



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

Entertainment Information Sheet No 16

Introduction

This information sheet is one of a series produced in consultation with the Joint Advisory Committee for Broadcasting and Performing Arts. It gives guidance for those in the film and television industries who intend to use explosives or pyrotechnics.

It does not cover the issues associated with physical effects or organised firework displays. The Association of British Theatre Technicians (ABTT) publishes a Code of Practice for the theatre industry entitled *Pyrotechnics and smoke effects* which has been adopted as an agreed standard for that industry (see 'Further reading').

Explosives and flammable materials are used in pyrotechnic work to create the impression of a dramatic event. The aim should be to minimise the quantity of explosive or flammable material used in order to create the desired effect.

Legislation

The main legal requirements covering special and visual effects are the Health and Safety at Work etc Act 1974 and the Management of Health and Safety at Work Regulations 1999 (the Management Regulations).

The Management Regulations require a suitable and sufficient risk assessment to be carried out by employers (or self-employed people) to assess the risk to employees and others who may be affected by their activities and to determine the control measures necessary to avoid risk or reduce it to acceptable levels. An opportunity arises during risk assessment to consider the application of any other relevant health and safety legislation, including the requirement to consider fire precautions and emergency procedures.

You must consult employees on health and safety matters, either directly or through elected safety representatives.

Hazards

Typical hazards arising from special effects include:

- flash or radiated heat;
- noise;
- blast effects – pressure waves and associated risks to people or surrounding buildings. These effects can be worse for people and equipment under water or in confined spaces;

- projectiles and other debris;
- unplanned spread of fire;
- toxic effects;
- misfires;
- poor transportation, storage and handling;
- spurious radio signals interfering with firing and control systems;
- flash-over from high-tension electrical lines due to presence of ionised particles in the air following the firing of an effect.

Competence

The amount of knowledge, skill and experience someone needs to be considered 'competent' will vary for different tasks. A person may be competent for simple tasks but not for more complicated tasks in the same area without supervision from a more experienced (and more competent) person. Competence should therefore be judged in the light of experience, training and the work to be undertaken.

Levels of competency are graded according to knowledge, skill, experience and training, as recommended by the Joint Industry Grading Committee. The Committee publishes a register of grading as follows:

- **supervisors:** capable of planning, supervising and executing most effects. For major events a special effects supervisor would normally advise and, where necessary, supervise the safe execution of the effect;
- **senior technicians:** supervise, control and execute special effects but would generally need supervision and guidance for major or complex events;
- **technicians:** competent to conduct special effects under the supervision of a special effects supervisor or senior technician. They would not normally plan and execute effects without such supervision;
- **trainees:** can assist other grades in the preparation of effects when adequately supervised.

Responsibility

Responsibility for health and safety rests 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 rests with the producer.

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

The producer retains overall responsibility for the production and is tasked with ensuring appropriate co-ordination and control of the overall event, taking into account the risk assessment from the special effects contractor and others. The producer should ensure that:

- the special effects contractors are competent for the work in question;
- special effects contractors are provided with adequate information regarding the production;
- adequate time and resources are allowed for the effect based on advice from the special effects contractors;
- additional time should be provided for 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.

The person in charge of the special effects will remain at all times responsible for advising the producer on the safe planning and execution of the effect. They are responsible for:

- ensuring the effect is adequately planned, including conducting a full risk assessment and communicating the significant findings and controls to the producer;
- procurement and specification of all explosives, pyrotechnics and other materials;
- ensuring all materials are fit for purpose;
- the safe transportation, storage and use of all explosives, pyrotechnics and other materials used in the effects;
- ensuring only competent persons are employed;
- identifying potential emergency measures such as fire-fighting or first aid.

Risk assessment

The producer should ensure that there is an overall risk assessment for the production. They should also ensure that the arrangements for communicating the risks and safety arrangements for the effect to all those involved are adequate.

The person in charge of the special effects is responsible for ensuring a suitable and sufficient risk assessment is undertaken for all the activities under their control, and that the identified control measures

are communicated to the producer. Control measures will affect the safety of:

- people and equipment under the control of the production, eg crew, artists;
- third parties not involved in the production, eg the public.

