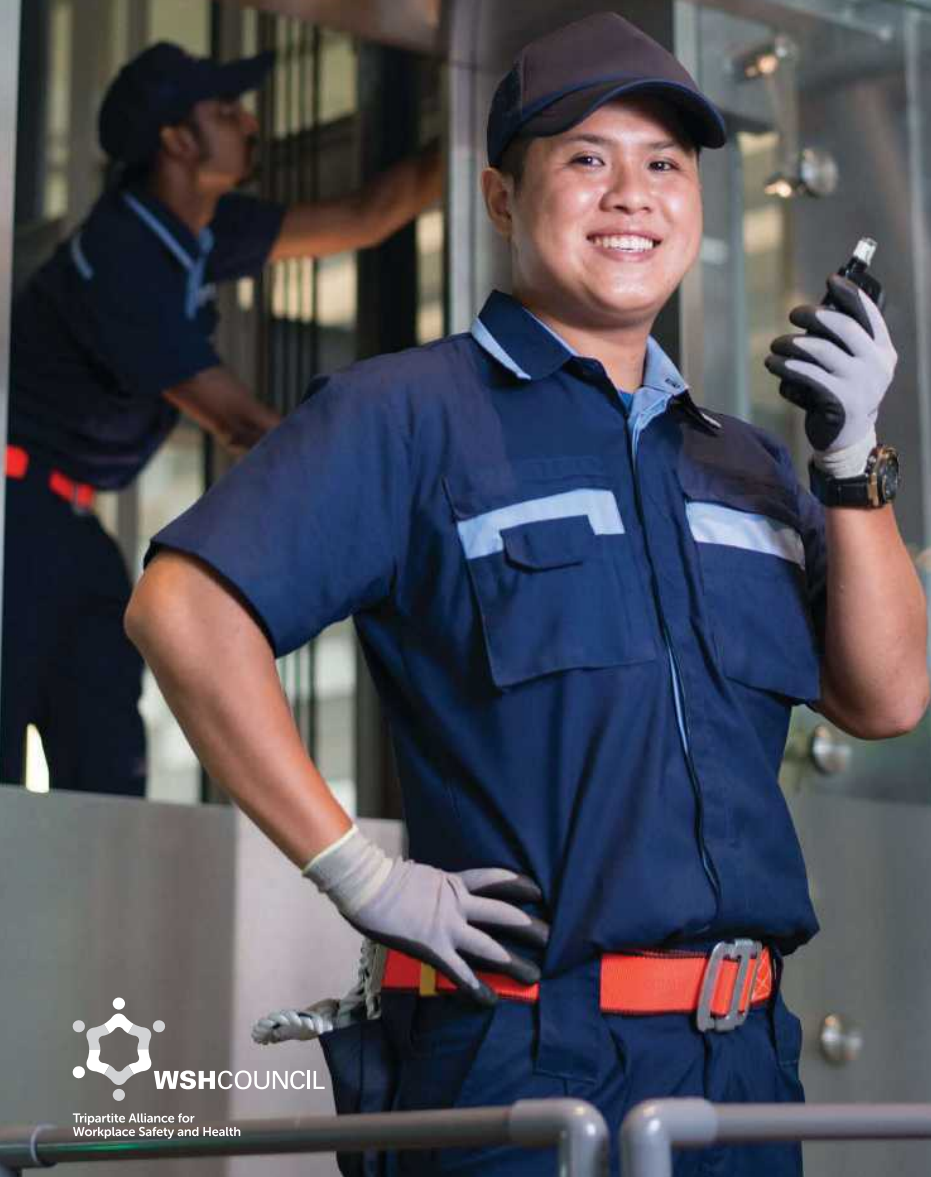


Workplace Safety and Health Guidelines

Working Safely During Maintenance of Electric Passenger and Goods Lifts



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1. Introduction

Lifts have become an indispensable part of our lives as many of us are living, working, entertaining and shopping in high-rise buildings. The high concentration of high-rise buildings in Singapore has made lifts an essential mode of vertical transportation.

Lifts that are not maintained adequately will not only cause inconvenience to users but may expose persons who are working on them to unnecessary risks. Therefore, it is important for all parties involved in such work to ensure that lift maintenance is done safely.

1.1 Scope

This set of guidelines aims to provide information and guidance to meet the requirements of relevant legislation and Code(s) of Practice in all workplaces where maintenance of permanently installed electric passenger and goods lift is required. It serves to equip stakeholders in the lift industry with useful practical knowledge and good practices on service and maintenance of such lifts in Singapore.

In general, there are two types of maintenance work:

- Routine maintenance (include but not limited to):
 - Lubrication;
 - Cleaning;
 - Inspection; or
 - Adjustments/alignments.
- Non-routine maintenance:
 - Troubleshooting and doing emergency repairs;
 - Replacing worn or damage components (e.g. cables, ropes, parts of elevator doors, and machine bearings that do not affect the characteristics of the installation);
 - Re-calibrating of load cell and re-adjustment of sensors and switches;
 - Job that requires special tools (e.g. cutting equipment, rigging equipment and heat generating equipment);
 - Assisting in or performing rescue operations; and
 - Replacement of major components such as the machine, the car, the control panel, and so on.

The following operations are considered as non-lift-related-maintenance work:

- Cleaning the external part of the hoist way;
- Cleaning the interior of lift car;
- Rescue operations carried out by the authorities (e.g. Singapore Civil Defence Force).

For additional information on periodic maintenance and examination, refer to prevailing Singapore Standard, SS550: Code of Practice: Installation, operation and maintenance of electric passenger and goods lifts.

Note

This set of guidelines replaces the Technical Advisory for Working Safely during Maintenance of Electric Passenger and Goods Lifts published by WSHC in 2010.

2. Definitions

2.1 Authorised Manager

An “Authorised Manager” is a person employed and appointed by the registered lift contractor to oversee and ensure that the maintenance work is done safely. The person may be the maintenance manager in the company.

2.2 Car

A “car” is a load-carrying unit including its platform, car frame, enclosure and car door or gate. In the industry, the word “car” also means “lift car” and “cab”.

2.3 Car Top

“Car top” refers to the top of the car that serves as a working platform or enclosure used for adjustment, maintenance, inspection and repair.

2.4 Competent Maintenance Person

A “competent maintenance person” (CMP) is a person who has sufficient skill, experience and training to perform lift maintenance work as appointed by the registered lift contractor.

2.5 Landing

“Landing” refers to the portion of the floor, balcony or platform of a building or structure used to receive and discharge passengers or goods or both into and from a lift car.

2.6 Lift Owner

“Lift owner” refers to a person who has the legal power of disposal of the lift and takes the responsibility for its operation and use.

2.7 Lift Pit

A “lift pit” is the space in the lift well below the lowest landing served.

2.8 Lift well (hoist way)

A “lift well” or “hoist way” is the fixed structure consisting of a chamber or shaft way for the vertical travel of one or more lifts.

2.9 Machine Room

A “machine room” is the room where machine or machines and/or the associated equipment are placed. It is any enclosed or partially enclosed space that:

- is not primarily designed or intended for human occupancy; and
- has a restricted entrance or exit by way of location, size or means.

An illustration of a typical lift installation with machine room is given in Annex 3.

2.10 Machine-room-less Lift (MRL)

“Machine-room-less lift” is a type of traction lift which does not require a machine room.

An illustration of a typical lift installation without machine room is given in Annex 4.

2.11 Machinery Space

A “machinery space” is the space inside or outside the well where the machinery as a whole or its parts (including controller) are placed.

2.12 Maintenance

“Maintenance” refers to all the necessary operations needed to ensure the safe and intended functioning of the installation and its components after the completion of the installation, and throughout its life cycle.

2.13 Manufacturer or Supplier

“Manufacturer or Supplier” refers to the natural or legal person who takes responsibility for the design, manufacture or supply, and places on the market either the machinery and/or safety components for lifts.

2.14 Other Entrants

“Other entrants” refers to any other person(s) who is/are authorised to enter the machine room, machinery space or hoist way to carry out work.

2.15 Registered Lift Contractor

“Registered Lift Contractor” refers to a contractor registered with the Building and Construction Authority (BCA) to maintain lifts. In this document, the use of the term “lift contractor” has the same meaning as “registered lift contractor”.

Note

WSHC recommends minimum bizSAFE level 3 for registered lift maintenance contractors.

2.16 Risk Assessment (RA)

"Risk assessment" is a comprehensive estimation of the probability and the degree of possible injury or damage to health or property, in order to identify appropriate mitigating measures.

2.17 Safe Work Procedure (SWP)

"Safe Work Procedure" refers to formal procedure, resulting from a risk assessment, which specifies safe methods of work to ensure that relevant hazards to the task being undertaken are eliminated and the remaining risks are minimised.

2.18 Soffit

"Soffit" refers to the lowered portion of a ceiling.

2.19 Work Authorisation

"Work authorisation" means a job order issued by lift contractor to the competent maintenance person to perform designated routine or non-routine maintenance work by his employer or the principal.

2.20 Workplace

"Workplace" refers to premises or part of premises where work is carried out.

Note 1

This can include:

- a) Any place that is accessible to those at the workplace;
- b) Any means of access to/from the workplace, e.g. staircase, corridor.

Note 2

A workplace is usually non-domestic, although the term can refer equally to domestic premises.

3. Responsibilities of Different Stakeholders

It is important for all stakeholders to comply with the relevant regulations and take reasonably practicable measures to ensure the safety and health of workers, visitors and the public at workplaces.

3.1 Lift Owner's Responsibilities

The lift owner (LO) should ensure that the lift maintenance environment is safe, conducive and healthy for work. The areas for the LO to consider include:

- Rendering any machinery or equipment within the maintenance environment safe;
- Providing a safe route of access and egress to the lift machine room, machinery space and hoist way without posing any safety risk to workers;
- Providing clear and visible warning signs at prominent locations along the route to the lift machine room, machinery space and hoist way;
- Providing enough and suitable lighting for entry into or working in the lift machine room and hoist way;
- Establishing protocol and control of entry to the lift maintenance environment. The lift owner should manage the entry for all the personnel involved including their staff, lift contractor and other trade contractors, if applicable;
- Ensuring that a fall preventive measures are in place when lift landings are opened, e.g. effective portable barriers for routine maintenance and effective barricades for major lift works;
- As lift maintenance is a regular feature, some of the common items, e.g. portable barriers, temporary caution signs could be stored on-site for easy retrieval whenever needed;
- Ensuring that lift contractor has in place relevant safety and health training for workers and supervisors on lift maintenance;
- Ensuring that thorough and site-specific risk assessments have been done together with the lift contractor for the lift maintenance operation;
- Ensuring that the rescue plan established by the lift contractor can be properly coordinated with the facilities and equipment (e.g. emergency routes of egress and rescue equipment) of the building during an emergency; and
- Ensuring that the lift contractor is registered under local statutory laws and licensed to conduct maintenance operations on lifts.

3.2 Contractor's Responsibilities

It is important for the lift contractor (LC) to protect the safety and health of his lift maintenance technicians by:

- Conducting site-specific risk assessment to remove or control risks at the workplace and communicating the risks, hazards and control measures to them;
- Maintaining a safe workplace and arrangement at work;
- Ensuring safety in machinery, equipment, plant, articles, substances and work processes at the workplace;
- Developing Safe Work Procedures (SWP) for maintenance works;
- Developing and putting into practice control measures for dealing with emergencies; and
- Providing lift maintenance technicians with adequate instruction, information, personal protective equipment (PPE), training and supervision.

3.3 Authorised Manager's Responsibilities

An authorised manager (AM) is employed and appointed by the LC to oversee and ensure that maintenance work is done safely. It is critical for the AM to ensure that risk assessment and control measures are carried out to reduce the risks to acceptable levels. The recommended steps to put in place risk assessment are addressed in Section 4.

3.4 Manufacturer's or Supplier's Responsibilities

Besides ensuring that the lift is safe for public use, the manufacturer or supplier would need to mitigate all foreseeable health and safety risks that the machinery and lift equipment they provided may pose to the lift maintenance person.

3.5 Competent Maintenance Person's Responsibilities

The competent maintenance person (CMP) should follow safe work procedures (SWP) strictly as specified by the lift contractor. The competent person should not endanger himself or others who are working around him by any unsafe behaviour or act. It is never safe to tamper with any safety device or undertake any wilful or reckless acts. The competent maintenance person should use the appropriate personal protective equipment (PPE) correctly while carrying out lift maintenance work.

