

Safety of Existing Lifts

Introduction to the SNEL application (EN 81-80)



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Introduction to the SNEL application
(EN 81-80)

March 2013



The following introduction to the safety of existing lifts in Europe, installed before the introduction of the Lifts Directive 95/16/EC, is complimented by two ELA documents, available upon demand:

- the **WHITE PAPER** on SNEL (April 2013)
- and
- the **ISO SIGNS & PICTOGRAMS** brochure (2008)
 - the **SNEL GUIDELINES** (2004).

For more information, please contact ELA, at www.ela-aisbl.org



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Introduction

LIFTS ARE A SAFE MEANS OF TRANSPORTATION, BUT...

YES, lifts are very safe...
Still, accidents happen!

Older lifts, which were installed before the introduction of European Lift Directive 95/16/EC, on July 1, 1999, can be dangerous in certain situations. The experts of the lift industry have compiled a list of 74 risks that can exist on old lifts. Some of these risks are very serious. They can lead to fatal accidents and should urgently be removed.

The difficulty is that the European directives in general, are not retrospective and only impose future demands. It is the case here, for the 1.5 million lifts installed in Europe since the application of the directive. But for the 3.5 million lifts which were installed before 1999, it is the national legislation of each Member State that applies. Each national legislation should be updated and improved, to impose a retrofit of the existing lifts that need a safety upgrade. This safety upgrade is very different from lift to lift, depending of its age. It varies depending on the legislation and standards applicable on the day of its installation. The cost varies accordingly.

The best way forward was for CEN to assess all existing risks on lifts, whatever their type or age. The experts listed 74 of them with varying degrees of urgency and defined the best way to suppress the risks. The new European norm they produced was EN 81-80, the Safety Norm for Existing Lifts (SNEL).

It is original in its concept, since it asks each national authority in charge to filter their national legislation and identify the missing elements of legislation to cover the risks to users and to lift technicians. This "filtering process" has been successfully applied in countries such as France, Spain, Austria, Belgium, Germany, Norway and governments have taken the nec-

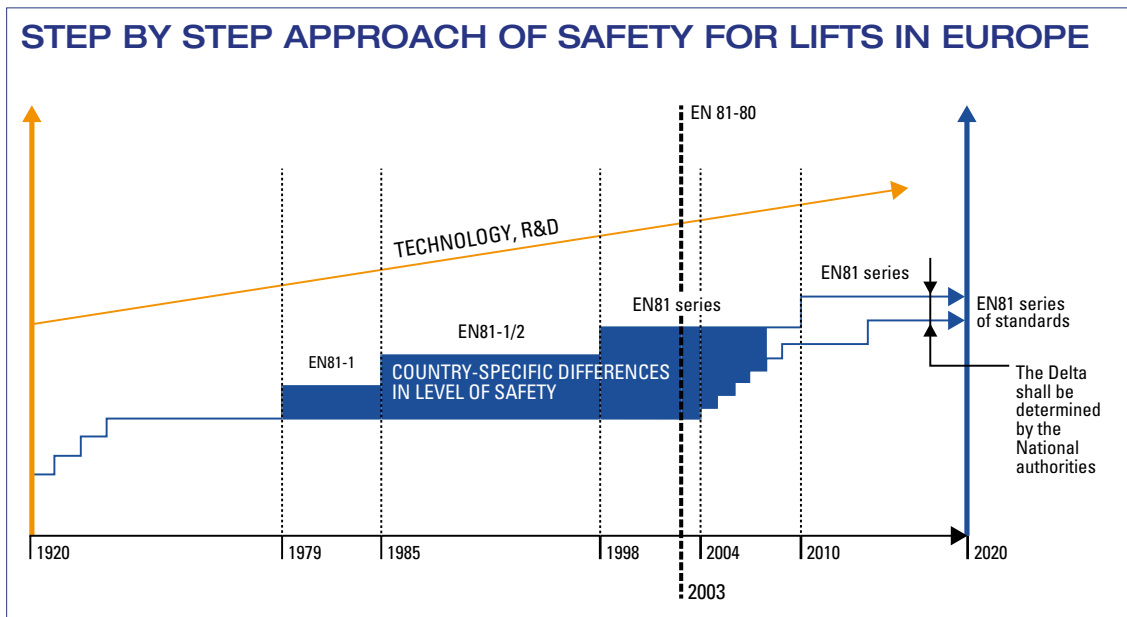
essary decisions: laws and application decrees, royal decrees, regulations or plain recommendations: the chosen path varies from country to country but if all apply EN 81-80, Europe will obtain a de facto harmonization of its legislation for existing lifts and dramatically improve the safety of the 5 million lifts in use in Europe. The result is very clear in France for example, fatal accidents have been mostly eradicated and the number of accidents divided by 3.

Asian and North American countries are very much interested in the European standard EN 81-80, they have asked the international standardisation system, ISO, to start work on a similar standard for the world.

