

# LIFT AND ESCALATOR SAFETY MANAGEMENT IN HONG KONG

G.M.W. Chui & L.C. Wong, Electrical & Mechanical Services Department, (Hong Kong Government) 98, Caroline Hill Road, Hong Kong.

## ABSTRACT

With the advancement of technology, much improvement has been made in the design and construction of lifts and escalators to safeguard public safety. While safety engineering remains an important tool to improve safety, it is not a total solution. On the other hand, safety management cares about overall safety achievements, which depend on carrying out effective management activities. This paper reviews a number of modern safety management principles and practices and examines the current safety management practices of the lift and escalator industry in Hong Kong.

## INTRODUCTION

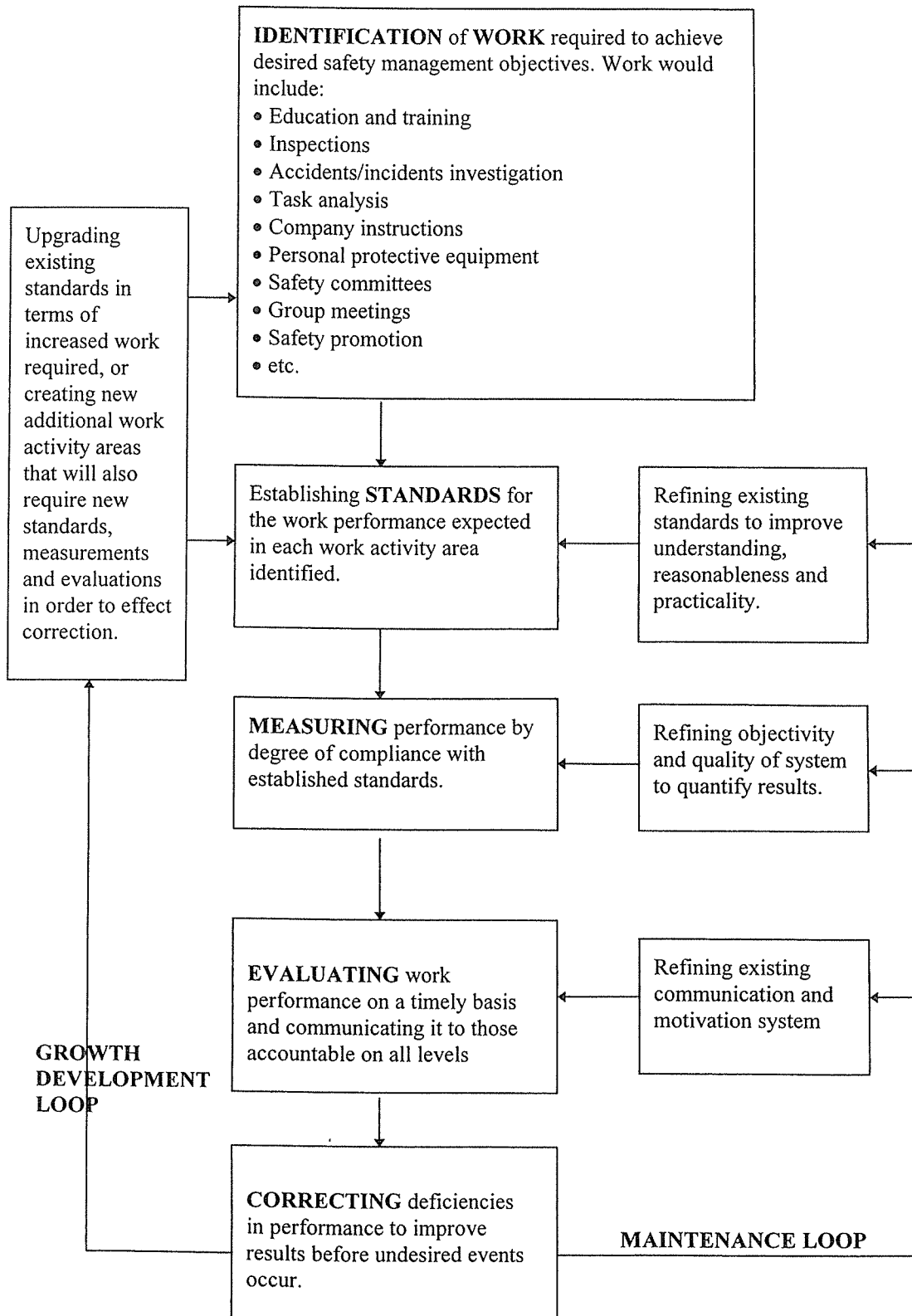
The large number of high-rise buildings and shopping plazas has made Hong Kong one of the big cities in the world having the highest density of lift and escalator installations. Everyday, six million people use the 40,000 lifts and 4,500 escalators in Hong Kong. The number of lifts and escalators increases at 5-8% per year. To enhance public safety, the installation, maintenance, repair and inspection of lifts and escalators are governed by the Lifts and Escalators (Safety) Ordinance, Chapter 327 of the Laws of Hong Kong (the Ordinance) which is enforced by the Electrical and Mechanical Services Department (EMSD) of the Hong Kong Government .

