

Safety of Lift Works

Here is the footage from “Site Safety Seminar for Capital Works New Works Contracts” organised by the Hong Kong Housing Authority on 26 April 2016.

The speaker is Mr Kwong Wai-kin, Divisional Occupational Safety Officer of the Labour Department.

His presentation topic is “Safety of Lift Works”.

I will talk about the safety of lift works.

We should be aware of safety throughout the process, from lift shaft works to completion of the lift, maintenance and repair works.

There are so many risks to deal with during the process.

My presentation will cover four key points.

Firstly, accident statistics.

How many lift or escalator accidents were there in the past few years?

Have the figures increased or declined?

Next, we will discuss common hazards related to the installation, repair and maintenance of lifts.

Earlier in Part 2 of the seminar, we have already seen examples of good and bad practices.

Those bad practices will often bring about hazards.

We will also look at some of the more serious incidents, and try to find out if they have anything in common.

The last part of my presentation will be case studies.

I have selected two real life incidents, and one textbook incident.

I will talk briefly about the causes of the accidents and the lessons learnt to prevent similar accidents from happening again in future.

Common hazards include the following types.

Firstly, Fall of Persons.

This includes falling from the top of the lift car to the bottom of lift pit, or falling into the lift shaft through opened landing doors during works.

The second common hazard is

Struck by Falling Objects.

You saw some examples of accidents in Part 2 of the seminar.

Some photos showed there were construction materials placed near the lift openings.

If someone is working inside the lift shaft, they could be hit by the materials or debris accidentally kicked into the lift shaft from above.

This could cause injury and even death.

Besides,

work sometimes may be carried out simultaneously at different levels inside the lift shaft.

The worker above may accidentally drop a tool or an object, hitting the worker below on the head.

The third common hazard, which is also the top cause of death, is trapping.

The worker may be trapped between an ascending lift car and soffit of the lift shaft opening or wall of the shaft;

trapped due to sudden ascending or descending movement of lift car;

trapped between an ascending lift car and the door opening;

Similar hazards exist for descending lift cars as well.

The worker may be trapped between a descending lift car and shaft structures or counterweights;

trapped between a descending lift car and the bottom of the lift pit.

We will look at the serious incidents in the past later.

The fourth common hazard is electrocution.

Workers often need to adjust the main power of the lift while carrying out work.

If they are not careful enough, they may be electrocuted.

Electrocution can happen during works inside the lift shaft as well as in the lift machine room.

The fifth common hazard is trapping by dangerous parts of machinery inside the lift machine room.

In the photos you saw, some of the machines have in-running nips of the belt as well as pulley type and discontinuous rotating parts.

These are dangerous and need to be guarded to prevent injuries caused by trapping.

When we remove the guard to add lubricant, we may come into contact with the dangerous parts.

In this case, we cannot put the guard back.

What should we do?

We can use equipment that helps us avoid touching the dangerous parts.

For example, bottles with longer spouts can be used to add lubricants.

We can use tools to reduce the risks at work.

The sixth common hazard is fire, caused by welding operations near flammable substances and heat source arising from smoking.

A common instance where welding operations are carried out near flammable substances

is when lift shafts are to be demolished.

Sparks are produced when using oxy-acetylene equipment and grinders.

If there are flammable substances in the works area, a fire may break out.

The seventh common hazard is risk of manual handling.

As you are all aware, lift spare parts are very heavy.

Machines are often used to help lifting them, but sometimes it is necessary to move them manually.

Meanwhile, it is hard to move objects in correct postures inside the narrow lift shaft,

and the workers easily get sprains or muscle strains that may result in permanent damage.

Does the existing legislation of Labour Department specifically regulates lift and escalator works?

The answer is no, not yet.

What can we do then?

In fact, the installation, repair and maintenance and dismantling of lifts are parts of construction work, which is regulated by legislation of Labour Department.

A construction safety regulation is often cited, especially for working at height.

You all know about Regulation 38B.

The law is used to prosecute contractors.

In addition to the regulation, the Labour Department has published the Code of Practice for Safety at Work (Lift and Escalator).

It is available on website or at office of the Labour Department.

Do you know when the Code of Practice was published?

It was published in 1997.

It has never been updated all these years. This is already the latest version.

But the contents are forward-looking and can still be applied to situations today.

However, some of the contents should be modified to keep abreast of the times.

For example, the Code of Practice cites the Construction Sites (Safety) Regulation 38P,

but the regulation was amended in 2003 with Section P removed.

When you read the Code of Practice you need to check the current Construction Sites (Safety) Regulations in parallel.