The control measures may be detailed in the form of a method statement. The information needs to be provided in good time to the producer.

Control measures

Control measures may include:

- determination of safe distances;
- 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;
- personal protective equipment (PPE);
- emergency arrangements for dealing with effects that do not go according to plan;
- 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 co-ordinating the effect;
- risks to others (eg public, crew, divers, stunt co-ordinators, artists).

The producer should use this information to inform the risk assessment for the whole production:

- considering the effect, timing and compatibility of each activity on all those involved;
- making all involved aware of the significant risks;
- considering whether new risks occur as a result of the combined method statements and systems of work;
- complying with the relevant regulations.

If there any significant changes to the production activity the VFX (visual effects) contractors and programme risk assessments must be reviewed to determine if they are still valid and to ensure the controls are still adequate. Any significant changes in the risks and controls should be communicated to all those involved.

Communication

All 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 contractor, is responsible for ensuring adequate arrangements for managing and policing the controls, for example any 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.

Co-operation

All parties should ensure that adequate information is exchanged. Special effects contractors should liaise with other contractors involved in the production. Special consideration should be given to the procedures for misfires that may impact upon others.

Materials

The special effects contractor is responsible for the procurement and specification of the explosives, pyrotechnics and other materials to be used in the effect, for ensuring all materials are fit for purpose and for the safe transportation, storage and use of all explosives, pyrotechnics and other materials. Specific legislation applies to the storage and handling of explosives and pyrotechnics.

Cueing

There should be an agreed system for cueing an effect that is clear and unambiguous. The special effects designer responsible for setting off any explosive, pyrotechnic or fire effect should have a clear line of sight.

The cueing arrangements should be rehearsed in situ before the effect is performed.

Rehearsal

Safety can be improved by rehearsing the action. Only essential personnel should be in the area. To ensure safety, there should be a thorough rehearsal of the action. All those involved in the sequence, including artists, 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 supervisor or technician 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 team, to ensure exclusion zones are in place, emergency plans are in place and that all appropriate PPE is worn. The person supervising the effect should have unambiguous confirmation that danger areas are clear, for example there is a line of sight, and 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.

Misfires

In the event of a misfire no one should approach the area until an adequate time has passed. This is defined by the pyrotechnics and firing circuit in use.

The special effects staff required to make the area safe should wear full PPE. The required procedures for misfires will be determined at the risk assessment stage but should include details of:

- PPE required;
- exclusion zones required;
- steps to make the effect safe;
- steps for disposing of explosives.

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, explosives could finish under water.

Further reading

Management of health and safety at work. Management of Health and Safety at Work Regulations 1999. Approved Code of Practice and guidance L21 (Second edition) HSE Books 2000 ISBN 0 7176 2488 9

Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972 SI 1972/917 The Stationery Office

Control of substances hazardous to health. Control of Substances Hazardous to Health Regulations 2002. Approved Code of Practice and guidance L5 (Fourth edition) HSE Books 2002 ISBN 0 7176 2534 6

Carriage of Dangerous Goods by Road (Driver Training) Regulations 1996 SI 1996/2094
The Stationery Office

Packaging of Explosives for Carriage Regulations 1991
SI 1999/2097 ISBN 0 11 015097 X The Stationery Office

Carriage of Dangerous Goods by Road Regulations 1996 SI 1996/2095 The Stationery Office
ISBN 0 11 062926 4

Pyrotechnics and smoke effects (Code of Practice)
Association of British Theatre Technicians

Further information

The Stationery Office (formerly HMSO) publications are available from The Publications Centre, PO Box 276, London SW8 5DT Tel: 0870 600 5522 Fax: 0870 600 5533 Website: www.tso.co.uk (They are also available from bookshops)

HSE priced and free publications are available by mail order from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA Tel: 01787 881165 Fax: 01787 313995 Website: www.hsebooks.co.uk (HSE priced publications are also available from bookshops and free leaflets can be downloaded from HSE's website: www.hse.gov.uk.)

For information about health and safety ring HSE's Infoline Tel: 08701 545500 Fax: 02920 859260 e-mail: hseinformationservices@natbrit.com or write to HSE Information Services, Caerphilly Business Park, Caerphilly CF83 3GG.

<p>This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do</p>
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