Unfortunately many European countries have not legislated and not even started the filtering required by EN 81-80. There is no obligation to proceed of course, and that is why the lift industry is producing this brochure, to show the importance of adopting SNEL at national level, to eradicate most risks on existing lifts. We can only beg owners, builders, political and technical deciders, to move in the right direction if they haven't yet, and to apply SNEL over a reasonable period of time. Most fatal accidents that took place on lifts in Europe in the last decade could have been avoided if SNEL had been implemented everywhere!

In the XXIst century, it is essential that Europe closes the gap, and makes its built environment SAFE for vertical transportation...

The ELA editorial team



The introduction of SNEL in many European countries, makes it that the safety of existing lifts (bottom line) "catches up" progressively with the safety of new lifts, which is very well covered by the Lifts directive 95/16/EC and the set of EN 81 norms.

Here follow some 21 situations which kill people every year in Europe, on lifts installed before 1999, and which have not been upgraded following SNEL (EN 81-80). ELA presses Member States to act responsibly and make existing lifts perfectly safe.

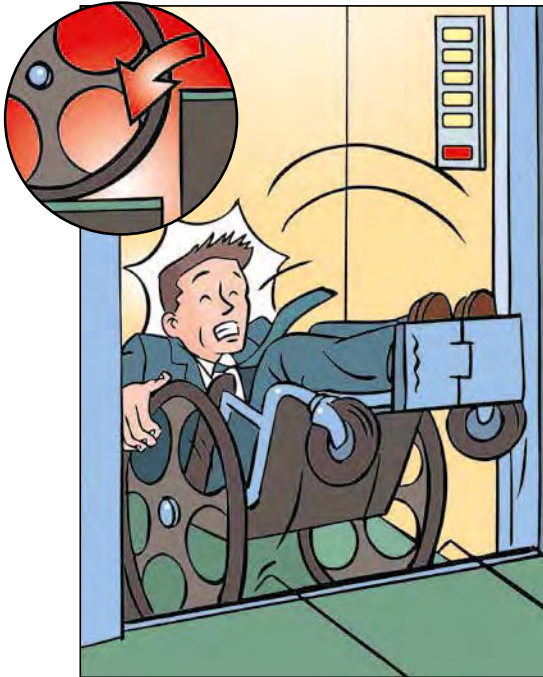
Each drawing presents the accident or the dangerous situation for the lift user or the mechanic working on it, and the situation, after the lift is upgraded and the safety situation solved. The risk (or risks) number(s) in the EN 81-80 standard are indicated accordingly, with a short definition.

NR.	HAZARD/HAZARDOUS SITUATION	RELEVANT CLAUSES IN EN 81-80	USER/WORKER
1	Presence of harmful materials	5.1.4	Worker/User
2	No or limited accessibility for disabled persons	5.2.1	User/Worker
3	Drive system with bad stopping/levelling accuracy	5.2.2	User/Worker
4	No or inadequate vandal resistance	5.3	User/Worker
5	No or inadequate control functions in case of fire	5.4	User/Worker
6	Weil enclosures with perforate walls	5.5.1.1	User/Worker
7	Partially enclosed well with too low enclosure	5.5.1.2	User/Worker
8	Inadequate locking devices on access doors to well and pit	5.5.2	User/Worker
9	Inadequate vertical surface below landing door sills	5.5.3	Worker/User
10	Counterweight/balancing weight without safety gear in case of accessible spaces below well	5.5.4	User
11	No or inadequate partition of counterweight balancing weight travel path	5.5.5	Worker
12	No or inadequate pit screen for several lifts in the same well	5.5.6.1	Worker
13	No or inadequate partition for several lifts in the same well	5.5.6.2	Worker
14	Insufficient safety spaces in headroom and pit	5.5.7	Worker
15	Unsafe pit access	5.5.8	Worker
16	No or inadequate stopping devices in the pit or in the pulley room	5.5.9	Worker
17	No or inadequate lighting of the well	5.5.10	Worker
18	No alarm system in pit and on car roof	5.5.11	Worker
19	No or unsafe means of access to machine and pulley room	5.6.1	Worker
20	Slippery floor in machine or pulley room	5.6.2	Worker
21	Insufficient clearances in machine room	5.6.3	Worker
22	No or inadequate protection on different levels in machine pulley room	5.6.4	Worker
23	Inadequate lighting in machine or pulley room	5.6.5	Worker
24	Inadequate means of handling equipment	5.6.6	Worker
25	Perforate landing doors and car doors	5.7.1	Worker/User
26	Inadequate design of landing door fixings	5.7.2	User
27	Inadequate glass in doors	5.7.3	User
28	No or inadequate protection against dragging of fingers on sliding car or landing doors with glass	5.7.4	User
29	No or inadequate lighting on landing doors	5.7.5	User/Worker
30	No or inadequate protective devices on power operated doors	5.7.6	User/Worker
31	Unsafe locking device of landing door	5.7.7	User/Worker
32	Unlocking of landing door without a special tool	5.7.8.1	User
33	Weil enclosure with perforate walls near door locks	5.7.8.2	User/Worker
34	No automatic closing device on sliding doors	5.7.9	User/Worker
35	Inadequate link between panels of landing doors	5.7.10	User/Worker
36	Inadequate fire resistance of landing doors	5.7.11	User/Worker
37	Car door moving with open landing door	5.7.12	User/Worker
38	Large car area in relation to rated load	5.8.1	User
39	Inadequate length of car apron	5.8.2	User/Worker
40	Car without doors	5.8.3	User/Worker

