



Safe design and build of production sets used for film and television

Entertainment Information Sheet No 19

Introduction

This information sheet is one of a series produced in consultation with the Joint Advisory Committee for Broadcasting and Performing Arts. It gives specific advice on the design, manufacture and build of production sets used for television, film or media productions.

Poorly designed, manufactured and built sets can present hazards to those working or performing on and around them. Priority should be given to design considerations and through design to manufacture and build. Safety of the overall production design is paramount and especially with any relationship to associated visual or special effects.

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.

The Construction (Design and Management) Regulations 1994 affect everyone who is involved in the construction process. Although the CDM Regulations are not likely to apply to most set building activity, there may be occasions when they will. This is most likely to be the case where particularly large or complex sets are involved. More sources of information on the CDM Regulations can be found in 'Further reading'.

Hazards

These include:

- unsafe structures resulting from poor design;

- use of poor quality or unsuitable materials (sharp or unfinished edges, protruding nails etc);
- poor manufacture and building standards;
- increased fire risk from the use of unsuitable materials;
- hazardous substances;
- manual handling difficulties caused by heavy and bulky scenery items etc;
- trips and slips on uneven or unsuitable floor surfaces, uneven steps or stair treads;
- falls from height caused by inadequate or unsuitable edge protection;
- failure to provide handrails;
- falling objects (eg scenery or lamps inappropriately suspended or poorly rigged);
- electrical shock or burns from unsafe electrical equipment;
- entrapment and entanglement from unguarded or unprotected mechanical devices.

Responsibility

Responsibility for the safety of a production set or scenery rests between the producer and the designer and construction team.

The producer is responsible for ensuring the overall safety of any production. In design terms this means that a competent designer and construction team is appointed with the specific health and safety responsibilities of each member clearly stated and understood. The designer and construction team should be provided with information on the nature of the production and any known risks. Adequate resources should be made available so that health and safety standards are not compromised.

Information regarding the safety of the set gathered from the designer and construction team (typically in the form of a risk assessment) should be clearly communicated to all parties through the production's own risk assessment. Any safety measures identified by the designer and construction team, such as inspections, should be implemented.

The designer and construction team are responsible for ensuring that the set or scenery is designed and manufactured to meet safety requirements and to minimise any identified risk during its lifetime. They should arrange for a risk assessment to be conducted for the set or scenery that considers possible risks to the scene crew, cast, production team and other contractors.

They need to ensure that adequate controls are put in place by:

- employing only competent scenery constructors, briefed as to the purpose of the set and given adequate information about the specification of the set and the resources to complete the construction safely;
- specifying any required inspection, testing or maintenance;
- conducting all required inspections, tests or certifications;
- following all relevant standards.

Any construction team employed is responsible for ensuring that:

- scenery is built, installed, rigged and dismantled safely in line with the information provided by the designer;
- they co-operate with the designer at all times on health and safety matters;
- only competent staff or subcontractors are employed;
- risks to all parties are adequately controlled at all stages during the scenery's life cycle;
- adequate risk or other (eg COSHH) assessments are conducted for the manufacture of any scenery;
- all electrical fittings and attachments comply with current standards;
- only safe and suitable equipment or materials are used.

Risk assessment

The designer and construction team should complete a suitable and sufficient risk assessment and identify appropriate control measures for any sets or scenery including props. The risk assessment should set out risks to members of the production team, artists, other contractors, contributors and audience members. Where appropriate, assessments should be supported by calculations or certification.

Control measures

The following control measures can be considered.

Fire

In order to control the risk of fire it is vital that any studio or theatre is adequately managed, a fire risk assessment has been carried out for the building and adequate means of escape from sets and buildings is provided.

All items of scenery, including props and dressings, bought into any studio should be either naturally fire-resistant, flame- or fireproofed and conform to the relevant British, European or International Standards. Certain legal restrictions also apply to furniture.

Remove or limit the use of materials that will give off toxic fumes during fire, such as polystyrene. Where it is essential to use polystyrene, the amount should be kept to the absolute minimum. Polystyrene foam should be treated as if it were a highly flammable liquid.

