hazard are to be preferred over **individual precautions**. In addition, the efficacy of individual precautions depends on how well each person applies and follows them.

Personal protection is the least preferred control measure used as the last resort when all other safety measures have been applied or discounted. Nevertheless, use of personal protective equipment (PPE) will give a supplementary level of protection and assurance.

### 8.2 Preferred hierarchy of controls

The hierarchy of preferred controls, following HSE advice and adapted from but closely related to the original NERC hierarchy, in descending order of preference, is:

- **Eliminate** risk – do not perform the hazardous work (the risk cannot be justified)
- **Reduce hazard at source, substitute or avoid** – perform the work in a different way involving less hazardous methods
- **Control at source** using engineering methods:
  - **Isolate or remove** - so that persons cannot come into contact with hazard
  - **Contain** – use enclosure (e.g. guarding) to prevent access to the hazard
- **Administrative controls**
  - **Procedure** – use procedural methods to control hazard and reduce risk
  - **Reduce exposure** – e.g. by cutting the working time.
  - **Education, training, supervision** – make improvements.
- **PPE** – protect the individual with personal protective clothing or equipment

An alternative hierarchy often used has the mnemonic **ERICPD**

- Eliminate
- Reduce
- Isolate
- Contain
- Protect
- Discipline

### 8.3 Worked example of applying hierarchy of controls to working with a tiger:

- **Eliminate** - Do not do use tiger - risk considered too high unless it can be justified (Eliminate)
- **Substitute** tiger with other less hazardous animal
- **Isolate** tiger – e.g. leave in jungle or place on island where no-one lives or visits (assuming tiger doesn't swim!)
- **Contain** tiger in cage
- Use safe working **procedure** (SSW) when landing on island or entering cage
- **Reduce exposure** by minimising the number of times needed to land on island or enter cage
- **Train** staff in safe working procedures such as use of sleeping dart
- Staff to wear **personal protective equipment** (e.g. body armour) to minimise effect of tiger attack (liable not to be very successful)

*Note: A tiger in the jungle is less of a risk than a tiger in a crowded town – the hazard is the same (getting attacked and eaten) but the likelihood of being attacked is much less.*

### 8.4 Put the control measures identified in place.

When measures have been determined, carry them out as soon as possible in order of priority, highest risks first. This is the crucial part of a Risk Management Policy. It may be helpful to log each action and agree who is responsible. If there are budget implications, calculate the cost of the various options and report back. Time-scales must be agreed for the necessary actions to be completed.

## 9. Record findings

Using the Assessment Form below, record all the findings of the assessment, including a review date. Use the assessment to ensure that control measures are put in place.

Include any notes, diagrams and other references that help to show how the risk assessment evaluation was achieved. This will allow NERC to successfully defend against scrutiny from regulatory agencies, the HSE and EA, and pressures from collaborators to show we have a robust risk management process - the first question asked will be: "Have you done a risk assessment?"

If any part remains as a "high risk" the work must not proceed without authority from senior management. Staff must not be forced to carry out such work against their will. High risk activities may be required to be included in the corporate risk register.

## 10. Acceptance (Approving / Authorisation / Agreement)

**Make sure the Risk Assessment Record or SSW form etc. is signed by the manager to establish they have accepted the risk assessment as being suitable and sufficient and that they believe the specified measures, controls and precautions will be sufficient to adequately control the risk.**

Managers must decide on and approve of the actions taken; staff must be aware of, and agree to, the provisions for risk management. It should be noted that signing the assessment or form will not lead to increased liability or responsibility but quite the opposite. Accepting the risk assessment will prove

the manager has fulfilled their duties and agreed the precautions. In the absence of any such proof of involvement in the risk assessment process they might be more liable to further action and sanction.

A checklist to help assessors and managers ensure that more detailed 'general' risk assessments are suitable and sufficient is given at Appendix D.

The effective management of health and safety in NERC is a key management responsibility - management at all levels have vital roles in ensuring the risk assessment process is carried out honestly and effectively. The integration of risk assessment into all NERC activities is vital for effective safety management.