It is generally accepted that the statutory requirements set by the regulating authority alone will not be adequate and that the procedures, the arrangement of work, the training of workers, and their competency are all essential factors affecting the safety of the public as well as the lift/escalator workers. Attention has been focused on safety engineering to prevent accidents. Though more safety devices, e.g. landing door lock bridging device and deflector device at skirting of escalator, have been introduced, accidents still happen. In 1995, there were 4 fatal lift accidents, 16 non-fatal lift accidents and 127 non-fatal escalator accidents including 115 accidents related to the 500 lifts and escalators in the railway stations. None of the fatal accidents were due to equipment fault and most of the non-fatal accidents, especially those involving escalators, were not related with the fault of the equipment. It indicates that solution to the safety problem must ultimately be based upon an integration of safety philosophies, techniques and management control into a comprehensive safety management system.

## SAFETY MANAGEMENT SYSTEM

Accidents occur when men, machines or materials in some way become uncontrolled to the point where physical damage or injury results. The occurrence of accidents may be divided into five stages, namely, lack of management control, basic cause, immediate cause, accident and loss. The greatest potential for prevention and control is to take action early in the sequence to

eliminate the situation of “lack of management control”. Effective safety management can be achieved by the establishment and implementation of a management control system within an organization. The model shown in Figure 1 is a typical safety management control system model.



**Figure 1 A Safety Management Control System Model**

There are five progressive steps in the safety management control model:

- **IDENTIFICATION** of **WORK** required to achieve desired safety management objectives.
- Establishing **STANDARDS** for the work performance expected in each work activity area identified.
- **MEASURING** performance by degree of compliance with established standards.
- **EVALUATING** work performance on a timely basis and communicating it to those accountable on all levels.
- **CORRECTING** deficiencies in performance to improve results before undesired events occur.

A built-in maintenance loop and a growth development loop which allow the system to have continuous improvements and growth, are also essential in this safety management control model.

Items of work required to achieve safety management objectives are identified. These are closely related to each other in the enhancement of safety.. Prevention of accidents requires predictive information which exposes the possible causes of accidents before they happen so that avoiding action can be taken. Safety inspections carried out regularly as a special activity at a specified frequency with recording of results are vital to effective monitoring of working conditions to identify hazards and provide predictive information. Inspection, on the other hand, may on occasion reveal the need for more intensive study using task analysis techniques which will produce data about risk areas and the measures needed to deal with them. Systematic accident/incident investigations can determine the causes after an accident has occurred and decide actions to avoid recurrences. Company safety instructions, including requirements on personal protective equipment, can then be set up for the workers to follow. To facilitate communication between management and employees on safety issues, safety committees and group meetings are set up. Furthermore, education and training are the means to transfer the knowledge of safety at work to the relevant employees for awareness and implementation. Safety promotion campaigns are useful in educating members of the public on the safe use of lifts and escalators.

## **SAFETY MANAGEMENT PRACTICES IN HONG KONG**

The EMSD and the lift and escalator contractors both take an active role in ensuring safety of the lift/escalator passengers and workers. The work carried out in various work activity areas to achieve the safety management objectives are described in the following sections.

### 1) Education and Training

To ensure that the lift works and escalator works which directly affect the safe working condition of the lifts and escalators are only carried out by competent personnel, it is stipulated in the Ordinance that maintenance, test and examinations must be performed by competent lift and escalator workers employed by registered lift and escalator contractors (RCs) and registered lift and escalator engineers (REs) who should have received the required education and training and have been assessed by EMSD to be

qualified to carry out the duties and exercise the functions required by the Ordinance. There are at present a total of 35 RCs and 265 REs in Hong Kong.