NR.	HAZARD/HAZARDOUS SITUATION	RELEVANT CLAUSES IN EN 81-80	USER/WORKER
41	Unsafe locking of car roof trap door	5.8.4	User/Worker
42	Insufficient strength of car roof	5.8.5	Worker
43	No or inadequate balustrade on car	5.8.6	Worker
44	Insufficient ventilation in car	5.8.7	User
45	Inadequate lighting in car	5.8.8.1	User/Worker
46	No or inadequate emergency lighting in car	5.8.8.2	User
47	No or inadequate protection means on sheaves, pulleys and sprockets against injury	5.9.1	Worker
48	No or inadequate protection against rope/chains leaving the sheaves, pulleys or sprockets	5.9.1	Worker/User
49	No or inadequate protection means on sheaves, pulleys or sprockets against introduction of objects	5.9.1	Worker/User
50	No or inadequate safety gear and/or overspeed governor on electric lifts	5.9.2	User/Worker
51	No or inadequate slack rope switch for governor rope	5.9.3	Worker/User
52	No protection means against ascending car overspeed on traction drive lifts with counterweight	5.9.4	User/Worker
53	Inadequate design of lift machine for electric lifts	5.9.4 5.12.1	Worker/User
54	No or inadequate protection against free fall, overspeed and creeping on hydraulic lifts	5.9.5	User/Worker
55	Counterweight or balancing weight guided by 2 wire ropes	5.10.1	User/Worker
56	No or inadequate buffers	5.10.2	User/Worker
57	No or inadequate final limit switches	5.10.3	User/Worker
58	Large gap between car and wall facing the car entrance	5.11.1	User/Worker
59	Excessive distance between car door and landing door	5.11.2	User/Worker
60	No or inadequate emergency operation system	5.12.2	User/Worker
61	No shut-off valve	5.12.3	User/Worker
62	No independent starting contactors	5.12.4	User/Worker
63	No or inadequate slack rope/chain device	5.12.5	User/Worker
64	No run-time limiter	5.12.6	User/Worker
65	No or inadequate low pressure device	5.12.7	User/Worker
66	Insufficient protection against electric shock and/or marking of electrical equipment; missing notices	5.13.1	Worker/User
67	No or inadequate protection on lift machine motor	5.13.2	User/Worker
68	No lockable main switch	5.13.3	Worker/User
69	No protection against phase reversal	5.14.1	User/Worker
70	No or inadequate inspection control station and stopping device on car roof	5.14.2	Worker
71	No or inadequate alarm device	5.14.3	User/Worker
72	No or inadequate communication system between machine room and car (travel height >30 m)	5.14.4	Worker/User
73	No or inadequate load control on car	5.14.5	User/Worker
74	Missing notices, markings and operating instructions	5.15	User/Worker

Drive system with bad stopping / levelling accuracy

Relevant clauses in EN 81-80: **5.2.2**



DESCRIPTION OF THE RISK

Bad levelling accuracy (a step between car and landing door) can make people trip and fall or worse, bang their head on the wall of the lobby or inside the lift. In case of a wheelchair user, getting into the lift, back first, this risk can kill by breaking the neck or the skull of the disabled person.



RISK REDUCTION MEASURES

New controllers, regulated drive-systems and re-levelling devices, make sure that the lift self-corrects and is always at the right level. The stopping accuracy of the car shall be ± 10 mm, a levelling accuracy of ± 20 mm shall be maintained. If, during e.g. loading and unloading phases, the value of 20 mm is exceeded, it shall be corrected..

Well enclosures with perforate walls

Relevant clauses in EN 81-80: **5.5.1.1**



DESCRIPTION OF THE RISK

Objects, limbs or body parts are passed into the well, causing shearing and crushing of limbs, or even death. Lifts installed in a large staircase, where the stairs climb round the lift need to have full enclosures and no possibility for humans to put part of their body inside the shaft. Very silent lifts coming down at that moment can decapitate a person who would be looking down or calling down.



RISK REDUCTION MEASURES

The solution is a full enclosure, that can be done in the same wrought iron or wood material for example, but also plexy-glass or glass, making sure no animal (cat) or human can put its life at risk.

Unsafe locking device of landing door

Relevant clauses in EN 81-80: **5.7.7**



DESCRIPTION OF THE RISK

The landing door (swing door) is closed but not properly locked, the person is opening the door. No car is standing behind the door, the person falls down the well and is seriously hurt or killed.



