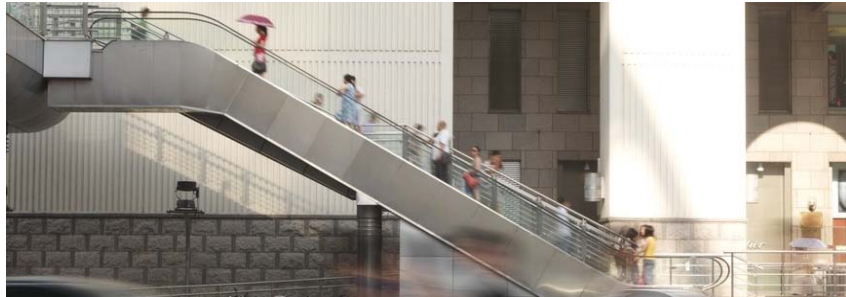




**MECHANICAL ENGINEERING TECHNICAL DIVISION**



**PPK Malaysia**  
Malaysia Shopping Malls Association



**Make Your Lifts and Escalators Young Again**  
**Raghib Azmi METD**

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## Background



- More than 70,000 lifts and 10 000 escalators and moving walks are in operation
- More than 50% were installed in the last century
- These machines are operational at different safety levels with different risk levels which may cause accidents.

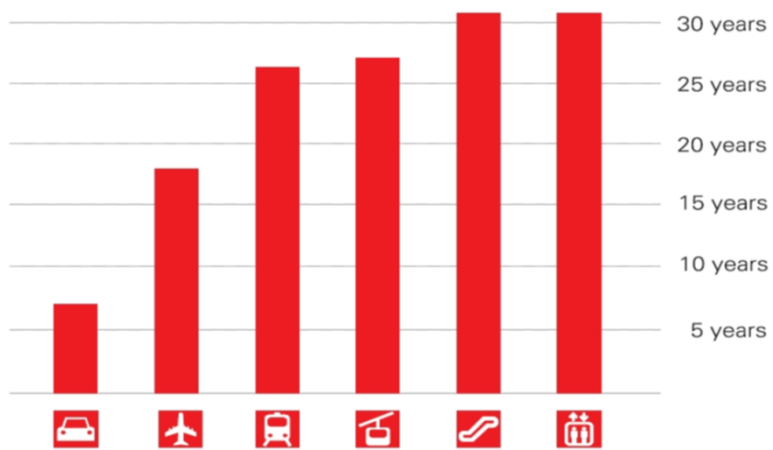
**In today's legal environment, owners and maintenance companies must warrant a high degree of safety for users and service technicians.**



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# Life Cycle Of Equipment

Average life cycle of transportation means



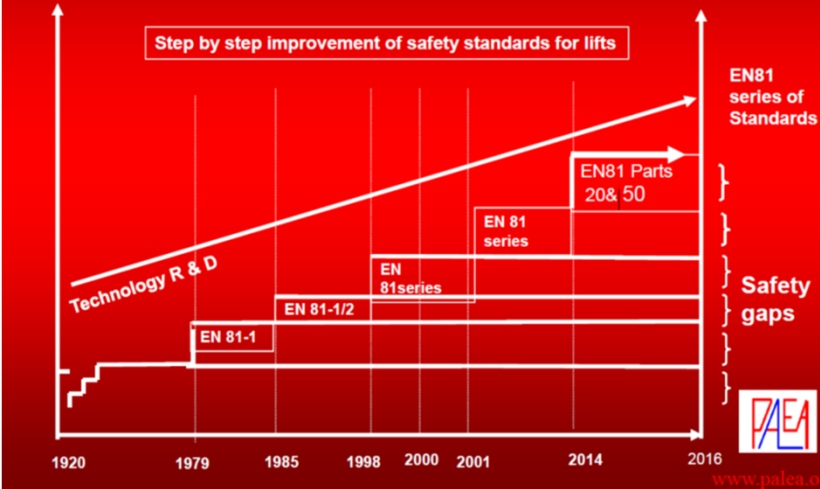
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# Safety Levels Over Time