4. Risk Management

Safety, health and wellbeing should be managed holistically for the employees and the workplace. Under the WSH (Risk Management) Regulations, organisations are required to conduct Risk Assessment (RA) to identify, evaluate and control safety and health risks posed to any person who may be affected by the activities in the workplace, prior to the commencement of the work. RA aims to reduce workplace incidents and improve the overall safety, health and wellbeing of everyone in the workplace.

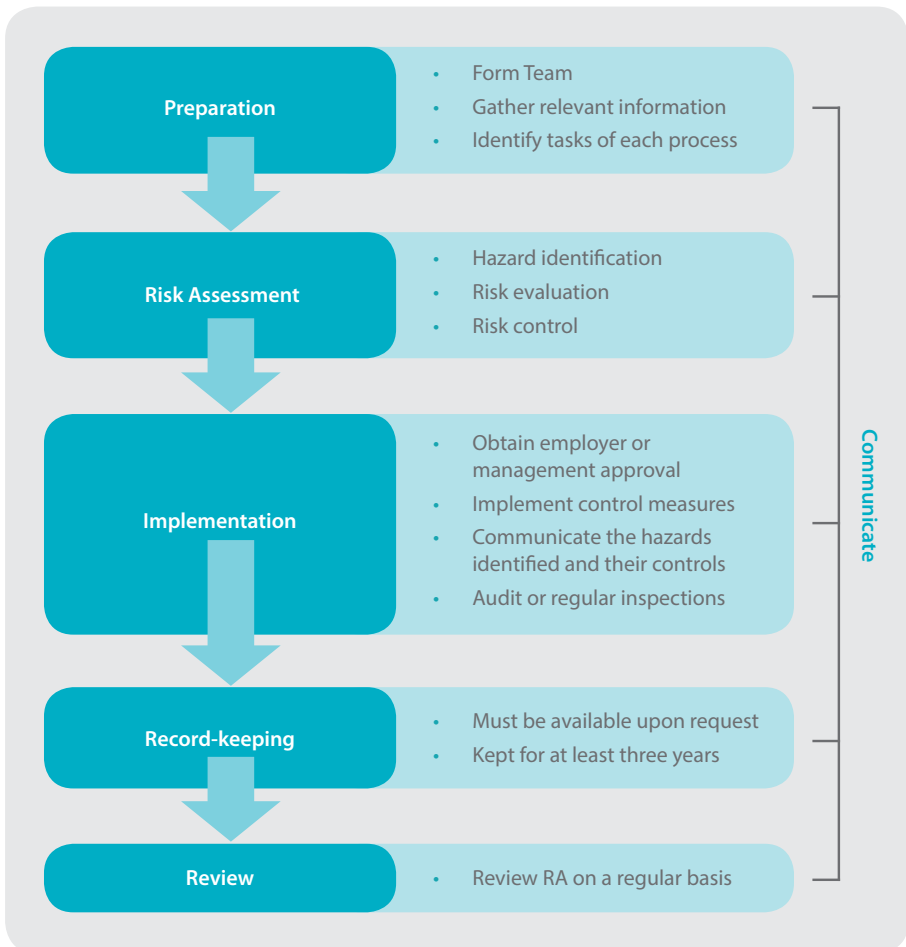


Figure 1: Risk Management Process

4.1 Preparation

A multi-disciplinary RA team should be formed, consisting of personnel who have different job responsibilities for the work operations, personnel who are familiar with the potential hazards and risks of the work activities such as WSH personnel, service buyers, services providers or contractors, and human resource representatives. Relevant information pertaining to the work and operations such as a list of work activities should also be collated beforehand to facilitate better understanding by the team.

After completing the preparatory work, the workplace risks are then assessed in three simple steps: hazard identification, risk evaluation and risk control (Figure 2).

1. Hazard Identification	2. Risk Evaluation	3. Risk Control
Identify hazards.	Estimate the risk levels of the workplace hazards identified.	Formulate the control measures according to the Hierarchy of Controls (see Figure 9).
Identify potential accidents or incidents.	Prioritise the hazards to be controlled.	Analyse and evaluate residual risks.

Figure 2: Three Steps to Evaluate Workplace Risks

4.2 Risk Assessment

All activities within the workplace should be assessed and the information should be kept up-to-date. The activities should include:

- Routine activities (e.g. lift routine maintenance);
- Non-routine activities (e.g. replacement of main and governor ropes, overhaul traction machine);
- Emergency situations (e.g. mantrap rescue operation);
- Activities of all personnel, including public, having access to the workplace; and
- Facilities at the workplace, whether provided by the facility or others.

4.2.1 Hazard Identification

When identifying hazards, three aspects should be considered and evaluated side by side. These aspects are the physical work environment and processes, work organisation and individual health factors. The possibility of exposure to hazards from other work processes in the workplace and the behaviour or work practices of employees at work should also be considered. Figure 3 illustrates the three aspects with some possible examples or areas to consider.



Figure 3: Three Aspects of Hazard Identification

4.2.2 Risk Evaluation

For each hazard identified, estimate the risk levels of the hazards and determine their acceptability. The outcome of a risk evaluation will help in prioritising actions to control the hazards and minimise safety and health risks to the affected employees.

When estimating the risk level associated with each hazard, predict the severity of the hazard and estimate the likelihood of the accident or ill-health by taking into consideration existing risk controls. Once the severity and likelihood have been established, the risk level can be obtained by using a risk matrix. Figures 4 to 7 give an example of how severity and likelihood help to determine the risk level via a 5x5 Risk Matrix with Risk Prioritisation Numbers (RPNs).

Likelihood (L)	Rare (1)	Remote (2)	Occasional (3)	Frequent (4)	Almost certain (5)
Catastrophic (5)	5	10	15	20	25
Major (4)	4	8	12	16	20
Moderate (3)	3	6	9	12	15
Minor (2)	2	4	6	8	10
Negligible (1)	1	2	3	4	5

Figure 4: 5x5 Risk Matrix with Numeric Ratings

Level	Severity	Description
5	Catastrophic	Death, fatal diseases or multiple major injuries.
4	Major	Serious injuries or life-threatening occupational diseases (occupational cancers, acute poisoning, disabilities including amputations, major fractures, multiple injuries, and deafness).
3	Moderate	Injury or ill-health requiring medical treatment (including lacerations, burns, sprains, minor fractures, dermatitis and work-related upper limb disorders).
2	Minor	Injury or ill-health requiring first-aid only (including minor cuts and bruises, irritation, ill-health with temporary discomfort).
1	Negligible injury	Not expected to occur but still possible.

Figure 5: A Guide to Severity Rating

Level	Likelihood	Description
1	Rare	Not expected to occur but still possible.
2	Remote	Not likely to occur under normal circumstances.
3	Occasional	Possible or known to occur.
4	Frequent	Common occurrence.
5	Almost Certain	Continual or repeating experience.

Figure 6: A Guide to Likelihood Rating

Risk Prioritisation Number (= Severity x Likelihood)	Risk Level
1 - 3	Low Risk
4 - 12	Medium Risk
15 - 25	High Risk

Figure 7: Risk Evaluation Using a 5x5 matrix with Corresponding Risk Prioritisation Numbers (RPNs)

4.2.3 Risk Control

Based on the risk level or RPN determined, risk controls should be selected to reduce the risk to an acceptable level. Figure 8 suggests the acceptability of risk for the different risk levels and the recommended actions. The most effective way to manage risk is to reduce the risk at the source. This can be achieved through upstream risk controls starting by eliminating the risk, followed by substitution, and implementation of engineering controls, according to the Hierarchy of Controls (see Figure 9). Engineering controls are physical means to reduce exposure to the hazards such as mechanical guards or local exhaust ventilation.

Risk level	Risk Acceptability	Recommended Actions
Low	Acceptable	• No additional risk control measures may be needed. • Frequent review and monitoring of hazards are required to ensure that the risk level assigned is accurate and does not increase over time.
Medium	Tolerable	• A careful evaluation of the hazards should be carried out to ensure that the risk level is reduced to as low as reasonably practicable (ALARP) within a defined time period. • Interim risk control measures, such as administrative controls or PPE, may be implemented while longer term measures are being established. • Management attention is required.
High	Not acceptable	• High risk level must be reduced to at least medium risk before work starts. • There should not be any interim risk control measures. Risk control measures should not be overly dependent on PPE. • If practicable, the hazard should be eliminated before work starts. • Management review is required before work starts.

Figure 8: Recommended Actions for Risk Levels

Most
Effective



ELIMINATION

Eliminate all hazards in the lift maintenance environment or control the hazards so that competent maintenance persons are able to carry out their maintenance work safely.

Example 1: To trip an overspeed governor located in a hoist way, a remote tripping device can be installed to activate the governor outside the hoist way.



Example 2: Better design for access to eliminate trip on pipes at roof top and fall from ladder while access to lift motor room.

SUBSTITUTION

This involves replacing the hazard by one that presents a lower risk.

Example 1: Bring the batteries up to the machine room by a lifting basket instead of carrying them by hand and climbing up the cat ladder at the same time.

Example 2: Replace lorry with elevating platform for transporting test weight to site.

ENGINEERING CONTROLS

Engineering controls are physical means that limit the hazard.

Example 1: Design safety railings along passageway to the roof-top machine room if the passageway is less than 1.5 metre away from the edge of the roof.

Example 2: Provide safety guards at rotating parts.

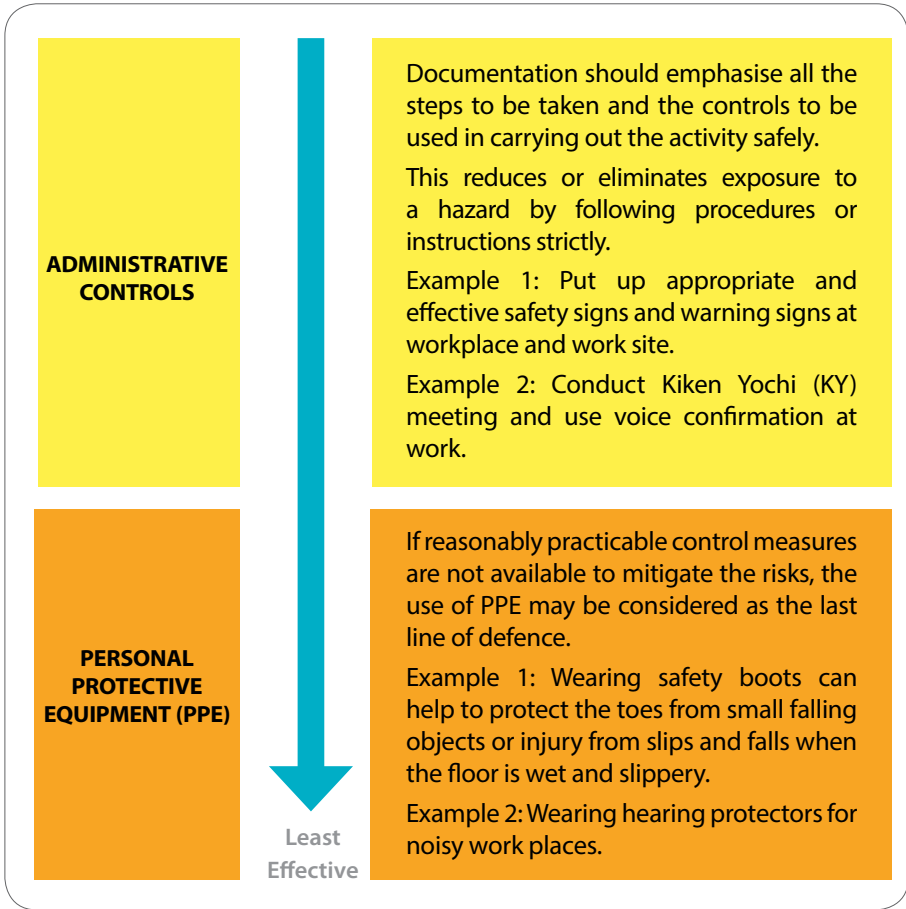


Figure 9: Hierarchy of Controls

4.3 Implementation and Review

The risk control measures should be implemented immediately once approved by the management.