### **11. Is this the end of the matter?**

The risk assessment and control measures should be reviewed (preferably annually by the group involved). Where there is significant change (e.g. new machinery or equipment, updated methods, technological developments, different staff involved with less experience) re-assessment is required. If there has been an accident, incident or near miss which suggests inadequate control of risk a similar re-assessment will also be needed. You must document your findings to maintain a clear audit trail.

**Effective managers should also consider foreseeable changes or problems.**

### **12. Communication**

Any actions taken as a result of the assessment **must be communicated to staff** and other people who may be affected, e.g. visiting scientists or contractors.

The risk assessment process needs to be practical and take account the views of staff who have the practical knowledge to contribute and should be appropriate to the nature of the work.

**Communication is a two way process – staff must make management aware of problems with the risk assessment or SSW as they arise.**

### **13. Walk-through assessment form**

See below:

### NERC 'WALK-THROUGH' RISK ASSESSMENT FORM

Assess the Level of Risk				Control Measures and Re-assessment				Other Actions
Description of Activity and Associated Hazards	Hazard (Consequence): (a)  3 – Major 2 – Serious 1 – Slight	Likelihood: (b)  3 – High 2 – Medium 1 – Low	Risk Rating: = (a) x (b)  High (6 to 9) Med (3 to 4) Low (1 to 2)	Controls in place or to be implemented	Revised Hazard (Consequence) (a)  3 – Major 2 – Serious 1 – Slight	Revised likelihood (b)  3 – High 2 – Medium 1 – Low	Revised risk rating = (a) x (b)  High (6 to 9) Med (3 to 4) Low (1 to 2)	

## 14. RECORDING THE SAFE SYSTEM OF WORK

Suggested headings that could be used or adapted to create a form to record a SSW are:

1. Activity covered by SSW including description of work
2. Identifier, version number and date of issue
3. Author, name and signature
4. Approver / Responsible Manager, name and signature
5. Related risk assessment(s) / safety document(s) / permit(s) to work / method statement(s)
6. Staff involved in activity (or task / step), including necessary level of competency if relevant
7. Significant hazards involved and their risk (H / M / L), listed in order of level of risk
8. Description of working methods to be used in activity (listing each task / step involved separately in required sequence if necessary):
  - i) Task / step
  - ii) Location / area / type of environment
  - iii) Controls to be applied for each task detailing safe working methods (using preferred hierarchy of controls – safe place over safe person / collective over individual)
9. Implementation including special tools or equipment, personal protective equipment, training, informing or excluding personnel, reinstatement of area, waste disposal etc
10. Actions to be avoided
11. Emergency provisions
12. Supervision and monitoring arrangements
13. Reviewed by name, signature and date
14. Date of next review

There may also need to be a signature box, either below the SSW or on a separate sheet, with names and signatures (with date of signing) of persons doing work, stating they understand and agree to follow the safe system of work

SSW forms should be retained by the relevant manager responsible for the area or activity covered by the SSW. Electronic copies of the SSW & associated documents should be archived and copied to the Local Safety Adviser or saved in a suitable electronic document storage system so they may be available to other users who may need to be aware of, or follow, the SSW.

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## APPENDIX B: POTENTIAL HAZARD SOURCES CHECKLIST (not exhaustive)

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### Chemicals

- scale and duration
- toxic/harmful/irritant
- flammable
- corrosive
- explosive
- volatility (gas/vapour)
- carcinogen/mutagen
- sensitiser
- reproductive hazard
- water reactive
- pyrophoric
- decomposition
- oxidiser
- incompatibilities
- runaway reaction

### Biologicals

- scale of work
- infectious
- hazard Group 3/4
- genetically modified
- toxins / allergens
- zoonoses

### Unattended work

- lone working
- working hours/  
overnight
- emergency info

### Radiation

- ionising
- non-ionising e.g. laser/  
UV/IR/microwave
- noise

### Fire

- escape
- warning/detection
- extinguishing

### PPE

- suitability
- incorrect specification
- hazards from PPE
- fit & inadequate choice
- compatibility of items
- availability

### Equipment

- suitability

- dangerous parts
- ejected material
- heat
- vibration
- access
- stability
- maintenance
- programmable
- controls/auto start
- strength/failure
- emergency stop

### Energy Sources

- electrical
- mechanical
- compressed gas
- hydraulic
- isolation
- stored energy
- rundown time

