

Uplifting the Safety of Aged Lifts in Hong Kong

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Keywords: Electrical and Mechanical Services Department, Hong Kong, lift safety, aged lifts, regulator, facilitator, promoter, lift modernisation subsidy scheme, special maintenance

Abstract. Hong Kong is one of the most densely populated cities. There are around 70,000 lifts in operation to transport millions of people in the built environment of the territory. The safety of lifts is dependent on proper periodic examination and maintenance. With rapid technological advancement, modern lifts are equipped with more comprehensive safety devices than the aged ones. Lift modernisation could transform aged lifts to deliver more versatile services with enhanced safety, reliability and ride comfort. The Electrical and Mechanical Services Department (“EMSD”) of the Government of Hong Kong Special Administrative Region (“HKSAR”) of the People’s Republic of China acts as the “regulator”, “facilitator” and “promoter” for electrical and mechanical safety in the HKSAR. The EMSD has been actively introducing multidimensional measures for uplifting the safety of aged lifts, thereby enhancing public safety. While paying attention to the progress of lift modernisation works, the EMSD has stepped up the surveillance of aged lifts and requested the responsible persons and registered lift contractors to step up the maintenance of aged lifts. At the same time, the Government has made available financial assistance with appropriate professional support to building owners in need to modernise or replace their aged lifts. In the long run, the EMSD will consider mandating measures for lift modernisation by making reference to relevant experience in other jurisdictions, the enactment and enforcement of similar ordinances in Hong Kong as well as taking into account the impact on the community and the trade. This paper will share the experience, effectiveness and challenges faced when implementing measures to enhance the safety of aged lifts in Hong Kong.

1 LIFT SAFETY IN HONG KONG

Hong Kong is a densely populated city packed with skyscrapers and high-rise buildings, where the social activities rely much on its sound and reliable vertical transportation. There are around 70,000 lifts operating diligently to transport millions of people from floor to floor among buildings of which 8,500 blocks are high-rise and about 500 are skyscrapers [1].

1.1 Lifts and Escalators Ordinance in Hong Kong

The safety of lifts in Hong Kong is regulated by the Lifts and Escalators Ordinance (Chapter 618) (“LEO”), which was put into operation on 17 December 2012, to replace the repealed Lifts and Escalators (Safety) Ordinance (Chapter 327). The EMSD, as the regulator, enforces the LEO through various means, such as conducting risk-based audit inspections, carrying out prosecution and disciplinary proceedings, promulgating codes of practice as well as registration of contractors, engineers and workers. In addition to being a regulator, the EMSD also acts as “Facilitator” and “Promoter” for improving lift safety in Hong Kong.

1.2 “Guidelines for Modernising Existing Lifts”

When a lift is put into service for the first time, its design must comply with relevant safety standards prevalent at the time of installation. The latest design requirements are stipulated in the Code of Practice on the Design and Construction of Lifts and Escalators 2019 Edition (“Design Code”) adopting the requirements of EN81-20/50. Since the roll-out of the Design Code in 1993, several amendments of the Design Code were made to uplift the safety requirements in line with the prevailing international safety standards and meet with technological advancements to make lifts

safer. In view of this, the EMSD promulgated in 2011 the “Guidelines for Modernising Existing Lifts” to facilitate owner of lifts to implement enhancement and modernisation solutions to make their existing lifts safer, more efficient and reliable, and with better ride comfort. The Guidelines adopted requirements from EN81-1:1998+A3:2009 [4], introduce seven application solutions for enhancing existing lifts. The first four solutions (namely installation of (i) double brake system, (ii) unintended car movement protection device, (iii) ascending car overspeed protection device, and (iv) car door mechanical lock & door safety edge) were considered essential and were recommended to be taken with priority, whereas the remaining three solutions (namely (v) installation of intercom & CCTV system, (vi) obstruction switch to protect suspension ropes, and (vii) automatic rescue devices) were recommended to be considered according to the actual situation or individual need (Figure 1).