There is no problem with the contents basically.

You need to follow the Code of Practice.

We mentioned safety at construction sites.

Most importantly, we hope proprietors and contractors can uphold their general duties

of creating a safety system

for lift and escalator works.

Firstly, planning and assessment of the works should be carried out.

Competent supervisors should be appointed.

A sufficient number of qualified workers should be employed and training should be provided.

Necessary tools, plant and equipment should also be provided, and a plant/equipment register should be kept up-to-date.

The relevant certificates for the lifting equipment and plants should also be kept properly.

A log book should be kept,

for the benefit of persons following up the work.

Necessary information and drawings must be provided to the workers.

They cannot be asked to work without the information.

First aid equipment is a basic requirement.

It is necessary to ensure that work is carried out

in a suitable and safe place with the consent of persons having control of that place.

Effective communication should be ensured

between the place at which work is being carried out, the persons having control of that place

and the emergency services including the police, fire and ambulance service.

Effective communication also benefits

the workers who need to communicate among themselves when installing the lift.

As I mentioned,

this Code of Practice was published in 1997.

At that time, mobile phones were not as developed as today.

Effective communication in those days would mean two-way radios, but reception was often bad in the lift machine room.

That was not good.

So effective communication is very important.

Today, communication by mobile phones is common.

However, before the workers start work, they should still check the signal reception of their mobile phones to ensure effective communication because different telecom carriers may have different signal coverage.

The cause of one of the accidents we will discuss later is the lack of effective communication between workers inside and outside the lift shaft.

Apart from the Labour Department, other government departments are also responsible for

regulating the safety of lift and escalator works, such as, the Electrical and Mechanical Services Department.

Apart from having a legislation regulating the projects, the EMSD has also published a Code of Practice.

I won't talk about the Code of Practice in detail,

but Sections 4.10, 4.11 and 4.12

identify the conditions in which the works can be carried out by one person, and in which two or more technicians are required to carry out the work.

This illustrates how to plan a project and what measures to take in the case of hazards

using the theory of "Man, Machine, Material, Method and Environment".

Apart from the Labour Department and the EMSD,

the Construction Industry Council has also published some safety guidelines as reference and guidance for lift shaft works.

These include Volume 1.

When constructing a building,

there are risks as soon as

the first lift shaft is built.

Workers can fall into the shaft.

The first volume discusses the lift shaft works in this stage.

The second volume discusses the stage when lift shaft has been completed, and a lift has to be installed in the lift shaft.

The risks in this stage are different

from those in Volume 1.

The guidelines will tell you what you should pay attention to.
Then, when the building is occupied,
the lift needs to be maintained, and perhaps some parts need to be added
or the lift has to be automated etc.

So we have Volume 3,
which was published in November 2013.

This volume discusses how lift works should be carried out safely in an
occupied building.

I must stress that
the three Volumes are not statutory.

But does that mean we don't need to pay attention to them?

Of course not.

The Construction Industry Council operates a number of task forces.

There is one on lift work safety,
which the Labour Department takes part in.

The contents are reasonable,
and the industry has agreed to follow the guidelines.

If during inspection, we discover the Guidelines have not been followed,
even though they are not requirements of the law,
a suspension notice may be issued.

Have any of you received a suspension notice?

After a suspension notice is issued,
you need to sort out a lot of documents, software and training.

We also need to follow up your submission.

We call it a lose-lose situation.

Nobody wins.

But it is necessary for the sake of safety.

If requirements are not met, we will issue the suspension notice.

According to the three Volumes, most accidents happen during maintenance
work.

I will highlight three important requirements.

Most importantly, an emergency stopping device should be installed at car top.

Notices should be put up at counterweight screens

to remind workers not to stay at the location as counterweights will descend;

and they should not put their hands or head there, otherwise they may get hurt.

Moreover, guard-rails with warning signs should be put up at the landing doors on the lowest floor, as well as inside the lift car.

Before work begins, safe/danger zones should be designated.

Entry to the danger zones is prohibited, whereas workers can stay in the safe zones.

They should stay in the safe zones as much as possible, and away from the danger zones.

In the case that more than one lift car is installed in one lift shaft, when one car moves, the other one may also move, and it is possible that you will be hit.

Adequate measures should be taken to prevent lift workers from being trapped.

Next, note that when the landing doors need to be opened, the opening should not be wider than 90 mm.

It should be just wide enough for the worker's head to go through and check the position of the lift.

This is to prevent fall of persons.

If works are carried out on the car top, the Inspection Switch must be installed.

In fact, the Inspection Switch is always installed.

