



**Pacific Asia Lift & Escalator Association**

**Maintenance and Modernization - Safety**

**8<sup>th</sup> November 2023**

[www.liftexpokorea.com](http://www.liftexpokorea.com)



**International Lift Expo Korea 2023**

**Nov. 8 (Wed) – 10 (Fri), 2023**  
**Hall 5, KINTEX, KOREA**



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08-11-2023

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# Introduction

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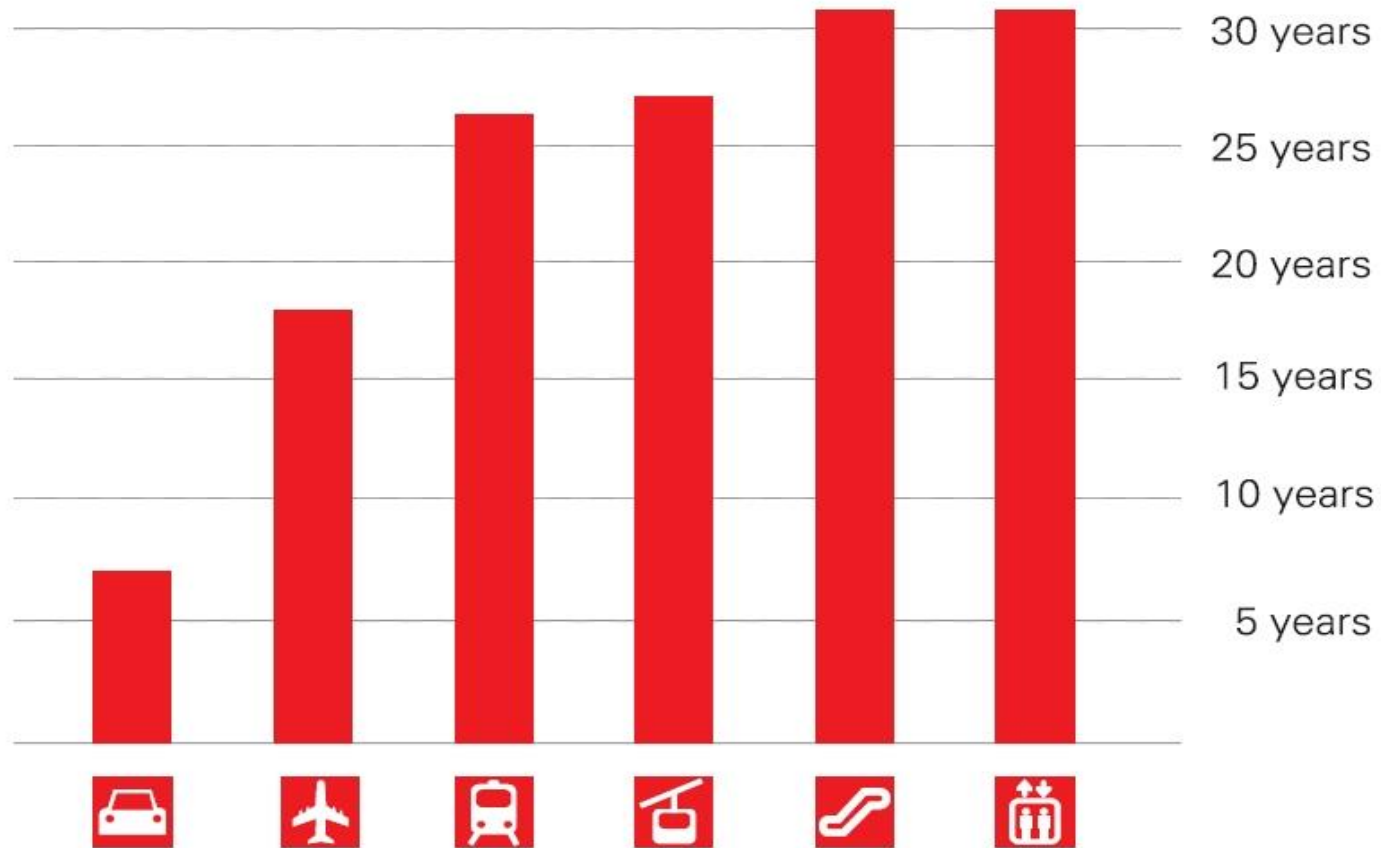
- A.P countries account for approximately 16% (3.5 million) of the global lifts and escalators that are in use today
- In many countries, more than 40% of the existing units are 25 years old or older
- Only a small percentage of them have been modernized to meet current published standards and state of the art safety and performance
- Unfortunately, injuries and even fatal accidents happen every year to users and lift industry workers alike.
- Lift industry members strive to make the installation, maintenance and use of lifts and on escalators totally safe, with “No Compromise on Safety”
- Ageing units can be made safer, more energy-effective, more reliable and comfortable through regular maintenance and in some cases modernization





# Life cycle of equipment

**Average life cycle of transportation means**



# Effect of a long life cycle

- This long Life Cycle places other objectives on maintenance and more frequent attendance by lift technicians
- Maintenance of equipment must keep pace with safety improvements
- Older lifts were installed to outdated standards
  - These standards provided lower standards of safety compared to modern standards
  - Many hazards were not recognised as they are today
- Generally speaking accident rates on old lifts is higher
- Accidents drive safety improvements in Codes but this is never retrospective





