



LEIA Safety Information Sheet

Guarding

Prepared by the LEIA Safety and Environment Committee

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PREAMBLE

This Information Sheet is one of a series produced by the LEIA Safety and Environment Committee on topics relevant to the Lift and Escalator Industry. Whilst every effort has been taken in the production of these sheets, it must be acknowledged that they should be read in conjunction with the relevant legislation, codes of practice etc. They should not be taken as an authoritative interpretation of the law but guidance to it.

INTRODUCTION

Passenger lifts should be safe for users but inspection and maintenance technicians are often exposed to unacceptable risks in the lift machine room.

On occasion this has resulted in accidents and life-changing injuries, including amputations.

Securing the room with a locked door is insufficient because, once inside the room, even trained and experienced lift technicians are at risk while they are inspecting and maintaining the machinery.

This problem is not restricted to old lifts, as guarding in new installations and modernisations are often not fit for purpose due to gaps that can permit accidental contact with moving machinery.

Guarding

The risk assessment required by the Management of Health and Safety at Work Regulations 1999 shows that hazards are present during our industry's activities and that there are significant risks arising from them.

We should deal with these hazards and the risk arising from them using the hierarchy of measures which are outlined in the general principles of prevention detailed in Schedule 1 of the MHSW.

The Provision and Use of Work Equipment Regulations 1998, Electricity at Work Regulations 1989 and the Work at Height Regulations 2005 require action to be taken in terms of dangerous parts of equipment and situations.

This information sheet covers aspects of physical enclosure and restricting access which is commonly referred to as guarding or fencing.

Risks may be a feature of design or work activity exposing the individual to risks such as entanglement, trapping, crushing or electrocution. There is also a need to take into account at the design stage under CDM Regulations 2015 and risk assessment for others who might have access to work areas, e.g. inspecting engineers, emergency teams and cleaners.

In the past, it was considered sufficient to secure the machine/ pulley rooms by providing a locked access door and restricting access to authorised personnel; to paint rotating objects such as traction sheaves and relying on the skill and experience of the operative as the protection against the hazards present. Standards change and risk assessment must now be the determining factor for whether action needs to be taken.

BS EN81-20 Table 10 provides a risk assessed framework for the protection of sheaves, pulleys and sprockets (Figure 1).

For sheaves, pulleys and sprockets, overspeed governors, tension weight pulleys, provisions shall be made as outlined in BS EN81-20 Table 10 (Cl 5.5.7.1) to avoid:

- a) Bodily injury;
- b) The ropes/ chains leaving the pulleys/ sprockets, if slack;
- c) The introduction of objects between ropes/ chains and pulleys/ sprockets.

As it is not possible to eliminate all hazards where the risk of injury is significant, then action must be taken.

Location of sheaves, pulleys and sprockets			Risk according to 5.5.7.1		
			a	b	c
At the car	on the roof		x	x	x
	under the floor			x	x
On the counterweight / balancing weight				x	x
In machine and pulley rooms			x ²⁾	x	x ¹⁾
In the well	Headroom	above car	x	x	
		beside car	x	x	
	between pit and headroom			x	x ¹⁾
	Pit		x	x	x
Jack	Extending upwards		x ²⁾	x	
	Extending downwards			x	x ¹⁾
	With mechanical synchronizing means		x	x	x

^x Risk shall be taken into account.

1) Required only if the ropes/chains are entering the traction sheave or the pulley/sprocket horizontally or at any angle above the horizontal up to a maximum of 90°.

2) Protection shall be nip guards as a minimum preventing accidental access to areas where ropes/chains enter or leave the sheaves, pulleys or sprockets (See Figure 18).

Figure 1 BS EN 81-20 Table 10

Design of Guards

See Appendix 1 for examples of some of the hazards that could be eliminated at the design stage. It is now a requirement for designers to carry out (and record) risk assessments. Where the design cannot eliminate the hazard or the hazard is found in existing equipment there is a need to fit guards or barriers.

Guarding should be designed to prevent access. Methods of guarding must be carefully considered to ensure it does not introduce additional hazards such as: -

- In running nips at guard extremes;
- Potential finger or clothing traps around the connecting shafts;
- The guard is heavy and cannot be easily removed;
- The guard is constructed from inappropriate material eg conductivity when protecting against electrical risk or flammable in a situation where significant heat is generated;
- The guard is of inadequate strength or stability and may come into contact with the equipment being guarded;
- Barriers or fences that are positioned so that clearances are insufficient e.g. top of car barrier too close to the counterweight or mid-travel counterweight screens;
- Apertures for entry of tools allow contact with live or moving parts;
- Barriers or fences that can be climbed or bridged; and

- Where guards have to be removed to carry out routine maintenance or adjustments when equipment is live or moving.

