

Health and Safety Executive		Sector Information Minute	
Commercial and Consumer Services, Transportation and Utilities Sector (CACTUS)		SIM 05/2004/09	
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Target Audience

FOD Inspectors with responsibility for entertainment venues
SG Inspectors (Process Safety)

SAFE USE OF LIQUEFIED PETROLEUM GAS (LPG) FIRED STAGE FLAME EFFECTS

This SIM provides information on the safe use of LPG fired stage flame effects and the precautions expected.

BACKGROUND

1. These devices are becoming more popular as a visual effect during pop concerts, stage performances and other similar events. Concerns have been raised about the standards of some of the devices and the way in which they are used.
2. The use of LPG poses potential fire and explosion hazards to people both on and off the stage. The LPG generally used for these effects is propane.
3. Some LPG fired equipment is manufactured in Europe whilst other equipment originates in the United States, Canada and elsewhere. The specifications to which the equipment is built will therefore vary.
4. Some of the equipment requires an accumulator and LPG cylinders on stage during the performance (in a fire these could Boiling Liquid Expanding Vapour Explosion (BLEVE)) whereas other types only have an accumulator holding sufficient gas for a performance and so in a fire any explosion would be less severe.

EQUIPMENT AND OPERATION

5. The equipment is generally composed of a gas accumulator with a connection for an LPG cylinder for filling and outlet valve or valves to supply the burner heads that provide the flame effect. There is a control system and flame detectors that are designed to ensure that gas is not released from the accumulator to the burner heads unless there is either a pilot flame or ignition spark present. The burner valve setting controls the size of the flame produced. The unit is operated remotely from a control panel that can be sited out of sight of the audience. Some units have a sufficiently large accumulator to power the effects for an entire performance; others require refilling from a propane cylinder during the performance.

RECOMMENDATIONS

6. The recommendations in this SIM are not specific to any manufacturer and alternative methods of achieving the same standard may be acceptable except where a legal

requirement exists.

7. A general risk assessment for the system and a site specific risk assessment should be available prior to setting up the equipment as part of the requirements of The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR). The risk assessment should include but not be limited to, consideration of the fire loading of the stage, the effects of any pyrotechnics during the performance and the number of people (operators, audience, performers) present.

8. DSEAR require a hazardous area classification to be carried out. Any electrical equipment installed should be suitable for use in the hazardous area in which it is to be used.

9. The Pressure Systems Safety Regulations 2000 (PSSR) require that a written scheme of examination is prepared for a pressure system and that a competent person examines the system. A certificate to show that such a person has examined the system should be available on site. The written scheme of examination should also be available unless the certificate indicates the date the next examination is due. A copy of all paperwork should be available in English if the original is in any other language.

10. All equipment should carry the CE mark including that originating outside of the EU.

11. The control system should include a hold to run device (dead mans handle) or equivalent in the form of a foot pedal.

12. There should be dual valve isolation for the LPG supply to the burners. One valve to be located local to the accumulator and one local to the burner. The accumulator valve should remain closed until just prior to the flame effect. The valve at the burner should remain closed until the igniter is operating and should close if the igniter stops operating.

13. The accumulator should be charged with gas only. The cylinders used for charging the tank should normally be removed to an open storage area outside the building once the charge has been completed. However, where the equipment needs an LPG cylinder to be attached during the performance the smallest possible quantity of gas and size of cylinder should be used i.e. enough for one performance only.

14. The accumulator and any LPG cylinder present should each be fitted with a relief valve. All LPG supply lines to the burners and pilot lights should incorporate a flashback arrestor.

15. There should be no low points within 2 metres of the equipment where an LPG leak could collect. For inside events hoses should ideally not be routed under the stage. This may vary for external events where there is adequate ventilation. Where piping is required under the stage for indoor events, adequately supported rigid pipe should be used.

16. Operators should be trained in the use of the specific equipment preferably by the manufacturer/designer of the equipment.

17. The risk assessment should consider how close the performers or any other person can be to the burners when the effect is operated. This should normally be no closer than 3 metres due to the heat radiated. A greater distance may be necessary depending on the size of the burners. To assist the operator it is suggested that the stage is marked with tape at the appropriate distance.

18. A suitable number of fire extinguishers should be ready for use before the LPG fired equipment is used. Personnel trained in the use of fire extinguishers should be present.

ENFORCEMENT

1. In the event of the above recommendations not being followed, there is a significant risk of fire or explosion, either as a result of a failure of the unit itself or because of a fire elsewhere in the venue affecting the unit. There is a risk of serious personal injury to one or more people. There are legal standards established for the use of LPG (DSEAR) and pressure systems (PSSR). The initial enforcement expectation where the recommendations in this SIM are not being followed is a prohibition notice.

FURTHER INFORMATION

2. Inspectors needing further technical information or support should contact the appropriate SG (Process Safety). Other enquiries about this SIM should be addressed to the Entertainment Section of CACTUS at the Glasgow Office (0141-275-3045, VPN 521-3045).

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