

Within the entertainment industry there are often occasions where it is necessary to move or suspend loads above people

HUK **HOIST UK**



| Tony Dickson

A new way

Tony Dickson, co-founder of Hoist UK, a distributor for the complete range of Verlinde industrial and entertainment lifting equipment, explains how a German lifting standard seems to have been adopted by the UK entertainment industry when suspending and lifting loads above people

Within the entertainment industry there are often occasions where it is necessary to move or suspend loads above people, using powered equipment such as chain hoists. There is great debate as to how this should be achieved both safely and legally.

Industrial lifting engineers will at this point no doubt be saying to themselves that there should be no debate at all: LOLER (Lifting Operations and Lifting Equipment Regulations 1998 [3]) should be the point of reference and loads should never be lifted over people. They would probably also add that if it is necessary to suspend loads over people they must have a secondary form of suspension bypassing the piece of lifting equipment, in effect dead hanging the load on fully rated and certified

steel wire ropes and shackles.

While I would agree that this is the correct option for industrial applications, within the entertainment industry there is obviously more requirement for the loads to be suspended or moved above people. For example, a lighting rig may be suspended above the audience or a piece of scenery will need to be moved into position during a performance. Here, it is necessary to provide equipment that is both fit and legal for this purpose.

When considering how to rig equipment in a theatrical situation we also have the added impediment of time. Often there is a limitation to the installation period. For example, an opening night has to happen when it is advertised and the time between a previous show closing and a new show opening is

usually kept to a minimum.

Bearing this in mind, the entertainment industry has had to develop methods of safely rigging these loads in a short time period and sometimes without the need for secondary safety components, yet in a safe and controlled manner.

There are in fact several different European standards and various codes of practice that have been written specifically to cover lifting operations within the entertainment industry. However, in Europe there is not a harmonised standard as yet for chain hoists in applications where loads are suspended overhead (static loads) or moving above people (dynamic loads) without the need for additional safety arrangements.

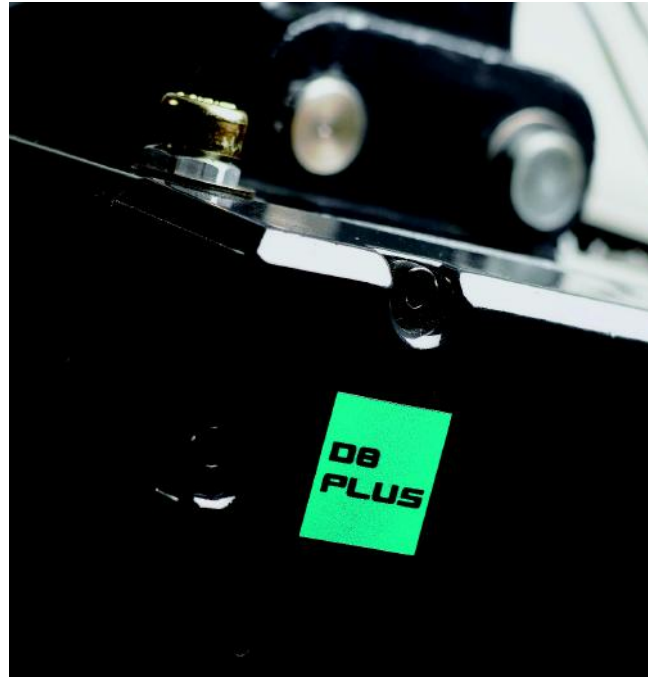
Most countries do have their own regulations covering this but they differ from case to case and country to country despite generally covering the same basic safety requirements.

In the UK, we have British Standard BS7905-1, a specification for the design and manufacture of above stage equipment and more specifically BS7906-1, code of practice for installation, use and removal of above stage equipment which specifically covers the situations where loads are suspended or lifted over people for performance, broadcast and similar applications.

However, we now have to consider that a show or tour may travel throughout Europe or indeed the world and the production team must ensure that the equipment used on the tour will fully meet the legal requirements of all of the countries visited. There is not the budget nor the time to have separate pieces of equipment for each country.

So, to return to the beginning, this is why the most well known and most commonly adopted code of practice is the German BGV-D8/D8+ or C1, which refers to the DIN standard (Deutsches Institute Fur Normung e.V. the German Institute for Standardisation), DIN 56925/DIN56950, for reference.

The popularity of the standard is probably due to the German authority's insistence that all national and in-coming



tours/shows comply with their own national standards regardless of origin. The German standards are the most stringent in Europe and cover all of the requirements of other European standards.

Conforming to these standards ensures that there will not be a problem when crossing the borders to other European countries, thus making it easier for production companies to use one set of equipment.