RISK REDUCTION MEASURES

The best way to prevent this type of accident is to install an adequate locking device on each landing door at every floor.

Inadequate length of car apron

Relevant clauses in EN 81-80: **5.8.2**



DESCRIPTION OF THE RISK

Rescuing trapped persons when a car is stopped above the landing. The person can fall down the well.

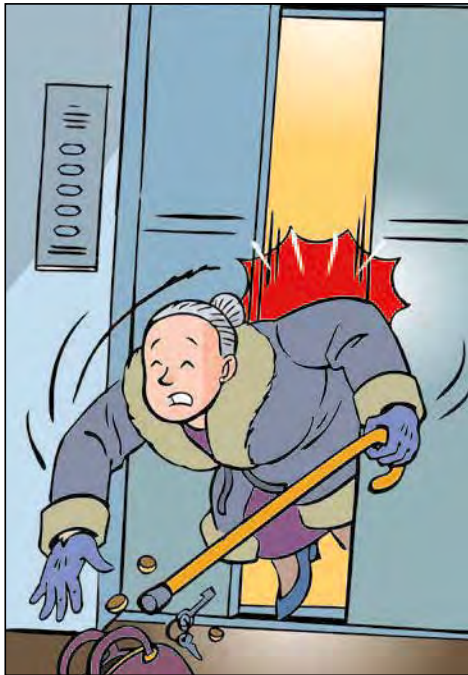


RISK REDUCTION MEASURES

An apron is positioned under the car. In case of stoppage of the car between 2 floors, if the passengers try to escape, climbing down on the landing, it often happens that they actually lose balance at the last second and fall in the shaft if the car apron is not long enough. The height of the vertical portion of the apron shall be at least 0,75 m.

No or inadequate protective devices on power operated doors

Relevant clauses in EN 81-80: **5.7.6**



DESCRIPTION OF THE RISK

The person is passing through the doors when the doors start closing. The automatic doors close fast and hard, hitting the full body length of the person entering or leaving the car. Fragile, old and disabled persons can have limbs or the hip broken by the shock or by the subsequent fall.



RISK REDUCTION MEASURES

Power operated doors must have an adequate protective closing device, detecting the presence of a body in the way and reopening after at most a light touch. Often for this purpose, sensitive light screens are installed.

Large car area in relation to rated car load

Relevant clauses in EN 81-80: **5.8.1**

DESCRIPTION OF THE RISK

The lift is not used as intended, the car is overloaded with persons and/or load. The car slips away from the landing. Persons are sheared and crushed. Serious injuries.

It occurs often that a user tries to put too much and too high a weight in a lift (pallet of paper, photocopying machine, furniture...) and falls to his death if the lift is not equipped with a load limiter and a brake strongly keeping the lift from travelling. Hospital very large (old) lifts, made to transport beds and stretchers, should never be overloaded. They could very well be overloaded by a large group of persons entering the lift carelessly.

RISK REDUCTION MEASURES

To prevent an overloading of the car by persons, the available area of the car shall be limited. Furthermore a lift shall be fitted with a device to prevent normal starting, including re-levelling, in the event of overload in the car.



Car without doors

Relevant clauses in EN 81-80: **5.8.3**



DESCRIPTION OF THE RISK

Goods in the car hit the sill or recesses on the wall and tip suddenly. A child enters the gap between the car sill and the wall. Users are crushed, suffer serious injury or death.

The absence of car doors makes it that the wall landing doors fly past at high speed. One should never touch the moving surface. It often happens that in the absence of a car door, a person transporting a large object, such as a big bin, is brusquely crushed against the back wall of the lift car. If the lift stops in that position, the person will not be able to reach the buttons if he/she is still conscious. He/she dies rapidly. Such accidents happen every year in countries where car doors are not compulsory.



RISK REDUCTION MEASURES

Lifts must be equipped with car doors, protecting the users from contact with a moving surface.

No or inadequate emergency light in car

Relevant clauses in EN 81-80: **5.8.8.2**



DESCRIPTION OF THE RISK

In case of loss of power supply, a user does not always have a light source at hand in the lift. It is then difficult to find the right button to go up or down, or to call for assistance by pushing on the intercom button. Panic and claustrophobia can be the result.



RISK REDUCTION MEASURES

All lifts should be equipped with emergency lighting in case of power failure.

No or inadequate safety gear and/or overspeed governor on electric lifts

Relevant clauses in EN 81-80: **5.9.2**



DESCRIPTION OF THE RISK

Overspeed down or free fall of the car, due to the suspension failure, breaking of traction sheave shaft, brake failure, etc. If the safety gear fails to function, the lift is in free fall and can cause serious or even fatal accidents.



RISK REDUCTION MEASURES

There must be a state of the art safety gear and overspeed governor on all existing lifts, that brings the lift to a stop in case of free fall.