### Manual Handling

- space
- weight/size
- human capabilities
- grip/handles
- uneven load
- uneven surfaces/  
slopes etc.
- high/low/difficult  
location

### Other ergonomic

- location of work
- layout of controls
- height of working
- speed/frequency
- repetitive actions
- awkward

### Gravity

- fall from height
- slips/trips/falls
- falling material
- overturning

### Fieldwork

- remote location
- gaining assistance
- communication
- weather

### Pressure

- high pressure
- vacuum
- over pressure
- catastrophic failure

### Temperature

- hot/cold environment
- hot/cold materials incl.  
cryogenics & dry ice
- hot/cold surfaces

### Lighting

- general lighting
- local lighting
- glare
- see detail/colour
- stroboscopic

### Other workplace issues

- space
- work surfaces
- hearing (e.g. audibility  
of alarms)
- distraction
- draughts/ventilation
- flooring
- cleanliness

### Waste

- segregation
- storage
- make safe
- transfer
- disposal
- spills

### Other risks not identified should be considered under all headings

### Other 'Others'

- sharps/glass
- transport
- travel
- driving
- confined spaces
- lack of oxygen
- violence/assault
- stress
- overseas working

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## APPENDIX C: PEME: PEOPLE / EQUIPMENT / MATERIAL / ENVIRONMENT

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**PEME** is a useful mnemonic to aid hazard identification. Considering each of the headings in turn is a simple, easy method to check likely hazards associated with the task or activity under consideration have been identified. Not all the headings apply to every task but it forms a check all relevant hazards have been covered, especially when used with the hazard checklist. Questions are given under each heading but these are merely examples and not intended to be exhaustive.

### People

People will bring a range of issues with them to a task or activity:

1. Competence
2. Experience or training required
3. Physical capability / fitness to do the work required
4. Personal issues
5. Young persons or new and expectant mothers

Other possible people issues include the number of people needed for a task, duration of task (i.e. level of exposure), management of the task and the supervision requirements.

### Equipment

A range of equipment is likely to be involved in the task or activity under consideration:

1. Is it suitable for the task (hazards may be introduced if the wrong type of equipment is used)?
2. Is the equipment potentially hazardous e.g. needs guarding?
3. Are there energy aspects (stored pressure, electricity, mechanical, run-down time, isolation)?
4. Does it need testing, maintenance or calibration to ensure it is safe (e.g. electrical or pressure testing)?
5. Does it have to be cleaned, decontaminated or moved?
6. What if the equipment breaks down?
7. Are there associated hazards such as heat, trailing leads, radiation, emissions?

### Materials

This covers all the substances that may be used or waste generated by the task or activity:

1. Are there any health hazards from chemicals or substances involved?
2. Are there physical hazards with material e.g. flammability, corrosivity, explosivity?
3. Can hazardous airborne levels of material be generated e.g. aerosols, fumes, dust?
4. Are there raw material issues e.g. due to size, weight, nature moving or storage)?
5. Is any special waste generated that must be disposed of?

### Environment

This is the place where the work is undertaken

1. Means of access/egress
2. Lighting, heating and ventilation
3. Layout (ergonomic)
4. Welfare / Housekeeping
5. Work at height
6. Uneven floors or slopes, ramps and steps
7. Wet, slippery or damaged flooring
8. Weather conditions
9. Tripping hazards and obstructions

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## APPENDIX D: DETAILED GENERAL RISK ASSESSMENT CHECKLIST

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- Have all the activities and their elements been identified?
- Have all the hazards involved in those activities been identified?
- Has sufficient hazard information been obtained to estimate their severity?
- Have you identified the likelihood of that hazard harming staff?
- Has a risk level (severity of hazard x likelihood of occurrence) been assigned?
- Can that level of risk be justified or can safer alternatives be identified?
- Has the activity been broken down into individual tasks and **PEME** (**P**eople / **E**quipment / **M**aterials / **E**nvironment) applied?
- Has the hierarchy of control measures [Eliminate / Reduce at source (substitute or avoid) / Isolate (or remove) / Contain (or enclose) / Procedure / Reduce exposure / Educate (train, supervise) and PPE] been applied and followed?
- Are the controls maintained, examined and tested?
- Is there adequate monitoring & supervision?
- Has adequate information, instruction and training been given?
- Has the use of suitably competent staff been ensured?
- Have health issues which would require contacting the Occupational Health provider been identified?
- Is there a need for occupational hygiene monitoring to be undertaken (what, by whom and when)?
- Are there any risks to new and expectant mothers or young persons?
- Are suitable emergency procedures specified?
- Have the significant conclusions been recorded?
- Is a safe system of work (SSW) necessary?
- Has any training required been identified?
- Is a review date specified?
- Has the risk assessment been approved / authorised, communicated to relevant staff and issued?