In many accidents, however, we discovered that the Inspection Switch was not switched on.

Or it was switched off accidentally, and the lift car changed from slow speed to normal speed.

The safety guidelines therefore stipulate that a lock should be fitted to the Inspection Switch,

and the key must not be kept by the worker on the car top.

It should be kept by the foreman.

If the Inspection Switch needs to be switched off,

the key keeper must perform

the necessary checks before unlocking the switch.

This is because if the Inspection Switch is switched off and the lift resumes normal operation,
it can be controlled inside the lift car and on any floor.
If workers are still working on the car top,
there will be a big safety hazard.

They do not expect the lift to move suddenly.
In the past, many accidents happened under these circumstances.
Now we will talk about some serious accidents that happened.
Some of them happened a long time ago, some are recent..
I hope twenty years from now,
the last accident we have this year will remain the last.
I hope there won't be any more accidents.
This accident happened on 20 April 2010
in Hiu Kwong Street, Kwun Tong.
A technician was working on the car top.
It was suspected that due to procedural errors,
another worker entered the lift car, pressed a button and the lift ascended.
Since no guard-rails were installed on the car top,
the technician lost his balance and fell.
He was trapped in a six-inch gap between the lift doors and the fifth floor.
Imagine a person trapped in a six-inch gap.
He was crushed instantly.
The second accident was similar to the first.
There was just a slight difference.
It happened in Quarry Bay in 2010.
The technician was also working on the car top and there were procedural errors.
This time, the technician was trapped between the lift doors and the landing doors.
His skull was crushed and he died.
It was also a six-inch gap.
We mentioned that there were three accidents in 2010.
This was the third incident,

in Kai Yip Estate, Kowloon Bay.

The technician was working near the landing doors.

He presumably slipped,

and the landing doors were not closed properly.

He fell to the bottom of the pit from the second floor.

Even though it was just the second floor, accidents can be fatal.

On 30 October 2014,

at the site of the St Paul's Hospital extension,

workers were testing the lifts.

One of the workers was testing the brakes at the bottom of the lift pit.

There was presumably miscommunication between the workers.

The workers testing the system from above did not know that someone was in the shaft,

and sent the lift car down.

The worker at the bottom of the pit did not know the lift car was descending, and did not escape in time.

He was trapped between the cat-ladder inside the pit and the lift car, and was killed.

On 31 March 2015, in Tseung Kwan O,

a worker was taking down a disused food lift.

According to newspaper reports, the deceased person was a labourer and not a lift technician.

Due to lack of technical knowledge, he did not know the counterweight would fall swiftly

once he dismantled the lift.

He was hit by the counterweight and was killed.

Whether it is installation, repair and maintenance or dismantling of lifts,

the Code of Practice published in 1997 specifies that

work must be carried out by qualified and properly trained workers.

If the worker is not familiar with the structure of lifts, they will risk their lives.

This incident is more recent.

On 4 February 2016,

a lift technician was working at the bottom of the lift pit.
When the lift ascends, the counterweight naturally descends.
Yet the technician didn't realise he was in the counterweight danger zone.
He was struck by the descending counterweight and got killed.
That is why the safety Guidelines laid down by us
and the Construction Industry Council
stipulate the need to set up safety zones
and put up signs to remind workers.
These are the incidents happened in recent years.
Now we will go over three accidents in detail,
two of them are real incidents, the other one is a textbook case study.
The lift was undergoing upgrading work.
When a worker was setting cables on the car top,
the lift car suddenly moved.
The worker lost balance and fell.
He was trapped between the first floor lift doors and the lift shaft,
and was trapped to death.
A six-inch gap.
The deceased person was trapped here.
Please pay attention to the motor here.
In the upcoming photos, you can use the motor as a reference point.
The photo shows the side view.
This is the floor; this is the car top. It's a 180-degree flip of the previous photo.
You can see the small gap here.
The Inspection Switch is here.
In this photo, the Inspection Switch was switched to normal position.
Presumably, the switch had not been put into inspection mode,
or inspection mode was switched off accidentally.
So we learned a lesson.
Since inspection mode can be switched off accidentally or not switched on at
all, the following should be done:

1. A lock or similar devices must be fitted to the Inspection/Operation Switch located on the car top.

You may refer to Sections CIC 8.4.1(c) and 9.1.8(c) in the Construction Industry Council safety Guidelines.

2. A work permit system should be laid down and implemented.

LD6.6.4

LD 6.6.4, namely Item 6.6.4 in the Labour Department's Code of Practice, stipulates the implementation of a work permit system.