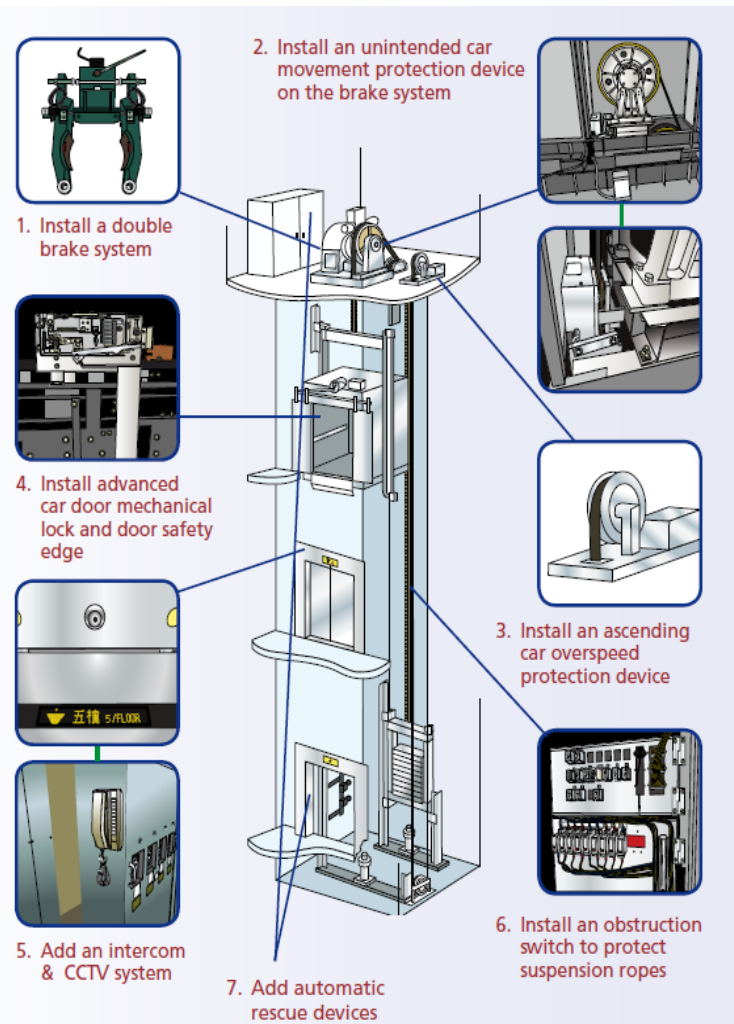


Figure 1 Applicable Solutions for Enhancing Requirements of Existing Lifts

1.3 Aged Lifts and Incidents

As the end 2020, there were about 70,000 lifts in Hong Kong, with over 41,000 lifts (about 60%) aged over 20 years and about 45,000 lifts (about 65%) were not equipped with all four essential modern safety devices (i.e. double brake system, unintended car movement protection device, ascending car overspeed protection device, and car door mechanical lock & door safety edge). Reported lift incident records in Hong Kong revealed that most of the lift incidents were related to passenger behaviors (Table 1) [2]. For those few incidents related to lift equipment fault, most of them were due to poor levelling.

Table 1 Reported Lift Incident Records in Hong Kong (2016 - 2020)

Main Cause of Incidents	Number of Incidents				
	2016	2017	2018	2019	2020
Passenger Behavior	411	449	387	358	225
Lift Equipment Fault	11	8	15	6	11
Injuries to Lift Worker	6	5	2	3	2
	430	462	404	367	238

However, there were a few lift incidents causing serious injury to passengers or even fatality¹. All of those lifts were installed over 20 years ago and the serious incidents could well be avoided if those lifts had been equipped with the four essential modern safety devices mentioned before.

In response to the above, especially for the two serious lift incidents involving Unintended Car Movement that resulted in serious passenger injury and death in 2018, the Government rolled out a series of measures to enhance the safety of aged lifts in June 2018.