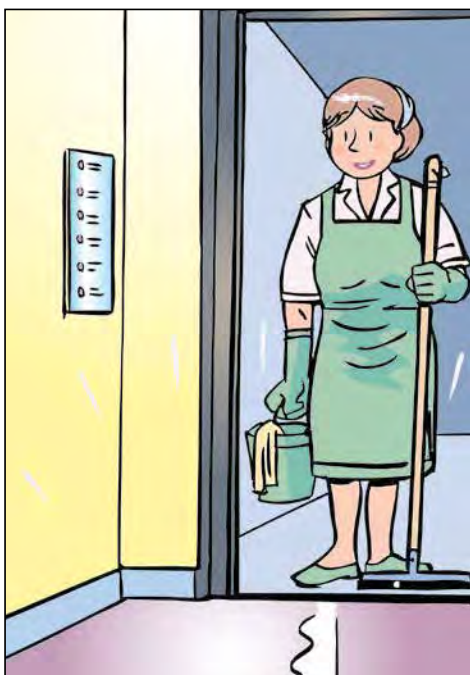
No or inadequate protection against free fall, overspeed and creeping on hydraulic lifts + no shut-off valve + no or inadequate low pressure device on hydraulic lifts

Relevant clauses in EN 81-80 : **5.9.5**, **5.12.3** and **5.12.7**



DESCRIPTION OF THE RISK

The car leaves the landing with open door and creates a step between landing and cabin or moves away uncontrolled. Persons can fall in or out of the car as a consequence. There can be several causes: failure of suspension means, rupture of hydraulic piping, oil leakage, dirt impairing valve closing. Note: if the car moves out of the door zone, the landing door closes automatically, so the big step disappears. Pipe rupture or leakage on hydraulic lifts can cause overspeed or "creeping" lifts, up or down. This surprises a person who is busy cleaning or passengers and creates dangerous situations if adequate safety devices are not installed.



RISK REDUCTION MEASURES

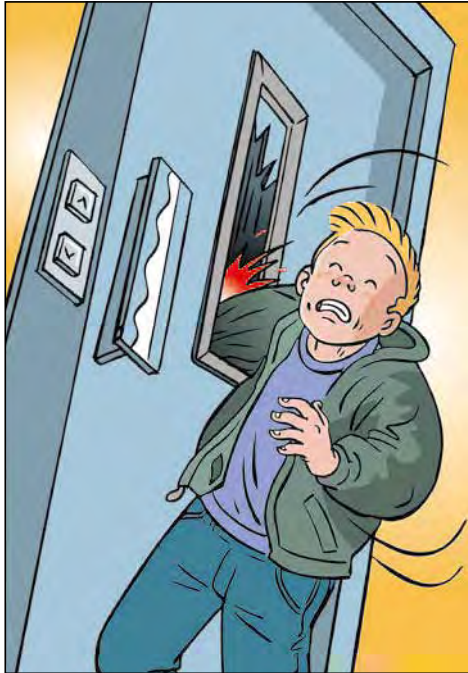
A shut-off valve and a double safety combination of safety valves, safety gear and relevelling device must equip all lifts (Amendment 3 also mentions this possibility of uncontrolled movement and risk reduction measures).

A low pressure device avoids danger for passengers and equipment caused by the free fall of the car during emergency lowering (manual or electrical).

Regular maintenance and inspection helps guarantee the functioning of safety systems, while reducing deterioration.

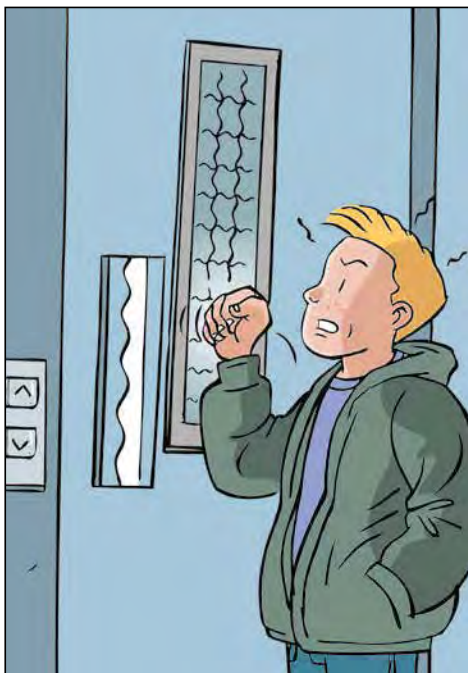
Inadequate glass in door

Relevant clauses in EN 81-80: **5.7.3**



DESCRIPTION OF THE RISK

If there is a glass panel in a lift landing door, it must be safety or armed glass, making it impossible for a person to break the glass by impact and to pass a limb or an object through the opening. It can lead to falling into the well, shearing of limbs, serious injury or even death.