3. Guard-rails and toe boards should be installed on the car top.

4. Foot rests should be provided on the car top.

We noted some lift car models provide guard-rails on three sides.

But it will give better protection if the rails are available on four sides.

They should be installed on the side facing the lift doors too.

And often there are motors and machinery on the car top, there may not be enough room for the workers to stand firmly. Secure foot rests should be provided for the workers, so that they can work safely.

Case Study 2

A few workers were changing the cables for Lift A in a building.

Both lifts, A and B, shared the same lift shaft.

As one worker stands on the car top of Lift B to carry out work on Lift A, he was trapped between the car top and the lift shaft and died.

As you can see in this photo, it was Lift A here and Lift B here.

There was no key hole outside Lift A to open the landing doors.

In order to open the landing doors of Lift A, the worker had to lean forward from Lift B when it descended to the same level as Lift A.

This photo shows the red figure standing on the car top of Lift B and trying to open the doors of Lift A.

It was suspected that he touched the Inspection Switch during his leaning.

For this switch, up is normal mode and down is inspection mode.

It was believed that while he leaned forward, he accidentally touched the switch. In inspection mode, the lift could only be controlled by the worker on the car top.

Yet when the switch was touched and the lift returned to normal mode, the lift car could be controlled from any floor.

At this time, presumably a lady wanted to go out. She pressed the button for the lift, and the lift car resumed normal speed.

The worker on the car top lost his balance and was trapped.

This is why we advise that the switch should be locked so that it will not be touched accidentally.

We suggest that a work safety system should be implemented for changing cable.

The system should include risk assessment and feasible solutions.

There should also be adequate information, guidance, training and supervision.

Now, the third case is taken from

A Casebook of Fatal Accidents in Lift Installation, Maintenance and Repairing Work,

published in 2004.

The cases studies in the book are lessons learned through bloodshed.

The causes of accidents discussed in it are still very much valid today.

You can refer to the casebook online.

In one of the cases,

Case 6,

a lift maintenance apprentice

was standing on a cat-ladder

at the bottom of a lift pit,

trying to open the lift landing doors on the ground floor manually.

When he found the lift car descending towards him

and tried to activate the emergency stopping device,

but he was not able to do it in time

therefore got trapped.

Just like the accident we talked about earlier, a worker had to perform tests at

the bottom of the lift pit,
but the workers above did not know someone is working below.
The lift car descended,
and the worker at the bottom could not escape in time and got trapped.

Many accidents happen this way.

The deceased person was assigned to work alone at the bottom of the lift pit,
with the ground floor landing doors closed,
and no one assisted him to open the landing doors from the lift lobby.

The deceased person needed to work in the lift pit,
but the workers at different locations could not see each other,
and they were not provided with effective communication devices.

They only communicated with one another by shouting.

This kind of communication was clearly not effective.

The deceased person was an apprentice
who had not been fully trained.

He did not have the experience to perform tests of the lift,
but he was not supervised at the time of the accident.

This case reminds us of the labourer who was killed while taking down the
food lift.

It is very dangerous.

The content of the book might sound like a cliché,
but indeed these accidents keep happening.

Lessons learned:

effective means of communication should be provided to the workers;
a safety system should be set up;
and adequate training should be provided to the workers;
emergency lift car stopping device should be fitted in a safe position, etc.

The three cases we discussed

can be summarised as:

a safe system of work should be set up;
and risk assessment should be conducted,
covering the areas of “Man, Machine, Material, Method and Environment” -
what are the dangers in these five areas and are there any solutions?

After deciding on the work method,
adequate information, training, guidance and supervision should be provided.
Some accidents may not be reported in the news.

We refer to those incidents as “near miss”.

One of the cases could easily have become a serious incident.

In 2014,

a lift was to undergo modernisation.

The lift car and runways needed to be taken down.

The workers removed the runways on the car top with oxy-acetylene
equipment

while the lift was in operation.

The oxy-acetylene cylinder was placed in the lift car.

There were presumably some flammable substances inside the lift, which
caught fire.

The workers tried to put out the fire, but failed,
and they fled the lift car just in time.

The fire intensified.

Soon the lifting device which held the lift car in place snapped,
and the car fell to the bottom of the pit from the 30th floor.

The lift fell into pieces.

Do you know about this accident?

It was not reported in the newspaper,
although real-time news had covered the incident.

This was a serious accident.

Fortunately, there was no casualty,
despite three workers were working on the lift at the time.

Please remember, lift works are not less risky than other works.

Work safety is everyone’s responsibility.

That’s all for my presentation today.