Generally, contractors in Hong Kong recognize that in addition to sufficient experience, specific knowledge, skills and care are also required for workers to perform their work safely and properly. Continuous education and training forms an important means for the front-line workers to keep abreast of up-to-date knowledge and skills. Those large lift and escalator contractors in Hong Kong, who are usually wholly-owned or joint-venture subsidiaries of world famous manufacturers, have their own training program for their engineers and mechanics in respect of product knowledge, skill and work instructions. Many have their own training centres which are equipped with various product samples as teaching aids for providing regular training to their staff. Safety training is usually incorporated in the technical training. Whenever new models of equipment are introduced into Hong Kong or there are engineering changes in existing designs, appropriate training is provided to their technical staff. This is especially important for the senior mechanics who are responsible for erection, overhaul and adjustment which require more skill and technical knowledge.

In addition, many contractors in Hong Kong offer formal apprentice training programs to their young workers. Besides the 3-year formal training in various departments within the company, apprentices are regularly released to attend certificate courses provided by technical institutes. As these apprentices are valuable human resource of the industry, the well established contractors usually provide them with adequate technical and safety training.

## 2) Inspections

Regular inspection programs can monitor the safe condition of the equipment as well as the workmanship of the mechanics who carry out the lift and escalator maintenance work. The statutory requirements for periodic maintenance, examination and testing of lifts and escalators by RCs, REs are given below:

Work by RC & RE	Intervals
Periodic maintenance of lifts and escalators such as cleaning, oiling and adjusting	Not exceeding 1 month
Periodic examination on lifts	Not exceeding 12 months
Periodic examination on escalators	Not exceeding 6 months
Periodic testing of safety equipment provided for lifts	Not exceeding 12 months
Periodic testing of safety equipment of lifts with full rated load	Not exceeding 5 years
Periodic testing of safety equipment of escalators with no load	Not exceeding 12 months

A Performance Monitoring Points System (PMPS) is set up by EMSD to provide a yardstick to monitor the performance of RCs and REs in carrying out lift/escalator works. The performance of RCs and REs is assessed based upon requirements stipulated in the Ordinance, the Code of Practice on the Design and Construction of Lifts and Escalators and the Code of Practice on the Examination, Testing and

Maintenance of Lifts and Escalators. Performance Monitoring (PM) points will be given to the RCs and/or REs for each item of non-compliance recorded during each lift/escalator inspection conducted by the inspectors of EMSD. In referring to the safety management system model mentioned above, the statutory requirements and the approved codes of practice are the standards and the PMPS provides the functions for measurement, evaluations and corrections.

PM points incurred for any non-compliance item will remain in the RC/RE's record for 12 successive calendar months from the month of the detection of the non-compliance items for the calculation of a moving average. For a RC or RE who has accumulated a specified number of PM points, the Director of Electrical and Mechanical Services (the Director) may issue a warning letter to the RC or RE; or if necessary, bring the matter to the notice of a disciplinary board appointed under the Ordinance.

Inspection is generally adopted by contractors in Hong Kong as an important tool for lifts and escalators maintenance. Every registered lift and/or escalator contractor employs an inspection program to fulfill the statutory and contractual requirements for periodic maintenance and periodic examination and testing of lifts and escalators. Regular equipment inspections are usually conducted by maintenance workers and are incorporated in the routine maintenance service. Large lift companies in Hong Kong usually have planned inspection programs for management to monitor the conditions and practices under their responsibility. Depot supervisors, maintenance managers and senior managers are required to visit the work sites (lifts or escalators) regularly to inspect the installations and the work of their subordinates.

### 3) Accident/Incident Investigations

Pursuant to the provisions of the Ordinance, lift and escalator contractors have to carry out investigations of certain occurrences involving lifts or escalators under their maintenance and submit reports to the EMSD. In case an accident occurs, the owner of the lift or escalator must immediately notify the EMSD in writing and identify the registered lift contractor or registered escalator contractor who most recently performed work on the equipment. The contractor shall, on receipt of a notice, immediately investigate and must submit a report to the EMSD giving full details of the occurrence within 7 days or, if this cannot reasonably be done, submit a preliminary report within 72 hours and a report giving full details within 2 weeks.

As the statutory duties of lift/escalator contractors and lift/escalator engineers are, respectively, to maintain and examine the installations to ensure that they are in safe working order and in compliance with the relevant standards, occurrence of lift/escalator accident may indicate that they have not properly performed their duties. In view of the possible legal implications, senior management and registered lift/escalator engineers of the contractors will usually head the accident investigation team. The scope of investigation involves interviews of victims and witnesses, and inspection of the concerned installation to find out the details of the occurrence, including causes and remedial actions. The lift/escalator engineers have to compile investigation reports for submission to the EMSD.