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## APPENDIX E: WHAT IS A SAFE SYSTEM OF WORK?

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A 'Safe System of Work' (SSW) arises out of the risk assessment for a particular task or activity and the two documents have certain similarities. The Risk Assessment is a systematic examination of an activity or task that identifies all the hazards involved and ranks, prioritises the risks arising from those hazards and identifies suitable controls. The SSW for that activity or task includes, and is informed by, the original risk assessment and adds a formal working method statement describing how the controls are to be implemented and the steps necessary to eliminate the hazards or minimise the likelihood of them occurring. The aim is to eliminate or reduce the risks to everyone affected to an acceptable level.

It consists of a number of steps:

- **Analysis of the activity** – what is used; who does what; when the work is to be done; where the work is to be carried out; how the activity is to be undertaken; covering interactions and effects on other persons/activities
- **Identification of the hazards associated with the activity** – consider the hazards to which people may be exposed as a result of undertaking the work e.g. use of tools, substances, plant, other equipment etc.
- **Assessment of the risk involved** - assess the severity and likelihood of the hazards arising from the activity affecting you under the conditions and proposed method of carrying of the work
- **Identification of the existing methods of control and if additional controls are necessary** – consider the nature of the intrinsic risk and whether existing controls methods are sufficient and robust enough to adequately control the risk. If there is any doubt then identification of additional controls, modification of the proposed method of work and/or future improvements is required
- **Definition of the safe methods of work** – having broken down the activity into its component elements or sequence of steps (e.g. preparation, authorisation, planning, operation, breakdown, maintenance, cleaning up, emergencies), specify safe methods for each step and document the work instructions
- **Implementation of the working system / procedure** – implement the SSW, providing training for all affected employees and supervisory staff. Ensure training details are recorded
- **Checking and regularly re-assessing the activity** – check when first undertaking to ensure the SSW is operating effectively, the identified precautions are practicable / match the risk and work instructions are being followed; make any necessary amendments to system if necessary. Periodically review the system and update as necessary in light of changed circumstances, new evidence or statutory requirements/guidance/methods of work.

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## APPENDIX F: CHECKLIST FOR A SAFE SYSTEM OF WORK

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- Is the activity covered by the system clearly stated?
- Does the system spell out the hazards that will arise during the work and assess their risk?
- Does it quantify or rank the risks and specify how they should be controlled?
- Are the classes of staff involved and their required levels of competence specified?
- Is it clearly stated who has overall responsibility for safe conduct of the activity?
- Is the necessary information, instruction and training specified and delivered?
- Is it clear what Personal Protective Equipment (if any) is necessary?
- Is fitness for the work or any other health aspect considered and are occupational health requirements specified if necessary?
- Are the necessary tools and equipment listed and available?
- Does it specify when and where specific safety procedures (e.g. such as informing relevant personnel, removing equipment from use, obtaining permits to work, isolations, labelling & signs) should be carried out and reinstated/removed?
- Do the precautions specified aim for a 'safe place' over a 'safe person' and, if not, are suggested improvements included and progress on their implementation monitored?
- Are safe working conditions and precautions specified for all stages of the activity (including unwanted but foreseeable occurrences)?
- Does the system require exclusion from the area of all people not involved with the job and specify how this will be achieved?
- Is good housekeeping a condition of the system?
- Does it include decontamination requirements, especially if components must be removed or equipment taken to a safe place?
- What mention is there of communication, co-operation and co-ordination between people engaged in the work or others who might be affected by it e.g. visitors, contractors, students, etc.
- Are lone working issues covered?
- Are clear arrangements in place to inform everyone involved when the activity covered by the system is started and completed?
- Are emergency and first aid arrangements clearly identified?
- How is the system checked to see if it is practicable and acceptable to the persons concerned, matches the risks, complies with the safety policy and meets all legal requirements?
- How is the system made known to all persons concerned, including management and contractors or other persons who may be affected by its conduct?
- What are the arrangements for monitoring the working of the system in practice and reviewing / revising it as necessary?

