Risk Assessment

Module 4

ROYAL SOCIETY OF CHEMISTRY

Health & Safety Essentials

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Evaluate the risks and decide on precautions

Having identified the hazards and the persons likely to be harmed and how, it is time to evaluate the risks:

Remember:

RISK is the likelihood that the hazard will actually cause harm.

Risk assessment requires assessing two main factors:

1 **Likelihood** – evaluation of the probability that the consequence will occur

2 **Severity** – the scale of the consequence that could occur.

'**Likelihood**'[17] - when determining likelihood, you will need to consider the following:

- The location of the hazard
- The extent of exposure (time, concentration, duration)
- When is the hazard likely to occur
- How many people are likely to be affected
- The ability of the people who are likely to be affected to deal with the situation
- Effectiveness of existing control measures

'**Severity**'[18] - this is an assessment of the scale of the consequence that could occur if the risk was not controlled properly. It is important to be realistic so that appropriate and proportionate controls are put in place to reduce the risk to as low as is 'reasonably practicable'.[4]

E.g. if a cable is trailing across a laboratory floor in a corner of the area, it is possible for someone to trip, fall over and be killed. The most realistic consequence, however, is a minor injury.

However, if that cable was placed in such a way that it was on an access route, near to other hazards such as stairs, openings or chemicals, then the severity of the consequence is greater.

There are many different examples of likelihood - severity tables to assist you in determining the level of risk. You should consult what is being used in your organisation. Likelihood and severity can also be represented in the form of a table, which can aid decision making. An example is shown below.

		SEVERITY OF OUTCOME		
		Slight (1)	Serious (2)	Major (3)
LIKELIHOOD OF EVENT	Low (1)	1	2	3
	Medium (2)	2	4	6
	High (3)	3	6	9

The Likelihood of harm:

3 HIGH (it is certain or near certain harm will occur)

2 MED (where harm will occur frequently)

1 LOW (where harm will seldom occur)

The Severity of harm:

3 MAJOR (significant injury or other major loss/damage)

2 MEDIUM (injury requiring medical treatment or other loss/damage that requires remedial/follow-up actions)

1 SLIGHT (minor first aid injury or other minor loss/damage)

The Risk Assessment Factor or 'Risk Rating'[19] is obtained by multiplying the severity number by the likelihood number to arrive at a risk factor for each hazard. This produces a number on a scale of 1 to 9. If you use this as an indication of the priority of the risk, it can help you determine the level of controls required and what priority to give them.

E.g. a risk ratings of 6 - 9 would be priority actions to address in the first instance but it should be remembered that the risk assessment factor is subjective and assigning numbers doesn't transform it into quantitative analysis. It is put together by individuals involved in the assessment and you should continually satisfy yourself that controls are adequate, and if any information comes to light to dispute that, the risk assessment should be reviewed and further controls considered.

It is a legal requirement to do all that is 'reasonably practicable'[4] to protect people from harm.

'So far as is reasonably practicable'[4]- means that measures are taken up to a point where the taking of further measures becomes grossly disproportionate to the risk. The greater the risk, the more likely it is that it is reasonable to go to substantial expense, trouble and invention to reduce or control it.

This is achieved by looking at best practice controls, such as what is current practice in your area already, guidelines and procedures in place and any information from organizations such as the Royal Society of Chemistry and the Health and Safety Executive.

The first step would be to look at what you are already doing to control the hazards, such as workplace procedures, equipment pre-use checks, personal protective equipment, maintenance procedures etc. Then compare this with best practice and see if you should do anything further to reduce the risk.

Proportionate risk control measures

In deciding on proportionate and appropriate control measures, a hierarchy is used to ensure that the most robust options are considered first.

Some people use the mnemonic "ERIC SP" to remember the hierarchy

Eliminate the hazard (remove or substitute for lower hazard option)

Reduce exposure to the risk (less time, fewer people, smaller quantity/process)

Isolate the hazard (enclosed plant/equipment)

Control exposure (engineering e.g. local exhaust ventilation)

Safe Systems of Work (procedural control/administrative control)

Personal Protective Equipment (including respiratory protection)

The upper options of the hierarchy require consideration at the 'design stage' of the activity and are the most robust/reliable requiring little or no supervision. The lower options of the hierarchy require effective maintenance of management, supervision and cooperation, all of which are potentially much less reliable.

Further information on control measures

Eliminate – this option should always be considered first where the risk is significant. This is necessary because all the other options may fail to some degree.

Reduce – this can be achieved by a suite of options such as reducing duration of exposure, reducing scale of possible consequence, reduce likelihood of consequence through better planning/design of experiments

Isolate – this is normally enclosing the hazardous activity so that the scope of the foreseeable consequence is limited. It can include more robust equipment or screening to provide a barrier

Control – is usually engineering equipment to limit exposure to the risk and can include extraction systems such as local exhaust ventilation (e.g. fume cupboard), process automation and interlocks/safety trip devices.

Use and maintenance of control measures

To use control measures effectively, you need to understand how they work so you may need further information, instruction and training. Satisfactory control of risks is only achieved when you use control measures correctly and the inspection and maintenance is effective. It is important that control equipment is maintained in an efficient state, in efficient working order in good repair, and in a clean condition. This helps to identify any trends or variations in equipment deterioration.

Routine checks on controls should be part of the normal daily or weekly tasks of designated laboratory staff.

To facilitate checking, equipment such as ventilated hoods (local exhaust ventilation) (LEV) and fume cupboards should be fitted with simple visual indicators of effective operation (e.g. air flow indicators or differential pressure gauge). Any necessary repairs or maintenance should be initiated immediately and actions recorded. It is advisable to keep a log of reported defects in the laboratory and when they have been repaired.

