

# Smoke and vapour effects used in entertainment

## HSE information sheet

## Entertainment Information Sheet No 3

### Introduction

This information sheet is one of a series produced by the Joint Advisory Committee for Entertainments (JACE). It gives specific guidance about the use of smoke and vapour effects in the broadcast, film and theatre industries.

It is aimed at production organisations, their employees and freelancers who may use or be exposed to smoke and vapours at work. More guidance is available on many of the topics (see Further reading).

In this information sheet, 'must' is used only where there is an explicit legal requirement to take a certain action, 'should' is used to indicate what to do to comply with the law – although dutyholders are free to take other action if that would result in compliance.

### What the law says

The Health and Safety at Work etc Act 1974 (the HSW Act) requires employers to take reasonably practicable steps to ensure the health and safety of all employees and anyone who may be affected by their work. This includes freelance staff and members of the public.

Other legislation may apply depending on the details of the work being carried out. For instance the Management of Health and Safety at Work Regulations 1999 build upon the requirements in the HSW Act and require dutyholders to assess and control risks.

Similarly, the Control of Substances Hazardous to Health Regulations 2002 require employers to carry out a suitable and sufficient assessment of the risks to health from using certain substances and put in place control measures to eliminate or reduce exposure to safe levels.

### Roles and responsibilities

The legal duties for health and safety rest with the employer. This normally means the production company. On a day-to-day basis, the overall responsibility for ensuring that the appropriate standards of health and safety are achieved and maintained throughout the production process normally rests with the producer.

In this information sheet, the term producer is used to represent the person in overall control of the production activity.

The producer is responsible for ensuring appropriate communication, coordination and control of the overall event, taking into account any risk assessments from others, including any SFX or other specialist contractors involved in the production.

### Effects

Smoke and vapour effects are used for a range of purposes within the entertainment industry and some of the substances used to create these effects may, under certain circumstances, be hazardous to health. These may include:

- dry ice – carbon dioxide immersed in water or steam to produce a fog heavier than air;
- oil mists/glycol/smoke guns – compressed air forced through mineral oils/glycol to produce either smoke or a misting effect;
- pyrotechnic smoke effects – a substance being burned to create a smoke effect.

### Hazards

Examples of hazards that can come from the production of smoke and vapours would include:

- freeze burns or frostbite caused by skin contact with liquid nitrogen or blocks of dry ice;
- skin irritation from mineral oils or glycols;

- asphyxiation due to high concentrations of carbon dioxide or nitrogen gases;
- toxic substances in smokes or vapours;
- reduced visibility due to smoke or vapours increasing the risk of slips, trips or falls;
- slips due to spilt oil or condensation from dry ice;
- leakages or misuse due to incorrect storage of any substances being used.

## Risk assessment

The producer must ensure risks arising from work on the production are controlled. To do this they must think about what things in the workplace might cause harm to people and take such steps as are necessary to eliminate or reduce the risk to acceptable levels. The risk assessment must be reviewed as necessary in light of new information and as the situation changes. This process is sometimes called dynamic risk assessment.

Risk assessment is required by law. If there are fewer than five employees it does not have to be written down.

The risk to people from exposure to hazardous substances in smoke and vapours is to be assessed and controlled in the same way as any other risk to the health and safety of those involved in film, broadcasting and theatre. This should be done by conducting an assessment in accordance with the Control of Substances Hazardous to Health Regulations (COSHH).

While conducting the general risk assessment the following should be considered when the use of smoke or vapours is part of the production:

- the possibility of effects obscuring fire escapes and associated signs;
- how the smoke will be directed to the desired area and away from areas it should not get to, eg the audience;
- potential slip hazards, eg from spilt oil;
- burns from hot/cold smoke or burning products etc;
- Ensuring carbon dioxide cannot pool in low-lying areas such as orchestra pits, front theatre stalls or pits where people are likely to be – these areas should be monitored frequently and, wherever possible, access to them should be prevented.

## COSHH assessment

As part of the risk assessment the producer must include the risk of exposure to hazardous substances and review it as necessary in light of new information and as the situation changes. This assessment will inform discussions about how to proceed with the effect, what controls must be put in place and what circumstances would cause change to be considered. Most exposure incidents can be avoided or their effects reduced with thorough pre-planning.

The COSHH assessment should be based on the following steps:

- Gathering information about the substances, the work and the working practices, ie finding out what the problems are. The safety data sheet that can be obtained from the supplier of the substance you are using will assist in this.
- Evaluating the risks to health, ie looking at the problems that are found. The guidance in Workplace exposure limits (see Further reading) will assist in this.
- Deciding on the necessary control measures to comply with regulations 7–13 of COSHH. Control measures will vary depending on the substance, how it is used and the amount of exposure to be expected.
- Recording the assessment. If you have five or more employees you must record the assessment. It is good practice to do this in any case as it will be useful when reviewing the process and the assessment.
- Deciding when the assessment needs to be reviewed. This should be done regularly and particularly when any part of the process changes.

The assessment should consider all people who may be affected, not just the people creating the effect but also the artistes, the audience and other employees.

## Controlling and managing exposure

Exposure should be controlled using the following hierarchy:

- Use alternative systems and/or processes where the hazardous substance is not used.
- Use systems and processes which reduce the amount of hazardous substance to the minimum required for the effect.

- Control exposure at source, eg by providing adequate ventilation systems, reducing to a minimum the number of people exposed and the level and duration of their exposure.
- Use personal protective equipment in addition to the previous measures where adequate control cannot be achieved by them alone.

If there is any doubt about the level of exposure that may result from using a particular effect, suitable on-site monitoring of the hazardous substance may be required.

## Audiences

As producers have no control over the composition or health status of their audiences, special care should be taken to minimise their exposure and, whenever possible, this should be avoided completely if there is any risk to them. If it is possible (or intended) for the effect to go into the audience the following precautions should be considered:

- Limit the amount of smoke/vapour to the minimum necessary for the desired effect.
- Direct and control smoke effects to ensure even spread and no areas of concentration.
- Print warnings on or with the tickets.
- Post warning notices on the premises (reinforced by verbal warnings before the performance if this is considered necessary).

All warnings should indicate the type of people who may be particularly at risk.

## Further reading

*Control of substances hazardous to health. The Control of Substances Hazardous to Health Regulations 2002 (as amended). Approved Code of Practice and guidance L5* (Sixth edition) HSE 2013  
[www.hse.gov.uk/pubns/books/l5.htm](http://www.hse.gov.uk/pubns/books/l5.htm)

*EH40/2005 Workplace exposure limits: Containing the list of workplace exposure limits for use with the Control of Substances Hazardous to Health Regulations 2002 (as amended)* Environment Hygiene Guidance Note EH40 (Second edition) HSE 2011  
[www.hse.gov.uk/pubns/eh40.htm](http://www.hse.gov.uk/pubns/eh40.htm)

*Risk assessment: A brief guide to controlling risks in the workplace* Leaflet INDG163(rev4) HSE 2014  
[www.hse.gov.uk/pubns/indg163.htm](http://www.hse.gov.uk/pubns/indg163.htm)

Fire safety risk assessments Department for Communities and Local Government (DCLG) 2006  
[www.firesafetyguides.co.uk](http://www.firesafetyguides.co.uk)

## Further information

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit [www.hse.gov.uk](http://www.hse.gov.uk). You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance.

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