Safety level



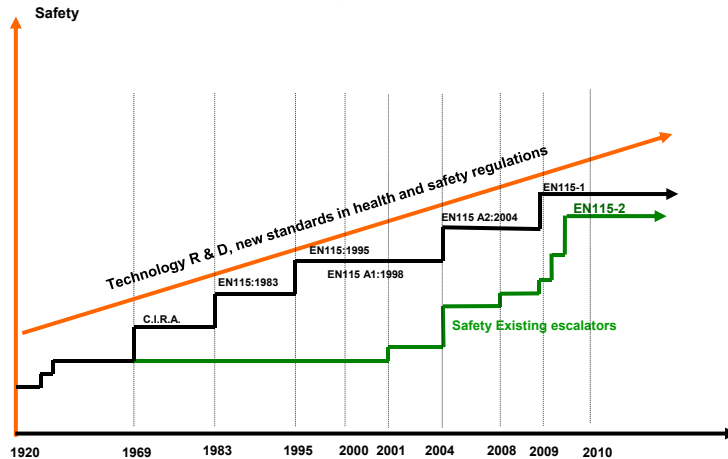
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## Today's state of the art of safety

### Reducing the gap with EN 115-2



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## What to Modernise?

The lift equipment generally consists of four parts:

The back bone:

The backbone is most of the metal items such as doors, car, guide rails, structural elements such as car sling & car frame, etc. These components have not undergone a major technological change over the years and may be retained. Replacing these parts will cost money but will not give any significant improvement to the system. Generally during modernisation it will be prudent just to replace all wear and tear components such as rollers, shoes, nylon gibs, etc.



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## What to Modernise?

### The muscle:

The lift machine is the muscle and work horse of the lift system. New machines are much more efficient compared to the older machines. However, the cost of replacing the older machines with new machines compared to energy savings shows very long periods for return on investment (ROI) usually going into more than 20 years. Lift machines if well maintained may easily last for 40 to 60 years.

The long life, smoothness, and high horsepower of gearless traction elevators provide a durable elevator service that can outlive the building itself. The original gearless machines in the Woolworth Building were reused when that building's elevators were modernized in 1950, again in 1970, and for a third time in 1990.



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## What to Modernise?

### The brain:

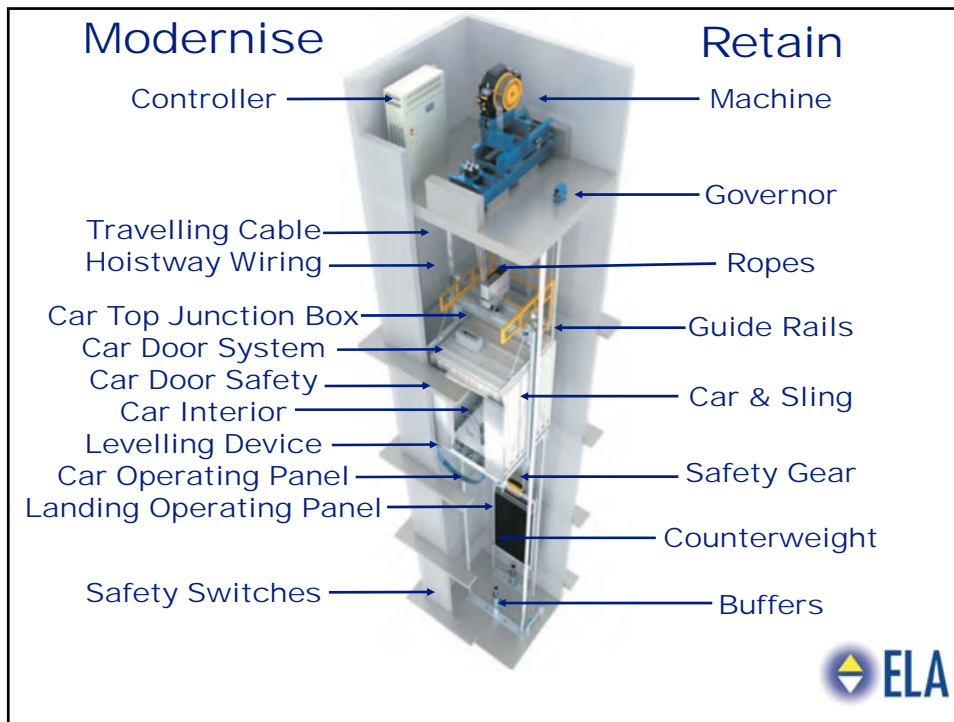
The brain and heart of the lift system is the controller and control components such as car operating panel, landing operating panel, etc. These components have undergone major technological changes and are the main contributors to improvement of performance and reliability of the lift system. Modernisation will involve a change of the controller and all related components and wiring.

