



NRAG GUIDANCE - LOAD SUSPENSION USING ELECTRIC CHAIN HOISTS OVER STAGES AND AUDITORIA

The following companies or associations endorse this NRAG Guidance



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Electric chain hoists ('motors') are used in the entertainment industry all over the world to lift and support production requirements. Modern motors are mass produced high quality machines meeting international standards.

Loads (trusses, audio arrays, scenic elements) are often supported by only two hoists and in the event of one failing the need to prevent injury is obvious. Traditionally a secondary suspension (a 'safety') is installed next to each motor to catch the load should the motor fail.

Hoist failure is actually extremely rare. Installing 'safeties' at the insistence of a venue to comply with a historic requirement may be cosmetic. Poor installation may go unnoticed at a venue without the necessary engineering competence being present. Using 'safeties' also increases work at height and once attached the load usually cannot be moved until the safeties have been disconnected, requiring yet more work at height. A false sense of security created by the installation of safeties can mask more important but less obvious safety considerations. However, because there could be a contractual requirement to use secondary suspensions from a licensing or insurance standpoint, check with the venue and comply with their policy unless you can satisfy their requirements in another way.

There has been an increase in the use of hoists with double brakes and a higher safety factor (typically de-rated by 50%) in the belief that then secondary suspensions are not needed. This is untrue; it only reduces the likelihood of the hoist itself failing.

Should one hoist fail in a single or two hoist system the result could be catastrophic. Using four hoists to lift and support a structure designed to cater for the increase in span or cantilever caused by a suspension failure may remove the need for secondary suspensions at all.

It is essential to consider the load, the lifting equipment and the supporting 'parent' structure. The quantity of suspensions is as important as their quality. Risk assessment is the key.

British Standards

BS 7905:1 and BS 7906:1 (both now withdrawn*) define hoists in two categories. Category A hoists are intended by their manufacturer to lift and support loads over people.

Industrial hoists will rarely meet these Standards without significant modification.

Category B hoists as specified in BS7906:1 are standard industrial hoists and may be used when personnel are excluded from the area while loads are lifted or lowered.

Technical Standards for Places of Entertainment contains guidance on suspended loads at K2.32.

This states that standard industrial hoists (Category B or D8, D8+) can be used to suspend loads over people at 50% of their rated capacity. (For example, a hoist with a WLL of 1000kgs loaded only to 500kgs as a SWL).

*Withdrawn British Standards can still be used for reference but are no longer maintained by BSI.

BS 7905:1 is superseded by EN17206. BS7906:1 has not been superseded at the time of writing.

European Standards

Hoists manufactured to EN17206 have an Entertainment Load Limit specified by the manufacturer. This accounts for the particular demands of operating above a stage or audience in their design and execution. It includes using an enhanced factor of safety derived from the industrial working load limit. The methodology is specified in EN17206 and is based on six classes of use ranging from lifting a load with one hoist with nobody present below the load to lifting performers with multiple hoists.

DGUV 17

Reference is often made to 'D8', 'D8+' 'D8++' or 'C1' chain hoists. In Germany employers must comply with certain requirements in order to secure workers' social accident insurance. The reference document is DGUV17 which is not a Standard in UK terms, more a code of practice. DGUV17 requires not only hoists with double brakes and enhanced factors of safety but also compliance with specifications for the controls, user training and maintenance programmes.

Using 'D8+' 'D8++' or 'C1' hoists alone may not make other precautions unnecessary.

UK Legislation

UK legislation contains few requirements specifically intended to apply to the entertainment industry. Lifting equipment is governed by the PUWER and LOLER Regulations 1998 and places the duties on employers and the self-employed.

PUWER requires that work is planned and carried out safely by trained people. Further it requires that work equipment is suitable for the application and maintained to keep it in a safe condition.

LOLER is specific to lifting and states in Regulation 4 that equipment must be strong and stable enough for the foreseeable use. In Regulation 6 it states that lifting equipment is installed in such a way as to reduce to as low as is reasonably practicable the risk of lifting equipment or a load striking a person and it is otherwise safe. Further it states that lifting equipment should be positioned or installed to minimise the need to lift loads over people.

Regulation 8 states that an employer shall ensure that every lifting operation involving lifting equipment is properly planned by a competent person, appropriately supervised and carried out in a safe manner. The Approved Code of Practice (ACoP) text for Regulation 8 in LOLER 1998, which although not law has a legal status, states that "where practicable, loads should not be carried or suspended over areas occupied by persons. Where this is not practicable there should be a safe system of work which minimises the risks to persons who may need to be below the load".

In guidance on Regulation 8, the ACoP states "where risks cannot be controlled by organising the layout of the workplace, other measures will need to be taken to protect people below the load to minimise the consequences if it falls". It suggests using lifting equipment with additional safety features or ensuring a secondary means to contain the load should it begin to disintegrate.

Assuming safeties are needed:

- They should not be slack but be as taut as possible
- They should be at least as strong as the primary suspension they safeguard
- They should be rigged as if they were primary suspensions, observing good slinging practice
- They should be independent of the primary support if possible.

Myths:

- 'Safeties' are not required by law.
- Double brakes do not mean safeties are not required.
- Higher safety factors do not compensate for poor rigging decisions