RISK REDUCTION MEASURES

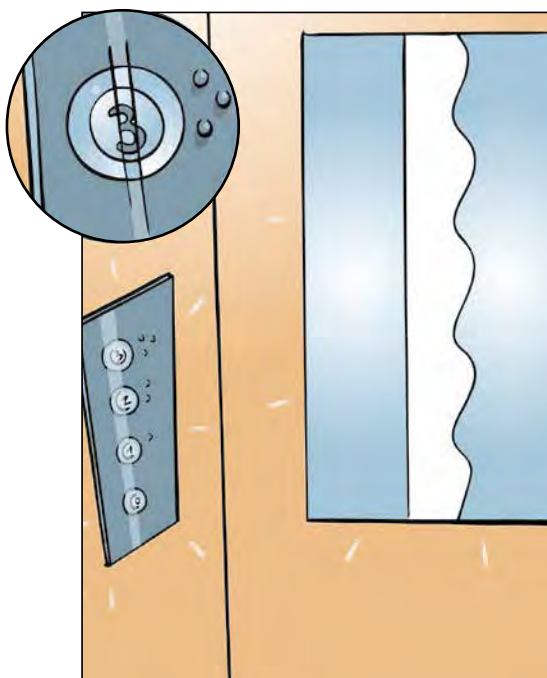
All lifts with a glass panel in landing doors must be equipped with safety glass.

No or inadequate vandal resistance

Relevant clauses in EN 81-80: **5.3**



Vandals can for example burn buttons made of varieties of plastic, which are slightly coming out of the surface of the button plate, or smash and scratch the car doors and car wall surfaces.



RISK REDUCTION MEASURES

All Lifts that must be vandal resistant should follow EN 81-71. Plastic buttons sticking out should be avoided and replaced with metal or other material buttons, flush with the surface of the plate. Glass doors and car mirrors must be made of toughened safety glass or equivalent.

No or limited accessibility for disabled persons

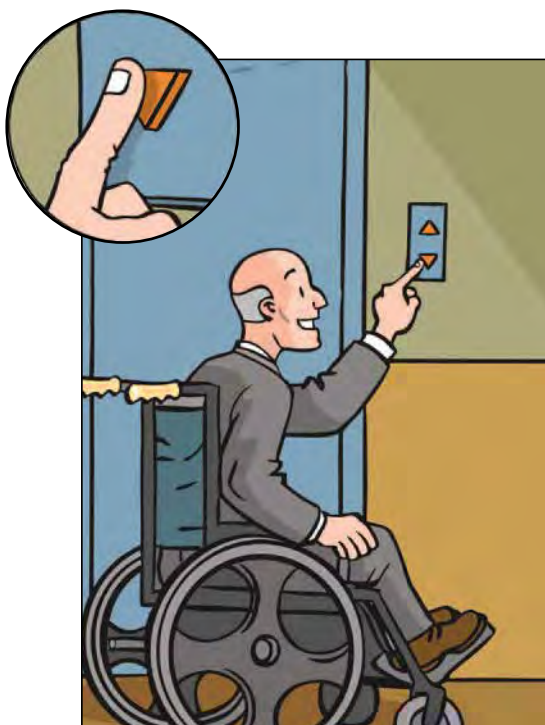
Relevant clauses in EN 81-80: **5.2.1**



DESCRIPTION OF THE RISK

Older lifts are often not disabled-friendly. A small element such as door width or distance/height of buttons on the wall, can make a lift simply inaccessible for a disabled person in a wheelchair.

Other functions are often missing: sound announcements, Braille or readable button indications, good lighting conditions, and of course general access to the lift (steps). This is of course much worse in public buildings or buildings accessible to the public.



RISK REDUCTION MEASURES

All lifts must be constructed or adapted so that they are accessible to ALL. Good guidance can be found in CEN TS 81-82 which is inspired by EN 81-70.

No or inadequate control functions in case of fire

Relevant clauses in EN 81-80: 5.4

DESCRIPTION OF THE RISK

In case of fire and smoke detection, the lift must automatically go to the exit floor, open its doors and stay there with open doors. Firemen must have access to the building and a have a key when they arrive on site, that enables them to take control of the lift. With that key, they can travel.



RISK REDUCTION MEASURES

All lifts must be equipped with safety functionalities, such as the automatic travel of the lift to the evacuation floor, and have a fireman key for access and control of the lift by the fire brigade in case of fire.



RISK(S)

8

32

Inadequate locking devices on access doors to well and pit + unlocking of landing door without a special tool

Relevant clauses in EN 81-80: **5.5.2** and **5.7.8.1**



DESCRIPTION OF THE RISK

Non authorized persons are entering the pit/well, and are crushed by moving parts.

The fact that vandals or thieves open access doors to the well in order to do harm or hide things in the lift shaft can be very dangerous for the users of the lift in the building. The car door can be absent when the doors open.



RISK REDUCTION MEASURES

In order to avoid vandals and thieves to fiddle with the key, the lock should be a triangular key, that is not available in shops and strongly restricts vandalism and opening of lift landing doors.

No protection means against ascending car overspeed on traction drive lifts with counterweight

Relevant clauses in EN 81-80: **5.9.4**

DESCRIPTION OF THE RISK

Overspeed in up direction due to failure of traction sheave shaft, brake failure, failure of electrical system, etc.. The person in the car is injured when the car hits the roof of the well. The maintenance person is crushed on the car roof.