### The look:

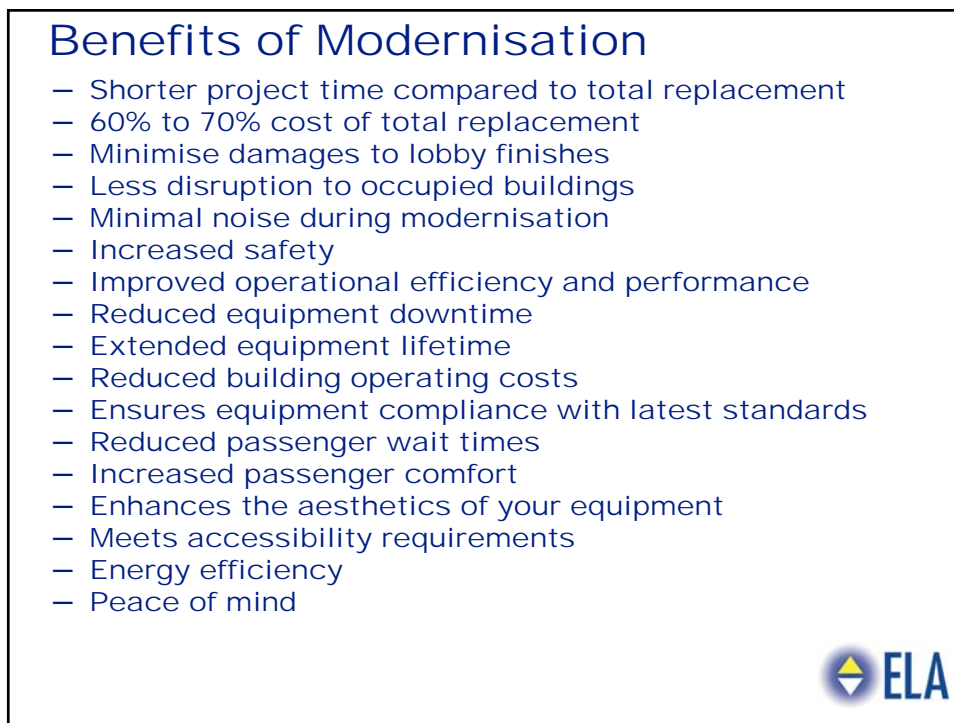
This is the aesthetic element of the lift system. When undertaking the modernisation project, it is worth investing in a new car interior as well as in some instances the lobby landing doors and frames too. A new interior gives users a new experience and the feeling of a new lift.



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## Before & After Modernisation



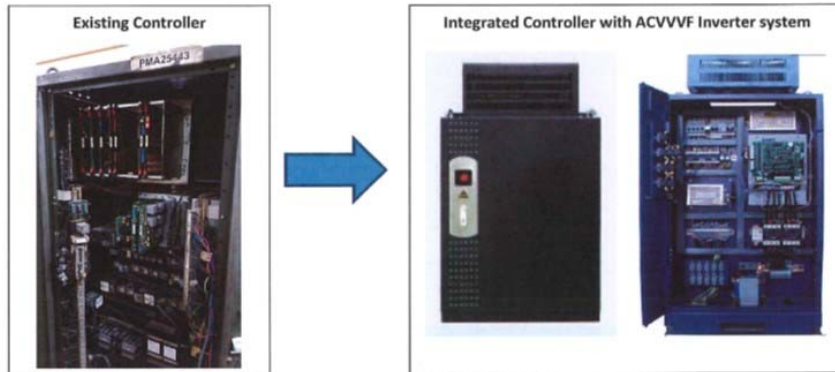
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## Before & After Modernisation



