

# StageSoc Risk Assessment - Pyrotechnics

Date assessment carried out: 20/01/2023  
 Primary Venue: The Annex Theatre (Annex), Building 2a - University of Southampton  
 Secondary Venues: N/A

Description of Work Assessed: Use of T1 and T2 pyrotechnic effects for use during a theatrical performance, during and after the performance (rigging and de-rigging), and during rehearsals.



Other documents that relate to this risk assessment: MSDS, CE declarations and instructions for pyrotechnic effects to be used.

Risk Assessment Carried Out By: Jonathan Ferguson (ASP Member 2023005)

Signed: *J Ferguson* (Jonathan Ferguson, President) *Turner* (James Turner, Annex Officer)

## Pyrotechnics B - General Pyrotechnic Effects

No	Hazard	Harm and how it could arise	Risk Groups	Inherent Risk			Control Measures	Body Responsible	Residual Risk			Notes
				Likelihood	Severity	Risk			Likelihood	Severity	Risk	
1	Ignition of pyrotechnic articles during storage	Burns, damage to property and major injuries or death resulting from fire	X	4	5	20	Pyrotechnic articles to be stored in accordance with manufacturer's instructions, MSDS, and following HSE and industry guidance.	Pyrotechnician	1	5	5	Explosive mixtures contain oxidiser, rendering external fire fighting measures ineffective. Fires of pyrotechnic articles must be allowed to burn, however nearby items can be extinguished to contain a fire.
							Keep articles in the manufacturer provided packaging, with appropriate labelling.	Pyrotechnician				
							Keep stored in a cool dry place away from sources of ignition, heat and other inflammable materials.	Pyrotechnician				
							No pyrotechnics to be stored at university or SUSU facilities (including the Annex) unsupervised.	Pyrotechnician				
							Only suitable competent persons to handle pyrotechnic articles.	Pyrotechnician				
							Ensure appropriate fire extinguishers are available to tackle fires in the vicinity of pyrotechnic articles.	Pyrotechnician				
			Do not attempt extinguishing of pyrotechnic articles themselves, allow to burn out.	Pyrotechnician								

2	Injury from debris	Minor injuries from casings or debris	A B C X	5	4	20	Ensure effects are not fired directly at people.	Pyrotechnician	1	4	4	All effects have the capacity to produce some debris (parts of packaging etc.). However other effects due to their nature produce substantial amounts of kinetic debris, such as maroons. Other effects produce debris during operation (e.g. confetti) which is safe to land on people, but unsafe if fired directly at them.
							Identify effects which have a definite capacity to produce debris, adjust safety distances accordingly. Use a bomb tank for maroons.	Pyrotechnician	Pyrotechnician			
3	Fire caused by effect/fallout	Fire causing destruction of property and threat to life	A B C G X	4	5	20	Identify which products in use have the capacity for hot fallout	Pyrotechnician	1	5	5	Safety briefing to include specific mention of escape procedures.
							Ensure that all materials in the area of effect are checked to determine if they are combustible	Pyrotechnician				
							All combustibles in the effect area are treated with fire retardant, or are removed.	Pyrotechnician				
							If combustibles are brought within the effect area during the performance (at other times), ensure that a clear checklist is made, to check if nothing has been left behind.	Pyrotechnician				
							Have appropriate fire extinguishers readily to hand by persons that know how to use them.	Pyrotechnician				
							Cover adjacent effects if necessary with a heat-proof protective cover.	Pyrotechnician				
							Person firing to perform additional independent checks of escape routes before performances.	Pyrotechnician				
4	Injury from firing directly at a person	Minor to major injuries (particularly burns) from being within direct line of a fired effect	A B C X	4	4	16	Establish clear boundaries during rehearsals which all persons must be clear of during the time around firing.	Pyrotechnician	1	4	4	In some cases it is not possible to perform a test firing. Safe distances can be determined from prior experience with the effect (prior firings) or from manufacturer information.
							Provide a safety briefing to warn all company persons of the dangers of the effects, and to always treat them as live if seen loaded.	Pyrotechnician				
							Safe distance to effect to be determined by test firing if possible.	Pyrotechnician				
							The person firing the effect must have line of sight to the effect on stage (or have spotters with a reliable means of communication).	Pyrotechnician				
							If there is any doubt of on-stage clearances, the effect must not be fired.	Pyrotechnician				
							Establish a clear, unambiguous, instruction to fire.	Pyrotechnician				
							If in any doubt over an instruction to fire, do not fire the effect.					
							Extensively rehearse all sequences with effects.	Pyrotechnician				
							Ensure all rigging points for effects are securely fixed to prevent change of firing direction and to allow for any forces experienced during firing.	Pyrotechnician				
			Ensure only competent persons with specialist knowledge are allowed to supervise firing of effects.	Technical Director								
5	Failure of an effect to fire (misfire)	Major injuries caused by an effect that fires without proper control	A B C X	3	3	9	Determine an appropriate course of action for a misfired effect (leave in situ, remove from stage, etc) depending on stage activity after the proposed fitting time and opportunity for safe removal.	Pyrotechnician	1	3	3	Soaking leeches out the nitrates within the explosive rendering it safe. Nitrated water can be readily disposed of outside.
							Misfired effects are to be left for 10mins to ensure that they have no delayed reaction to firing stimulus.	Pyrotechnician				
							After waiting, misfired effects are to be packaged up and disposed of. Disposal by means of soaking in water.	Pyrotechnician				
							Perform a continuity test as soon as possible after rigging.	Pyrotechnician				
							Store effects according to manufacturer instructions.	Pyrotechnician				