For Risk Management (RM) to be effective, the hazards and their control measures must be communicated to the employees performing the work. The manager who oversees the work area, function or activity where the risks exist should ensure that all persons who will be exposed are informed about the risks and the associated mitigating measures.

It is necessary for authorised managers/ supervisors to inform the competent maintenance persons of:

- Work activities to be carried out;
- Associated safety and health hazards affecting them, and the nature of the risks involved;
- Types of control measures implemented to protect them;
- Responsibilities and expectations to comply with all work requirements including:
 - Obeying general safety rules and regulations;
 - Using of PPE;
 - Complying with safe work procedures; and
 - Obeying instructions as required under Work Authorisation.
- Changes to the work conditions and risks control measures, if any.

Regular inspections or audits can be carried out to verify the effectiveness of the control measures put in place. This will ensure that the measures are current and effective to manage the risks at the workplace.

RA must be reviewed or revised at least once every three years. It must also be reviewed after an accident, incident or occurrence of an occupational disease as a result of exposure to a hazard, a significant change in the work processes that could affect the safety and health of employees e.g. the introduction of a new maintenance procedure.

4.4 Record-keeping and Documentation

All WSH RAs and related documents should be kept for at least three years and must be made available upon request by the Commissioner for WSH.

It is important to maintain duly approved record and current risk assessment. The record can include:

- Results or findings recorded in the risk assessment;
- Risk control measures taken or to be taken within an agreed and reasonable time frame; and
- Any method statement on Safe Work Procedures (SWP).

An example of Risk Assessment form for Lift Maintenance Operation is given in Annex 1.

For more information on RM, refer to the WSH Council's Code of Practice on WSH Risk Management at www.wshc.sg.

5. Types of Hazards in Lift Maintenance

Many hazards can exist in a lift maintenance work environment. Therefore, it is important for the competent maintenance persons and other entrants to be aware of and understand the hazards so that they may take the necessary precautions.

The associated common hazards in lift maintenance work include:

- Mechanical hazards;
- Electrical hazards;
- Working at heights;
- Physical hazards;
- Fire hazards;
- Hot, humid and low ventilation environment, and
- Asbestos hazard.

5.1 Mechanical Hazards

5.1.1 Crushing Hazards

Crushing hazards in lift maintenance operations can be caused by:

- Being trapped between an ascending lift car and the soffit of the lift shaft;
- Being trapped between an ascending lift car and the door;
- Being trapped between a descending lift car and counterweight inside the hoist way; and
- Being trapped between a descending lift car and the bottom of the lift pit.



Figure 10: Being trapped between an ascending lift car and the soffit of the lift shaft

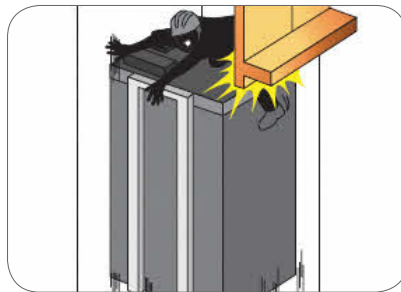


Figure 11: Being trapped between an ascending lift car and the door



Figure 12: Being trapped between a descending lift car and counterweight inside the hoist way



Figure 13: Being trapped between a descending lift car and the bottom of the lift pit

5.1.2 Cutting, Shearing and Pinching Hazards

The cutting, shearing and pinching hazards in lift maintenance operations can be caused by:

- Landing door panels;
- Sharp corners of machine beams under car channels;
- Ropes coming into contact with pulley or sheave;
- Moving parts that are left uncovered;
- Moving parts becoming dangerous and trap the worker inside the lift machine room; and
- Unsecured hatch door while accessing roof top.



Figure 14: Sharp corner of metal beams

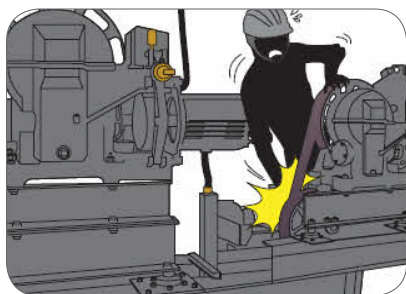


Figure 15: Fingers may get pinched when ropes come into contact with pulley or sheave



Figure 16: Fingers may get pinched at the moving parts that are left uncovered

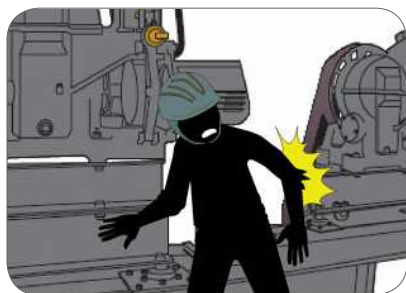


Figure 17: Trapped by dangerous parts of machinery inside the lift machine room

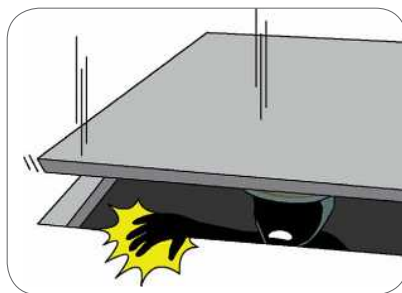


Figure 18: Fingers/hands injuries caused by unsecured hatch door while accessing roof top

5.2 Electrical Hazards

Electrical hazards during lift maintenance operations can be caused by:

- Electrical panels without covers;
- Damaged electrical cords;
- Exposed wires;
- Coming into contact with non-finger safe termination blocks;
- Overloaded circuits and plugs;
- Flooded lift pit;
- Carelessness while working inside the lift machine room;
- Rainwater entering lift motor room through damaged window panel; and
- Coming into contact with a damp hoist way.



Figure 19: Electrical panels without covers can expose workers to electrical hazards



Figure 20: Damaged electrical cords

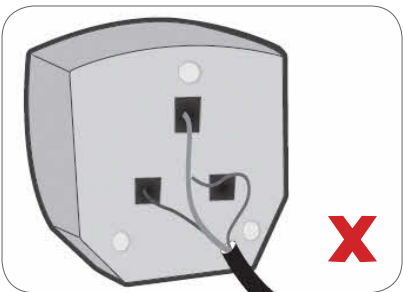


Figure 21: Exposed wires



Figure 22: Electrocuted when worker comes into contact with non-finger safe termination blocks

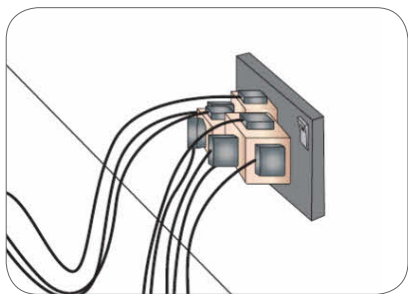


Figure 23: Overloaded circuits and plugs



Figure 24: Electrocuted while working inside the lift machine room

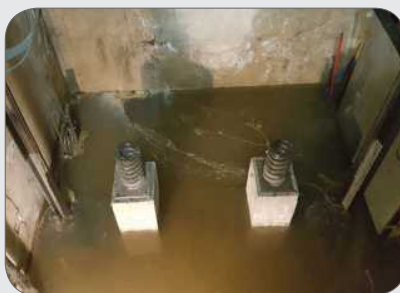


Figure 25: Flooded lift pit

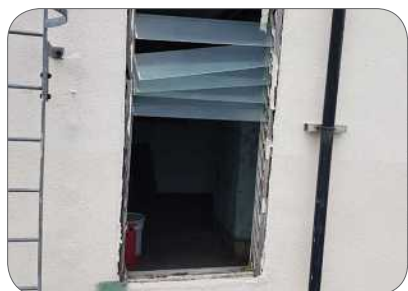


Figure 26: Electrical hazards due to rainwater entering lift motor room through damaged window panel



Figure 27: Worker can get electrocuted when he comes into contact with a damp hoist way

5.3 Work at Heights

The hazards associated with working at elevated locations are:

- Falling off from open sides at the roof or from edges of buildings;
- Falling off from the edge;
- Falling off from cantilevered scaffold;
- Falling off from the top of the lift car to the bottom of the lift pit;
- Falling through the open landing door into the hoist way; and
- Falling off from improperly constructed platform.



Figure 28: Falling off from open sides at the roof or from edges of buildings



Figure 29: Falling off from the edge



Figure 30: Falling off from cantilevered scaffold



Figure 31: Falling off from open sides at the roof or from edges of buildings



Figure 32: Falling off from open sides at the roof or from edges of buildings

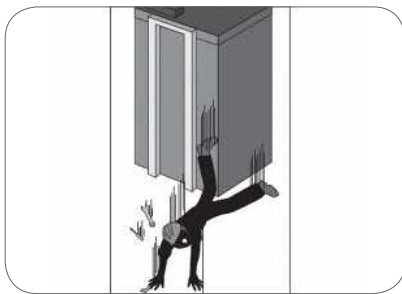


Figure 33: Falling off from the top of the lift car to the bottom of the lift pit



Figure 34: Falling through the open landing door into the hoist way



Figure 35: Falling off from improperly constructed platform

5.4 Physical Hazards

5.4.1 Struck by Falling Objects

The hazards associated with falling objects during life maintenance may be due to:

- Hand tools falling from lift car top to hoist way;
- Equipment falling through the landing door to hoist way; and
- Objects falling through the openings in the machine room into the hoist way.



Figure 36: Hand tools falling from lift car top to hoist way



Figure 37: Equipment falling through the landing door to hoist way



Figure 38: Objects falling through the openings in the machine room into the hoist way

5.4.2 Struck by Moving Objects

The hazards associated with moving objects are:

- Being hit by stationary bracket while on cage top when the lift moves; and
- Staying too close to the adjacent lift or moving equipment inside a common hoist way where there are multiple lifts in the same hoist way or shaft.



Figure 39: Multiple hoist ways and car top

5.4.3 Slip, Trip & Falls

The hazards associated with slip, trips and falls are:

- Slip and fall from ladder;
- Slip on wet or slippery floor; and
- Trip due to uneven ground, with a small step, or with obstruction.



Figure 40: Vertical cat ladder to access to lift pits may be difficult and dangerous with the risk of falling



Figure 41: Examples of vertical cat ladder (without safety cage) to access to lift motor room on roof top may be dangerous with risk of falling



Figure 42: Motor room access with obstruction



Figure 43: Motor room access with obstruction

5.4.4 Manual Handling

The hazards associated with manual handling are:

- Risk of cuts, lacerations if load drops down;
- Risk of back injury when lifting heavy load; and
- Risk of hand pinch by load during unloading.



Figure 44: Loading/unloading – test weight (using lorry crane / movable platform / forklift / trolley)

5.4.5 Posture/Ergonomics

Heavy load, over-exertion, awkward postures and incorrect lifting techniques can lead to increased risk of musculoskeletal disorders (MSDs) to the hand, arm, neck, shoulder and back.



Figure 45: Manual handling within the confines of the shaft can be difficult

5.4.6 Scorched by Light Source

Lighting in the lift well, and lift pit are often provided from light sources such as incandescent light bulbs with low energy efficiency and a high thermal footprint. CMP working in close proximity of the much-needed light source in the poor ventilated lift shaft, will feel uncomfortably hot from the radiated heat source. If the incandescent lamp is not guarded, the CMP will risk being scorched by this light source when performing maintenance work.

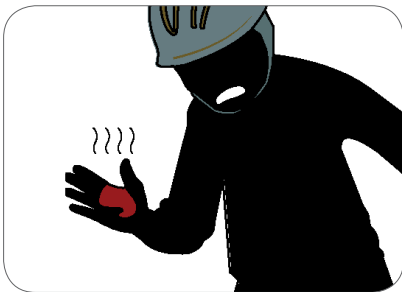


Figure 46: Scorch marks left on the hands of a CMP after being in contact with an incandescent light bulb

5.5 Fire Hazards

Fire Hazards are:

- Ignition of flammable substances or materials by a heat source arising from operations involving the use of naked flame, e.g. welding or flame cutting operations;
- Cloth or rags that absorbed oil or solvents can be controlled by disposing them from work areas. Similarly, lubricating or machine oils, or solvents should be stored away from work areas;
- Hot work which is incompatible with painting works, due to solvents in paint emitting off flammable vapours; and
- Smoking of cigarettes.