2 STEP UP THE MAINTENANCE WORKS OF AGED LIFTS

The LEO requires that lifts must undergo periodic maintenance by registered lift workers (“RWs”) at least once a month² and be examined by registered lift engineer at least once a year to ensure the safe operation of the lifts. As short-term measures to uplift the safety level of aged lifts, the EMSD stepped up the surveillance checks of relevant maintenance items to ensure the quality of the inspection and maintenance works carried out by the registered contractors and introduced special maintenance for the aged lifts in June 2018.

2.1 Surveillance Inspections of Maintenance Works

The EMSD increased its manpower to step up the surveillance checks on the maintenance and examination of aged lifts which have not yet been modernised, i.e. not yet equipped with the four essential safety devices. The number of inspections increased from the earlier level of 11,000 inspections per year to about 29,000 inspections per year and about 55% of the inspections were concerned about maintenance works.

2.2 Special Maintenance

The EMSD revised the “Code of Practice for Lift Works and Escalator Works” [3] in 2018 to require aged lifts, which have not equipped with unintended car movement protection device, ascending car overspeed protection device, or double braking system, to have “special maintenance” conducted twice a year, unless alternative requirements have otherwise been specified by the manufacturers.

The scope of special maintenance of aged lift includes:

- a. Disassembly maintenance of the braking mechanism for the lift machine brake.
- b. Measure the braking distance by performing no-load brake test to ensure compliance with the lift manufacturer's requirements.

¹ There was a fatal case in 2018 due to uncontrolled car movement of an age lift.

² In actual practice, most responsible persons require registered lift contractors to organize RWs to perform periodic maintenance for their lifts twice a month.

- c. Check grooves of traction sheave in the lift traction machine to ensure they are in accordance with the lift manufacturer's specifications.
- d. Perform no-load traction test for the lift and measure the leveling accuracy to ensure the traction and leveling accuracy are in compliance with the lift manufacturer's requirements.
- e. Check the mechanical locks and electrical contacts of all lift landing doors to ensure they are in safe working order.

The special maintenance is meant to enhance the reliability of the critical components of aged lifts which have yet undergone modernisation. To ensure the works quality, the EMSD conducted over 5,000 inspections for the special maintenance works done by registered contractors in 2020.

There was obvious improvement in the performance of aged lifts following adoption of special maintenance and the stepped up inspections. The irregularities found per inspection dropped by about 50% from the third quarter of 2018 to the first quarter of 2021. On the other hand, the EMSD took the initiative to share statistics and summary of inspection findings regularly with the trade to enhance awareness and drive for continuous improvement in uplifting lift safety. The transparency and facilitation have brought greater collaboration with the trade to tackle the safety concerns of aged lifts for the common good of the society.

3 LIFT MODERNISATION SUBSIDY SCHEME

The EMSD always takes on the role of “Promoter” to publicise improvement and enhancement options and solutions for better lift safety. In 2011, “Guidelines on Modernising Existing Lifts” was published and distributed to lift owners, the trade and other stakeholders, recommending owners to modernise their aged lifts. For further expediting lift modernisation, the Government launched a HK\$4.5 billion Lift Modernisation Subsidy Scheme (“LIMSS”) over seven years starting from the financial year 2019-20 to provide financial incentives and appropriate professional support to building owners in need to carry out lift modernisation works, thereby enhancing the safety of their aged lifts.

3.1 Needs of Aged Lifts Owners

Whilst it is always the primary responsibility of lift owners to upkeep and improve the safety of their lifts and to comply with the legal requirements, lifts installed in buildings would commonly be used by visitors and the general public and so enhancing lift safety would benefit the community at large. From publicity events and communications with aged lift owners, the EMSD recognised that some owners may face difficulties in carrying out modernisation works due to problems of finance, technical knowledge, organisation ability, etc. In view of these difficulties, the EMSD has partnered with the Urban Renewal Authority (“URA”) to implement the LIMSS, where the URA in Hong Kong, allows a very experienced statutory body to undertake, encourage, promote and facilitate urban renewal of Hong Kong, with a view to addressing the problem of urban decay and improving the living conditions of residents in old districts.