Other control measures require appropriate maintenance and inspection as defined in user manuals and operating instructions.

All engineering controls require thorough examination and testing at specified intervals depending on the risk, and in the case of LEV at least once every fourteen months. Competent persons, with appropriate specialist knowledge, must carry this out, and they will certify the equipment and provide suitable records, which should be kept.

Safe System of Work – A formal procedure which establishes a systematic examination of a task or process, in order to identify all of the hazards involved. This may include written procedures for safe operation, maintenance checks, procedures that reduce numbers of people in the area, emergency procedures and spillage control measures. Safe systems of work require those involved to have the necessary level of competence that will ensure the 'planned arrangements' actually take place. This is normally achieved through information, instruction, training and supervision (see below).

Information, Instruction, Training and Supervision

Information, instruction, training, and supervision is required for all persons who may be exposed to hazards so that they know the risks and the precautions needed to prevent harm or what to do in the event of an emergency. It is important to review the risk assessment with all persons that may be affected.

Information about hazards, risks and appropriate precautionary measures should be authoritative, understandable and accessible to everyone potentially exposed to the risks, including contractors and visitors to the laboratory.

Instruction should be suitable and sufficient for individuals to know how to work safely and without risk to their health and when to use a control measure. People given instructions will need to have the competence level to actually follow them whether it is cleaning, disposal, storage, use of PPE or procedures to follow in an emergency. Where individual actions are critical in the control of risks, clear instructions should be given, preferably in writing (as approved procedures or standard operating procedures or instructions).

Information and instruction are only effective when provided to people that have the necessary competence to identify and achieve the intended outcome.

Training is normally an iterative process where an activity is explained, demonstrated before the 'trainee' practices with feedback on performance being given. It should be carefully targeted at the needs of trainees to ensure that they understand the hazards and risks and are competent to carry out the necessary instructions (control measures). It is essential that training is completed and understanding assured before people are exposed to risks.

The level of **supervision** of workers is inversely proportional to their competency level. Thus, workers new to an area carrying out a process that they have not completed before would need a high level of supervision. Those experienced with the procedures and the area, and have completed the process many times previously may require a lower level of supervision, unless the nature of the process and its hazards required further controls. Supervision does not automatically mean being "glued" to someone 24/7! The level of supervision is dependent on the nature of the task, the competency of those undertaking the task, and the task environment.

Personal Protective Equipment – is lowest choice selected from the hierarchy and is often referred to as the 'last line of defence'. Where control measures higher in the list are chosen and these have failed or are inadequate, PPE may reduce the consequences of personal injury but its use has significant weaknesses.

Items of PPE have been designed with specific uses in mind and there are many limitations such as correct selection for the work, compatibility with other PPE items, difficulty of achieving correct fit and the need for maintenance, repair and replacement. In terms of risk reduction, personal protective equipment should not be the first control considered but the last after other controls have been deliberated.

Personal Protective Equipment as a control measure includes all equipment that is worn or help to reduce risk and Respiratory Protective Equipment (RPE)

Examples are:

- Respiratory Protection (facemasks, air hoods)
- Protective gloves
- Protective clothing (lab coats)
- Protective footwear (safety shoes, boots)
- Eye protection (safety glasses, goggles, visors)

It is important that policy is in place setting out the use of PPE and you know why you need PPE, and are trained to use it correctly; otherwise it is unlikely to offer the protection as required. Employers are responsible for providing protective equipment when required, and for establishing procedures to ensure that PPE is effective, maintained, and its use enforced. This will include:

- Visual checks, observation and supervising individuals
- Ensuring that where more than one item of PPE is worn the different items are compatible
- When defective equipment is noted, providing prompt action and replacement

It is best practice to wear safety spectacles as a minimum requirement at all times whilst in the chemical laboratory.

If there is a risk that can only be controlled by personal protective equipment, consider the type and duration of contact (splash, immersion), consider user (size and comfort), and consider the task and how wearing PPE will affect the user during the work activity.

You should be aware of the rules regarding the minimum level of PPE in your organisation

For detailed information related to controls for hazardous substances please review the COSHH Health and Safety Essentials Resource.

For 'hazardous substances'[20] 'COSHH Essentials'[21] (published by HSE) suggests similar hierarchical control regimes. Appropriate application of the principles of good practice for the control of exposure to substances hazardous to health will enable employers to select the optimum combination of control measures that may include:

- Totally enclosed process and handling systems
- Plant or process changes that keep the fume or vapour to a minimum, contain the substance, and limit the area of contamination if a spill occurs.
- Changes to systems of work such as methods that minimise emission, reduce peoples exposure time, and minimise the people exposed.
- Ventilation (enclosed/LEV/general)
- Safe handling, storage, transport and use of substances
- Hygiene and hand washing procedures

In laboratories these equate in practical terms to:

- Using a glove box or similar containment to achieve a higher degree of separation/containment
- Using a fume cupboard or other exhaust ventilation to achieve extraction
- Purpose-designing a special facility where a particularly stringent level of control is needed
- Storing and handling chemicals safely, in an orderly manner, using labelled containers.
- Washing your hands before leaving the laboratory and immediately if contaminated.

Safety and environmental risks from hazards such as high pressure, reactive, flammable or radioactive substances and biological agents also need to be addressed separately and proper provision made, as should risks to the environment outside the laboratory (See EHSC Note on 'Environmental Risk Assessment,'[22] 2008).