



# ABTT interim Guidance Note 08a

## Safe Use of Pyrotechnic Effects

### December 2015

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#### Introduction

This interim guidance note has been prepared by the ABTT in order to recommend safe working practices as far as the use of theatrical pyrotechnics is concerned within the United Kingdom.

This is interim guidance until such time as the ramifications of the Explosives Regulations 2014 become apparent.

This guidance note applies to Stage Pyrotechnics, 'Articles Pyrotechnic T1 or T2' and Indoor Fireworks, 'Fireworks Category 1'.

The content has been tailored to the use of theatrical pyrotechnics within enclosed premises for the accommodation of theatrical entertainment and includes the associated necessary minimum safe standards for venue and production staff, performers and the public.

This document is not definitive and in all cases the manufacturer's instructions must be followed.

#### Legal issues

Many venues are regulated by their local authority and/or local fire authority, where permits/approvals are required before any pyrotechnics are allowed to be used. Early discussion with a venue owner/operator about the use of pyrotechnics is strongly recommended.

The production manager shall ensure that suitable risk assessments have been completed under Regulation 3 of the Management of Health and Safety at Work Regulations and current fire safety legislation.

Pyrotechnics must only be used by competent adults aged over 18 years.

The path to determining competence requires that reasonably practicable steps are taken to confirm the skill, knowledge and experience of those engaged in the use of pyrotechnics.

## ABTT recommendations in regard to using pyrotechnic effects:

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### Planning

The first element of planning in relation to pyrotechnics is to establish exactly what the production is trying to achieve and to assess how appropriate the effect is for the venue or location.

Anyone wishing to use pyrotechnics must inform the venue and/or local authority of this intention, usually at least 14 days prior to the event but potentially earlier. Check with the venue with regards to notice periods during the planning stages.

*A proposal to use pyrotechnics must include:*

- A list of all the devices that are to be used along with the name of the manufacturer(s).
- A proposed plan of where the pyrotechnics will be placed in the venue.
- A cue list of when the pyrotechnics are being used.
- Details of the operator in the form of a resume or CV.

Consideration should be made of the residual effects that a device could produce, such as:

- Smoke
- Staining (coloured smokes and used device materials)
- Noise
- Sparks
- Flames
- Odours
- Hot fall-out
- Other debris fall-out
- Deliberate projectiles (streamers, confetti)

A suitable emergency plan should be discussed and documented with the venue and to their approval.

As the planning process leads towards the event, review all documentation and procedures to ensure continued safety compliance.

## **Risk**

Risk assessment is not intended to prevent the use of effects but should be used to identify suitable precautionary measures and controls to enable the event to proceed as safely as reasonably practicable.

The reduction of potential risks is a continuance of the planning procedure for pyrotechnics.

Fire safety legislation requires that a suitable and sufficient assessment of the risks from fire is completed. This will include pyrotechnic devices and to identify the general fire precautions that need to be taken.

When positioning devices, account must be taken of all personnel, scenery and other objects within the immediate vicinity of the pyrotechnics. The operator must ensure that all fabrics in close proximity are of a non-flammable nature including performers' costumes.

Where an unfamiliar pyrotechnic device is to be used, a test firing should take place with the relevant parties present. If additional safety measures are identified and required then the specific risk assessment should be updated to include them.

All those involved in a production should be familiar with the nature of the effects to be used.

The operator should ensure as far as possible that any device is in a position where the likelihood of being tampered with by an unauthorised person is avoided.

The operator should also ensure that the effect is not modified in anyway, to enhance or reduce an effect. Such modification could cause the effect to perform differently to that expected and therefore increases the risk to those in the vicinity.