Figure 47: Welding operations with the presence of flammable substances in the vicinity



Figure 48: Heat source arising from smoking of cigarettes

5.6 Hot, Humid and Low Ventilation Environment

Lift maintenance work is primarily indoor activities, but the work environment in the lift motor room and lift shaft is generally hot, humid and poorly ventilated.

The hazard associated is:

- Workers are prone to heat stress due to loss of body fluid from perspiration.

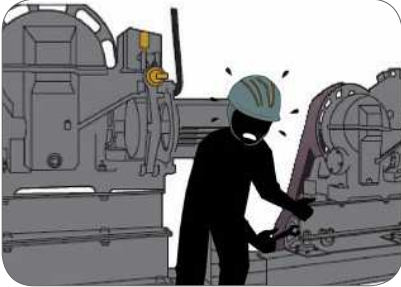


Figure 49: Worker perspiring in motor room environment may lead to heat cramps, heat exhaustion and heat stroke which can be fatal

5.7 Asbestos Hazard

Asbestos brake lining is commonly used for lift especially in older lift motors. There is a possibility that asbestos fibres may be released due to wear and tear of the lining overtime. It is important to check for this hazard when maintenance work is being carried out on lifts. As part of risk assessment, the first step is to identify the hazard.

Check with the manufacturer or supplier whether the existing brake lining in the lift motor to be serviced contains asbestos.

- If it is confirmed that the brake lining contains asbestos (through documentary proof or asbestos survey), requirements for work involving asbestos procedures will have to be established and comply with WSH (Asbestos) Regulations Part III – General Provisions for Work Involving Asbestos.
- If the lining is confirmed to be non-asbestos, work can proceed with normal lift maintenance procedures.

When no information is available, what should be done?

- If brake lining replacement is required or the maintenance work will disturb the brake lining, engage an asbestos surveyor¹ to conduct survey and take a sample of the brake lining for lab analysis using NIOSH 9002 Polarised Light Microscopy method.
- If work does not disturb brake lining, assume the brake lining to be an asbestos containing material (ACM) and follow safe work procedures without disturbing the brake lining.

¹Definition for asbestos surveyor: Competent person who acquired the WSQ Competency on Survey Asbestos and Other Fibre Risks at the Workplace.



Figure 50: Examples of asbestos brake lining found in lift motors

Note

Asbestos surveyor must acquire the WSQ Competency on Survey Asbestos and Other Fibre Risks at the Workplace.

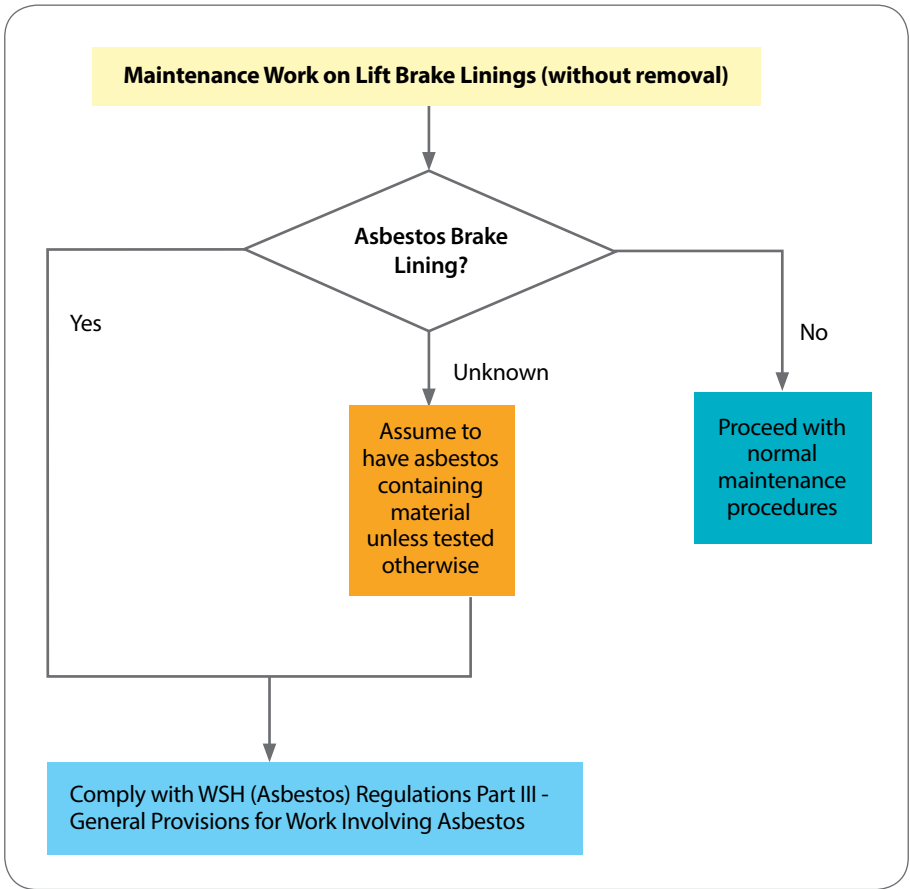


Figure 51: Flow chart on Maintenance Work involving Brake Linings (without removal)

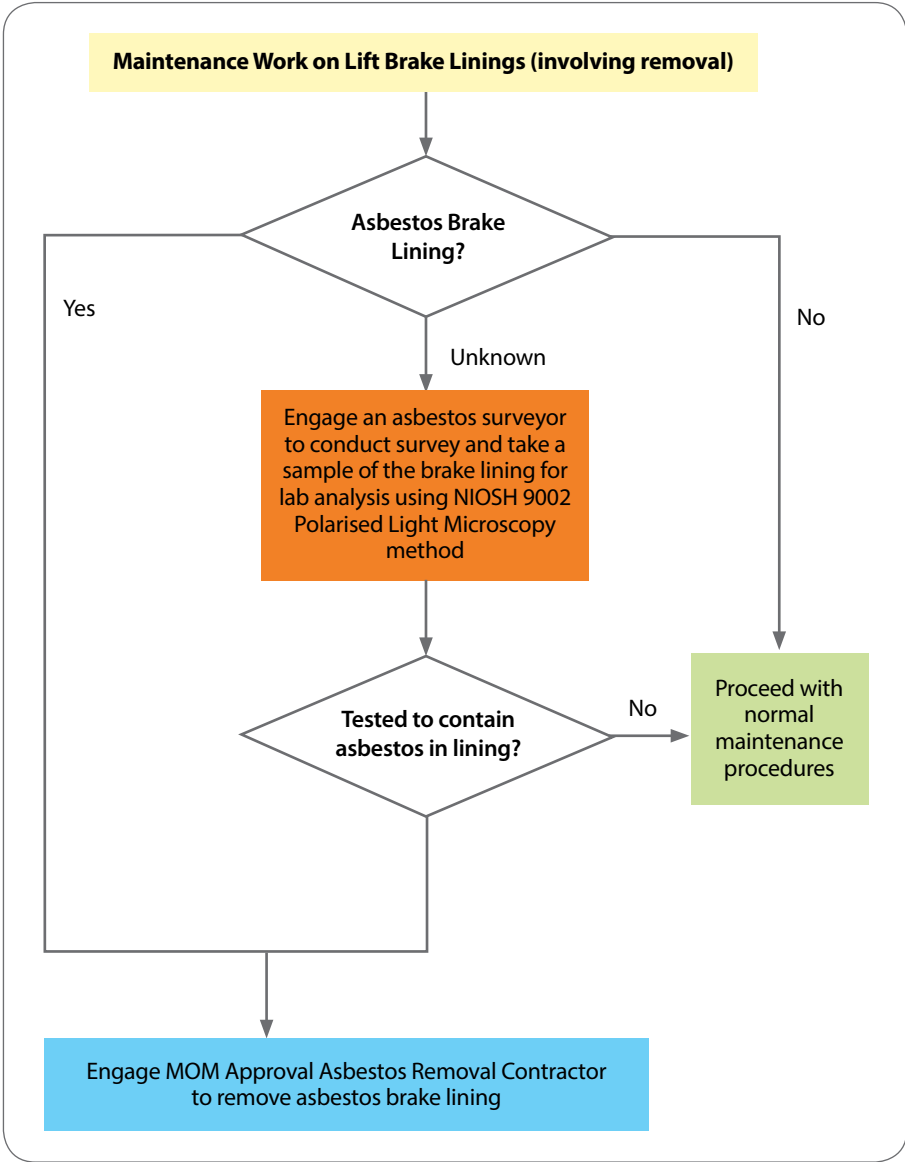


Figure 52: Flow chart on Maintenance Work involving Brake Linings (involving removal)

5.7.1 Working Near Suspected Asbestos Brake Lining

When the maintenance work is carried out near to the suspected asbestos brake lining, precautionary measures must be taken to prevent unnecessary exposure to asbestos fibres. If there is no information to confirm that the lining is non-asbestos, assume that brake lining is an asbestos-containing material (ACM) before any work commences.

The following measures will have to be taken before work can start:

- Restrict access to asbestos work area to minimise the number of persons who may be exposed;
- Persons carrying out the maintenance work have to be trained on asbestos hazard and briefed on working near suspected ACM;
- Respiratory protection (minimally N95 respirator) will have to be provided for the workers carrying out work close to suspected ACMs; and
- Establish a contingency plan when ACM is disturbed/broken during the course of work.

If suspected ACMs need to be removed as part of the maintenance work such as replacement of brake lining:

- Engage an asbestos surveyor to ascertain the presence of asbestos in the brake lining.

If the material is tested to contain asbestos:

- Engage MOM's Approved Asbestos-Removal Contractor (AARC) to carry out asbestos removal work.

For more information on asbestos removal work, refer to WSH Guidelines on Management and Removal of Asbestos.

5.8 Other General Hazard Considerations

While the most likely hazards for working in the lift maintenance environment are highlighted in sections 5.1 to 5.7, other elements of hazards (Table 1) can exist at the same time. Hence it is important to consider these general hazards as well in the risk assessment for lift maintenance work.

MAINTENANCE AREAS						
Hazards	Car	Machinery spaces	Pulley spaces	Areas outside lift car	Lift pit	Car top
Unauthorised entry		✓	✓	✓	✓	✓
Inadequate lighting (including access)	✓	✓	✓	✓	✓	✓
Uneven floor surface (holes, projection)	✓	✓	✓	✓	✓	✓
Slippery floor surface	✓	✓	✓	✓	✓	✓
Strength of the floor	✓	✓	✓	✓	✓	✓
Unsuitable dimensions (passages, maintenance places)	✓	✓	✓	✓	✓	✓
Unexpected movements	✓	✓	✓	✓	✓	✓
More than one lift car in the same area		✓	✓	✓	✓	✓
Manual handling		✓	✓	✓	✓	✓
More than one maintenance person working		✓	✓	✓	✓	✓
Absence of a means of communications	✓	✓	✓	✓	✓	✓
Ventilation and temperature for persons	✓	✓	✓	✓	✓	✓
Dangerous substances	✓	✓	✓	✓	✓	✓
Entrapment	✓	✓	✓	✓	✓	✓
Means/controls for rescue operations	✓	✓	✓	✓	✓	✓
Fire	✓	✓	✓	✓	✓	✓

Legend: Not relevant ✓ Relevant

Table 1: Other elements of hazard

6. Good Systems for Implementation by Lift Owner with Lift Contractor

6.1 Authorisation Systems

6.1.1 Entry Authorisation System

The lift owner should set up an entry authorisation system to ensure security of the building and safe entry of the competent maintenance persons or other entrants to the lift maintenance environment. It is also advisable to put up notices early to inform the general public on the lift maintenance operation before the actual work starts.

6.1.2 Work Authorisation

The purpose of Work Authorisation is to ensure that the competent maintenance persons have been given the necessary instructions and support to carry out the lift maintenance operation. This authorisation is granted by the lift contractor through his authorised manager. Therefore, it is important for the lift contractors to ensure that:

- Site specific risk assessment has been carried out on the lift maintenance work;
- Competent maintenance persons have been informed of the associated hazards in the lift maintenance work; and
- Necessary safety precautions and control measures have been implemented and enforced before lift maintenance work is carried out.

