

Special or visual effects involving explosives or pyrotechnics used in film and television productions

HSE information sheet

Entertainment Information Sheet No 16

Introduction

This information sheet is one of a series produced by the Joint Advisory Committee for Entertainments (JACE). It gives specific guidance on the control of risks arising from the use of explosives and pyrotechnics used to produce special effects in the film and television industries.

It is aimed at employers including production companies, freelancers and others in control of special effects during the production of film or television productions. Employees and others who may be exposed to risks to their health and safety from the effects of pyrotechnics or explosives will also find it useful. More guidance is available on many of the topics covered (see Further reading).

The Association of British Theatre Technicians (ABTT) publishes a Code of Practice for the use of explosives and pyrotechnics in the theatre industry entitled *Pyrotechnics and smoke effects* (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 will include affected freelance staff and members of the public.

The Dangerous Substances and Explosive Atmospheres Regulations 2002 require employers and self-employed people to find out what dangerous substances are in their workplace, what the risks are, and to put measures in place to either remove those risks or, where this is not possible, control them.

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 and other specialist contractors involved in the production. The producer should make sure that:

- the special effects personnel are competent for the work in question;
- special effects personnel are provided with adequate information regarding the production;
- adequate time and resources are allowed, including for rehearsals for the effect based on advice from the special effects personnel;
- appropriate arrangements have been made for emergencies (such as firefighting and first aid);
- additional time is provided within the schedule for misfires or changes of plan;
- an overall risk assessment for the production is produced;
- adequate arrangements are in place for communicating the risks and safety arrangements to all those involved;
- appropriate facilities are available for the assembly, fusing etc of explosive effects prior to use.

Hazards

Explosives and pyrotechnics used in special effects

present a number of hazards including:

- premature firing due to mobile phone or other types of electromagnetic transmitting equipment, eg radios;
- premature firing caused by extreme weather such as electrical storms;
- flash or radiated heat;
- high noise levels;
- blast effects – this effect can be worsened in water or in confined spaces;
- projectiles and other debris;
- unplanned spread of fire;
- release of toxic by-products;
- clearing of misfires;
- unstable equipment or substances caused by unsuitable transportation, storage and handling;
- flash-over from high-tension electrical lines caused by airborne ionised particles following the firing.

Risk assessment

The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) require employers and self-employed people to assess the risks to employees and others from the use of dangerous substances. This will include explosives and pyrotechnics used in film and television productions. This assessment will inform discussions about whether and how to proceed with the effect, what controls must be put in place and what circumstances would cause it to be halted or changed.

The findings of any assessment and control measures implemented must be reviewed in light of new information and as the situation changes. This process is sometimes called dynamic risk assessment.

More specifically employers and self-employed persons must:

- find out what dangerous substances are in their workplace and what the risks are;
- put control measures in place to either remove those risks or, where this is not possible, control them;
- put controls in place to reduce the effects of any incidents involving dangerous substances;
- prepare plans and procedures to deal with accidents, incidents and emergencies involving dangerous substances.

Further detailed information on DSEAR is available at www.hse.gov.uk/fireandexplosion/dsear.htm.

Risk management

Competence

Effects using explosives or pyrotechnics will vary in size, complexity and the level of hazard created. Those in control of the production must ensure they use people that are competent to plan and safely execute the effects required.

Help with determining competence in this specialist area can be obtained from industry bodies such as:

- www.jigs.org.uk/special-effects;
- standards@skillset.org.

People working with pyrotechnics and explosives must continually assess the effectiveness of any controls they have in place and monitor their surroundings to make sure any changes will not affect the safety of their effect. They should, in consultation with those in charge of the production, make changes as necessary to ensure their own and others safety.

Communication

All those involved should be thoroughly briefed about the effect, the risks and required controls prior to any rehearsal. There should be effective means to warn and exclude people from any danger area. The producer, in consultation with the special effects personnel, is responsible for making sure adequate arrangements for managing and policing the controls are in place, for example an exclusion zone. The risk assessment should clearly identify those arrangements and also those responsible for enforcing and monitoring the exclusion zone. Any persons nominated should have adequate authority to ensure full compliance and should be dedicated to the task for the duration of the effect.

There should be agreed systems or code words to stop the effect immediately if required.