In some circumstances additional protection can be provided with the fitting of electro-mechanical interlocks to gates and covers which have to be opened for inspection, maintenance or access to manual controls.

BS EN81:20 States that

The devices used shall be constructed so that the rotating parts are visible, and do not hinder examination and maintenance operation. If they are perforated the gaps shall comply with EN ISO 13857:2008, Table 4.

Traditionally guards have been constructed from sheet metal and metal mesh. Plastics are now available which overcome the previous objections to their use such as flammability, construction difficulties, age hardening, discoloration with age and cost.

Combinations of the available materials can now be used to produce practical solutions to many guarding applications.

Fixings

All guards and barrier fixings which are removable must be made with fixings that require the use of tools e.g. screwdrivers, Allen keys or spanners.

The fixings may be of the quick release variety such as Dzus spiral cam fasteners which require a fraction of one revolution to be released. Guards should not be installed without suitable fixings.

Additional Features

The posting of instructions and warnings on guards significantly adds to the effective information at the location where it is needed.

Protective entrance barriers must incorporate relevant safety signs.

The use of colours for guards and fences to heighten awareness of relevant features will also contribute to their effectiveness.

Any guards removed during work to a lift or escalator must be refitted before the lift is restored to normal service.

Guards from Specialist Suppliers

It is common practice to use specialist guard manufacturers. When doing so the enquiry or order for the work must be specific and include: -

- Description of the hazard to be guarded;
- Parts which need to be accessible for servicing, using tools for adjustment, live equipment requiring visual inspection/examination;
- Standards to be maintained;
- Material to be used; and
- Drawings or instructions so that dimensions can be ascertained.

For any clarification of this information sheet contact your company Safety Advisor or the LEIA Safety and Training Manager.

Design References:

The following publications are available and give guidance on guard and fencing designs and the standards to be attained.

British Standard BS 7255:2012

British/ European Standard BS EN 81-20

British/ European Standard BS EN 81:50

BS EN ISO 12100:2010 'Safety of machinery. General principles for design. Risk assessment and risk reduction'

BS EN ISO 14120:2015 'Safety of machinery. Guards. General requirements for the design and construction of fixed and movable guards'

BS EN ISO 13857:2008 'Safety of machinery. Safety distances to prevent hazard zones being reached by upper and lower limbs'

PD 5304:2014 'Guidance on the safe use of machinery'

Although it is not a standard, PD 5304:2014 is a Published Document from BSI. It has evolved from BS 5304:1988, the old British Standard for machinery safety, and contains a wealth of useful guidance and practical examples of guard design. Many of today's international machinery safety standards incorporate principles contained in PD 5304 but they lack the illustrative examples found in the Published Document.

Further Reading

LEIA/ SAFed Guidance: Working at Height Specific Guidance

LEIA Information Sheet: Electrical Working

Risk Assessment Calculator

Based on the requirements of BS EN ISO 12100 and designed to be simple to use.

Safety Distance Calculator

Establishes machine guard safety distances and heights in accordance with BS EN ISO 13857.

Guide to Machine Guarding Standards

A list of current machine guarding standards and advice for designing standards-compliant machine guards.

Guide to the New Machinery Directive 2006/42/EC

To help companies comply with the Directive that came into force on 29 December 2009.

White paper: CE Marking of Machine Guards

Explains the requirements relating to CE marking of guards under the Machinery Directive.

White paper: Machinery Directive and Fixings for Fixed Guards

Explains the recently amended requirements for fixings for fixed guards.

White paper: EN 349, Minimum Gaps to Avoid Crushing

Explains the requirements in the standard for minimum gaps to prevent crushing.

White paper: Differences Between BS EN 953 and BS EN ISO 14120

Explains what changes were introduced in BS EN ISO 14120 when it replaced BS EN 953.

White paper: The 2014 Edition of PD 5304

Explains the changes in the latest edition of BSI's Guidance on safe use of machinery.