If the storage of props and redundant scenery is kept to a minimum within any studio or stage while it is in use, the fire loading will be correspondingly reduced.

Suspended scenery items

All sets or scenery suspended above head height should be securely suspended. Designers and the construction team should ensure suitable hanging points are provided which are clearly identified. Hanging irons and points etc for wood structures should be bolted through; for metal structures they should be either bolted or welded.

It is particularly important that items suspended above audiences should not present any risk. Adequate fail-to-safety systems of support should be used.

Glass

The use of glass within studios and stage sets should be avoided. Where possible, use rubber glass, sugar glass or plastics such as corbel or perspex. If real glass is to be used then it should be either laminated or toughened glass. Ordinary glass can be covered with a plastic film. Sets containing real glass should be clearly marked and appropriate warnings posted.

Scaffolding and supporting trusses

Working scaffoldings and supporting trusses, whatever their intended purpose, should only be built by competent contractors or riggers to an approved design. Each structure should be built to ensure it is safe for its intended purpose. Regular inspection of long-standing structures should be carried out by a competent person, especially in external locations.

Scaffolding used as props does not require regular inspection once it has been safely erected but where scaffolding is to be accessed by crew or artists it should be subject to regular inspection.

Video walls

Video walls should be adequately designed and constructed. Several video walls have collapsed in the past due to poor designs. They should be designed and constructed with regard to the intended usage including factors such as intended mobility, height, eccentric load etc. Counterbalancing should be provided where necessary and be integrated into the design and build of the video wall.

All screens within a video wall should be bonded to each other and to the main structure to ensure the stability. Additional stability can be achieved by using a

skirt to widen the base area. LCD screens are safer than typical monitor screens as their centre of gravity is in the middle.

Electrical installation, integrity and protection

The design of sets frequently requires electrical fittings and wiring to be mounted on flats and scenery. Competent people should be consulted at the design stage. A competent electrician should undertake the work of fixing and wiring-up electrical fittings and fixtures. The essential principles are covered in both BS 7671 and BS 7909.

Gas safety

Accidental release of gas can lead to fire, explosion or asphyxiation. Gassing accidents can occur from the build-up of fume or poisonous combustion products, particularly carbon monoxide.

The installation of gas appliances, whether supplied from the mains or liquefied petroleum gas (LPG) from fixed or transportable cylinders, should only be done by a CORGI-registered gas fitter. Gas appliances need good, general and fixed ventilation so that combustion products are safely dispersed.

A portable or mobile gas appliance hired for the purpose as a temporary prop (and capable of being connected to a LPG cylinder by the means of a proprietary bayonet-type safety fitting) can be safely used without engaging a CORGI-registered gas fitter, provided that no changes whatsoever are made to the burner or delivery pipework. The purchaser should ensure the items have been properly maintained and are safe to use in the intended environment.

Real flame

Real flame or practical flame used on a production set should always be kept an adequate distance from staff, artists and audience. All surrounding materials should be durably fireproofed or be fire-retardant. Intended action should be carefully choreographed to prevent or reduce the possibility of loose clothing (flowing costumes) coming into contact with flames.

Specialist contractors or special effects contractors may need to be in attendance.

Water

Water tanks or containers should be properly designed to ensure that they are suitable for the intended use and adequately tested for leakage prior to use. Normal practice should include the provision of secondary containment. Ensure the water source is free from contamination, including bacteriological contamination, especially legionella. Water treatment may be necessary if the water is retained.

Machinery and equipment

Equipment or machinery either integral to the set or used during its construction needs to meet the requirements of the Provision and Use of Work Equipment Regulations 1998. The main requirements are that:

- it is appropriate for its intended use;
- all dangerous or moving parts are adequately guarded;
- the controls are accessible and understandable;
- emergency stops are fitted and provide isolation from power source if required;
- adequate information on its safe use and operation is provided.

Pressure systems

Production sets incorporating hydraulic and pneumatic assemblies as part of the operating systems should be built to current standards, especially if failure could result in injury.