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## Before & After Modernisation



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## Before & After Modernisation



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## Before & After Modernisation



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## Before & After Modernisation



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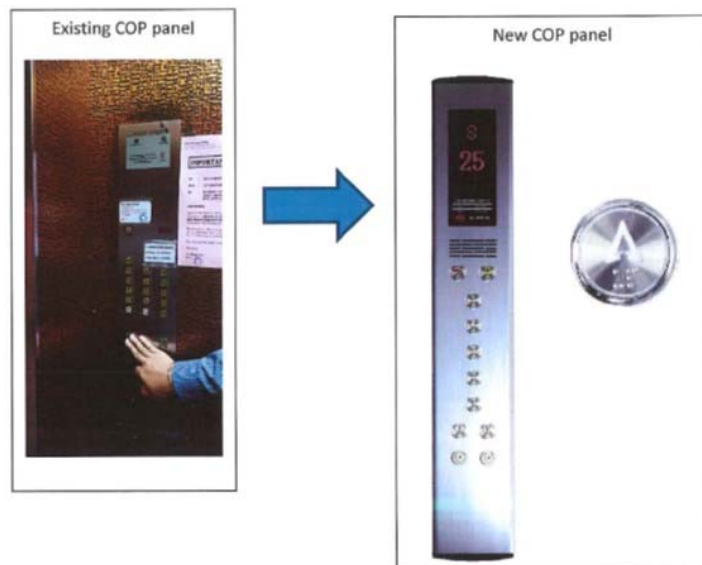


## Before & After Modernisation



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## Before & After Modernisation



18

## Before & After Modernisation



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## Before & After Modernisation



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## Approach of EN 115-2

- **Categorization of hazards and hazardous situations, each of which has been analyzed by a risk assessment**
- **Provision of corrective actions to**
  - Improve, step by step, the safety of all existing units to today's state of the art for safety
  - Enable each unit to be audited and safety measures to be identified and implemented
  - List the high, medium and low risks and corrective actions which can be applied in separate steps in order to mitigate (reduce) the risks



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## Use of this standard

- National authorities to determine their own programs of implementation in a step by step process
- Process in a reasonable and practicable way
  - based on the level of risk (e.g. high, medium, low) and
  - social and economic considerations
- Owners to follow their responsibilities according to existing regulations (e.g. Use of Work Equipment Directive)
- Maintenance companies and/or inspection bodies to inform the owners on the safety level of their installations
- Owners to upgrade the existing units on a voluntary basis



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## The Scope

- **This European Standard gives rules for improving the safety of existing escalators and moving walks**

=> Aims to reach an equivalent level of safety to that of a newly installed escalator and moving walk by the application of today's state of the art for safety.



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## The Scope

- **This standard includes the improvement of safety of existing escalators and moving walks for:**

- Users
- Maintenance and inspection personnel
- Persons outside the escalator or moving walk (but in its immediate vicinity)
- Authorized persons

- **This standard is not applicable to:**

- Safety during transport, installation, repairs and dismantling of escalators and moving walks
- Spiral escalators
- Accelerating moving walks



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## List of significant hazards