HSE leaflet INDG393: Thorough examination and testing of lifts

Website: www.hse.gov.uk

European Commission

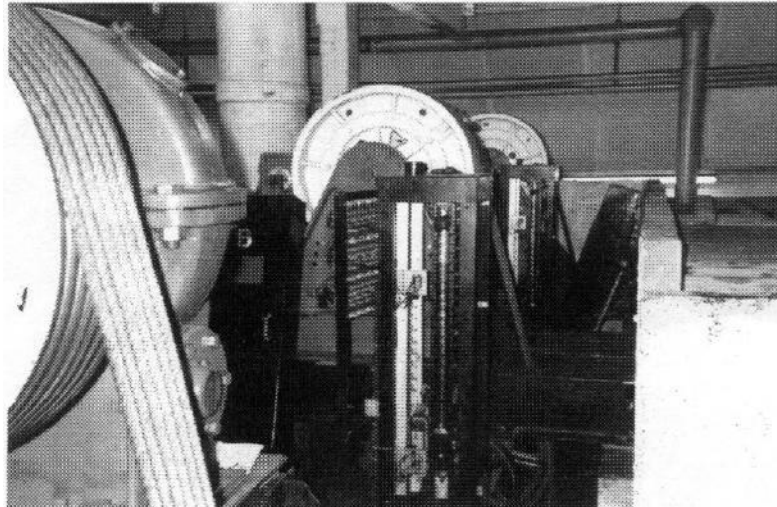
Definitive list of standards harmonised to the Machinery Directive 2006/42/EC, official guide to the application of the Machinery Directive and guidance on ergonomics and safety fences used as safety components.

<http://ec.europa.eu/growth/sectors/mechanical-engineering/machinery>

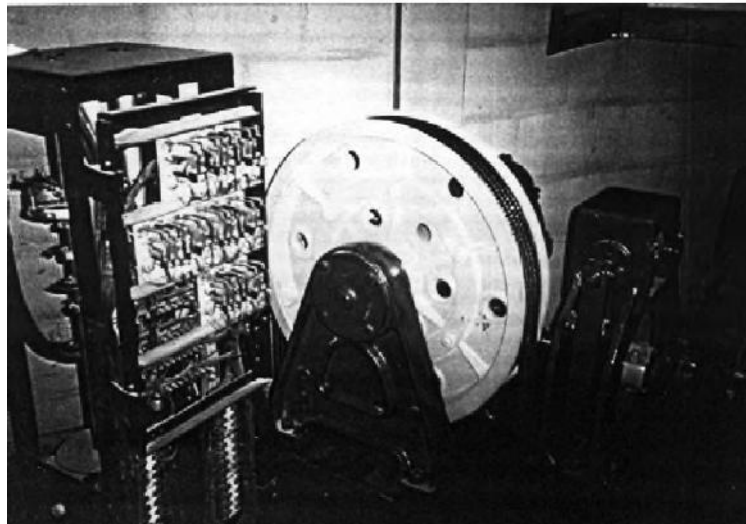
LEIA Toolbox Talk 'Machinery Guarding' available from the LEIA website (Member's pages login required):

<https://www.leia.co.uk/safety-and-environment/site-safety/>

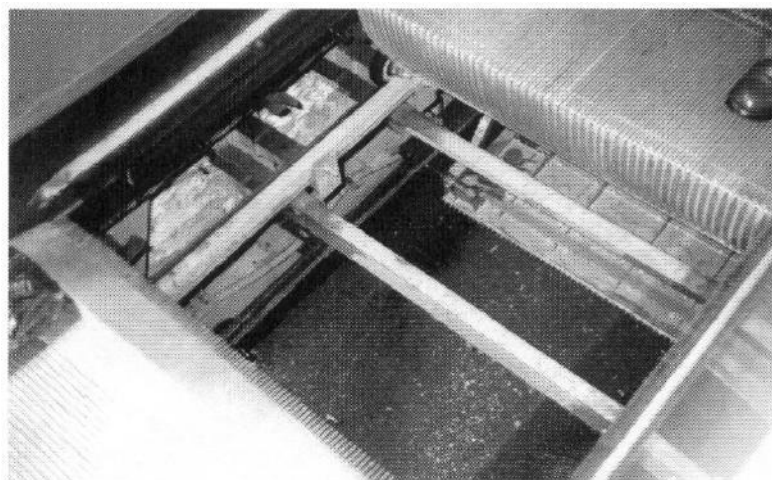
APPENDIX 1 DESIGN HAZARDS



Potential for Entanglement in Traction Sheave



Potential for Contact with Sheave, Live Terminals and Ropes



Potential for Trapping by Moving Escalator Parts