Additionally, the Work Authorisation should incorporate safety requirements for lift maintenance work. These include but not limited to:

- RA and SWP for lift maintenance must address public safety such as safety barrier, warning signs;
- The competent maintenance persons shall be briefed on the Risk Assessment (RA) and Safe Work Procedures (SWP) before they carry out the lift maintenance work;
- The competent maintenance persons must be issued with the appropriate PPE to perform the lift maintenance operations;
- Workers (helpers of CMP) without sufficient and relevant experience should not work alone, without supervision from competent maintenance persons or supervisor; and
- Proper documentation should include (but not limited to):
 - competent maintenance persons:
 - i. letter of appointment covering job scope
 - ii. training records
 - lift owners:
 - iii. job order/contract

6.1.3 Work Authorisation for Non-Routine Maintenance Operations

A separate Work Authorisation for non-routine maintenance work (NRMO) is recommended. These include work activities that involve scaffolds, hot-work and working at car-top beyond the safety railings.

This separate Work Authorisation would help to list some of the job details and ensure control measures have been put in place. Please refer to Annex 2 for examples of Work Authorisation Form.

6.1.4 Stages of Work Authorisation System for NRMO

A work authorisation typically consists of the following stages:

Stage 1- Risk Assessment by Supervisor

The supervisor should:

- Conduct site survey/inspection;
- Generate an inventory of work activities, risk assessments and develop safe work procedures; and
- Keep a record of the above-mentioned document and use it as reference whenever a safety appraisal is required for the same site.

Stage 2 - Safety Appraisal Conducted by an Appointed Person

Before any NRMO, safety appraisal should be conducted by a person who is appointed by Authorised Manager. The appointed person should:

- Determine the hazards and establish appropriate monitoring plan to ensure that the conditions of the lift environment remain unchanged during the whole lift maintenance operation;
- Ensure that the competent maintenance person has been briefed on the work activities, method statements and safe work procedures; and
- Review, endorse and forward the Work Authorisation for NRMO form to the authorised manager for approval.

Stage 3 - Approval by Authorised Manager

The authorised manager may approve a work authorisation for NRMO if he is satisfied that:

- Effective steps have been taken to ensure the safety of the competent maintenance person and other entrants who may be using the available lift nearby; and
- All reasonable practicable measures have been taken adequately to ensure the safety and health of persons who will be entering or working in the lift environment.

After the Authorised Manager has reviewed and approved the authorisation form for NRMO, a copy of the form will be returned to the supervisor. At the same time, he will record the results of the application in a registry that is normally kept in the lift contractor's office.

Notes:

- At any time during the NRMO, the Authorised Manager reserves the right to revoke or re-endorse the form if necessary (refer to Annex 2).
- If a stop work order is issued on site, the Work Authorisation for NRMO form is automatically revoked.

6.2 After Issuance of Work Authorisation for NRMO

After a work authorisation for NRMO has been issued, the supervisor should:

- Ensure that a copy of the Work Authorisation for NRMO form is available on site at all times during the course of the work;
- Review the site's status regularly and check the necessity for re-endorsement or revocation; and
- File and retain the form for a reasonable period after completion of work.

6.3 Record-keeping

It is important for the lift contractor to keep a record for the past Work Authorisation for NRMO forms together with all maintenance records for a period of at least five years after the issue of the records.

Notes:

For details on record retention, refer to Building Maintenance and Strata Management (Lift and Building Maintenance) (Amendment) Regulations (2016).

7. Good Practices for Lift Maintenance Work

The lift owner is required to ensure a safe access to lift machine room, hoist way and lift landings as per prevailing Singapore Standard SS 550: Code of Practice: Installation, operation and maintenance of electric passenger and goods lifts.

7.1 Access to Lift Machine Room, Pulley Spaces and Hoist Way



Figure 53: An example of ladder with safety cage



Figure 54: An example of vertical aluminium retractable cat ladder



Figure 55: An example of a safe access through sliding hatch door



Figure 56: An example of cat ladder with guard & proper handhold



Figure 57: Display notice of lift maintenance in progress



Figure 58: An example of access platform over pipes



Figure 59: An example of roof top safety railing

The access/egress consists of access route to the passageway and the passageway itself. Some examples of a safe access to passageway are:

- Staircase or “ship’s ladder”;
- Cat ladders with safety cage from three metres and above; and any other practicable measures.

The characteristics of a safe passageway include:

- Clear, unobstructed and sheltered (at least a width of one metre and height of two metres) for ease of movement by the competent maintenance person;
- Non-slip floor surfaces;
- Railings at the edge of the access route or passageway when its width is less than 1.5 metres from the roof or building’s edge;
- Lighting of not less than 50 lux and installed with permanent electric light fixture to provide clear vision at all times; and
- Ventilation is adequate for both machine & equipment and human comfort.

7.2 Working Safely in the Machinery Room or Machinery Space

7.2.1 Characteristics of a Well-Maintained Lift Machine Room and Hoist Ways

Some characteristics of a well-maintained lift machine room and hoist ways are:

- Protection against weather;
- Lockable machine room or maintenance door;
- Illumination levels of at least 200 lux at machine room floor level from permanent guarded lighting fixtures;
- Properly maintained lighting and switch socket outlets that are compliant to prevailing Singapore Standard CP5: Code of Practice for Electrical installations;
- Two-way lighting switches should have been installed at various locations within the lift maintenance environment so that the maintenance operations would not be jeopardised (e.g. near the entrances to machine rooms and machine spaces, preferably within an arm's length, so that the working space can be lit before entering);
- Ambient temperature of workplace around the machinery space is maintained at not more than 30°C. This will keep out dust and heat to protect the electronic components, and at the same time provides a conducive environment for maintenance work. This can be achieved by designed and installed with Heating, Ventilating, and Air Conditioning (HVAC) system (Figure 62, Figure 64); and
- Relevant safety signs are displayed within the machinery room. (See Section 8.7 for more details).



Figure 60: Exhaust fan with guarding providing cooling for machinery

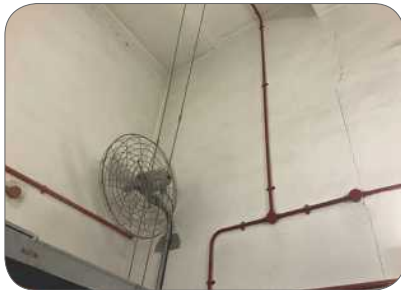


Figure 61: Cooling fan in motor room for workers may not be adequate



Figure 62: Example of an enclosed lift motor room designed and installed with ducted HVAC system



Figure 63: Clean, tidy and bright motor room



Figure 64: Motor room with ventilation system



Figure 65: Floor demarcation



Figure 66: Sheave marked



Figure 67: Safety railing to prevent falling from height

7.2.2 Good Practices for Working in Machine Room or Machinery Space

The following are some good practices for working in the lift machine room or machinery space:

- Lift contractor to conduct risk assessment before starting work;
- Competent maintenance person to:
 - Abide strictly by all safety and warning signs;
 - Conduct a thorough check before starting work. This is especially important when there is more than one lift in the lift maintenance environment. This would help the competent maintenance person to have a better understanding on the relationship between the specific lift, its corresponding lift well and its associated equipment;
 - Keep all machine room(s) or machinery space door(s) locked at all times when unattended during the lift maintenance operation. This is to prevent any intrusion by other persons when the work activities are carried out;
 - Render the lift inoperative and lock out before any inspection, cleaning, oiling or lubrication of wire ropes and moving parts;
 - Block the lift car in order to prevent any downward movement of the lift prior to removing any hanging cables or repairing any support system of an electric/ hydraulic lift;
 - Put back the protection guard immediately once the maintenance work for the dangerous part of any machinery is completed; and
 - Return all equipment and facilities for maintenance, service or installation work (e.g. propping device) to their proper locations or positions.

7.2.3 Good Practices for Working with Moving Parts in Machine Room or Machinery Space

The following are some good practices for working with moving parts in the machine room or machinery space:

- Use pulley guards with a viewing window for ropes or pulleys inspection. This would reduce the chances of contact between any body parts and the moving machinery while the competent maintenance person is performing such tasks;
- Install some form of stopping devices (e.g. emergency stop switches) next to the machinery. It is important to install the devices within easy reach by the competent maintenance person when he is conducting the inspection;
- Use safety guards for the moving parts of governors, tension pulleys and selector; and
- Ensure machine guarding are in place and in good working condition.



Figure 68: An example of pulley guards with a viewing window for rope inspection



Figure 69: An example of an emergency stop switch next to the drive sheave



Figure 70: Emergency stop switch at lift motor room



Figure 71: An example of safety guards provided for moving parts



Figure 72: An example of safety guards provided for moving parts

7.2.4 Good Practices for Controlling Electrical Hazards in the Machine Room or Machinery Spaces

The following are some good practices for controlling electrical hazards in the machine room or machinery spaces:

- Reduce the risk of electrical shocks from electrical parts inside the lift control panels by installing suitable guards or other forms of protection (e.g. finger-safe terminal blocks) to isolate them;
- Use clear marking and labelling to identify electrical wires and terminals. Additionally, clear markings are critical for lift isolators and distribution boards as they are required to be identified individually in an emergency. Where incoming supply of electricity (400V AC) is monitored through relays and such relays require a replacement, it is important for the lift contractor to ensure that a Work Authorisation for NRMO procedure is in place due to its high-risk nature;
- When the main power is cut off for work to be done on the machinery, it is important for the lift contractor to have an authorisation system to ensure that the control of electrical energy is monitored. In addition, lockout and tagout procedure can be used as one of the control measures to isolate the source of electrical energy.



Figure 73: Examples of clear labelling, finger safe terminal block (plastic covering)

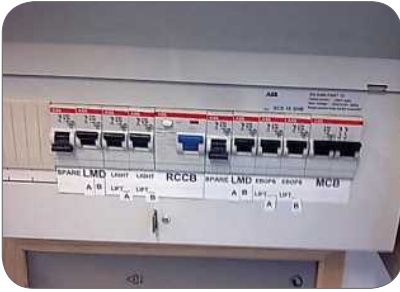


Figure 74: Residual Current Circuit Breaker (RCCB)



Figure 75: Rubber mat

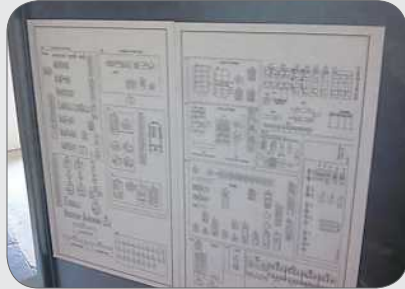


Figure 76: Examples of clear marking and labelling on electrical wires and terminations



Figure 77: Examples of clear marking on lift isolators and distribution boards



Figure 78: Examples of using lockout and tagout to isolate the source of electrical energy in the machine room

7.2.5 Good Practices for Controlling Other Hazards in Machine Room or Machinery Space

The following are some good practices for controlling other hazards in the machine room or machinery space:

- Place corner protectors or round off the edges or corners of machine beams, bed frames and channels to remove sharp edge hazards;
- Keep the floor of the machine rooms free of oil to reduce the risk of slips and falls;
- For machinery spaces, it is necessary for the main features of its maintenance platform to comply with prevailing code of practice and Singapore Standards. For example:
 - Blocking device and an electric cut-off switch are used to keep the drive stationary;
 - Platform is able to support the weight of two persons with tools; and
 - Platform is guarded with safety railings.



Figure 79: Round off the edges or corners of machine beams and marking of sharp edges

7.3 Working Safely on Lift Car Top

When the lift car top is used as a working platform, the lift contractor is to ensure that safe work procedures are in place and agreed by all stakeholders.

7.3.1 Good Practices on Working Safely on Lift Car Top

The following figures 80-83 are some good practices for working safely on lift car top:



Figure 80: Car positioned near landing



Figure 81: Operational switch set to maintenance



Figure 82: Adequate lighting with lamp guard, and car top barricade



Figure 83: Car top brightly lit with LED lighting, visible signage, and barricaded

- The CMP should:
 - Position the lift car top inspection box within reach of the landing threshold and check for proper operation (such as verifying the emergency stop button on the inspection box);
 - Activate the Stop switch and switch the lift to inspection mode before accessing the lift car top;
 - Switch to inspection mode “INSP” mode from sub-control panel and call lift to top floor such that car top is within 500mm level with landing lobby; and
 - Use car-top control, switch to INSP mode and activate E-stop. A typical control is shown in Figure 85.