3.2 Core Elements of LIMSS

The LIMSS is a new initiative in Hong Kong. The development of LIMSS has directed to the correct focus. The LIMSS comprises the following five core elements:

- a. **Care-based:** In view of the rateable values reflect the condition of buildings and lifts, the LIMSS focuses on providing subsidies to building owners in need by targeting aged lifts at private residential or composite buildings with relatively low average rateable values.
- b. **Safety-based:** Priority is accorded to lifts with higher risk, such as lifts having statutory improvement orders or lifts which have not been installed with the safety devices of the

prevalent safety standards.

- c. **Resource-based:** Having struck the balance between the availability of resources and attractiveness of the financial incentive to building owners, the LIMSS subsidises 60% of the cost of the modernisation works / replacement works, subject to a cap of HK\$500,000 per lift. Additional subsidies are to be provided for elderly owner-occupiers aged 60 or above, subject to a cap of HK\$50,000 per domestic unit of buildings having had the lift modernisation.
- d. **Capacity-based:** Having regard to the capacity of the industry to avoid inflating market prices and affecting works quality due to the additional lift modernisation works, the LIMSS would roll out in an orderly manner to modernise about 8 000 lifts in batches over seven years starting from 2019-20.
- e. **Streamlined procedures:** As the URA is now undertaking various subsidy schemes for building rehabilitation and fire services improvement works, the Government has partnered with the URA in delivering the LIMSS to maximise synergy and facilitate participation by the public.

3.3 Scope of LIMSS



Figure 2 Examples of work scope covered by LIMSS

- a. Retrofitting of the following “Essential Safety Devices” under the scheme (the first 4 solutions in the Guidelines for Modernising Existing Lifts).
 - i. Double brake system;
 - ii. Unintended car movement protection device;
 - iii. Ascending car overspeed protection device; and
 - iv. Car door mechanical lock and door safety edge.
- b. Addition of the following “Optional Safety Devices” (the last 3 solutions in the Guidelines for Modernising Existing Lifts)
 - i. Intercom and CCTV system;
 - ii. Obstruction switch; and/or
 - iii. Automatic rescue device.
- c. Lift drive replacement and associated works where it is technically necessary or more cost-effective in order to install the “Essential Safety Devices” and “Optional Safety Devices” specified above (Figure 2).
- d. Owners are granted with the flexibility to opt for installation of specified safety devices or carrying out complete replacement of their lifts.

- e. Subsequent follow-up services during defect liability period for the related safety devices above, but exclusive of routine maintenance services (it is emphasized that the LIMSS is not intended to subsidise lift maintenance services as which should be the sole responsibility of the owner to ensure that lifts are in a proper state of repair and in safe working order).

Free consultancy services would be assigned to the Applicant. If the Applicant opts to appoint their own consultant to co-ordinate the lift modernisation works, relevant consultancy fee will be subsidised.

3.4 Technical Assistance and Other Associated Support

Consultants are assigned to participating buildings for pursuing lift modernisation works and technical advice services. The services include scope assessment, cost estimation for budgeting purpose, tender document preparation based on standard tender document templates, tendering through e-tendering platform, tender evaluation, works supervision and contract management associated with the lift modernisation works.

It is inevitable that building owners' access would be affected during lift modernisation works, especially for buildings with single lift or with floors served by one lift only. As such, under the LIMSS, the URA has also engaged non-government organizations to provide outreach social services to the needy residents, such as the aged and the disabled, of these buildings in order to minimise inconvenience caused to them by the lift modernisation works. Such outreach social services include delivery of meals, procurement of daily supplies and provision of stair-climber services, temporary accommodation etc.

Two rounds of applications for the LIMSS were launched in Mar. 2019 and Jan. 2020. Very encouraging results of applications for more than 8,200 lifts were received, meaning that the launch of LIMSS has correctly addressed the need of building owners.

4 FACILITATION AND PROMOTION OF LIFT MODERNISATION

Equal weight has been given to coordination of the trade and industry, and promotion to the public for smooth implementation of the lift modernisation scheme, such as LIMSS.