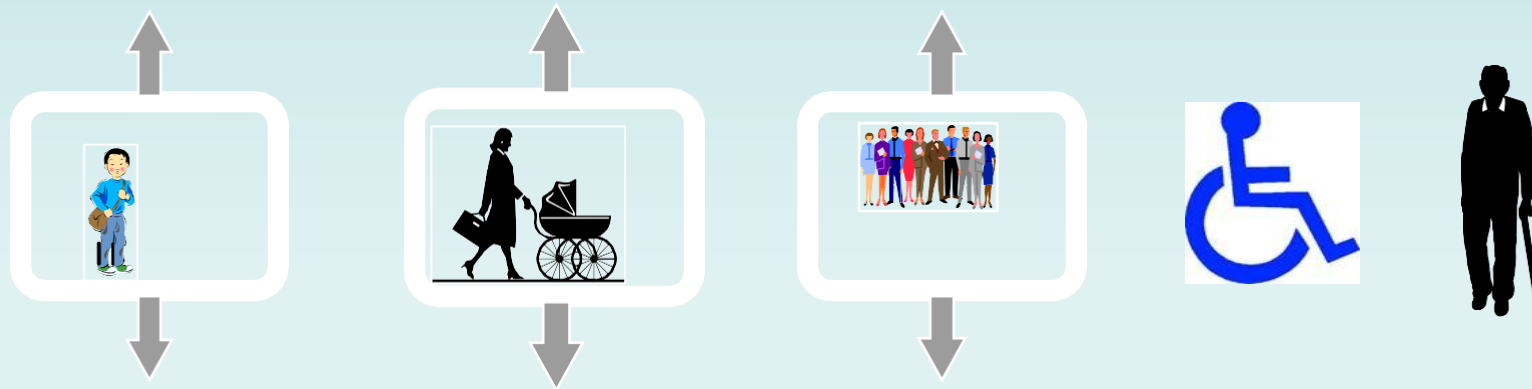
# Ageing Lifts

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- More intrinsic safety risk to users and technicians
- Therefore more opportunity for accidents
- Both users and mechanics are exposed, lifts are not selective
- Education and new technology can reduce risks
- Code revisions are also not retrospective
- Safety gaps must be reduced to achieve equivalent safety for all lifts , new and old.
- Maintenance and educational programs must address these issues

# Lift Users must be assured safety

- Lifts are used by everyone, including children , disabled and senior persons, they can be alone or un-supervised
- Their safety is not in the direct users control
- Therefore they have to have lifts independently safe!!!





# Ensuring ongoing safety for Users

- Issuance of safe use documents and circulars by regulators and lift associations
- Preventative maintenance by the lift service company

## Safe use guides and booklets





# Maintenance objectives

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- Ensure safety equipment functions as designed and certified
- Ensure lifts are safe for users and maintenance technicians
- Prevent unscheduled shutdowns
- Ensure equipment achieves or exceeds its useful Life
- Reduce operating costs
- Ensure performance and safety of equipment during normal Life

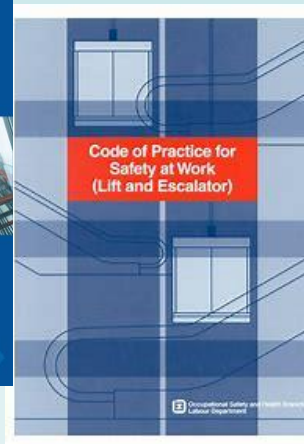
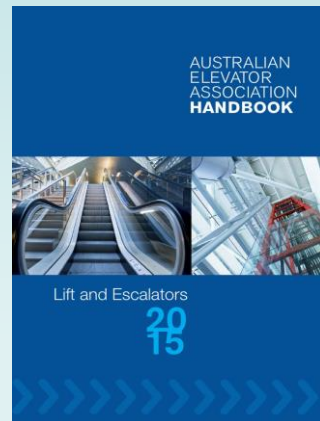




# Safety for Technicians – risk control

- Safe Work Inspections by OEM prior to carrying out works
- Following strictly the approved maintenance manual of the OEM
- Issuance of safe use documents and circulars by regulators and lift associations

## Safe Work Regulations and circulars for lifts and escalators





# Risk controls by other means

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## Elimination - removal of the risk

- Trip overspeed governor remotely
- Remove need to access top of car externally

## Substitution – use in place of

- Remote Monitoring and Diagnostics in lieu of physical inspections
- Using mechanical lifting and moving devices in lieu of manual



# Risk controls by other means

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## Engineering - better design

- Design and provide additional safety guards
- Minimize gaps , redundant safety devices

## Administrative - information and training

- More safety signage
- Additional training / Tool-Box meetings
- Documented safe working procedures



# Remote monitoring and diagnostics

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## Risk Reduction by reducing “hands on” Maintenance / Visits

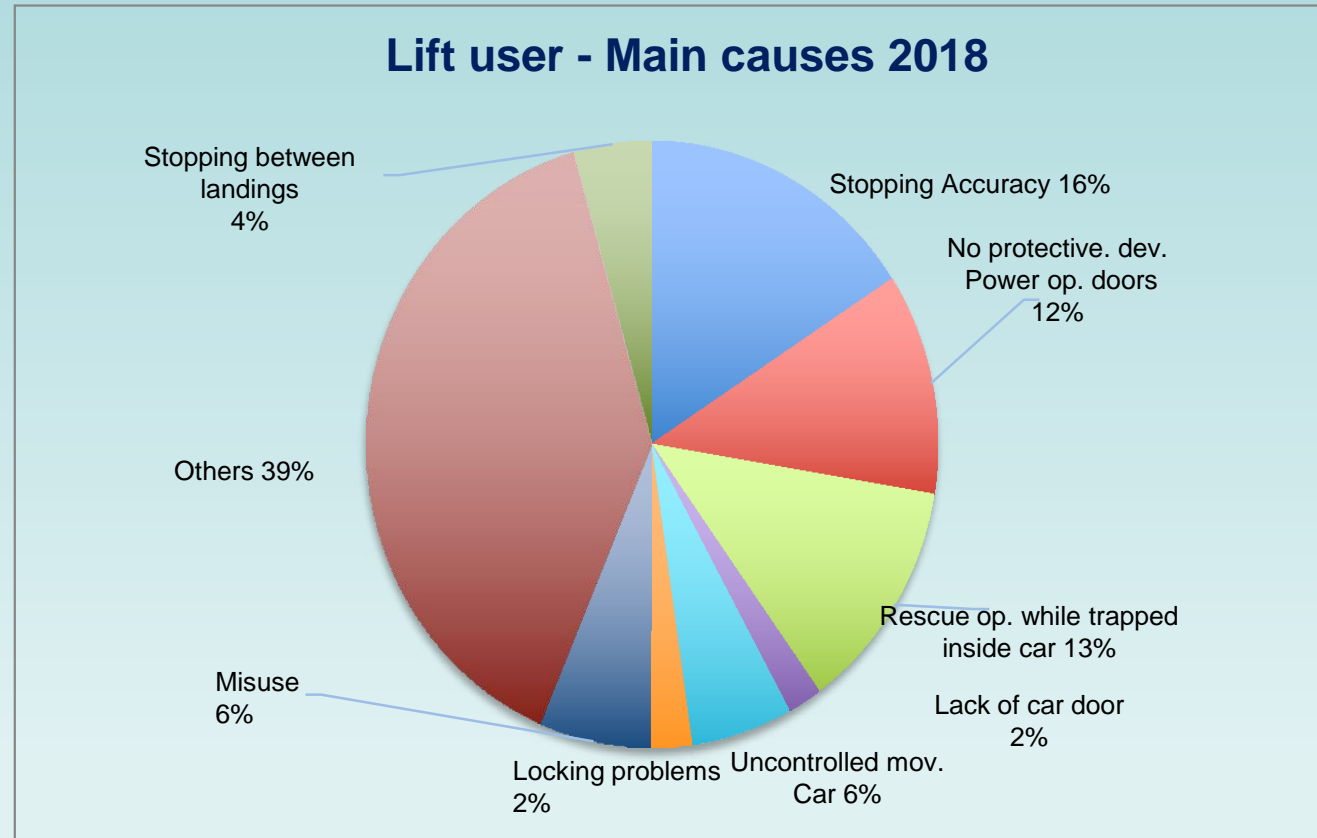
These includes:

- Adjustments
- Visual Inspections of safety devices
- Physical checking of component/ lift health
- Pro active preventive maintenance

OEM's agree  
that physical  
visits can be  
reduced by up  
to 60%

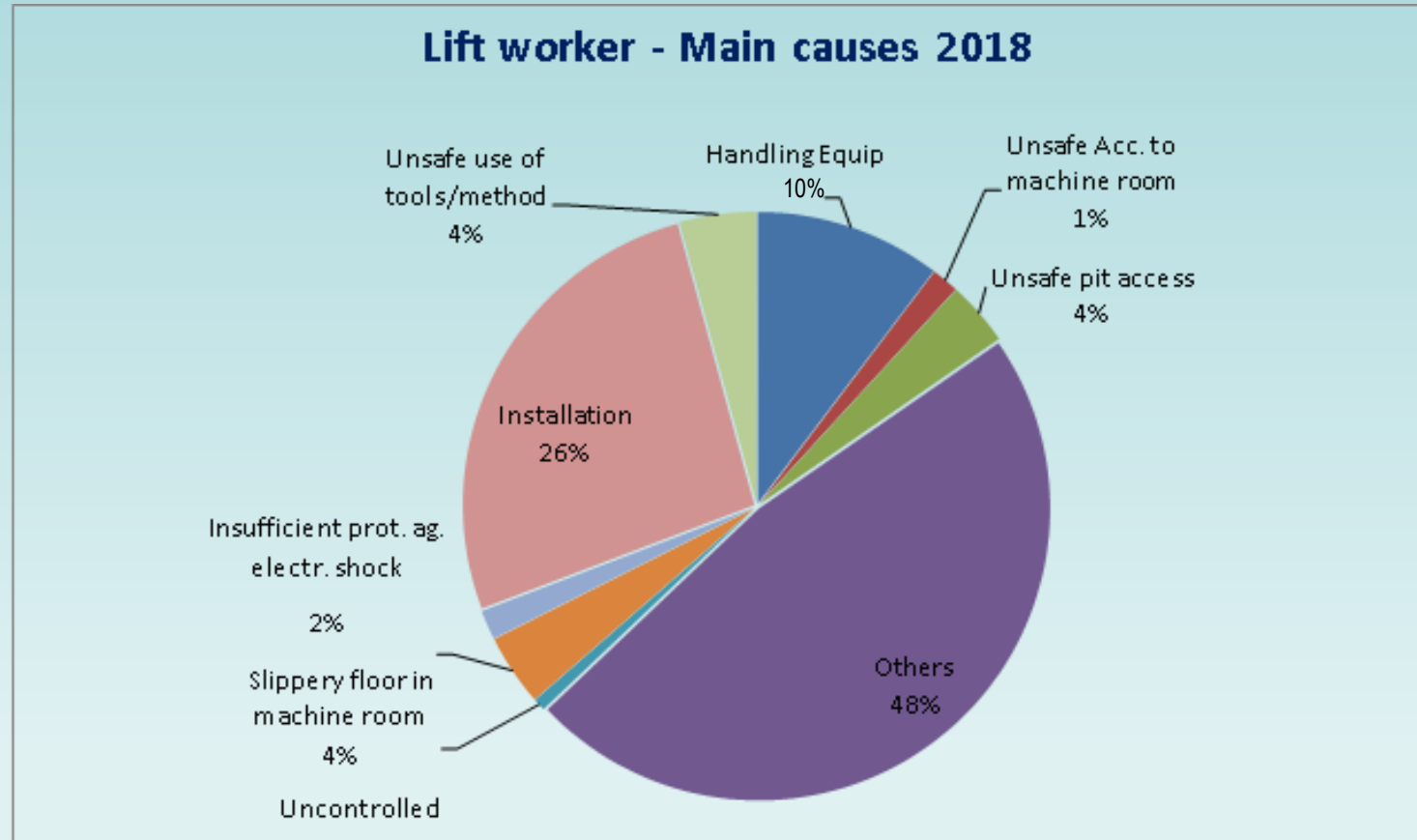


# Main causes of accidents - User



Source : SNEL White Paper ELA Publication – September 2020

# Main causes of accidents - Lift Worker



Source : SNEL White Paper ELA Publication – September 2020

# Possible corrective actions

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- Replace old units based on age or condition – can be very expensive
- OR
- Upgrade through Safety improvement Programs

But How Do You:

- Ensure correct items are targeted
- Address economics
- Correctly prioritise



# The Solution is EN81-80

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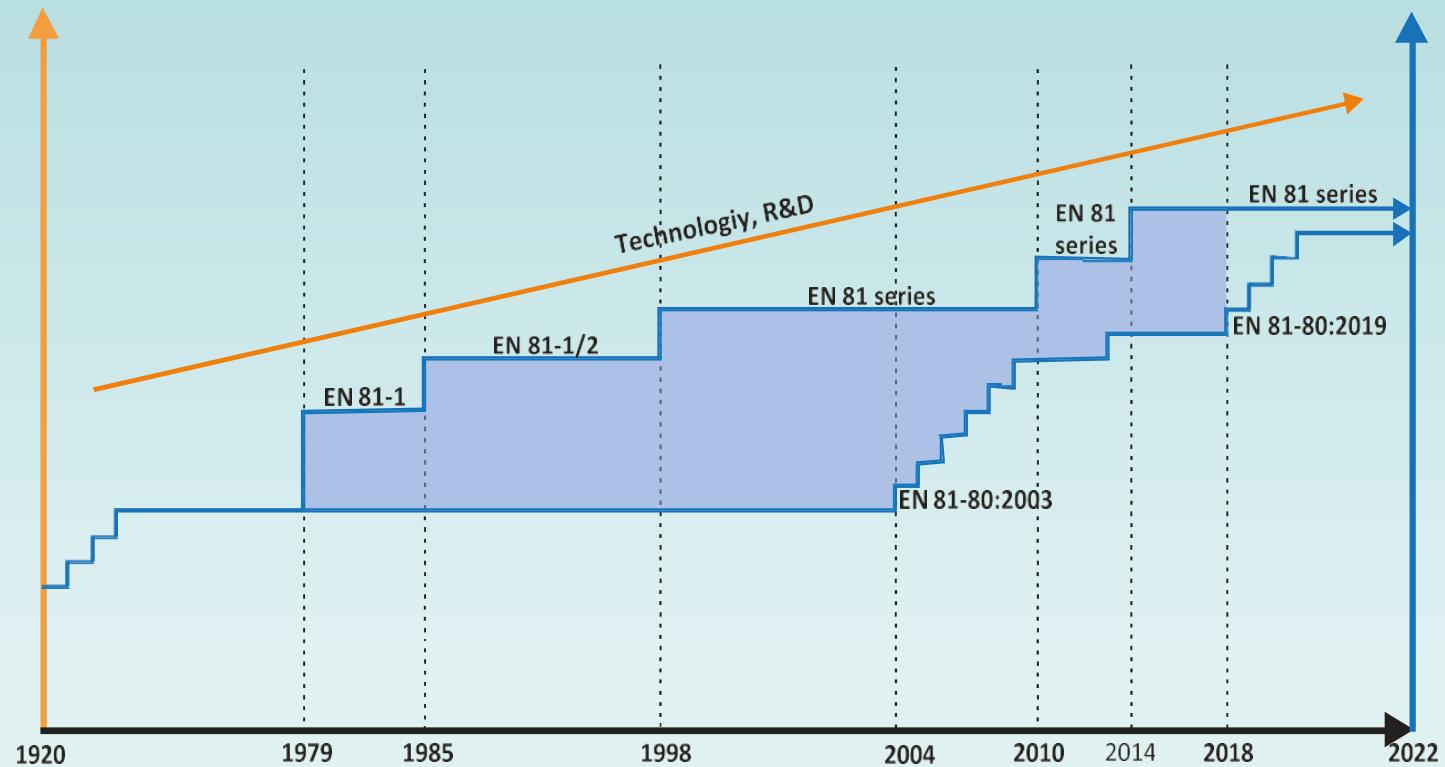
Development of a Standard to address Safety Norms of Existing Lifts (SNEL) **EN 81-80**. Rules for the improvement of safety of existing passenger and passenger goods lifts

- Developed by
  - Lift industry members
  - Approval bodies
  - Code bodies and working committees
  - Regulatory bodies
  - Consumer associations
  - And others ...





# EN 81-80 keeps step with new codes



# The EU Commission recommendation - 1995

## COMMISSION

COMMISSION RECOMMENDATION  
of 8 June 1995  
concerning improvement of safety of existing  
(Text with the EEA relevance)  
(95/216/EC)

### PRINCIPLES RELATING TO IMPROVEMENT OF THE SAFETY OF EXISTING LIFTS

*Preliminary remark*

*European standards EN 81-1 and EN 81-2 may be applied, whenever possible, in order to obtain numerical values relating in particular, to dimensions, tolerances, speeds or acceleration rates.*

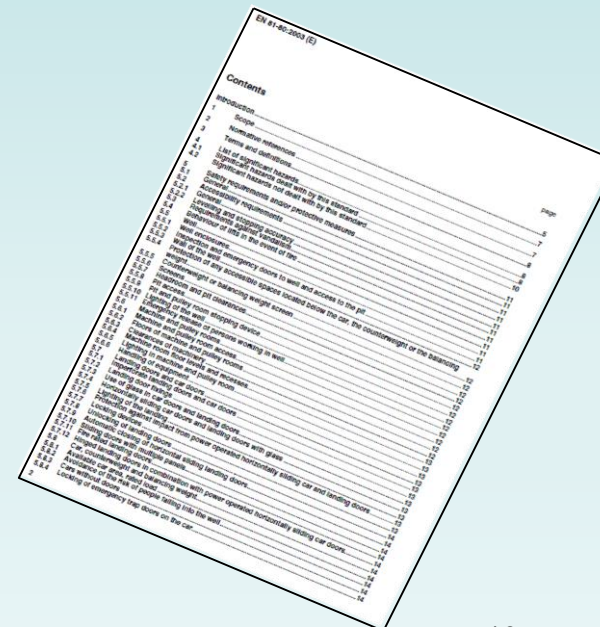
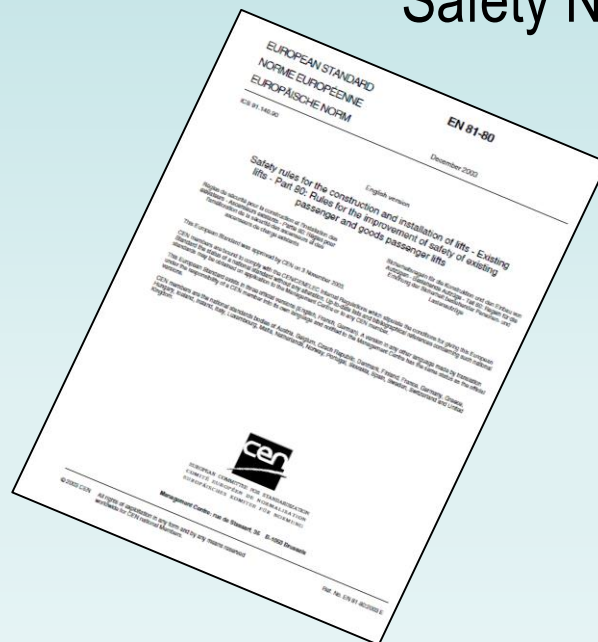
1. Car doors to be fitted and a floor-level indicator to be fitted inside the car.
2. The car suspension cables to be inspected and possibly replaced.
3. The stop controls to be modified in order to achieve a high degree of precision in the stopping level of the car and a gradual deceleration.
4. Make the controls in both the cars and lift wells intelligible and usable by unaccompanied disabled persons.
5. Fit human- or animal-presence detectors to the automatic doors.
6. For lifts which travel faster than 0,6 m/s, fit a parachute system allowing them to decelerate smoothly when stopping.
7. Modify the alarm systems to establish a permanent link with a high-speed breakdown service.
8. Eliminate any asbestos in the braking systems, where this exists.
9. Fit a device preventing uncontrolled movements towards the top of the car.
10. Provide cars with emergency lighting that operates in the event of a main power supply failure. It must operate for long enough to enable the rescue services to intervene in a normal manner. The installation must also enable the alarm system provided for in item 7 to function.



