

Dry Ice

When a Dry Ice Machine was operated on stage during a preview performance of a popular musical - carbon dioxide (CO₂), being heavier than air, seeped into the pit. A member of the theatre staff who was in the orchestra pit became disorientated and collapsed. The member of staff was taken to hospital and later released, fortunately without suffering any apparent long-term injury.

HSE prosecuted the producer on two counts:

1. Under COSHH exposing a person to Carbon Dioxide fumes.

11. Health and Safety at Work, Failure to assess the risk.

Fines were imposed amounting to £4000,

The use of Dry Ice comes under the COSHH regulations which came into force on 1st October 1989, applying to all work activities where hazardous substances are used. COSHH Regulations (now forming part of the Health and Safety at Work Regulations) involve all employees, HOD's and Theatre Managers in an assessment to prevent a health risk that may arise from a substance 'Hazardous to Health'.

These machines are used extensively in Pop Concerts, Ballet and Pantomime. This accident highlights the problems associated with such effects and the need for technicians to be aware of the associated problems.

Solid carbon dioxide is immersed into hot water and the resulting vapour is usually directed by a fan and ducting across the stage. Often the dry ice is purchased in pellet form or solid blocks and when broken up into smaller pieces allows a more rapid vaporisation which increases the dry ice effect.

The effect produces a solid white cloud mist over the stage. Carbon dioxide does not support life. CO₂ is heavier than air and can exclude the oxygen in the air by flowing into low-lying confined spaces; anyone breathing in these conditions for only a short time, will at best become drowsy and at worst is liable to suffocation.

A number of points need to be observed:

1. It is important that everyone on stage should be aware of the dangers of CO₂ and know when the dry ice machine is to be operated. Operation of the machine should take into account safety of the staff, performers and audience. Vapour outlets should be in sight of the operator at all times.

2. Rehearsal of the effect must be carried out to determine the direction of flow of the dry ice vapour and people coming into contact with it. Precautions must be observed if dry ice vapour falls into the orchestra pit or flows into areas such as basements, under stage storage or the auditorium. Care needs to be taken to move the machine to a new location or redirect ducting. The amount of Dry Ice should be limited to the minimum necessary to create the desired effect.

3. Good ventilation is important - as the vapour becomes invisible the gas concentration may become difficult to determine. Health and Safety recommend that if there is any *'doubt about the concentration present, expert advice should be sought to monitor the oxygen and carbon dioxide levels before the equipment is used'*.¹

¹ Guide to Health, Safety and Welfare at Pop Concerts and Similar Events.