4.1 Attraction of New Blood to the Industry

In accordance with the LEO, all lift works are required to be carried out by RWs or any person under the supervision of a RW. RWs are specialised technicians for carrying out lift works including installation, commission, maintenance and repair works. It was foreseeable that launching of the LIMSS might increase the demand for RWs.

In order to alleviate manpower shortage in the trade, the EMSD partnered with the Construction Industry Council ("CIC") to expand the coverage of the Intermediate Tradesman Collaborative Training Scheme ("ITCTS") launched in 2017 to training of lift technicians. Under the scheme, trainees are recruited on a first-hire-then-train basis and primarily trained on-site. This is a 6-month training, jointly provided by the CIC and lift companies, consisting of two parts. The two parts are respectively a 12-day initial training, giving trainee general knowledge of background and skills required for performing lift works, and an on-site practical training where trainee will perform actual works under the guidance of their employers. To ensure the quality and progress of the training, the CIC regularly conducts site visits to the workplace and inspects training progress of trainees by prior arrangement with the trainers. Towards the end of the scheme, trainees will have to complete a certification test in order to ensure their knowledge and skillsets are up to the requirements before

granting certification test bonus. Employers will also receive an employer completion bonus after that.

Trainees, who have completed the ITCTS, will be eligible to join the Advanced Construction Manpower Training Scheme – Pilot Scheme (ACMTS – Pilot Scheme) and proceed on with their career path in the trade. The scheme has successfully helped attract young newcomers to join the industry, alleviating the manpower demand.

4.2 Promotion of Lift Modernisation

Since the release of the “Guidelines on Modernising Existing Lifts” in 2011, the EMSD has started promoting lift modernisation via various means for lift owners to uplift the safety standard of aged lifts. To synergise with the launch of LIMSS in 2018, EMSD conducted a series of publicity activities. As revealed in the announcement of public interests, the proper safeguard for aged lifts is not personal protection equipment, but lift modernisation (Figure 3). The message of lift modernisation, delivered in a laymen’s tone, was direct and easily understood by the general public.



Figure 3 API of Lift Modernisation Subsidy Scheme in 2019³

In addition to the television and radio announcements, posting advertisements on newspapers and bus bodies, etc., the EMSD has also delivered and participated in numerous public briefings, seminars, owner’s meetings, district council meetings, etc. (Figure 4 and 5), to promote the lift modernisations and lift safety.

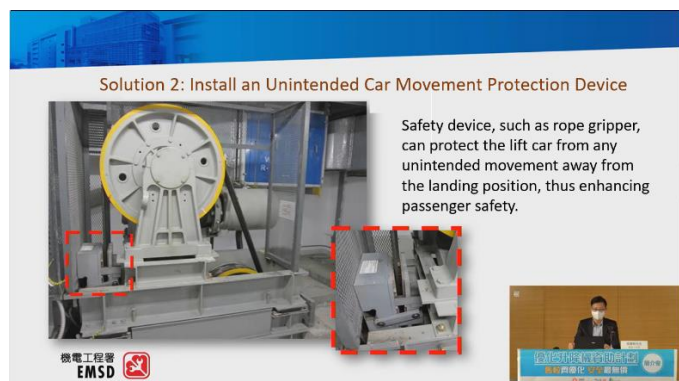


Figure 4 and 5 Mass briefing and Online briefing for promoting Lift Modernisation

³ Full API of LIMSS available online at https://www.isd.gov.hk/eng/tvapi/19_eg91.html

4.3 Facilitation to Upkeep Lift Safety with Technology

As one of six smart areas under the “HKSmart City Blueprint” induced by the Government since 2017, the “Smart Government” concept has guided the EMSD to have more initiatives on adoption of technology for enforcement of legislative requirements as well as facilitating the trade to use innovation technologies on their daily works. The EMSD launched the E&M InnoPortal⁴ (F6) which lists the service wishes of various government departments, public organisations and the electrical and mechanical trades, and invites the I&T sector, including start-ups and universities to propose relevant I&T solutions for matching. Up to June 2021, more than 750 I&T solutions and 350 I&T wishes were collected for matching, and over 130 trial projects were started and completed in the past few years. One of the successful matching between the I&T solutions and wish items on the portal is the development of e-log book of lifts and escalators.



