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# Hierarchy of controls

Risks to workers' health and safety caused by work activities should be adequately managed so that the risk is reduced to the lowest reasonable or technically practicable level. Many work activities create potential hazards either by the nature of the work or by substances used or made in the cause of work, and it is essential – often a legal duty on the employers underpinned by regulations and guidance – to eliminate or reduce risks arising from those hazards.

Taking an ad-hoc approach to the control of risks or the reduction of exposure to hazardous substances may not result in effective control, may be more expensive than necessary, and may in fact introduce greater risks to workers or others nearby. To encourage improvements in the control of risks and exposure to hazardous substances, European Council Directive 89/391/EEC 'on the introduction of measures to encourage improvements in the safety and health of workers at work', establishes basic rules on protecting the health and safety of workers in every aspect related to their work.<sup>[1]</sup> These aim to eliminate or reduce the risk of accidents or developing occupational diseases in a structural and hierarchical manner. Key principles involve a) replacing the hazardous substances with less hazardous or non-hazardous substances and b) installation of collective protection measures rather than individual worker control measures. Further control measures and actions may also be required when workers are at risk from exposure to carcinogens or mutagens.<sup>[2]</sup>

Creating a safe working environment is also good business - not only by protecting a highly valuable asset, i.e. the workforce but a healthy workforce also equals reduced absenteeism and potential claims, leading to greater productivity and more efficient and effective practices. Eliminating hazards and risks at the earliest opportunity is the best way to prevent occupational exposure and injuries. Installation of new processes that either do not create a hazard or control the hazards at source, together with the use of safer materials, can result in reduced exposure and waste disposal costs, i.e. investment in process rather than measures to remove contamination from the workplace. once it has been released. This reduces the reliance on individual protection controls such as fall arrest harnesses, respiratory protective equipment, ear muffs, etc. It can also result in cost savings.

The Hierarchy of Controls is graphically represented in Figure 1 (overleaf). There are five steps in the hierarchy, with the steps shown at the top considered more effective and therefore more protective than those lower down meaning you should always start at the top. Following this hierarchy leads to the implementation of inherently safer systems, where the risk of illness or injury is reduced. Each control step should be considered in order, starting with elimination and ending with the use of personal protective equipment (PPE); often more than one control means is required to achieve adequate and effective control.

PPE should only be used when other controls cannot be implemented or when implemented do not adequately control the hazard to a safe level, i.e. when you have taken all other reasonably practicable measures to prevent or control the hazard.

### Figure 1 – Hierarchy of controls



### Elimination

This step focuses on eliminating, i.e. removing the hazard altogether. Ideally, prevention through early design using either a process or application that generates a hazard, or new construction projects designed to automatically eliminate hazards, for example windows that are self-cleaning or can be cleaned from the inside. While this step can be difficult to implement for existing processes, it is something to consider when upgrading and replacing process or equipment.

### Substitution

This step looks at the materials used in the process and considers whether there's a suitable alternative that's safer – i.e. the alternative either does not pose a risk to health or is of a form that reduces potential exposure, such as using pellets or paste rather than powders to minimise airborne dust or the use of less volatile solvents.

### Engineering controls

This step examines what engineering controls can be installed in existing processes, applications or facilities to reduce exposure to the hazard at source before it poses a risk to workers, such as inhalation or dermal exposure to hazardous substances, loud noise or guard rails to prevent workers accessing potentially dangerous areas such as balconies or roof parapets.

Local exhaust ventilation (LEV), when well-designed, maintained and used correctly can be very effective at reducing exposure to hazardous substances. LEV that are independent of worker interactions, i.e. systems that start automatically with the process and do not require actions by the worker, can offer greater reliability. Other engineering controls can include on-tool extraction to remove airborne hazards as close to the source as possible and dust suppression techniques such as water spraying during stone cutting.

Process isolation, the use of vibration dampening techniques and sound absorbing materials can all effectively reduce potential exposure of dangerous noise levels, reducing the reliance on the use of hearing protection.

### Administrative controls

The last of the collective controls, before examining personal protective equipment, are administrative controls. While these offer collective controls they sometimes, as in the case of safety signage, require the individuals to abide by these control measures and some extent rely on the safety culture of the workforce. Job rotation and the introduction of PPE zones will reduce the time workers are exposed to hazardous substances. Other controls include safe handling of materials, worker training and general good housekeeping practices.

## Personal protective equipment (PPE)

One of the benefits that applies to all the other steps in the hierarchy of control is that they will offer collective protection, i.e. protect more than just an individual worker. However, as very often is the case, personal protective equipment (PPE) may still be required in addition to the implementation of other controls. PPE, as the name implies, will only protect the wearer, and how much protection they will receive depends on many factors.

PPE such as respiratory protective equipment, hearing and eye protection and fall arrest harnesses are classified as the least effective and reliable control measures in the hierarchy. The effectiveness of PPE is reliant upon the employer having conducted a suitable and sufficient risk assessment\*, and the correct selection of adequate and suitable PPE (using the results of the risk assessment), along with correct use, care and maintenance of the PPE (supported by training and supervision) - a process known as a PPE Programme. Without the implementation of an effective PPE programme there will always be the potential that PPE wearers may still be exposed to hazards.

### **PPE programme**

Management of a PPE programme is therefore key to the success of the PPE in protecting the wearer. Some countries have regulations that require an administrator be appointed to manage the implementation and delivery of the PPE programme. Whether or not it's required by regulation, it's good practice to assign a person to implement and manage it. Ultimately it's the employer who's responsible for the entire PPE programme, but clearly defining the roles and responsibilities of those involved will help ensure a transparent structure is implemented so that any issues that arise over the use of PPE, e.g. the need for additional training or reporting of a faulty item, are raised and actioned promptly. All persons involved in the PPE programme should be competent in their area of responsibility within it.

### Five step risk assessment:



Identify all the hazards present

Identify who might be harmed and how

Evaluate the potential risks arising from the hazards and decide on suitable controls

Record finding and implement controls

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Review the risk assessment at suitable intervals or when there's a change in the process or application

### Elements of a PPE programme are:

- a) Roles and responsibilities
- b) PPE programme implementation
- c) Risk assessment
- d) Selection procedures
- e) Medical assessment
- f) Fit testing
- g) Training
- h) Use
- i) PPE maintenance procedures
- j) PPE storage
- k) Programme review
- I) Records and record keeping

### When might the use of PPE be required?

The use of PPE may be needed in a variety of scenarios and situations within the workplace, including:

- When there's a risk of exposure to an unsafe airborne hazardous substance or noise level even after all other possible control measures have be implemented
- Whilst installing, maintaining or otherwise implementing other control measures
- During emergency work or failure of other control measures
- When the implementation of other control measures is not reasonably practicable
- For short-term, occasional or one-off tasks where other control measures are not reasonably practicable

#### References

- 1. Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:31989L0391
- 2. Directive 2004/37/EC of the European Parliament and of the Council (29 April 2004) on the protection of workers from the risks related to exposure to carcinogens or mutagens at work. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:02004L0037-20180116

For advice and support on implementing a fit testing programme, please contact your local 3M representative.

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