# Publishing of EN81-80

EN81-80 - Rules for improvement of safety of existing passenger lifts and goods passenger lifts was first published in 2003 with an updated revision published in 2019 with the addition of 11 new hazards identified, from 74 to 85 hazards.

## Safety Norms for Existing Lifts (SNEL)

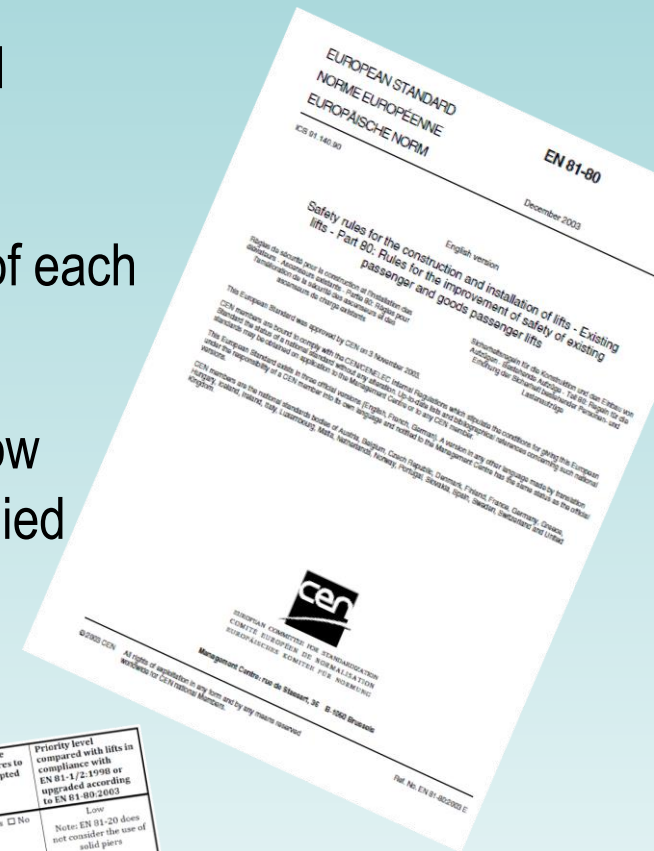






# How does EN81-80 : 2019 work ?

- Identifies and categorizes various hazards and hazardous situations
- Provides corrective actions to improve safety of each hazard or hazardous situation
- Categorises the items as high, medium and low risks and corrective actions which can be applied and prioritise them
- Includes a checklist that can be used to audit existing lifts to identify hazards



Checklist for site audit

No.	No. in EN 81-80: 2019	Items to be checked for compliance with EN 81-80: 2019	Requirement fulfilled	Priority level	Protective measures (risk reduction measures)	Possible measures to be adopted	Priority level compared with lifts in compliance with EN 81-1/2:1998 or upgraded according to EN 81-80:2019
2.7	10	Protection of any accessible spaces below the well where no solid pier extending down to solid ground is existing	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable	Low	Provide a safety gear to the counterweight or balancing weight according to EN 81-20:2018, 5.2.5.4	<input type="checkbox"/> Yes <input type="checkbox"/> No	Low Note: EN 81-20 does not consider the use of solid piers
2.8	11	Counterweight or balancing weight screens to prevent access to area below counterweight or balancing weight	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable	Low	Provide counterweight or balancing weight screen according to EN 81-20:2018, 5.2.5.5.1	<input type="checkbox"/> Yes <input type="checkbox"/> No	0
2.9	12	Partition in the pit for lifts in a common well to avoid access to adjacent lift	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable	High	Provide partition in the pit according to EN 81-20:2018, 5.2.5.5.2	<input type="checkbox"/> Yes <input type="checkbox"/> No	Low





# How does EN81-80 : 2019 work ?

1 Lists possible hazards with existing lift equipment

➤ Provides corrective actions to improve safety of each hazard or hazardous situation

2 Risk assess hazards to identify severity level

➤ Identify risks and corrective actions which can be applied and prioritise them

➤ Categorise each item as High, Medium & Low Priority

➤ Include existing lifts to identify hazards

4 Checklist to use for site audit



No.	No. in EN 81-80: 2003	Items to be checked for compliance with EN 81-20:	Requirement fulfilled	Priority level	Protective measures (risk reduction measures)	Possible measures to be adopted	Priority compared with lifts in compliance with EN 81-1/2:1998 or EN 81-1/2:1998 or upgraded according to EN 81-80:2003
			C6		Provide safety gear to the counterweight or to the pit according to EN 81-20:2018.	<input type="checkbox"/> Yes <input type="checkbox"/> No	Low Note: EN 81-20 does not consider the use of solid piers.