Designs should be subject to failure mode analysis carried out by a competent engineer, to ensure that all critical components fail to safety. Once built, an installation should be subjected to an initial test to check the safety critical elements, such as switches, valves, variable controllers (eg pressure regulators) and overload protection (eg pressure-release valves) are properly set and functional. Thereafter, pressure systems should be subject to a regular periodic thorough examination as recommended by a competent person. Any system with an operating pressure of 0.5 Bar or above or using steam at any pressure will be subject to the Pressure Systems Safety Regulations 2000.

Falls from heights

There are three basic ways of preventing people falling from a height (normally considered to be above 2 m), in order of preference:

- edge protection - parapet, guard rails etc;
- restraint - safety harness fixed to suitable anchorage points etc;
- by position - maintaining a safe distance from an unprotected edge.

Safety by position, normally a distance of 3 m, will depend on a number of factors including the type of activity taking place, the amount of space and number of people, the prevailing environmental and weather conditions, the rake of the stage, roof etc.

A potential fall height of under 2 m may also require the precautions described above if it is considered dangerous.

Steps and stairs

All steps and staircase risers should be of a consistent height and rise where practicable. Anti-slip strips can be fitted to stairs where required and suitably marked. Steps or stairs are much safer if they are properly lit.

Hazardous chemicals and substances

Control measures should consider the information supplied by the manufacturer. Storage and use of chemicals on a set should be carefully controlled. Consideration should also be given to the need to conduct maintenance operations within a studio or location environment.

Manual handling

Much can be done at the design stage to reduce manual handling problems arising from sets or scenery by:

- minimising the weight of individual sections so far as practicable;
- providing handles or similar at suitable points on all bulky or heavy items;
- ensuring that heavy sets (over 50 kg) are marked as such;
- avoiding sharp edges or similar at handling points.

Where handling equipment is likely to be required, or additional staff are required to handle such sets safely, the designer should ensure that such information is provided to the producer or contractors in advance of the scenery being delivered.

Fire lanes and fire exits

Means of escape in case of fire should be clearly identified and kept clear at all times. The designer and construction team should clearly identify any special fire precautions and bring these matters to the attention of the management.

Sets should not obstruct the statutory fire signage used within studios, stages or theatres. If necessary, temporary signage should be provided if any scenery obstructs the view of normal fire escape signs.

Audience seating

Configurations used for audience seating are covered by consent from the local authority licensing section under licensing law requirements for theatres and similar places of entertainment. Standard units of seating in most theatres and some television studios have already been approved. Applications for non-standard audience seating configurations or specialised events should be submitted to the appropriate local authority as early as possible.

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

Workplace health, safety and welfare. Workplace (Health, Safety and Welfare) Regulations 1992. Approved Code of Practice L24 HSE Books 1992 ISBN 0 7176 0413 6

Safety of pressure systems. Pressure Systems Safety Regulations 2000. Approved Code of Practice L122 HSE Books 2000 ISBN 0 7176 1767 X

Safe use of work equipment. Provision and Use of Work Equipment Regulations 1998. Approved Code of Practice and guidance L22 (Second edition) HSE Books 1998 ISBN 0 7176 1626 6

Guide to fire precautions in existing places of entertainment and like premises The Stationery Office 1990 ISBN 0 11 340909 7

A guide to managing health and safety in construction HSE Books 1995 ISBN 0 7176 0755 0

Managing health and safety in construction. Construction (Design and Management) Regulations 1994. Approved Code of Practice and guidance HSG224 HSE Books 2001 ISBN 0 7176 2139 1

Working at heights in the broadcasting and entertainment industries Entertainment Information Sheet ETIS6 HSE Books 1998

Smoke and vapour effects used in entertainment Entertainment Information Sheet ETIS3 HSE Books 1996

Further information

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.

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

© Crown copyright This publication may be freely reproduced, except for advertising, endorsement or commercial purposes. First published 12/02. Please acknowledge the source as HSE.