Currently without a recognised European norm, the European entertainment industry in general has chosen to adopt the German standards and to try to explain the requirements I have detailed below some points to consider when choosing the type of suspension required and have compared the relevant German and British standards that are generally followed:

1 Static appliances (where the load remains in one position overhead)

- a) The load is independently secured with safety rope or inertia roller safety between suspension point and load.
- b) The load is not independently secured.

In situation **1a**, a standard rigging hoist to BGV D8 specification or a standard hoist meeting the BS 7906-1

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Hoist requirements	Suspension (static loads), hoist type and standard			
	With secondary suspension (as in 1a in the text)		Without secondary suspension (as in 1b in the text)	
	BGV D8	Category B	BGV D8+	Category A
Safety factor	5:1	4:1	10:1	8:1
Brake type	Single	Single	Double	Double
Brake position	Brake may act via the clutch	Brake may act via the clutch	Direct acting brake required	Direct acting brake required
Electrical limits	Not a requirement	Not a requirement	Not a requirement	Top, bottom and (two) ultimate limits required
Mechanical chain stops	Required	Not essential	Required	Required
Emergency stop	May not be provided	May not be provided	May not be provided	Required
Secondary suspension	Required	Required	Not a requirement	Not a requirement
Controller	May not be provided	May not be provided	Desirable	Desirable
Clutch	Load bearing clutch acceptable	Load bearing clutch acceptable	Load bearing clutch NOT acceptable	Load bearing clutch NOT acceptable

Table 1

STANDARDS - 2



Full compliance to BGV C1 is often unnecessary as the majority of cases can be categorised as static

Category B type hoists may be used, but it is essential to have secondary suspension via safety steel, inertia reel or load arrestor. A category B hoist is a hoist that is not intended by the manufacturer for lifting or suspending loads over people.

Situation 1b, however, requires a higher degree of mechanical safety and would require a hoist to BGV D8+ specification or a hoist meeting the BS 7906-1 Category A type hoists may be used. A category A hoist is a hoist that is intended by the manufacturer for lifting or suspending loads over people.

BGV D8+:

- The hoist should have a mechanical factor of safety of 10:1.
- The hoist should be fitted with a double brake system.
- The clutch (mechanical overload device) is not permitted to be load bearing (in line with the load).
- The hoists should be fitted with mechanical limit stops on

either end of the chain.

- An emergency stop is not deemed necessary in the standard although referral to the machinery directive is advised.
- Specific controller is not deemed essential.

BS7906-1 Category A:

- The hoist should have a mechanical factor of safety of 8:1.
- The hoist should be fitted with a double brake system.
- The clutch (mechanical overload device) is not permitted to be load bearing (in line with the load) as the brake must act directly to stop the load.
- The hoist should be fitted with four position limit switches (both operational and emergency upper and lower limit switches).
- The hoists should be fitted with mechanical limit stops on either end of the chain.
- The hoist should be fitted with emergency stop.
- Specific controller is not deemed as essential in the standard.

The BGV D8+ concept was created some years ago after practical experience showed that there was a distinct gap between the BGV D8 and BGV C1 standards and that full compliance to BGV-C1 was really "over-kill" since the majority of cases could be designated as static.

In both cases 1a and 1b there is no requirement for special control and electrical limits are only called for in BS 7906-1 Category A type hoists when used in this application. Both standards assume that during set-up, the area underneath the load is kept clear and secured before and during the movement. Once the load is in position, the control system should be disconnected from the main power supply.

In cases where standard hoists are used in 1a and 1b, it is still advisable to consider additional safety measures like low voltage control, standard limit switches, thermal protection, a controller etc. However, this is not compulsory in terms of regulations.

2 Dynamic appliances (where the load is required to move overhead)

a) The load is independently secured by means of an

Hoist requirements	Lifting (dynamic loads), hoist type and standard			
	With secondary inertia type suspension (as in 2a in the text)		Without secondary suspension (as in 2b in the text)	
	BGV D8	Category B	BGV C1	Category A
Safety factor	5:1	4:1	10:1	8:1
Brake type	Single	Single	Double	Double
Brake position	Brake may act via the clutch	Brake may act via the clutch	Direct acting brake required	Direct acting brake required
Electrical limits	Not a requirement	Not a requirement	Top, bottom and (two) ultimate limits required	Top, bottom and (two) ultimate limits required
Mechanical chain stops	Required	Desirable	Required	Required
Emergency stop	Not essential	Not essential	Required	Required
Secondary suspension	Required	Required	Not a requirement	Not a requirement
Controller	Not required	Not required	Required	Desirable
Clutch	Load bearing clutch acceptable	Load bearing clutch acceptable	Load bearing clutch NOT acceptable	Load bearing clutch NOT acceptable
Overload monitoring - shut down at 120% SWL	Not a requirement	Not a requirement	Required	Not a requirement
Underload monitoring	Not a requirement	Not a requirement	Required on guided loads or multiple group lifts	Not a requirement

Table 2 |

inertia roller safety or load arrestor between suspension point and load (the use of this type of safety systems is time consuming, expensive and has restrictions in terms of height).

b) The load is not independently secured.