Some examples of potential risks associated with pyrotechnics:

- People - working at height (crew in grid/fly floor, follow spot operators on truss), the proximity of effects, warnings to artists, FOH staff etc., requirement for rehearsals, potential smoke inhalation for people above the effects.
- Venue – air draughts that could blow sparks, flames & smoke in an unfavourable direction.
- Building and set furnishings: Curtains, carpets, ceilings, wallpaper, etc.
- Musical instruments i.e. Sparks onto instruments, including drum kit skins, band leaders and musicians.
- Confetti/streamers falling into instruments.
- Lighting Systems - Filters/lighting gels, entanglement with streamers etc.
- Sound Systems – Sparks/flames catching speakers, microphones including hanging microphones. Added noise levels of maroons damaging sound system
- Clothes/materials, costumes and wigs - check flammability.
- Scenery/Set – check flammability.
- Slips, trips and falls – Cable placement, slippery residue on floors/steps from smoke machines, etc. Concealment of devices by low lying fog effects producing trip hazards.

## **Competence**

People handling and operating pyrotechnics must be competent to carry out the activities under all conditions. They must understand the hazards and risks which may arise and the actions to take in abnormal or emergency situations. Inclusion on the Association of Stage Pyrotechnicians membership register\* (or similar) could be taken as an initial measure required to establish an individual's competence.

## **Venue Duty-Holders (*not the operator*)**

Theatre staff should ensure that those involved in or providing support to the Operator in the use of pyrotechnics:

- understand the nature of the risks and hazards that may arise out of the use of pyrotechnics;
- can identify that appropriate measures to be taken have been implemented before the use of pyrotechnics including any demonstration or test firing.

They should:

- know the procedures that must be followed;
- know the site rules that apply to the use of pyrotechnics;
- know what the indications are and the actions to be taken, when an abnormal or hazardous incident occurs;
- know the actions required in the event of an emergency;

They should check:

- that the Operator is competent for the task;
- that the pyrotechnics proposed are suitable for the venue;
- that the pyrotechnics are positioned appropriately.
- that the pyrotechnics are stored appropriately.

\*Association of Stage Pyrotechnicians [www.stage-pyro.org.uk](http://www.stage-pyro.org.uk)

## **Pyrotechnics Procurement**

Ensure that the manufacturer's instructions and material safety data sheet(s) (MSDS) are readily available and can be sourced.

It is illegal to mix/make-up, charge or recharge devices on premises other than those venues licensed for the purpose.

T2 products may only be purchased by a person with specialist knowledge and public liability insurance.

Black Powder is NOT allowed in a venue without an 'acquire and keep' license and its use would not normally be covered by the venue insurer.

## **Transport (in and around the venue)**

Transport by road/vehicle is not covered by this document

Transportation around the venue to a secure and safe storage area is imperative.

All pyrotechnics should be supplied and delivered in UN regulation approved packaging and should remain in such packaging (as storage) until required for use.

## Safety Documentation

The production of effective safety documentation is essential in any application to use pyrotechnics.

As an operator, it is necessary to be able to provide, or to know where to find, the following:

- Manufacturer's information for the products to be used.
- Material Safety Data Sheets for the products.
- A suitable risk assessment covering the effects to be used and their application within the event. This will also require a section on fire related risks. This should include any specific mitigation or method statements required to use the pyrotechnics as safely as reasonably practicable.
- Operators resume, covering experience and training.
- A suggested stage plot of positions of pyrotechnics to be used.

## Storage

Pyrotechnics are different from other fire hazards in that they have inherent explosive capabilities; they do not require oxygen to burn and usually have an internal source of ignition. They are however, unlikely, to explode spontaneously.

Keep pyrotechnics in their original UN transport boxes. Close the tops of the boxes securely each time after removing the required show supply and return them to the storage area.

Only devices immediately required should be placed in the firing positions; additional devices should not be present on the stage. If, due to time/access constraints between shows, it is necessary to rig multiple shows then the risk assessment should address the implications of doing so and implement any agreed mitigation to minimise the risk of cross ignition or tampering of devices between shows.

The venue should, where practicable, site any storage area away from public areas, fire routes or exits and any likely ignition source such as switch or plant rooms and waste areas.