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## APPENDIX G: PITFALLS IN RISK ASSESSMENT

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**From HSE 'Good Practice and Pitfalls in Risk Assessment',  
HSE Research Report 151, HSL, 2003**

- Carrying out a risk assessment in an attempt to justify a decision that has already been made
- Using a generic assessment when a site-specific assessment is more appropriate
- Carrying out a detailed quantified risk assessment without first considering whether any relevant good practice was applicable, or when relevant good practice exists
- Carrying out a risk assessment using inappropriate good practice
- Making decisions on the basis of individual risk estimates when societal risk is the appropriate measure
- Only considering the risk from one activity
- Dividing the time spent on the hazardous activity between several individuals - the 'salami slicing' approach – thereby spreading the risk more widely (but may sometimes be appropriate)
- Not involving a team of people in the assessment or not including employees with practical knowledge of the process/activity being assessed
- Ineffective use of consultants
- Failure to identify all hazards associated with a particular activity
- Failure to fully consider all possible outcomes
- Inappropriate use of data
- Inappropriate definition of a representative sample of events (e.g. not considering high consequence / low frequency events)
- Inappropriate use of risk criteria
- No consideration of "As Low As Reasonably Practicable (ALARP)" or further measures that could be taken
- Inappropriate use of cost benefit analysis
- Using 'Reverse ALARP' arguments (i.e. using cost benefit analysis to attempt to argue that it is acceptable to reduce existing safety standards)
- Not doing anything with the results of the assessment
- Not linking hazards with risk controls (not using proportionality or matching)

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## APPENDIX H: HSE PRINCIPLES OF SENSIBLE RISK MANAGEMENT

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The Health and Safety Executive (HSE) are well aware of the bad publicity that poor risk management creates (although this is largely a myth with health and safety being blamed for decisions that are made for totally different reasons). The best example of this is the 'Bonkers Conkers' story when a school supposedly banned games of conkers unless eye protection was worn, the truth of which is hotly denied but whose underlying safety basis the HSE discount.

To counter this poor image of risk assessment and risk management, the HSE has introduced various initiatives. There is a Mythbusters poster programme (discontinued but old posters still available) and a Mythbusters panel, led by the chair of the HSE, to issue robust news release responses when newspapers publish incorrect or misleading articles blaming health and safety for poorly thought-out decisions.

# Great health and safety myths



**The myth** Kids must wear goggles to play conkers

**The reality** This is one of the oldest chestnuts around, a truly classic myth. A well-meaning head teacher decided children should wear safety goggles to play conkers. Subsequently some schools appear to have banned conkers on 'health & safety' grounds or made children wear goggles, or even padded gloves!

Realistically the risk from playing conkers is incredibly low and just not worth bothering about. If kids deliberately hit each other over the head with conkers, that's a discipline issue, not health and safety.



Go to [www.hse.gov.uk/myth/index.htm](http://www.hse.gov.uk/myth/index.htm) to find out more

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As part of this campaign the HSE publish their 'Principles of Sensible Health and Safety Management':

1. Sensible risk management **is** about:

- ✓ Ensuring that workers and the public are properly protected
- ✓ Providing overall benefit to society by balancing benefits and risks, with a focus on reducing real risks – both those which arise more often and those with serious consequences
- ✓ Enabling innovation and learning not stifling them
- ✓ Ensuring that those who create risks manage them responsibly and understand that failure to manage real risks responsibly is likely to lead to robust action
- ✓ Enabling individuals to understand that as well as the right to protection, they also have to exercise responsibility

2. Sensible risk management **is not** about:

- × Creating a totally risk free society
- × Generating useless paperwork mountains
- × Scaring people by exaggerating or publicising trivial risks
- × Stopping important recreational and learning activities for individuals where the risks are managed
- × Reducing protection of people from risks that cause real harm and suffering