Figure 6 E&M InnoPortal Website

In Hong Kong, it is a statutory requirement for responsible persons⁵ to keep and maintain a log-book for their lifts. The log-book must be in the specified form, containing information such as: (i) description of the lift, (ii) name and contact details of registered contractors who undertake maintenance works, and (iii) particulars of every incident of the lift concerned. Responsible persons are required to keep track of the entries of the log-book to ensure works by registered contractors are accomplished and on schedule.

There are approximately 26,000 conventional paper-bound log-books in Hong Kong. Some responsible persons may pay less attention to the statutory requirements for the upkeep of log-books, leading to unnecessary sanctions or warnings, while other responsible persons may find paper-bound log-books cumbersome to trace and summarise different maintenance logs and occurrences for monitoring and ensuring timely execution of lift works. Thus, a new way of logging and analysing these data has been proposed by the EMSD.

To facilitate stakeholders to better manage, analyse and monitor lift works, the EMSD has proposed to develop a common electronic platform, viz. digital log-book, to replace the paper-bound log-books. The digital log-book will be accessible on both mobile devices and desktop computers, adopting a newly designed user-interface, offering user-friendliness and easy information access to responsible persons and trade personnel. It can also strengthen the Government’s monitoring/regulatory control as well as encouraging compliance and enhancing works quality. The system, capable of uploading of images, audios and videos of lift works carried out will aid incident investigations and equipment fault analysis. The works and entries recorded for each lift generated every day will be analysed for insights leading to setting of performance indicators for quality assessment, better strategic regulatory moves and policies for healthy trade developments. Automatic alerts will be dispatched to

⁴ The E&M InnoPortal <https://inno.emsd.gov.hk/en/home/>

⁵ According to the Lifts and Escalators Ordinance (Chapter 618) in Hong Kong, the responsible person for a lift is defined as (1) the owner of the lift; or (2) any other person who has the management or control of the lift.

responsible persons and registered contractors, reminding statutory activities and the relevant submissions are due, safeguarding stakeholders from contravening the legislative requirements. All in all, the digital log-book combining with big data analysis will facilitate all trade parties to work hand-in-hand to enhance lift safety.

5 Conclusion and the Way Forward

Looking into the long run for addressing the safety issues of aged lifts, the EMSD has been studying the feasibility of mandating measures for lift modernisation. The EMSD will make reference to relevant experience in other jurisdictions, the enactment and enforcement of similar ordinances in Hong Kong as well as taking into account the impact on the community and the trade in formulating the resolution proposal. In this connection, EMSD will consult the public, legislators and the trade in due course.

Recently, the EMSD has conducted a benchmarking study to review 10 overseas jurisdictions (i.e. Germany, Belgium, France, UK, New York City, California, Tokyo, South Korea, Singapore and Shenzhen) on regulatory measures over aged lift modernisation. The study results reveal that financial subsidy and mandatory risk assessment of modernisation are two major measures to drive for upgrading or replacement of aged lifts. The EMSD would further explore the possibilities of adopting similar measures in Hong Kong.

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BIOGRAPHICAL DETAILS

Ir Vincent H.K. CHOW is the Chief Electrical and Mechanical Engineer of the EMSD, Government of the HKSAR. He has diversified managerial experience in the regulation of lift, escalator, amusement ride, fuel gas and electrical systems as well as implementing government policy and schemes. He is currently overseeing the stepped-up inspection of aged lifts, the implementation of LIMSS as well as the feasibility study and proposal of long term mandatory measures of aged lifts in Hong Kong. *Ir CHOW* is a Chartered Engineer in the Engineering Council of the United Kingdom, a Member of the Institution of Mechanical Engineers, a Member of the Institution of Gas Engineers & Managers and a Corporate Member of Hong Kong Institution of Engineers.

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