Nr.	Hazard/Hazardous situation	Priority level	Relevant Clause EN 115-2
1	Affect of harmful materials (e.g. asbestos)	H	5.1
2	Contact with moving machinery parts (e.g. driving unit, handrail drive, step or pallet) normally not accessible to the public	M	5.2.1, 5.4.1, 5.12.2, 5.13.2.1
3	Fire inside the supporting structure and machinery spaces	M	5.2.2, 5.9
4	Slipping on steps/pallets/belt and landing areas	H	5.3.1, 5.7.1
5	Falling due to insufficient step demarcation	M	5.3.2
6	Trapping between skirting and steps	H	5.3.3, 5.5.3
7	Trapping between step and step or pallet and pallet	H	5.3.4
8	Missing steps or pallets	H	5.3.5
9	Collision between fixed and moving parts of the step/pallet/belt system	M	5.3.6
10	Uncontrolled movement or a failure to stop of the machine resulting from missing second independent main contactor	H	5.4.1, 5.4.2.3
11	Excessive speed and unintended reversal of direction	M	5.4.2.1, 5.4.2.2, 5.4.2.5
12	Effect of excessive stopping distance	L	5.4.2.4
13	Falling due to reduced stopping distance	H	5.4.2.6
14	Falling over the balustrade	M	5.5.2.1, 5.5.2.2
15	Falling resulting from sliding on the outside of the balustrade	L	5.5.2.3
16	Climbing on the outside of the balustrade or falling from the landing	H	5.5.2.3, 5.13.1.6
17	Falling due to handrail speed deviation	M	5.6.1
18	Crushing of fingers between handrail and balustrade	H	5.6.2
19	Drawing-in at handrail entry into the balustrade	H/M	5.6.3.1
20	Trapping at handrail entry (between handrail and floor)	M	5.6.3.2
21	Trapping between comb and step/pallet	H	5.7.2, 5.7.3
22	Trapping of users resulting from sagging of the step/pallet	H	5.7.4
23	Miscellaneous equipment in workers' area not related to the installation	M	5.8.1



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## List of significant hazards

Nr.	Hazard/Hazardous situation	Priority level	Relevant Clause EN 115-2
24	Insufficient space in workers' area	H	5.8.2, 5.13.2.4, 5.13.2.5, 5.13.2.6
25	Injuries due to missing lifting equipment for heavy loads	M	5.8.3
26.1	Missing lighting in the workers' area and access to it	H	5.8.4
26.2	Inadequate lighting in the workers' area and access to it	M	5.8.4, 5.13.2.2, 5.13.2.3
27.1	Missing emergency stopping device (working area)	H	5.8.5
27.2	Inadequate emergency stopping device (working area)	L	5.8.5
28	Contact of persons with live parts - Insufficient isolation	H	5.11.1.1, 5.13.3
29	Contact of persons with live parts - Isolation failure	H	5.11.1.2, 5.11.1.3, 5.13.3
30.1	Unsafe working conditions due to missing main switch	H	5.11.2
30.2	Unsafe working conditions due to or inadequate main switch	M	5.11.2
31	Electrostatic discharge from moving components	L	5.11.3
32.1	Injuries due to missing stop switch for emergency situation	H	5.12.1
32.2	Injuries due to inadequate stop switch for emergency situation	M	5.12.1
33	Impact on bodies caused by collision with building structures (wall, roof, criss-cross arrangement)	H	5.13.1.1, 5.13.1.2, 5.13.1.3
34	Crushing due to restricted circulation areas	M	5.13.1.4
35	Crushing of persons resulting from traffic congestion on succeeding escalators or moving walks	L	5.13.1.5
36	Falling due to inadequate lighting at the landings	M	5.13.1.7
37	Missing safety signs	M	5.14
38.1	Missing devices resulting in misuse of escalators by transporting other items than persons (e.g. shopping trolleys or baggage carts)	H	5.15.1
38.2	Inadequate devices to prevent use of trolleys or baggage carts on escalators	M	5.15.1
39	Crushing due to incompatible trolleys on moving walks	L	5.15.2



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## The Safety check list acc. EN 115-2 – The tool to

- Identify the significant hazards on an existing escalator or moving walk
- Determine which type of protective measure(s) proposed by this standard is/are applicable

Example of 5 out of 65 items:

Nr.	Items to be checked	Clause	Requirement fulfilled?	Priority level	Protective measure(s) (risk reduction measure) according to EN 115-1:2008	Possible measure to be adopted
<b>5.1 General requirements</b>						
1	Installation without harmful material, e.g. asbestos	5.1	<input type="checkbox"/> Yes <input type="checkbox"/> No	H	- Removal of harmful material which is subject to disintegration (e.g. replacement of brake lining material) and - installation of warning label to prevent working if harmful material is not removed which may include the cladding	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No
<b>5.2 Supporting structure (truss) and enclosure</b>						
2	Complete enclosure of mechanically moving parts	5.2.1	<input type="checkbox"/> Yes <input type="checkbox"/> No	M	Provide enclosures according to 5.2.1	<input type="checkbox"/> Yes <input type="checkbox"/> No
3	Ventilation apertures according to EN ISO 13857:2008, Table 5	5.2.1	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable	M	Provide cover according to EN ISO 13857:2008, Table 5	<input type="checkbox"/> Yes <input type="checkbox"/> No
4	Protection of access to machinery spaces, driving and return spaces by safety contact	5.2.1	<input type="checkbox"/> Yes <input type="checkbox"/> No	M	Provide protection in accordance with 5.2.4	<input type="checkbox"/> Yes <input type="checkbox"/> No
5	Safety devices for inspection covers and covers that can be opened	5.2.1	<input type="checkbox"/> Yes <input type="checkbox"/> No	M	Provide protection in accordance with 5.2.4	<input type="checkbox"/> Yes <input type="checkbox"/> No



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## National implementation of EN 115-2

- **All technical solutions for upgrading to the state-of-the-art are listed in Clause 5 of this standard**
- **No binding requirements for measures to be carried out on which unit and within which period of time**
  - Subject to national legislation
  - The given procedures are intended to assist in setting up national regulations
- **Conclusion: this standard gives examples and templates, but they have to be introduced by national recommendations or laws**



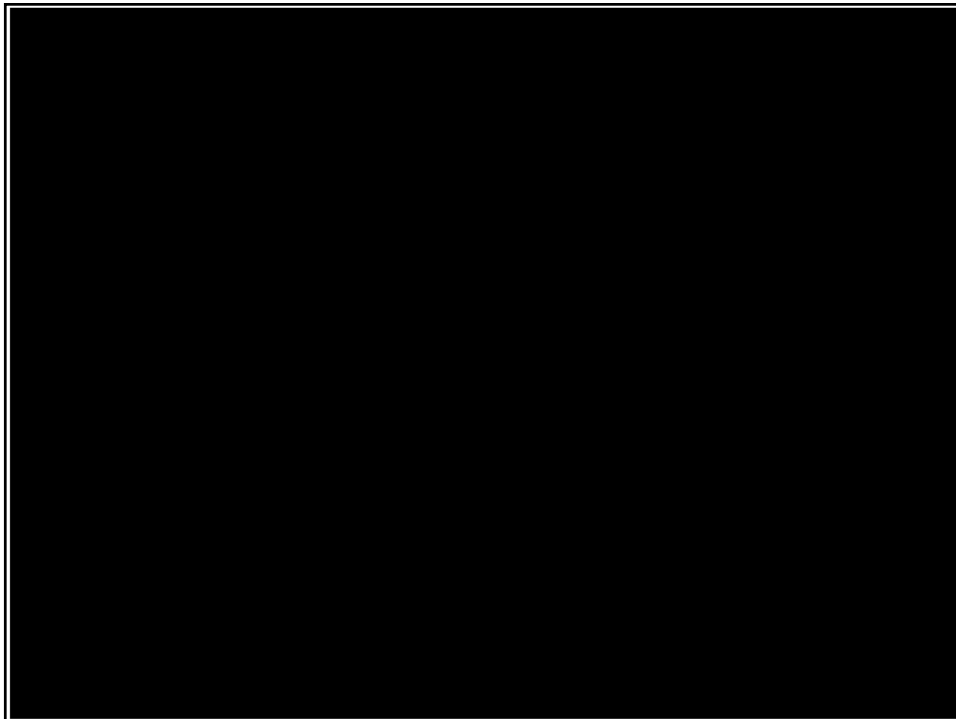
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## Legal environment

- Today's state of the art of safety is based on
- the European Machinery Directive 2006/42/EC,
- the harmonized standard EN 115-1 (Safety of escalators and moving walks – Construction and installation) and
- the standard EN 115-2 (Rules for the improvement of safety of existing escalators and moving walks)
- National laws and regulations related to work and operation safety



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