2-5	12	below counterweight or balancing weight	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable	High	Provide partition in the pit according to EN 81-20:2018, 5.2.5.5.2		
		Partition in the pit for lifts in a common well to avoid access to adjacent lift					

# Identification of Hazardous Situations

1

The list of hazardous situations in table 4.1

No.	Hazard/Hazardous situation	No. in EN 81-80:2003
2.8	accessible spaces below well	11
2.9	No or inadequate screen of counterweight/balancing weight in the pit	12
2.10	No or inadequate partition in the pit for lifts in a common well	13
2.11	No or inadequate partition between moving parts of lifts in a common well	14
2.12	Insufficient refuge spaces and clearances in headroom	14
2.13	Insufficient refuge spaces and clearances in pit	15
2.14	No or inadequate means to enter the pit	16
2.15	No or inadequate lighting of the well	17
2.16	No or inadequate stopping device in the pit	18
2.17	No or inadequate alarm system in pit and on car roof	58
2.18	Excessive horizontal distance between the inner surface of the well and the sill, door frame of the car or closing edge of car sliding doors	59
2.19	Excessive distance between car door and landing door	Not covered
3	Too large distance between leading edges of car and landing doors	
3	Machinery spaces and pulley rooms	

2

Each hazard situation has been risk assessed

Table 2 — Original risk profile

Level of probability	Level of severity			
	1	2	3	4
Number of hazardous situation				
A			4.9/4.10/4.11	
C		2.3/4.1/4.2/4.9 4.10/4.11/8.2	4.19/5.8/7.3	
C-D	10.4	2.6/2.13/2.14/3.1 3.2/3.7/4.5/4.6/4.7 4.8/4.20/5.3/5.11 6.4/7.2/10.3	4.13/5.7	
D	1.6/2.1/2.2/2.4/2.5/2.9 2.10/2.11/2.12/2.14 2.15/2.17/2.18/2.19 3.3/4.3/4.5/4.6/4.7 4.8/4.14/4.15/4.16 4.20/5.2/5.5/5.11/6.4 6.6/6.7/8.1/8.2/8.3 9.1/9.2/9.4/10.3	2.16/3.4/3.6/4.4 4.12/5.3/5.6/6.1 6.2/6.5/6.9/8.6	5.4/6.3/8.4/8.5	
D-E	3.8/4.17/4.18/4.21 6.5/6.8/10.1/11.1	3.5/5.1/5.10/7.1 9.3/9.5/10.2/10.5		
E	2.7/2.8/3.4/5.10/7.1	5.9		

3

Plotted on risk profile





# Evaluation of risk level

Table 2 — Original risk profile

Level of probability	Level of severity			
	1	2	3	4
	Number of hazardous situation			
A	EXTREME	HIGH	4.9/4.10/4.11	LOW
B			4.9/4.10/4.11	
C	HIGH 10.4	2.3/4.1/4.2/4.9 4.10/4.11/8.2	4.19/5.8/7.3	
C-D		2.6/2.13/2.14/3.1 3.2/3.7/4.5/4.6/4.7 4.8/4.20/5.3/5.11 6.4/7.2/10.3	4.13/5.7 MED	
D	1.6/2.1/2.2/2.4/2.5/2.9 2.10/2.11/2.12/2.14 2.15/2.17/2.18/2.19 3.3/4.3/4.5/4.6/4.7 4.8/4.14/4.15/4.16 4.20/5.2/5.5/5.11/6.4 6.6/6.7/8.1/8.2/8.3 9.1/9.2/9.4/10.3	2.16/3.4/3.6/4.4 4.12/5.3/5.6/6.1 6.2/6.5/6.9/8.6	5.4/6.3/8.4/8.5 LOW	
D-E	3.8/4.17/4.18/4.21 6.5/6.8/10.1/11.1 MED	3.5/5.1/5.10/7.1 9.3/9.5/10.2/10.5 LOW		
E	2.7/2.8/3.4/5.10/7.1 LOW	5.9		Table 2

## The checklist

Table A.1 in Annex A

- List item to be checked
- Priority level
- Proposed protective measure

4

Assign  
Priority level

No.	No. in EN 81-80: 2003	Items to be checked for compliance with EN 81-20: 2018	Requirement fulfilled <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable	Priority level	Protective measures (risk reduction measures)	Possible measures to be adopted <input type="checkbox"/> Yes <input type="checkbox"/> No	Priority level compared with lifts in compliance with EN 81-1/2:1998 or upgraded according to EN 81-80:2003 Low Notes: EN 81-20 not consider the solid pie
2.7	10	Protection of any accessible spaces below the well, where no solid pier extending down to solid ground is existing	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable	Low	Provide a safety gear to the counterweight or balancing weight according to EN 81-20:2018, 5.2.5.4	<input type="checkbox"/> Yes <input type="checkbox"/> No	
2.8	11	Counterweight or balancing weight screen to prevent access to area below counterweight or balancing weight	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not applicable	Low	Provide a counterweight or balancing weight screen according to EN 81-20:2018, 5.2.5.5.1	<input type="checkbox"/> Yes <input type="checkbox"/> No	





# Annex A.1 examples

Table A.1 — Safety checklist for existing lifts

No.	No. in EN 81-80: 2003	Items to be checked for compliance with EN 81-20: 2018	Requirement fulfilled	Priority level	Protective measures (risk reduction measures)	Possible measures to be adopted	Priority level compared with lifts in compliance with EN 81-1/2:1998 or upgraded according to EN 81-80:2003
4.4	Not covered	Strength of car doors	<input type="checkbox"/> Yes <input type="checkbox"/> No	Medium	Provide car doors according to EN 81-20:2018, 5.3.5.3	<input type="checkbox"/> Yes <input type="checkbox"/> No	Low Note: EN 81-80:2003 did not cover car doors.