Ensure that the storage area is labelled with an appropriate hazard sign.

The pyrotechnics should NOT be stored in a metal cupboard, drawer or similar construction due to fragmentation which could occur in the event of an incident.

Make sure that the following controls are in place:

- Clear signage to describe contents of store (i.e. "Pyro Store").
- Fire-fighting equipment is readily available.
- The storage area is clear of any other flammable material.
- The storage area is secure and kept locked when not in actual use.
- The storage area is NOT in the path of a fire exit route.
- The appropriate venue management have the Operator's contact details.

## Placement of pyrotechnic devices

Review the manufacturer's safety information for the appropriate safety heights and distances. Persons with specialist knowledge can make other decisions with accompanying risk assessment.

To ensure that effects cannot be moved, knocked over or redirected they should be firmly fixed to a surface. Consideration should be given to securing flash pods/holders to the floor, a board or other item considered as secure (not flight case).

### **Placement of pyrotechnics on lighting and sound trusses:**

Consider a permanent installation if the effect is being used for a number of shows. Build holders into the scenery with all hardware and wiring hidden from view.

Be aware that rigging may be accessed by lighting and sound technicians. Ensure that they are aware of the location of effects holders and request that they inform you if they have had access to the area and especially if they have noticed any problems or issues.

If the production can accommodate a dedicated truss or bar specifically for pyrotechnics, this will reduce the risks.

### **"Messy" pyrotechnics:**

These include such devices as confetti, streamers and glitter projectors. Whilst the materials inside are flame proofed, it is usually desirable to use and operate these types of devices after all the Flash/Star/Jet/Gerb/Flame types have been fired in order to avoid the likelihood of any smouldering.

## Firing systems

Firing systems used must be of a recognised design and manufacture, incorporating both electrical and mechanical 'fail-safes' i.e. multiple points of disconnection, key switch and panel switches that protect and prevent accidental ignition. The operator should only insert the key and 'arm' immediately prior to operation.

At no time should the key be left unattended in the controller.

- Wiring layouts should be so designed and positioned so as not to be in close proximity to electrical power systems.
- Wiring should be located so that it cannot be a trip hazard or damaged or pulled by equipment or other means.
- The power supply indicator light should be sited so as to be clearly visible.

Switch key off immediately after firing.

### **Maintenance**

Pyrotechnic equipment should be purchased or hired from a reputable supplier with appropriate test and electrical safety certification.

Device holders and fragmentation tanks must be cleaned after use to prevent debris catching fire or corrosion of metal parts and thereby ensure safe, efficient operation when next used.

All equipment should be regularly tested and inspected for damage or system failure. This includes suitable electrical inspection and testing.

## **Communications**

The operator should have sight of all devices. If it is unsafe to initiate any device, then the operator must not fire. If it is found that an operator does not have full line of sight to all effects then the use of competent individuals tasked as “spotters” can be considered.

**The final decision to fire any effect must rest with the operator.**

## **Warning Signage**

Clear warning signage should be positioned to warn those in the area of effects.

Warn the audience by means of notices in the foyer that pyrotechnic devices will be used during the performance.

Ensure any area designated as a storage area is clearly signed.

Where necessary, place notices in dressing rooms with details of scenes involving pyrotechnics.

## **Noise Levels**

Such effects must be assessed to ensure that staff and the public are not exposed to excessive noise levels.

Both technical and front of house staff should be warned of the presence of such effects and a notice identifying that special effects are in use during the show be displayed (Foyer Area and entrance doors etc.).

Sound levels are usually higher in an empty auditorium when testing, which may mean initial levels are lower than expected during performance.

## **Demonstrations - Planning Tests (for performers)**

Most venues and/or local authorities will require a demonstration prior to authorising pyrotechnic use. This demonstration needs to be planned into schedules allowing sufficient time to modify and rectify any possible issues.