In situation **2a**, again, the use of a standard BGV D8 or a category B hoist is permitted. In the case of a lift involving more than one hoist, which is common in the entertainment industry, it is necessary to have the hoists controlled as a group and in such a way that all the safety components such as overload device, emergency stop and over travel limits of all of the hoists in the group act in unison.

For example:

- If one hoist in a group system is overloaded, all hoists in that system should stop.
- If the over travel limit switch of one hoist in a group system is activated, all hoists in that system should stop.
- If it became necessary to activate an emergency stop button all of the hoists within the designated group should be affected and stop.

Situation **2b** applications require a much higher degree of mechanical and electrical safety. This configuration is becoming more popular in the entertainment industry where overhead lifting is normal practice and due to the complexity of the various regulations throughout Europe, when loads are to be moved overhead, the rigging fraternity have adopted the full BGV C1 safety standard as the norm. Although the British Standard BS 7906-1 adequately covers this situation for use in the UK, there are differences in the requirements.

In these situations a complete system designed to BGV C1 is compulsory to meet the requirements of the German standard. In this instance it is absolutely necessary that the controller as well as the hoist meet the same exacting standards. In a system in which the hoists are to BGV-C1 specification but the controller is not, the installation will not be considered compliant.

Case in fact: A recent major European tour was in danger of being cancelled when a German authority audit of the above stage equipment moving loads above people found that the equipment supplied did not comply to the BGV C1 standard in the control system functionality. Fortunately, the production team were able to hire suitably certified equipment from a German rental company, albeit with considerable disruption and cost. Lesson learned.

BS7906-1 Category A:

- The hoist should have a mechanical factor of safety of 10:1.
- The hoist should be fitted with a double brake system.
- The clutch (mechanical overload device) is not permitted to be load bearing (in line with the load) as the brake must act directly to stop the load.
- The hoist should be fitted with four position limit switches (both operational and emergency upper and lower limit switches).
- The hoist should be fitted with mechanical limit stops on either end of the chain.
- The hoist should be fitted with a direct acting electrical overload device.
- The hoist should be fitted with a direct acting electrical underload device when used for guided loads or multiple group lifts.
- The controller should have group safety monitoring to stop all

hoists in a group if any one of the safety devices are activated.

- The controller should monitor emergency limit switch operation.
- The controller should monitor the electrical overload/underload device.
- The controller should monitor the brake and limit switch functions.
- In controllers that include software, standards to comply to are EN61508 / SIL3 or EN62061 after a proper risk analysis is made.

BS7906-1 Category A:

- The hoist should have a mechanical factor of safety of 8:1.
- The hoist should be fitted with a double brake system.
- The clutch (mechanical overload device) is not permitted to be load bearing (in line with the load) as the brake must act directly to stop the load.
- The hoist should be fitted with four position limit switches (both operational and emergency upper and lower limit switches).
- The hoist should be fitted with mechanical limit stops on either end of the chain.
- The hoist should be fitted with emergency stop.
- Specific controller is not deemed essential.

Hoists that comply with BGV-D8/D8+ or C1 requirements must be clearly identifiable and should be marked as such.

Summary

Hopefully the above will have helped to clarify the present situation as it stands. However, the good news is that sometime soon (in legislative terms that is) there will be a European norm covering the specific requirements for overhead lifting.

Under the CEN (the European Committee for Standardisation) supervision, and in close cooperation with DIN, a new work group CEW25 was formed in 2006 to start the harmonisation process based on the various existing European standards. This initiative has a wide European coverage and support.

Its aim was to finalise the project by the end of 2007. In fact the new code WS25 has already been issued for public review and will be presented to CEN for acceptance later in the year (2008).

Once CEN acknowledge and publish it as an EN document it will not take on the status of a full EN standard immediately, this process may take several years depending upon the harmonisation and adoption process in relation to individual countries national standards.

Nonetheless this is set to be the first European document that has been created by and for the whole of the European entertainment industry and as such looks to be readily accepted. Sweden has in fact already indicated that they will adopt it as their national standard as soon as it is issued. ■

The above list of requirements is indicative and meant only as a guide. Compliance with these standards does not imply immunity from any legal obligation. The above contents should be read in conjunction with the following statutory regulations:

- The Lifting Operation and Lifting Equipment Regulation (LOLER) 1998 [3].
- The Provision and Use of Work Equipment Regulations (PUWER) 1998 [4].
- The Supply of Machinery (safety) Regulations 1992 [5].
- Relevant risk assessments and method statements.