EMSD would examine the accident investigation reports submitted by the contractors to see whether any measures should be taken to prevent the recurrence of the accidents. For serious and fatal accidents, EMSD would investigate the accident with assistance from the contractor as necessary. Its investigation report may be required to be submitted to coroner in case there is a death inquest.

4) Task Analysis/ Company Instructions/ Personal Protective Equipment

Works that have not been done properly to lifts and escalators can immediately lead to serious consequence such as fatalities and injuries of people. Doing lift and escalator works not in compliance with safety standards may also have legal consequences. Most safety related tasks are the installation, replacement, maintenance, examination and testing of the critical parts.

As an example of task analysis, in the course of conducting repairs or tests on a lift, a worker may need to override some safety circuit or some safety device temporarily. In doing this, it is very important that the worker resumes the function of the safety circuit or the safety device before lift service is resumed to normal. Otherwise, an accident may occur. Thus these tasks are critical and procedures must be properly laid down for the workers to observe.

For tasks that have serious safety or legal implications, company instructions are established to guide the practices of the workers. The wearing of appropriate personal protective equipment whilst working at site, such as safety shoes and safety harness, is an important safety practice adopted by local lift and escalator companies. As required by the Hong Kong law, it is the duty of an employer to provide suitable personal protective equipment to his employees.

The lift and escalator contractors in Hong Kong usually obtain the technical support and recommendations from the manufacturers regarding the detailed procedures and practices for carrying out major tasks. Many contractors also conduct task analysis to suit the local situation.

5) Safety Committees/ Group Meetings

Many lift and escalator contractors in Hong Kong have set up safety committees/group meetings in their organizations to discuss and facilitate communication between management and employees on safety issues. The membership of a safety committee usually composed of representatives from top management, supervisors, and workers from various sections of the company. Through the safety committee, workers can reflect their opinions. On the other hand, the safety committee is a useful management tool for the managers to carry out safety policy within the company. Normally the number of management representatives does not exceed the number of employee's representatives. The chairman is usually a senior management person, such as a director, but some contractors appoint the safety officer to chair the committee. The committee meetings are held regularly, e.g. once per month. Group meetings are usually held among supervisors and workers to review the safety issues they encountered.

Major safety issues, such as accidents, safety equipment failures, management inspection reports, legislative requirements etc., are discussed in the meetings to review the safety programs and establish safety guidelines and/or remedial actions. In some companies, the safety committees carry out inspections at the work sites. This helps members to assess the effectiveness of the safe systems of work, and also the adequacy of the safety training which is being given to employees.

#### 6) Safety Promotion

Every year in Hong Kong, there is a certain number of lift and escalator accidents attributable to improper use or undesired interference of the equipment. This is particularly so for escalator accidents involving children who may not be aware of the hazard of not using the escalators properly. In view of the long term need for continuous publicity on the safe use of lifts and escalators, EMSD has produced relevant videos which were screened in the local television to draw the attention of the general public to the safe use of escalators and lifts. Posters and leaflets promoting lift and escalator safety are also published to educate the public, including children in kindergarten and schools. EMSD is committed to promoting safety and often participates in various kinds of seminar, course and exhibition to deliver talks and/or display information on safety to the workers, users and the owners.

The lift and escalator industry in Hong Kong is also keen in promoting lift and escalator safety. The lift and escalator contractors' association has joint campaigns relating to public safety and industrial safety. Early this year, the underground railway company in Hong Kong which is the owner of over 400 escalators has organized a large scale safety campaign to publicize the proper use of escalators in its stations.

## **CONCLUSION**

The lifts and escalators in Hong Kong have good designs and construction to safeguard the public safety. Moreover, the need to have safe working environments is recognized and the technical personnel engaged in the field usually have good initiatives and self-discipline in safety practices. In order to enhance safety, an effective and comprehensive safety management control system needs to be established and implemented within the organization of the contractors. Whereas some contractors have set up good safety management systems in their organizations, there are some who should put in more efforts so as to achieve the objectives of safety management. With the joint effort of the industry and Government, safety of lifts and escalators in Hong Kong should be able to continue to improve.

## **BIOGRAPHY**

GREGORY M.W. CHUI and L.C. WONG are being employed as a senior electrical and mechanical engineer and an electrical and mechanical engineer respectively by the Electrical & Mechanical Services Department of the Hong Kong Government. They are currently working in the Lifts and Escalators Section of the General Legislation Division, and are responsible for the administration and enforcement of the Lifts and Escalators (Safety) Ordinance.