If there is no protective means installed to avoid car overspeed in up direction, the lift may shoot up rapidly and crash against the ceiling of the shaft.



RISK REDUCTION MEASURES

All traction drive lifts should be equipped with the necessary protective means.

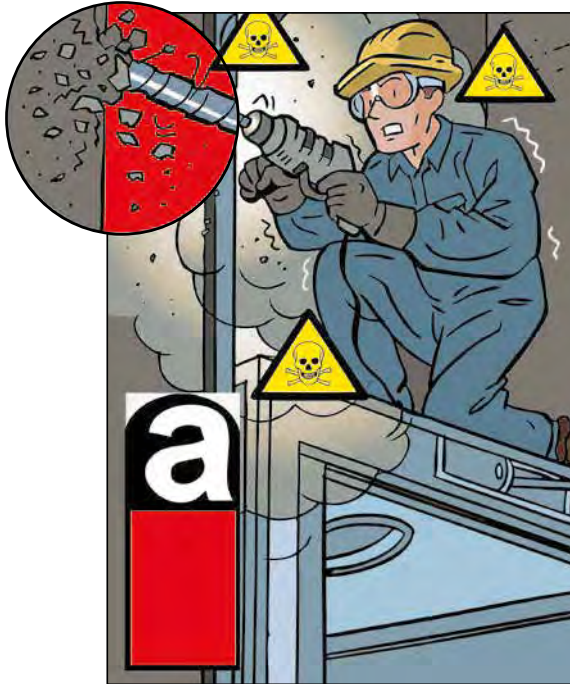


RISK(S)

1

Presence of harmful materials, such as asbestos in brake linings, well, etc...

Relevant clauses in EN 81-80: **5.1.4**



DESCRIPTION OF THE RISK

The technicians or inspectors (and possibly users) are exposed to harmful materials, due to wear, ageing, repair or modernization work. Asbestos is particularly harmful today in the building as it was used as insulation on walls and in cavities. The mechanic can inadvertently drill into it and create dangerous dust, which can cause a fatal lung disease much later in time.



RISK REDUCTION MEASURES

The owner of the building has to eradicate asbestos and other materials from the building, and hire specialist teams that remove it completely or like here, put a special film over the asbestos covered surfaces with stickers indicating that there is asbestos behind the film. Existing asbestos brake lining must be replaced with asbestos free brakes.

Insufficient protection against electric shock and/or marking of electrical equipment; missing notices

Relevant clauses in EN 81-80: **5.13.1**



DESCRIPTION OF THE RISK

For workers, the electric distribution board can be old and the wiring dangerous to work on or even approach.



RISK REDUCTION MEASURES

All electrical connections and wiring should be state-of-the-art.

RISK(S)

17

23

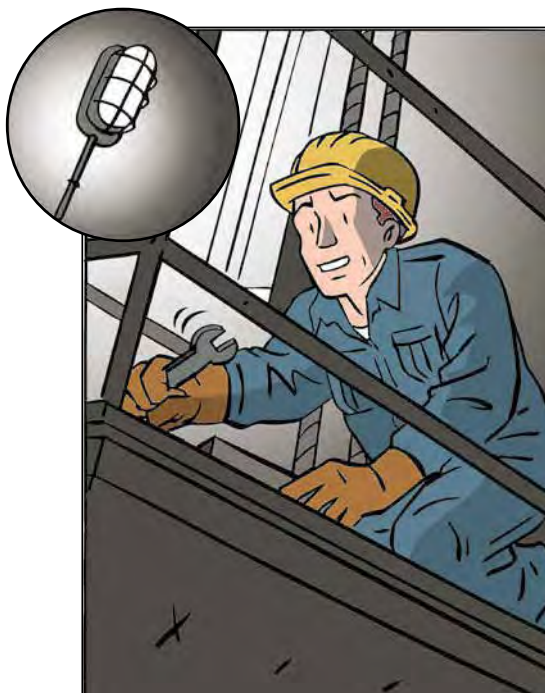
No or inadequate lighting of the well or inadequate lighting in machine or pulley room

Relevant clauses in EN 81-80: **5.5.10** and **5.6.5**



DESCRIPTION OF THE RISK

The lift well is a working area for technicians and inspectors and can be a dangerous space to work in if not correctly lit.



RISK REDUCTION MEASURES

The pulley/machine room and the shaft will be lit with a light that can be switched off when not needed.

Insufficient safety spaces in headroom and pit

Relevant clauses in EN 81-80: **5.5.7**



DESCRIPTION OF THE RISK

Mechanics and lift inspectors can be crushed between the top of the car and the shaft ceiling or in the pit, if there is not sufficient pit and head room to hold him/them in a standing, crouched or lying position.