5.2	39	Car apron to avoid people falling into the well	<input type="checkbox"/> Yes <input type="checkbox"/> No	High	a) Provide car apron according to EN 81-20:2018, 5.4.5, or b) provide apron according to EN 81-21:2018, 5.8	<input type="checkbox"/> Yes <input type="checkbox"/> No  <input type="checkbox"/> Yes <input type="checkbox"/> No	Low
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# EN115–2 Safety Norms for Existing Esc's

## List of Significant Hazards

Nr.	Hazard/hazardous situation	Priority level	Relevant clause of 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

# Modernisation – 3 steps

## Step 1 – What to do?

*Site Audit*

Use EN81- 80 and EN81 Family  
to identify what needs to be done

*Priority of  
items*

## Step 2 – How to achieve?

*Scope of  
works*

EN 81 -21 & ISO14798

- Awareness of consequential changes & risks
- Guidance on testing

*Interfacing  
components*

## Step 3 – Delivery

*RAMS*

Planning & Risk Assessment of the works agreed

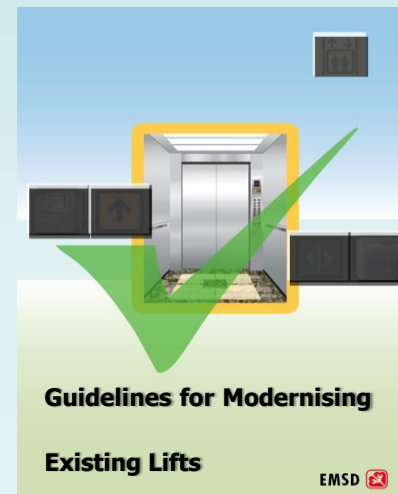
*Planning &  
Logistics*



# Promoting modernisation

Regulators and Lift Associations in Asia Pacific actively promote the modernisation of existing lifts -

- Gazettes , Directives and Circulars are issued and updated by Regulators and Associations.
- Some Regulators provide exacting requirements for the modernisation and safety upgrade of existing lifts and have laws of the same.



# Initiatives for modernisation from Regulators

## Hong Kong EMSD

- Has dedicated web pages for maintenance and modernization  
[https://www.emsd.gov.hk/.../lift\\_modernisation\\_resource\\_corner/index.html](https://www.emsd.gov.hk/.../lift_modernisation_resource_corner/index.html)
- Provides financial incentives to owners

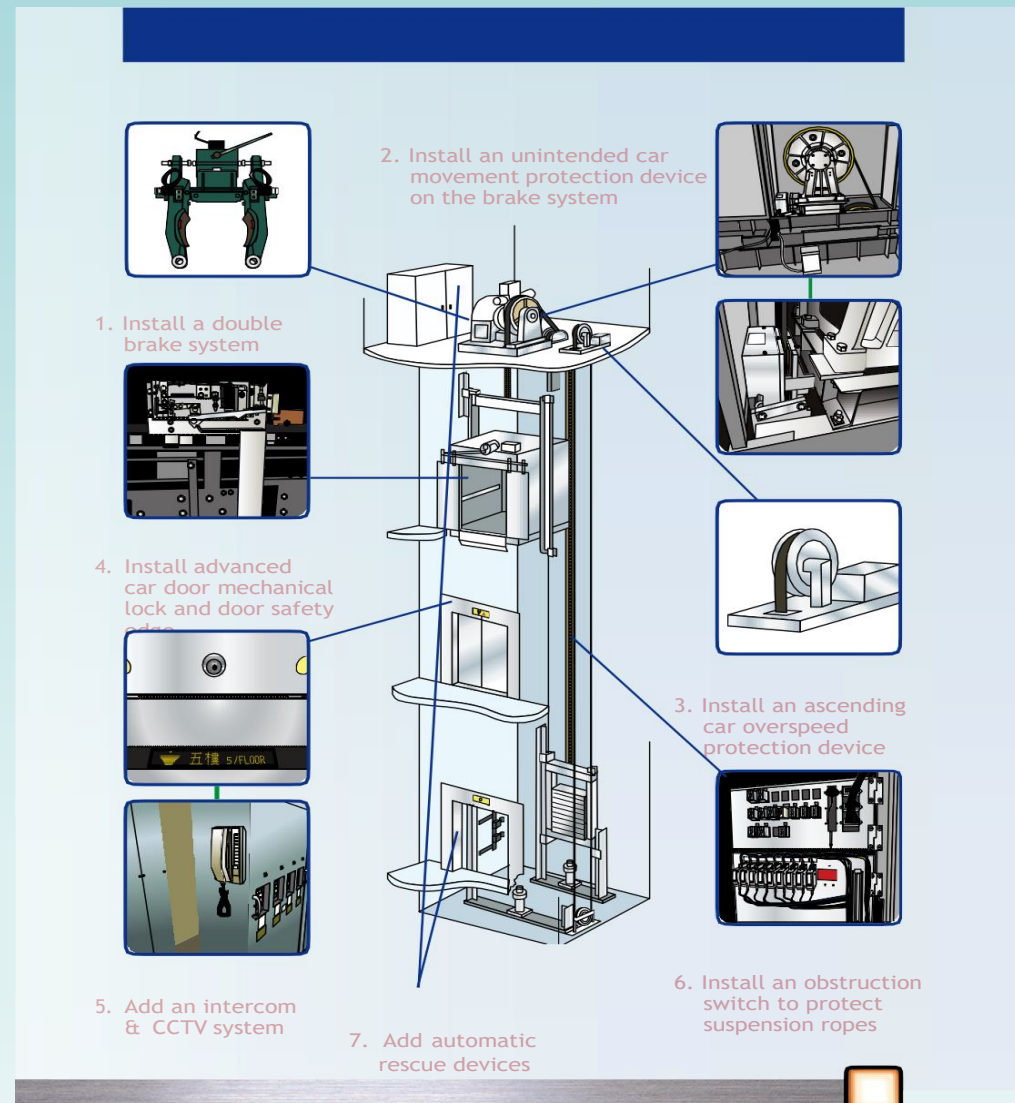
*The Government has partnered with the Urban Renewal Authority (URA) to implement the "Lift Modernisation Subsidy Scheme" (LIMSS) to promote lift modernisation <sup>Note 1</sup> in the community through provision of financial incentive with appropriate professional support to eligible building owners of private residential or composite (commercial and residential), thereby enhancing lift safety.*

## South Korea KoELSA

- Lifts 15 years + must have regular inspection of safety components
- Lifts 21 years + must have 8 specified safety components added to the lift