## Misfires

Misfires can be divided into four distinct categories:

- Mechanical failures
- Product failures
- Crossfires
- Human error

### 1. Mechanical failures

Mechanical failures are the most common in using pyrotechnics. A failure can be one or more of the following:

- Control unit electrical failure
- Cable and/or connection break
- Pyrotechnic holder connection failure

### 2. Product failures

Failures or misfires due to manufacture or transportation do occasionally occur and whilst tests of electrical continuity can be made, such tests cannot guarantee the operation of the device. Such product failures can cause the effect to not fire at all or not function as intended.

### 3. Crossfire

This is when one pyrotechnic device ignites an adjacent device with a stray spark or flame. This can usually be eliminated by lightly covering, but not sealing, the adjoining device with aluminium foil. Again this should be identified at the planning stage in order to reduce the risk of occurrence.

### 4. Human errors

Rehearse, rehearse, and rehearse. Ensure the operator is not distracted or expected to multi-task whilst operating devices.

## Devices failing to function

When you are absolutely certain that the device is no longer going to function then it should be approached with care and returned to the original packaging for disposal. Ensure all electrical connections are disconnected and control system keys are removed before carrying out any such procedure.

## Disposal of failed devices

Follow instructions as provided by device manufacturer.

**Under no circumstances should a failed device be placed in domestic or commercial waste or be allowed to be incinerated.**

## Emergency

Suitable fire-fighting equipment should be deployed in strategic positions, and all stage technicians made fully aware of both their position and that of the devices:

Warning signs should be displayed while pyrotechnics are in the building. The signage should be changed to reflect the current areas where pyrotechnics are in use/stored. Do not keep pyrotechnic signage in place when pyrotechnics are no longer in that area (they will become routine and ignored).

## **Fire**

Ensure that suitable fire fighting equipment is available and that all personnel who are working in the vicinity such as the Stage Crew and others are trained in its use.

It is unlikely that the use of fire fighting equipment directly onto a pyrotechnic effect will extinguish the effect. The equipment should be used to put out any secondary fires that start after the effects use.

## **Fire Alarms Systems**

The smoke released when pyrotechnics are fired may activate venue fire alarm systems, in the auditorium, corridors or roof spaces. Where possible, fire systems should be set to performance mode. This can include if dual smoke and heat switchable (multi-head) detectors are in place, switching to heat detection only prior to firing any pyrotechnic.

At no time should a system be totally isolated to prevent activation of an alarm panel.

## **Waste**

Devices which have functioned correctly should be allowed to cool before be placing in general commercial waste. Consider recycling of used pyrotechnics by separating cardboard, plastic and electrical wire.

## **Clear-up and reset.**

Matinee shows may limit available time for this operation. Consider where the final resting place for messy products will be, for example, in the orchestra pit or auditorium.

## Definitions and glossary

### **Pyrotechnics**

A "pyrotechnic article" is a device containing explosive substances or an explosive mixture of substances designed to produce heat, light, sound, gas, smoke or a combination of some or all of these.

### **Operator**

The operator in the context of this document is the individual who activates the pyrotechnic device(s). The operator should have an appropriate level of skill, knowledge and/or training, proportionate to the desired effect to be achieved. The final decision to fire any effect must rest with the operator.

### **Person with Specialist Knowledge**

A person with specialist knowledge is someone having undertaken training recognised in the theatrical profession and is competent to use T2 products.

### **Consumer**

A consumer of pyrotechnics is anyone, who is over 18 years old and wishes to purchase products for use in a theatrical/live event environment.

A consumer may also be the operator.

### **T1 and T2 effect classifications**

**Category T1:** Articles for stage use which present a low hazard and which are intended for indoor and outdoor use. Some T1 articles are restricted for outdoor use only and will be denoted as T1 'for outdoor use only'.

**Category T2:** Articles for stage use which are intended for use only by "persons with specialist knowledge". The term 'stage use' includes film and television productions or similar use.

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