RISK REDUCTION MEASURES

There should be enough room on top of the car and in the pit when the lift is in extreme positions (actual space or at least space created by other means). There should be a stop button on the car roof and in the pit, including also an inspection box on the car roof.

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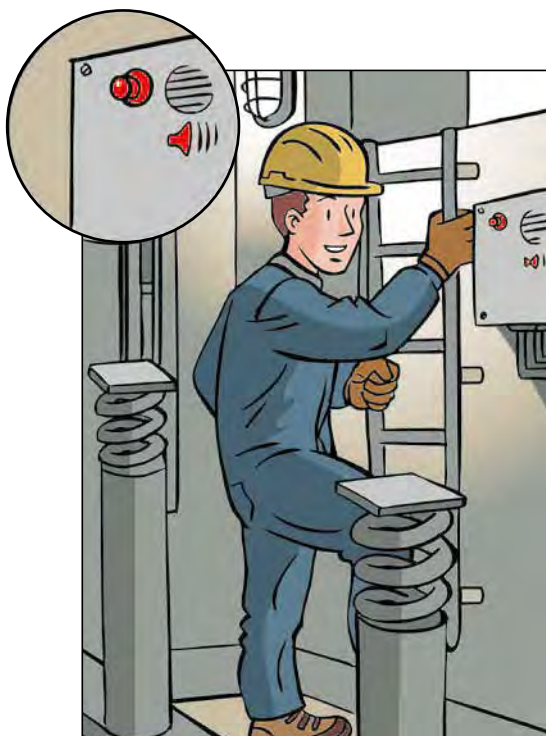
Inadequate vertical surface below landing door sills + unsafe pit access

Relevant clauses in EN 81-80: **5.5.3** and **5.5.8**



DESCRIPTION OF THE RISK

Pit access, pit walls and bottom can be in a very bad condition, with litter filling the pit, oil or liquid residues, the absence of a ladder, risk of fall from height, no lighting, etc... and no communication.



RISK REDUCTION MEASURES

The pit shall be clean, dry, the walls in good condition, a ladder provided and an intercom button with microphone must be put in the pit, to allow a trapped mechanic to call and request help (portable phones may not work in pits, shafts and confined spaces in general).

No alarm system in pit or on car roof

Relevant clauses in EN 81-80: **5.5.11**



DESCRIPTION OF THE RISK

A person is trapped or injured in the pit or on the car. If there is no alarm system in the pit or on the car roof, rescue and treatment of injury cannot reach the mechanic in time. It can lead to serious injury.

RISK REDUCTION MEASURES

Install adequate alarm system in the pit and on the car roof.



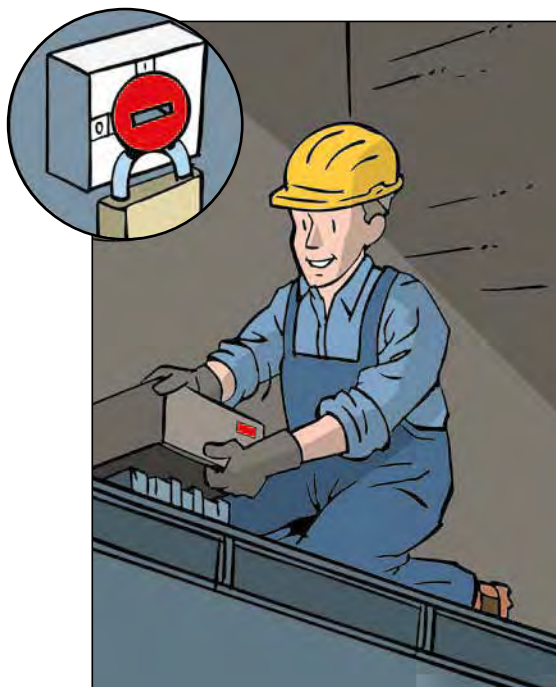
No lockable main switch

Relevant clauses in EN 81-80: **5.13.3**



DESCRIPTION OF THE RISK

A person switches the lift on when another person is working on the lift. Result: the maintenance/ inspection person is sheared or crushed. Injury to users or workers can take place, for example electric shock or unintended car move that can harm the mechanic working in the well.



RISK REDUCTION MEASURES

The main switch must be lockable by the mechanic when he works on the lift.

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No or inadequate partition of counterweight/balancing weight travel path + no or inadequate pit screen for several lifts in the same well + no or inadequate balustrade on car

Relevant clauses in EN 81-80: **5.5.5**, **5.5.6.1** and **5.8.6**




DESCRIPTION OF THE RISK

The mechanic working in a shaft with multiple lifts can be hit by the car or a moving part of another lift than the one he is working on. He can also fall in the shaft if there is no balustrade, harness system and/or adequate partition.



RISK REDUCTION MEASURES

If there are two or more lifts in the same well, balustrade and partitions must be installed where necessary. The technician must be protected from falling by a balustrade.



A White Paper on SNEL (2013), Powerpoint presentations, specific documentation and accident statistics are available at ELA, the European Lift Association.

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