



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

The following companies or associations endorse this NRAG Guidance



the worldwide voice of entertainment technologies

**The advice contained within this guidance is presented without warranty and compliance with it does not of itself confer immunity from any legal obligations. Any recommendations reflect the conclusions of the National Rigging Advisory Group only and have no legal precedent.**

**The reader remains free to take other action.**

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.

Trusses are often supported by a hoist at each end and the need to prevent the truss falling in the event of one of the hoists failing is obvious. Traditionally the method of doing this has been to use a secondary suspension, or 'safety', installed next to each motor to catch the truss should the motor fail.

Hoist failure is extremely rare and so installing safeties at the insistence of the venue is often cosmetic, being a time consuming undertaking, increasing work at height with loose equipment overhead and slowing down the get-out. Once the safeties are attached the load usually cannot be moved until they are disconnected, requiring more work at height.

Poor installation of safeties frequently goes unchallenged because there is not the necessary engineering competence present at a venue. Importantly it can create a false sense of security in the process; concentrating on safeties may create risks rather than reduce them and mask more important but less obvious considerations.

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 there is then no need to use secondary suspensions. This is untrue because should any hoist or part of its rigging fail, the load will fall. If the failure of only the hoist is the issue, then a higher specification may be of value.

**Category A** hoists as defined in BS 7905 and BS 7906 are declared by the manufacturer as intended to move loads overhead in the entertainment industry, that is to say lift or lower over people. Entertainment industry motors will rarely meet these Standards without modification since they call for a 15% overload sensor. Most motors are supplied with overload limiters operating between 25% and 40% of the hoist's lifting capacity, and it is often impossible to adjust many to 15%.

**C1 hoists** are a requirement in Germany. German employers must comply with BGV C1 classification to meet conditions relating to employee insurance. It is not a Standard and hoists with double brakes and enhanced factors of safety are only one of the requirements for the lifting system which also includes specifications for the controls, user training and maintenance programmes. Using 'C1' hoists does not make other precautions unnecessary.

**Category B** hoists (**D8** hoists in Germany) are standard industrial hoists and can be used overhead for suspension – in other words personnel are excluded from the area while the load is lifted or lowered.

**Technical Standards for Places of Entertainment and CWA 15902\*** both state that standard industrial hoists (Category B or D8, D8+) can be used to suspend loads overhead (not move loads overhead) but only within 50% of their rated capacity. (A hoist with a SWL of 1000kgs loaded only to 500kgs).

Irrespective of hoist classification, it is essential to consider the load, the lifting equipment and the structure supporting it all rather than just the hoist. The quantity of suspensions is as important as their strength. Risk assessment is the key.

There are times when properly installed secondary suspensions are appropriate but the easiest and probably safest way to guard against failure is to use, for example, four suspensions where two would usually be sufficient. The suspensions might be hoists, wire ropes or other appropriate methods.

The principle can be applied to the suspensions for trusses, ladderbeams and bars provided the resulting span or cantilever is within design parameters.

\*CEN Workshop Agreement 15902 = next step down from an EN (EuroNorm) or European Standard.

## Legislation and background

UK law on lifting equipment contains few requirements that can easily be related to entertainment industry practices but lifting equipment is governed by the PUWER and LOLER Regulations 1998.

PUWER requires that work is planned and carried out safely by trained people.

Further it requires that work equipment is appropriate and maintained to keep it in a safe condition.

**Regulation 6 of LOLER** states that every employer shall ensure that lifting equipment is installed in such a way as to reduce to as low as is reasonably practicable the risk of the lifting equipment or a load striking a person and it is otherwise safe.

**Regulation 8 of LOLER** 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 for LOLER** (having legal status) at Regulation 6 states that lifting equipment should be positioned or installed to minimise the need to lift loads over people.

The ACoP text for Regulation 8 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”.

Regulation 8 guidance (not law) 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.

We need to think about more than just the hoists.

It is essential to consider the load, the lifting equipment and the structure supporting it all.

Should a failure occur in the load-path anywhere between the luminaires on a truss and the venue walls the classification of the hoist is irrelevant. The remaining suspensions and the truss itself must be able to support the load.

### Assuming safeties are needed:

- They need to be almost taut
- 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.