# 7 Solutions for mod safety upgrade - EMSD



# Solutions for safety upgrades - EMSD

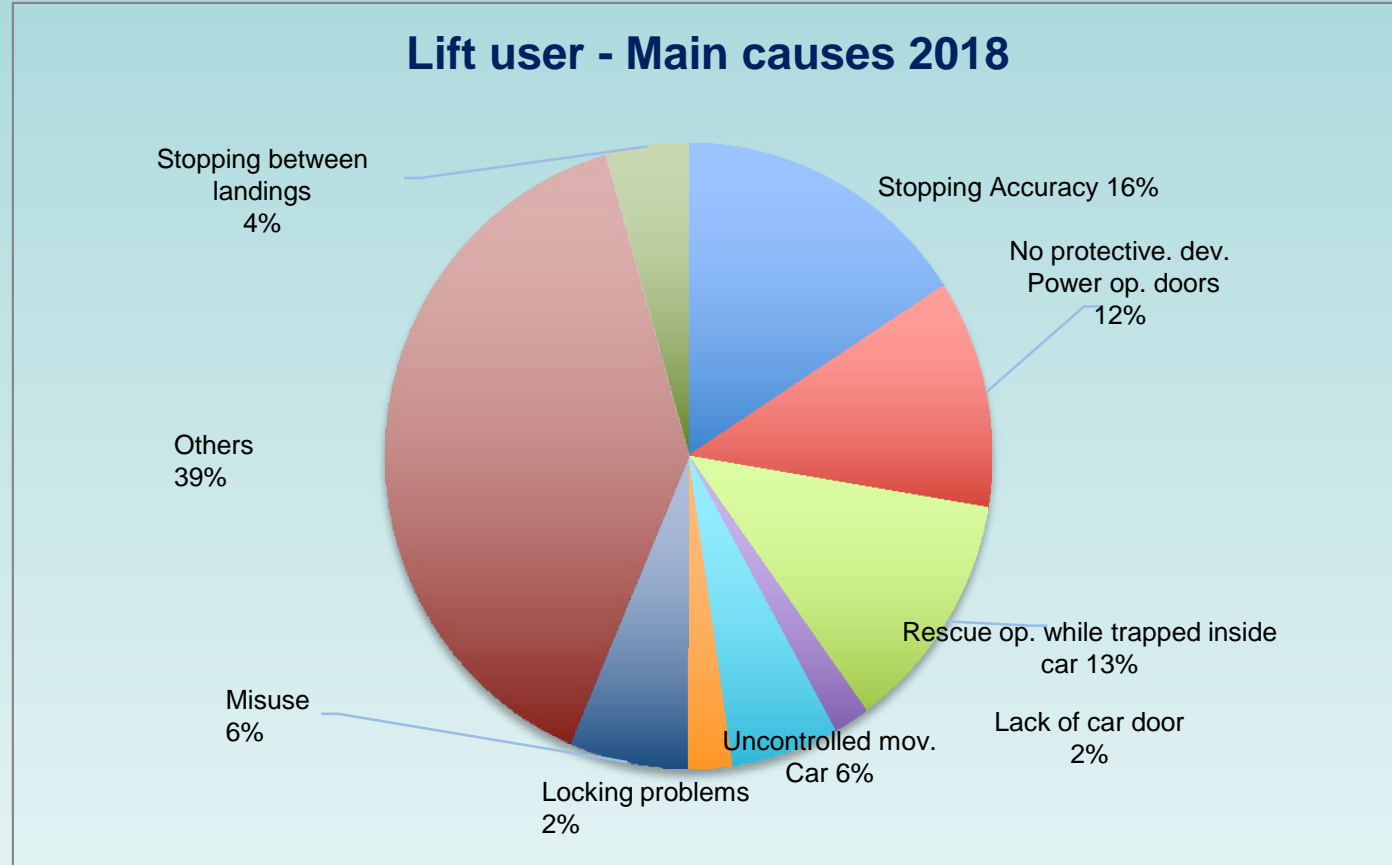
## Summary of Seven Enhancement Solutions

	Enhancement Solution	Benefit
1.	Install a redundant brakesystem	Older lifts with one brake may lead to ineffective braking should the brake fail.If a redundant brake system is installed, the lift will be able to stop safely even ifone set of the brake fails.
2.	Install an unintended car movement protection deviceon the brake system	It can prevent any unintended lift carmovement, passengers will be safer asthey go in and out of a lift.
3.	Install an ascending car overspeed protection device	Prevent overspeed of an ascending lift car. Increased safety and reliability of liftooperation.
4.	Install car door mechanicallock and door safety edge	Prevent passengers inside the lift cars from forcibly opening the lift door, andfrom being struck by the lift door as it isclosing. Passengers will be safer as they enter and exit the lift.
5.	Add an intercom and CCTVsystem	It enables trapped lift passengers to communicate instantly with managementstaff, speedy rescue action for trapped passengers.
6.	Install an obstruction switchto protect the suspension ropes	When the movement of the lift car or counterweight is obstructed while the motor is still in operation, it will cause excessive wear and tear of the suspensionropes and sheaves. This enhancement solution prevents from excessive wear andtear of suspension ropes and sheaves, sothat the lift is more safe and reliable for riding.
7.	Add automatic rescue device	Prevent passengers from being trapped in case of power failure. Increased reliability of lift operation.

Essential

Optional

# Safety upgrades to enhance safety



Source : SNEL White Paper ELA Publication – September 2020

## 7 Safety Upgrades - EMSD

1. Double brake system
2. UCMP
3. Ascending car overspeed
4. Car door mechanical lock and door safety edge
5. Intercom & CCTV
6. Obstruction switch protection
7. Auto rescue device

All of the above causes covered by these 7 items



# Conclusion

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- A code , EN81-80 exists to guide lift companies and regulators in identification of the most important safety hazards (85 items)
- Measures for safety upgrades to systems have been recommended and published by many regulators and lift associations
- Technology available to monitor health of the installed units and reduce physical visits to site
- There is no reason or excuse why existing lifts and escalators cannot be modernised to current state of the art safety levels





Pacific Asia Lift & Escalator Association

Thank you for your attention



관심을 가져주셔서 감사합니다  
L M B M B



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