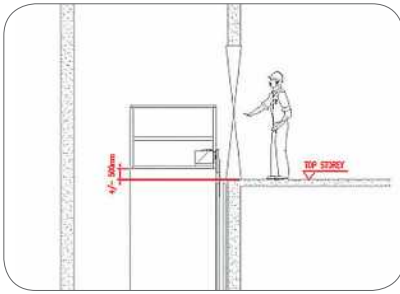


Figure 84: Levelling of lift car for access

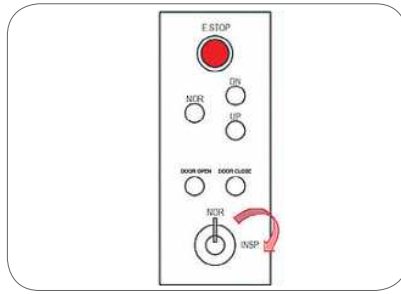


Figure 85: Typical control

- Inspect the lift car top control and check its operational effectiveness before carrying out any work on the car top;
- Confirm adequate lighting is available on the access platform before working;
- Look out for any safety signs before working on the lift car top;
- Ensure that there are necessary means to interrupt the normal control circuit for preventing undue car movement before working;
- Confirm that necessary controls have been implemented for all the foreseeable risks according to the risk assessment. For example, lift car fan, door operators and light fittings are properly guarded to control the risk of shearing by moving parts or contact with electrical terminals. Guard rails or other fall prevention measures are to be provided at the lift car top to prevent worker from falling through the gap between the lift and hoist way;
- Note the number of persons allowed on the lift car top taking into consideration the space of car top and the safe working load (SWL) of the lift installation including all material, tools and equipment;
- Ensure that workers stand clear of moving rope, sheaves or other moving objects;
- Be extra careful at places where the lift car tops are curved or domed;
- Follow an established communication protocol for all persons working on the lift car top;

- Keep your body (including hands, elbows, feet and head) within the perimeter of the lift car top. Do not hold onto any wire rope when the lift is moving;
- Avoid contact with the counterweights of any adjacent lift in the same lift well; and
- Maintain good housekeeping by clearing and cleaning up the lift car top immediately after the lift maintenance work is done to ensure that no tools or parts are left lying around.
- Ensure one CMP is appointed to take control of the car movement if more than one person is working on the lift car top. All persons on the lift car top should understand the procedures for activating the car movement.

7.4 Working Safely Within the Hoist Way

If working at lift car top is not suitable, the lift contractor should ensure that other means of access are available for the competent maintenance person to carry out his maintenance work safely.

For example, when a cantilever or other forms of supporting structure from the hoist way is used for machine-roomless installation. (Refer to Section 8 on requirements for Scaffold or Cantilever Scaffold erection)

7.4.1 Good Practices for Working Safely in the Hoist Way

The following are some good practices for working safely in the hoist way:

- The competent maintenance person should:
 - Abide by all safety signs in the hoist way;
 - Set up barriers in front of the landing door. This would prevent unauthorised persons from intruding into the machine room or machinery space while the competent maintenance person is working in the hoist way;
 - Isolate the source of the electrical energy and consider using lockout-and-tagout when necessary;
 - Familiarise himself with all safe means of egress before entering the hoist way;
 - Note the number of persons allowed to work in the hoist way and keep it to the minimum, working only at one level at any time; and
 - Ensure that no other person, tools, access equipment, and so on are in the hoist way before the lift returns to normal operations. He should return all equipment and facilities for maintenance, service or installation work (e.g. propping device) to their proper locations or positions. This could be included as part of an end of a work checklist.

7.5 Working Safely at Lift Landings

If there is a need to open the lift landing door for maintenance operations, the unlocking and opening of the lift landing door must be carried out by the CMP only. Unauthorised personnel may not be familiar with lift maintenance environment and put themselves at unnecessary risks of falling into the lift shaft. For example, the lift car may not be positioned at the lift landing.

7.5.1 Barrier at Lift Landings

It is unsafe for the lift landing door to remain open longer than necessary. However, if the lift landing door needs to remain unlocked and opened for any length of time, the lift contractor must implement control measures to prevent any falling hazards. For example, a lift barrier is used to warn the public off any unauthorised entry. It can help to prevent falling hazard or objects from falling through the landing opening. In areas where there is heavier traffic flow, barriers can be used to divert the traffic. The barrier should be placed about one metre away from the sills of landings at the lift lobbies.



Figure 86: An example of using lift barrier to warn the public of falling hazards at lift landings

Note

In the absence of any lift maintenance personnel in the vicinity of the lift landing, the lift landing door should not be left unlocked and opened, even though a lift barrier was put in place at the lift landing.

7.5.2 Door Stopper

A door stopper can be used to prevent the lift door from being accidentally shut by placing it onto the landing door sills. The competent maintenance person can use it to keep landing doors open.

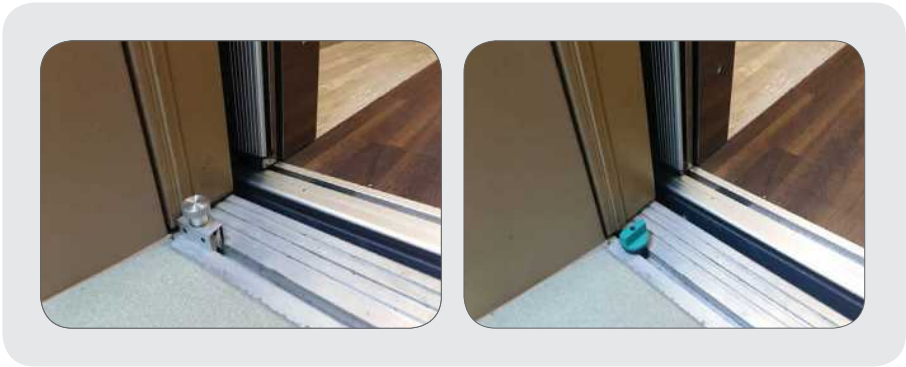


Figure 87: An example of door stopper to prevent door from getting accidentally shut

7.6 Working Safely in Lift Pit

When the CMP is carrying out the maintenance work in the lift pit, he has to confirm that all stopping devices are effective, before entering the pit. If the lift needs to be moved during the maintenance work, it is critical that the lift is operating only at inspection speed. In some situations, he may also need to isolate and lock off the main power supply.

Note

Provision of access door to lift pit (Fig 87) would have been in place if the pit depth exceeds 2.50 m in accordance with SS 550.



Figure 88: Door access to lift pit more than 2.5 metres

7.6.1 Good Practices for Working Safely in Lift Pit

The following are some good practices for working safely in the lift pit:

- The competent maintenance person should confirm that adequate lighting is available in the lift pit before working;
- In situations where the counterweight screen (Figure 89) or safety fencing (Figure 90) is not available, the lift contractor must put up a safety sign in a prominent position to warn the CMP; and
- For hydraulic lifts, the CMP has to ensure that a pit prop (Figure 91) is in place before any maintenance work is started in the lift pit. This device would prevent the lift from moving if the lift is activated accidentally while the CMP is working in the lift pit.



Figure 89: Counterweight screen installed in lift pit



Figure 90: Safety fencing in lift pit at multiple lift shafts



Figure 91: Pit props located in pit under the car in the middle of the pit for hydraulic lift



Figure 92: **Prop along the wall or guide rail for home lift**

- The competent maintenance person should:
 - Confirm the safety guard for tension pulleys in the lift pit (if applicable);
 - Ensure three point contact when using the pit ladder to descend into the lift pit; and
 - Familiarise himself with the locations of the lighting and pit stop switches for access in lift pit using scaffold or ladder. (Refer to section 8 for the requirements and safe use)



Figure 93: **Pit ladder in good condition**



Figure 94: Use of fall arrestor

- The competent maintenance personnel should remove any oil stains before, during and after every lift maintenance work. This is to keep the lift pit clean and dry to prevent any slip and fall hazards.



Figure 95: Clean & well lighted pit



Figure 96: Emergency stop & lighting button switch with easy access

7.7 Working Safely on Machine Roomless (MRL) Lifts

Machine Roomless (MRL) Lifts are traction lifts which have their equipment installed in the hoist way, eliminating the need for a machine room. A typical layout of MRL is shown in Annex 3.

7.7.1 Pre-checks required

Conduct necessary safety briefing before commencing work.

The following PPE shall be made available by lift contractor for use by CMP:

- Restraint belts- prevent CMP from going beyond boundary of car top;
- Safety harness – required for fall protection if CMP needs to access machine beam or beyond the safety railing;
- Gloves - prevent cuts to the hands during general work;
- Headlamp - enhances local illumination; and
- Bumpcaps – prevent head injuries.

7.7.2 Car Top Ingress Procedure

- Refer 7.4 on access car top safely;
- Before entering lift hoist way, ensure E&I panel is closed and locked to prevent tampering by external parties.

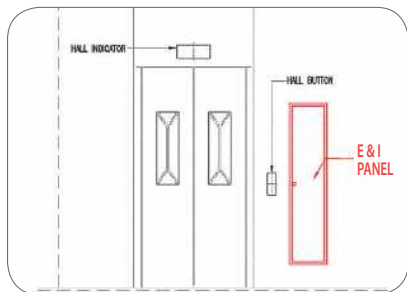


Figure 97: Control panel at lift lobby



Figure 98: Hooking up of restraint belt

The E&I (Emergency and Inspection) panel is usually located in the hallway to facilitate emergency rescue operation;

- Enter car top. Work within the safety perimeters of the lift car cage safety railing. Where there are activities which have the possibility of falling over railings, hooking up of restraint belt is necessary. Look for hook up points which are properly secured to lift car structure. This restricts movement area of CMP to within the safety railing or within perimeter of the car top if there is no provision of railing especially in older MRLs;
- For inspection of traction machine brake, call lift to highest point. Activate Emergency Stop push button at car top controller. Also, engage the car blocking device;

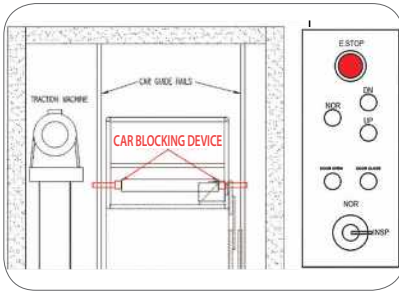


Figure 99: Engaging car blocking device

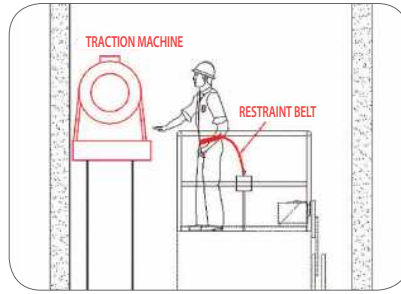


Figure 100: Inspection of traction machine

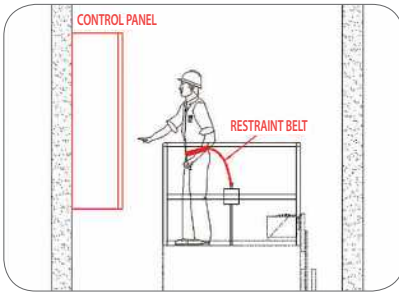


Figure 101: Inspection of control panels

- e. For routine maintenance, CMP is usually not required to go beyond the safety railing for inspection of traction machine. In some cases where machine or equipment is beyond reach, ensure proper safety precautions such as working platforms and safety harness are provided for;
- f. For inspection of EBOPS/UPS, ARD and control panels, move car to suitable heights so that controls are within reach. CMP shall stay within boundary of car top at all times;
- g. After the maintenance work session is completed, ensure all control panels/cabinets are properly closed and locked. This prevents collision and damage to the control panels after the lift is returned to normal operation.

7.7.3 Non-routine Maintenance

In certain situations, the traction machine is located at an elevation which is beyond car-top access. These are unique cases where additional access methods are to be considered.