Cooperation and coordination

Those involved in staging the effect should ensure that adequate information is exchanged and that they coordinate their activities to ensure risks are effectively controlled. Special effects contractors should liaise

with other contractors involved in the production. Special consideration should be given to the procedures for misfires.

Materials

Nominated special effects personnel are responsible for:

- the procurement and specification of the explosives, pyrotechnics and other materials to be used in the effect;
- making sure all materials are fit for purpose;
- ensuring the safe transportation of all materials;
- storage and use of all explosives, pyrotechnics and other materials;
- ensuring adherence to specific legislation which applies to the storage and handling of explosives and pyrotechnics.

Further information on transport, storage and use of dangerous materials is available at www.hse.gov.uk/fireandexplosion/about.htm.

Cueing

There should be an agreed clear and unambiguous system for cueing an effect (this may need to incorporate both sound and vision). The special effects person responsible for setting off any explosive, pyrotechnic or firing the effect should have a clear line of sight to it. The cueing arrangements should be rehearsed in situ before the effect is performed.

Rehearsal

Safety can be improved by rehearsing the effect. Only essential personnel should be in the area. To ensure safety, there should be a thorough rehearsal of the entire action. All those involved in the sequence should be present at rehearsal or re-rehearsal and should be made fully aware of the action intended, the risks, control measures and emergency arrangements.

Execution

The special effects person in control of an explosive, pyrotechnic or fire effect should have absolute authority over the safety arrangements during the execution of the effect.

Before commencing any effect, checks should be made by the producer, supported by the special effects personnel, to ensure exclusion zones are in

place, emergency plans are in place and that all appropriate personal protective equipment (PPE) is worn. The person supervising the effect should have unambiguous confirmation that danger areas are clear, for example that there is a line of sight, and they should be in direct communication with all key players. Firing circuits should not be connected or armed until the last possible moment to minimise the risks of accidental firing.

Other control measures

Where risks cannot be controlled by elimination or substitution by a less hazardous substance or process, a combination of the following measures will normally be required:

- Plan adequate time to allow for unforeseen issues such as clearing misfires or changes to complex effects.
- Determination of safe distances and exclusion zones.
- Prohibitions on the use of mobile or other radio transmitting equipment.
- Establish exclusion zones from mobile or other radio transmitting equipment.
- Establish controls against flash or radiated heat.
- Noise control.
- Blast control.
- Control of fragmentation particles and other debris.
- Control of unplanned spread of fire.
- Control of toxic effects.
- Cueing arrangements.
- PPE.
- Emergency arrangements for dealing with effects that do not go according to plan or other foreseeable events such as fire.
- Other specialist advice or support used, eg engineering advice about structural integrity or specialist dive contractor for work involving underwater explosions.
- Misfires.
- Specific responsibilities of special effects team and others directly involved in managing and coordinating the effect.
- Risks to others (eg public, crew, divers, stunt coordinators, artists).

Emergency procedures

Those in control of the production should establish procedures to be followed in the event of an emergency. Those in charge of the special effects should be involved in and contribute to this process. Further information on emergency procedures is available at www.hse.gov.uk/toolbox/managing/emergency.htm.

Misfires

The safety area around a misfired effect should not be entered by people not authorised directly by the person in control of the special effects until they have declared it safe. Only competent special effects personnel should be involved in clearing the misfire and the procedure for this should be set down during the planning and risk assessment stages. Risk assessment should take into account the possibility of misfire and controls for clearance should consider:

- the pyrotechnics and/or explosives in the effect;
- PPE required by the person and any assistants making the effect safe;
- any further exclusion zones required;
- the steps required to make the effect safe;
- steps for disposal of the pyrotechnics/explosives recovered from the effect.

Diving and explosives in water

A specialist dive contractor and extraordinary controls will be required for all work involving underwater explosions or where, in the event of a misfire, live explosives could fall into water.

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

Dangerous substances and explosive atmospheres. Dangerous Substances and Explosive Atmospheres Regulations 2002. Approved Code of Practice and guidance L138 (Second edition) HSE 2013 www.hse.gov.uk/pubns/books/l138.htm

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

Code of practice for pyrotechnics and smoke effects Association of British Theatre Technicians 1999 www.abtt.org.uk

Further information

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit 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.

This document is available at www.hse.gov.uk/pubns/etis16.htm.

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