6	Tampering of effects	Major injuries or fire caused by unsupervised effect firing	A B C G X	4	5	20	Ensure that effects are kept in a secure location or are guarded.	Pyrotechnician	1	5	5	Pyrotechnic control systems cannot be activated without the key for the keyswitch. This key should only be held by the pyrotechnician, so they know the effects cannot be fired without their presence at the control system.
							Rig effects as close to the performance time as is reasonably practicable.	Pyrotechnician				
							Audit Use.	Pyrotechnician				
							Limit access to firing system and safety keys to designated persons.	Pyrotechnician				
							Ensure all control circuits are clearly marked and cannot be accidentally mixed up with other circuits. Use incompatible connectors if possible or ensure that all connections are labelled and secured.	Pyrotechnician				
							Perform a check of rigging, wiring and firing systems before loading effects.	Pyrotechnician				
							Monitor access to areas with rigging and wiring to identify any suspicious behaviour.	Technical Director & Pyrotechnician				
							Restrict access to rigging points, circuit locations and firing positions if possible.	Pyrotechnician				
7	Vapours from effects	Respiratory distress	A B C X	3	3	9	Consult manufacturer information sheets to identify effects which pose a smoke/vapour hazard.	Pyrotechnician	1	3	3	Fire alarm isolation is necessary when using effects as they may produce smoke from their electric igniter or from the effect itself. However, when isolated, the capacity to detect fires is lessened, precisely when it may be most needed. This requires extra vigilance from all company members.
							Extensively rehearse scenes with effects, with blocking adjusted if necessary to distance people from effects.	Technical Director & Pyrotechnician				
							Ensure adequate ventilation onstage is using effects that give off harmful smoke/vapours.	Technical Director				
							Ensure fire alarm isolation is enabled during and immediately after firing.	Pyrotechnician				

Likelihood		<i>Likelihood of hazard event.</i>
Level	Descriptor	Description
5	Likely	1 in 10; once in two weeks or longer for daily activities
4	Possible	1 in 100; once in six months or longer for daily activities
3	Unlikely	1 in 1000; once in 4 years or longer for daily activities
2	Rare	1 in 10,000; once in a decade or longer for daily activities
1	Almost Never	Less than 1 in 100,000; once in a century or longer for daily activities

Consequence		<i>Reasonably foreseeable worst case scenario.</i>
Level	Descriptor	Description
1	Minor	Minor first aid treatment causing minimal work interruption.
2	Moderate	Injury requiring first aider treatment causing inability to continue with current work activity for 3 days or less. Minimal financial loss or damage.
3	Major	Medical treatment required. RIDDOR required for injuries causing over 3 days lost-time. Moderate environmental implications. Moderate financial loss or damage. Moderate loss of reputation. Moderate business interruption.
4	Critical	Permanent or life changing injuries. RIDDOR major injuries. High environmental implications. Major financial loss or damage. Major loss of reputation. Major business interruption.
5	Catastrophic	Single or multiple deaths.

Risk Matrix							
Severity	5	Fatalities	5	10	15	20	25
	4	Major	4	8	12	16	20
	3	Serious	3	6	9	12	15
	2	Minor	2	4	6	8	10
	1	Negligible	1	2	3	4	5
			Very unlikely	Unlikely	moderate	Likely	Very Likely
			1	2	3	4	5
			Likelihood				
<b>Negligible</b>			All risk should be reduced to this risk as much as is reasonably				
<b>Low</b>			Requires control measures to be implemented. The risk is acceptable subject to guidance. Risk should be reduced if possible.				
<b>Moderate</b>			Requires control measures to be implemented. The risk is acceptable subject to guidance. Risk should be reduced if reasonably practicable.				
<b>High</b>			Unacceptable level of risk. Risk must be reduced before activity				

Items in blue pertain to things affecting a range of groups

Items in white primarily pertain to activities conducted by the crew alone

Risk Groups		
A	Audience	People that enter performance locations as patrons, either paying or non-paying.
B	Band	Members of the show company that are primarily located in the band 'pit', where they may encounter additional hazards.
C	Cast	All other members of a show company, including production team.
G	General Public	Any member of the public not attending a show.
X	Crew	Any person that is involved with technical aspects of a show. StageSoc member or otherwise.