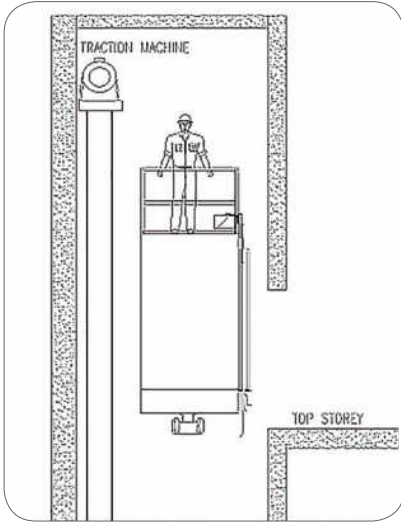


Figure 102: Traction machine inaccessible even at maximum reach

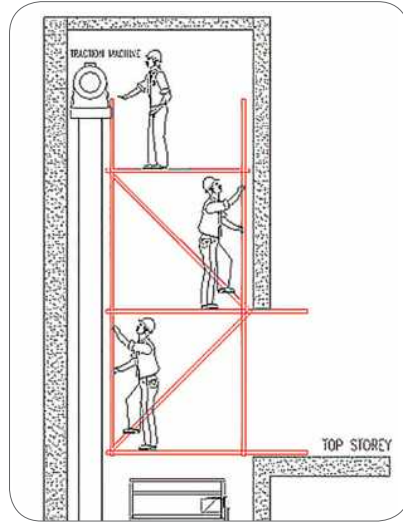


Figure 103: Installation of cantilevered scaffold

- Move car to level below top storey, ensuring enough clearance for installation of scaffold. Suspend or prop up counter-weight to prevent lift car from moving upwards unintentionally;
- Install cantilevered scaffold to suitable height whereby traction machine can be accessed for maintenance. (See Section 8.6 on requirements for scaffold/cantilevered scaffold)

7.8 Working Safely in Hoist Way with Multiple Lifts

For multiple lifts housed in a common hoist way (Fig. 104), the hazards will involve adjacent moving equipment, falling objects, debris and tools.

The following are some good practices for the CMP to ensure working safely at multiple hoist ways and pits:

- Prohibiting simultaneous work in hoist way and motor room with unguarded holes;
- Locking the motor room to prevent other work conducted at the same time;
- Isolating the source of the electrical energy and lockout-and-tagout the adjacent running equipment; and/or
- Keeping body (including hands, elbows, feet and head) within the limits of the lift car top guard rail.

Additional precautions include:

- Not wearing anything that could catch or tangle while on top of a moving lift car;
- Not carrying tools in pockets;
- Using Guardrails wherever possible where a fall hazard exists;
- Avoid connecting harnesses and lanyards while moving a car on inspection;
- When unusual conditions require the use of this form of fall protection, then the following precautions must be followed:
 - a. The lift car should be placed on inspection by two independent methods;
 - b. A risk assessment must be conducted, and steps taken to ensure that the harness or lanyard cannot become entangled or snagged;
- Assuring provision of a clean flat surface to stand on that will support the weight of personnel and equipment. Incorporate the use of special care when lift car tops are curved or domed;

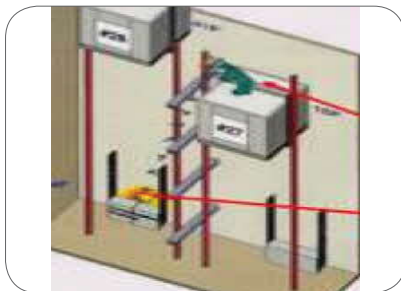


Figure 104: Multiple Hoist ways and Pits



Figure 105: Example of control measures



Figure 106: Example of lockout-and-tagout

- Eliminating the possibility of falling while riding a moving lift car, by taking a position near the centre of the lift car and maintaining a firm handhold on the crosshead away from moving parts;
- Placing tools and other equipment required for the job on the lift car top safely positioned away from the edge of the car, or using tie down cord/tool lanyard (Figure 107) to prevent hand tools from dropping while working on car top without entanglement hazard with any moving part;
- Avoid storing material of any nature on top of the car;
- Not hanging an electric extension light from the hoist ropes; and
- Keeping the body (including hands, elbows, feet and head) within the limits of the lift hoist way being inspected. Accidents from adjacent moving lifts can occur. Be aware of the counterweight's position at all times.



Figure 107: Tool lanyard/tie down cord to prevent hand tools from dropping while working on car top without entanglement hazard with any moving part

Note

The CMP should ensure no unprotected simultaneous work in the same hoist way, where no individuals or groups would be working independently of each other and/or where the workers are stacked in the hoist way (i.e. above/below each other).

8. Good Practices in Lift Maintenance Operations

8.1 Documentation

All relevant documents and records should be updated and kept in their proper locations.

Examples of documents and records to be provided by manufacturer or supplier are:

- Installation, operation and maintenance manuals;
- Equipment layout;
- Equipment arrangement;
- Hydraulic circuit diagrams;
- Wiring diagrams;
- Operation/ maintenance logbooks;
- Process flow charts; and.
- Asbestos documentary proof.

Documents and records to be provided by the lift contractor are:

- Risk assessment record; and
- Safe working procedures and checklists.

8.2 Identification – Uniform, Display of Name and Identification Badge

The CMP and his supervisor should wear the lift contractor's uniform and display their identification badge at the workplace.



Figure 108: CMP clearly identified with uniform and identification badge at the workplace

8.3 Communication

The lift contractor should establish an effective and reliable communication plan during the lift maintenance operation. This is particularly important if routine maintenance is carried out by a single competent maintenance person.

When choosing a means of communication, it is advisable to anticipate all foreseeable risks or conditions within the lift maintenance environment. Whatever system is used, it is important that all messages can be communicated easily, rapidly and clearly among relevant people. A regular monitoring mechanism should be available at all times to ensure the well-being of the competent maintenance persons, for example, conducting a regular check with walkie-talkies every two hours.

8.4 Personal Protection Equipment (PPE)

Use PPE only as a last resort after all other control measures have been considered. In some occasions, it is used as a short-term contingency during emergency, maintenance, repair or as an additional protective measure. The success of this control depends critically on the protective equipment chosen, and its fit-for-purpose, maintained properly and complies with prevailing codes or standards.

The following are some examples of PPE commonly used by competent maintenance person:

- **Head Protection**

A safety helmet or bump cap is required when there is a risk of head injury.



Figure 109: Examples of head protection – bump cap complies with EN 812

- **Eye and Face Protection**

Eye protection is required in all hot work or steel cutting work. If eye-irritating chemicals, vapour or dust are present, it is necessary to wear a pair of appropriate safety goggles.

- **Hand Protection**

Gloves and protective clothing made of a suitable resistant material should be worn to protect the skin from exposure to potential injuries. Specialty gloves may be required to protect the wearer against heat, cold, or when handling material or tools.

- **Foot Protection**

Special foot protection may be worn to protect the wearer against slippery surfaces, electricity, falling objects, chemicals, or sparks.

- **Hearing Protection**

All persons are required to wear hearing protection if they are exposed to excessive noise.

- **Safety Harness/ Restraint Belt**

Safety harness or restraint belt must be worn when there is a potential of falling from height. When wearing a safety harness or restraint belt, it is advisable to take extra care that such equipment would not introduce a new hazard or hinder any free movement within the work area. Serious consideration on the hazards and rescue arrangements when selecting the type of safety harness or restraint belt should be made.

8.5 Safe Use of Ladder

The following are some good practices on the safe use of the ladder:

Dos

- Select the right ladder for the job. For example, the ladder must be safe for the duration of the job and high enough for the worker to reach his work area without standing on its top rung;
- Use a ladder of sound construction and material that complies with prevalent code and standards;
- Check ladder. Ensure that there are no visible defects and it is in good working condition;
- Remove any oil or grease (if any) on the ladder;
- Set up ladder properly in a safe environment, fully extended and away from opening doors, windows, and open sides. Position the ladder where it will not be easily knocked over by other persons;
- Place ladder on level and firm ground. If necessary, get another worker to hold it firmly;
- Maintain three points of contact while using the ladder;
- Keep both feet on the same rung or step throughout the task;

- Always keep weight centred between the side rails. Do not lean away;
- Ensure co-worker at the bottom of the ladders acts as a watcher and holds on to the ladder for support;
- Put on proper non-slip footwear;
- Use handhold available on the steps; and
- Ensure maximum recommended time for working on ladder to be 10~15 minutes.

Don'ts

- Do not overreach- make sure the belt buckle (navel) stays within the stiles.

For more information, refer to WSHC Code of Practice for Working Safely at Height, Ladder Safety Pack and Safe Use of Ladder Checklist.

8.6 Safe Use of Scaffold/Cantilever Scaffold

The following are requirements for safe use of scaffold/cantilever scaffold:

- Designed by a Professional Engineer for construction of metal scaffolds exceeding 30 metres in height or/ with cantilever;
- Scaffolds shall be erected by trained scaffold erectors under the immediate supervision of a trained scaffold supervisor; and
- Scaffolds shall be erected by an approved scaffold contractor if more than four metres in height.

Before using scaffolds, ensure that:

- All scaffolds have been inspected by a competent and authorised scaffold supervisor (except for trestle scaffolds or scaffolds which do not permit a person to fall more than two meters);
- All scaffolds have been inspected by a competent and authorised scaffold supervisor:
 - Before its first use;
 - After substantial alteration;
 - After any event likely to have affected its stability; or
 - When it has been in place for seven days.
- All scaffolds are used on stable ground;
- Check "Safe to use tag" is valid;
- Comply with safety and warning signs;
- Provide for proper access and egress;
- Basic PPE such as safety harness, helmet and safety shoes are worn;
- Scaffolds are not overloaded; and
- All scaffolds and their components must meet the requirements of the regulations stipulated in the Workplace Safety and Health (Scaffolds) Regulations.



Figure 108: PE designed staging and staging erected by Approved Scaffold Contractors



Figure 109: Check "Safe to use tag" is valid



Figure 110: Use of scaffold in lift pit to reach the under carriage of the car lift

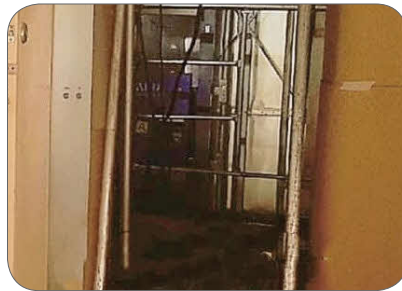


Figure 111: Use of cantilever scaffold at higher level above the car lift to reach traction machine in Machine Room Less (MRL) lifts

For more information, refer to WSHC Code of Practice for Working Safely at Height and WSH (Scaffolds) Regulations.

8.7 Safety Signs and Symbols

Safety signs and symbols are important because they tell us the relevant safety message and instruction to be observed and followed. A competent maintenance person (CMP) must be familiar with and adhere to the signs and symbols. They are:

8.7.1 Prohibition Signs & Symbol

The prohibition sign instructs us that we must not do what as indicated by the symbol. These include:

No Smoking	No Naked Fire, Light or Smoking
 Smoking prohibited	 Fire, open light and smoking prohibited
No Entry	Operation prohibited
 Entry prohibited	 No Operation is Allowed. Do not operate

Figure 112: Prohibition signs

8.7.2 Fire-Fighting Equipment Sign

This sign tells us about the fire-fighting equipment and its location:

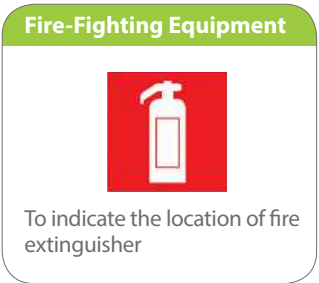


Figure 113: Fire-Fighting Equipment sign

8.7.3 Mandatory Signs

Mandatory sign tells us that we must follow the instructions as indicated by the symbol. These include the following signs:

Head Protection Must Be Worn	Eye Protection Must Be Worn	Hand Protection Must be Worn
 To indicate that safety helmet must be worn	 To indicate that eye protection such as safety goggles must be worn	 To indicate that the suitable type of hand gloves must be worn
Safety Harness/ Restraint Belt Must Be Worn	Hearing Protection Must Be Worn	Foot Protection Must Be Worn
 To indicate that safety harness/belt must be worn to prevent person falling from height	 To indicate noisy area and workers must wear ear plugs/ear muffs to prevent noise-induced deafness	 To indicate that foot protection such as safety shoes or safety boots must be worn
Face Shield Must Be Worn	Respiratory Protection Must Be Worn	
 To indicate that face shield must be worn	 To indicate that appropriate respirators must be worn to protect the workers against injuries or health hazards e.g. chemicals	

Figure 114: [Mandatory signs](#)

8.7.4 Warning Signs

Warning signs tell us about the presence of certain hazards as indicated by the symbol and workers must take precautionary measures to avoid the risk. These include:

Caution, Overhead Load Hazard  A warning to all workers approaching or working in the vicinity of possible falling hazard. Worker should not work under suspended load.	Caution, Risk of Fire  To indicate the presence of highly flammable materials and high temperatures. To use this warning sign where paints, solvents or flammable liquids are stored. Permission must be first obtained from the safety department before any hot work is carried out.	Caution, Risk of Explosion:  To indicate the possible existence of an explosive atmosphere, flammable gas or explosives.
Caution, Risk of Ionizing Radiation  To indicate that safety harness/belt must be worn to prevent person falling from height	Caution, Toxic Hazard  A warning on the presence of tools, materials such as toxic or poisonous gases or fumes, chemicals. Workers should obtain permission before entering the area.	

Figure 113: **Warning signs**

For more information, refer to:

- SS 508 : Graphical symbols - Safety colours and safety signs
- Part 1 : Design principles for safety signs and safety markings
- SS 508 : Specification for graphical symbols – Safety colours and safety signs
- Part 2 : Design principles for product safety labels Amendment No.1 (2013) 2008
- SS 508 : Graphical symbols – Safety colours and safety signs
- Part 3 : Design principles for graphical symbols for use in safety signs 2013
- SS 508 : Graphical symbols – Safety colours and safety signs
- Part 4 : Colorimetric and photometric properties of safety sign materials 2013
- SS 508 : Graphical symbols – Safety colours and safety signs
- Part 5 : Registered safety signs

8.8 Housekeeping

Good housekeeping goes hand in hand with safe working practices in the workplace and results in a safe and comfortable workplace. It increases productivity and can prevent slipping, tripping, falling and fire hazards.



Figure 114: To clear and remove all waste contaminated with grease or oil from the lift pit or lift car top before leaving the workplace

For more information, refer to WSH Guidelines on Workplace Housekeeping.

8.9 Well-being of Persons Working Alone

In situation where CMP works alone, the following procedures are recommended:

- Before commencing work, the CMP should register his presence with the owner's site representative;
- Suitable arrangements should be made periodically to confirm the continued well-being of the CMP periodically;
- Suitable arrangements should be made to organise assistance in the event of an emergency; and
- The specific arrangements and frequency for confirming the CMP continued well-being should be described in the relevant safe working procedure document and should be acted upon.

Note

These procedures are particularly important if a CMP is working alone in unoccupied premises.

9. Emergency Preparedness for Lift Maintenance

The CMP has to understand clearly and familiarise himself with the emergency procedure. This would enable him to act promptly and know how to deal with the emergency appropriately and safely.

The following are some examples of the emergency scenarios in lift maintenance:

- Fire Emergency;
- Entrapment; and
- Injured worker.

9.1 Establishment of Emergency Response Plan

The lift contractor should establish and implement an emergency response plan for emergency situations that relate to lift maintenance work activities with the lift owner.

The following items are recommended to be included in the emergency response plan:

- Types of emergency (e.g. fire, entrapment and injuries);
- Communication protocol (e.g. emergency contact numbers and notification to relevant parties concerned);
- Appropriate types or methods to address the emergency situation (e.g. self-rescue, SCDF and specialist rescue);
- Identify a competent Incident Commander to communicate, coordinate internally and/or with SCDF on site and provide technical support or assistance as and when required by internal rescue or SCDF;
- Effective means to assemble the required technical/engineering personnel and Incident Commander at site in a timely manner; and
- Logistics support such as tools and equipment, PPE and fall prevention equipment.

9.2 Emergency Response Arrangement

The emergency response arrangement is dependent on the types of emergency and their associated risks or hazards present on site.

For example:

- Fire at lift pit or lift machine room;
- Entrapment on lift car top or in lift pit due to electrical and/ or mechanical failures; and
- A fully or partially injured person, following a fall or caught in-between objects, hit by/ against object inside a lift pit, lift motor room, in-cage, hoist way or landing.

Conducting the risk assessment for emergency response, it would help to determine the appropriate arrangement and strategies for the particular situation. The following are examples of emergency response strategies:

- Self-rescue when the situation allows and where the hazards are understood, and control measures are available. Self-rescue may be conducted only if the person is capable and it is safe to do so.
- Emergency response member who is trained and competent or a team of competent members.
- Rescue by SCDF which requires site incident coordination and may need the support of lift contractor's logistics and resources to facilitate the rescue operation.

Reminder: Do not take unnecessary risks.

9.3 Emergency Response Consideration

The lift contractor should plan and prepare for all the possible emergency responses at the work site. Serious consideration should be given to:

9.3.1 Communication Protocol for Worker Safety Check

Note that when an injured person is incapacitated or partially or fully unconscious, the person is unable to communicate to his supervisor, co-worker or SCDF for help. Therefore, it is critical for lift contractor to establish an operation system check to ensure that all workers on-site are contactable and safe during their normal course of work.

9.3.2 Factors for Considering Self-Rescue, Internal Rescue or by SCDF

- Safe access/egress;
- Adequate lighting;
- Adequate ventilation;
- Types of injury;
- Physical size (e.g. height and weight of the injured); and
- Spoken language preferred (translator may be required).

9.3.3 Emergency Response Plan Exercise

In an emergency rescue operation, proper coordination, communication and logistics should be managed and implemented in time. Therefore, it is important that the appointed Incident Commander coordinates a table-top emergency exercise annually and keeps the record of such an exercise. The record typically includes:

- Time and date of exercise;
- Personnel involved;
- Brief description of the type of exercise;
- Post evaluation; and
- Any improvement on the exercise conducted.

9.4 Logistics Required for Emergency Response

Generally, the logistics equipment should be readily available and retrievable from the nearest location. This would ensure that there is suitable and sufficient rescue equipment during the internal or during the SCDF's rescue operation. It is critical that all logistics equipment is properly maintained and made readily available in the shortest possible time.

The following are some items that are required during the emergency response:

9.4.1 Tools and Equipment

The lift contractor should make available or organise equipment for such emergency responses. These tools can include those commonly associated with lift installation and major or minor repairs, such as ladder, chain-block, electrical winch, slings, chains, welding machines, and grinding machines.

9.4.2 Electrical Cabling, Lighting and Mechanical Ventilation

The lift contractor is to provide at least:

- Electrical cabling and plugs with suitable connector (industrial and household type);
- Electrical lighting;
- Mechanical exhaust and supply fans with flexible ducting; and
- Torchlight with spare batteries.

9.4.3 Communications Equipment

The lift contractor should provide communication equipment like:

- Walkie-talkie;
- Mobile phone with enough spare batteries and charger;
- Conventional hand signal and relayed verbal communication may be considered in the absence of walkie-talkie or within sight at close proximity.

9.4.4 PPE

The lift contractor should provide adequate and appropriate PPE during an emergency, for example, safety helmet, gloves, welding shield, mask and ear protector. In addition, the lift contractor is required to provide adequate fall protection equipment such as body harness, lanyard, fall arrestor and lifeline, and so on.

9.5 Emergency Response Team

The lift contractor has to appoint or organise an Emergency Response Team (ERT) comprising engineers, technicians, servicemen or repairmen to address any mechanical, electrical, or software support during an emergency. Additionally, the ERT has to provide technical and in-house logistics support to SCDF to facilitate the rescue operations.

9.6 Training

The competent maintenance persons are to be trained on the procedures of the emergency response plan and guidelines on addressing emergency situations.

The ERT should be trained so that the team is able to perform the role effectively. The team members need to be familiar with the rescue plan options and the procedures for different types of emergency.

The rescuers should be familiar with the rescue equipment. They should check and ensure that all the equipment is in order and in good working condition prior to use.

The lift contractor needs to evaluate the training programme for its effectiveness and relevance, and conduct capability evaluation of rescuers and others who are involved.

10. Incident Reporting and Investigation

The WSH (Incident Reporting Regulations) requires employers to report accidents, dangerous occurrences, occupational diseases and all work-related traffic accidents involving their employees at workplaces.

Employers are advised to submit the report within 10 days of the incident to MOM through the electronic reporting system, iReport (<http://www.mom.gov.sg>).

Reportable Incidents, Accidents and Occupational Diseases are defined as:

(1) An accident in the course of work that results in:

- Fatality; and
- Hospitalisation for at least 24 hours; or
- The injured is given more than three days of medical leave (cumulative)

(2) Work-related traffic accidents involving employees

(3) A dangerous occurrence such as:

- Explosion or fire;
- Collapse of structure or equipment; and
- Machinery damage

(4) An occupational disease (regardless of whether any medical leave was given)

Employers must submit notifications of occupational diseases within 10 days of receipt of a written diagnosis. Reports or notifications made under the Regulations must be kept for at least three years from the time of reporting.

Employee injuries and illnesses of employees which are not reportable to MOM could be recorded and kept by the facility for monitoring purposes. These records can provide insight into the WSH performance of the facility as well as the effectiveness of its WSH programme(s).

Other useful information that could be captured in such a monitoring log can include:

- Severity of the injury or illness;
- Date and time of the occurrence;
- Brief description of the occurrence;
- Particulars of the employee(s) involved; and
- Lost time associated with the injury or illness.

After being notified of an accident or incident, the management should review the information collected and decide on the next course of action. The facility should develop and implement effective procedures for investigating accidents, occupational illnesses and incidents.

The purpose of accident/incident investigation is to prevent recurrence of similar situations. These procedures could include, but not restricted to the following.

- Process for capturing information and record keeping;
- Type of events to be investigated e.g. those that have led or could lead to serious harm;
- Process of investigation;
- Identification and implementation of corrective and/or preventive actions; and
- Review of follow-up actions for effectiveness.

Refer to the WSH Guidelines on Investigating Workplace Incidents for SMEs for guidance on incident investigation methods and their related tasks.

Annex 1: Sample of Risk Assessment Form for Lift Maintenance Operation

INVENTORY OF WORK ACTIVITIES

Company:

No.	Process / Location	Work Activities
1.	Access to lift machine room.	1.1 Access to rooftop using cat ladder. 1.2 Moving to lift machine room via roof access. 1.3 Access to lift machine room using cat ladder.
2.	Servicing of lift traction machine and controller/ lift machine room.	2.1 Moving about in the machine room. 2.2 Working on the controller/traction motor terminals. 2.3 Working on stalled traction machine (main sheave), governor and floor selector. 2.4 Checking of main ropes and governor rope.
3.	Maintenance work on lift car top.	3.1 Opening lift door and accessing to the lift car top. 3.2 Working on lift car top. 3.3 Checking of electrical parts (PCB, Indicator, button, switches, apparatus box, door motor and connection).
4.	Working in lift pit.	4.1 Access to lift pit. 4.2 Working in lift pit.
5.	Working inside lift car and lobby.	5.1 Servicing door at lobby. 5.2 Checking lift levelling at lobby. 5.3 Working inside lift car.

Company	RA Leader	Approved By			Reference Number
Process	RA Member 1	Signature			
	RA Member 2				
	RA Member 3				
Location	RA Member 4	Name			
Original RA Date	RA Member 5	Designation			
Next Review Date	RA Member 6	Date			
Last Review Date					

Hazard Identification				Risk Evaluation				Risk Control						
No	Work Activity	Hazard	Possible Injury/ Ill Health	Existing Risk Controls	S	L	RPN	Additional Controls	S	L	RPN	Implementation Person	Due Date	Remarks
4.1	Access to lift pit	Public may fall into lift pit when open door is open.	Serious injury.	1) Put up notice at lobby. 2) Public check to ensure no person is near.	5	2	10	1) Set up safety fencing.	5	1	5	Service Supervisor/ Technician		
		Slip and fall from pit ladder.	Bodily injury.	1) Clean safety shoes (free from oil and grease). 2) Hold and step on ladder firmly. 3) Turn on pit light.	4	2	8	1) Maintain 3-point contact on ladder. 2) Co-worker assists to open/ close landing door.	4	1	4	Service Supervisor/ Technician		

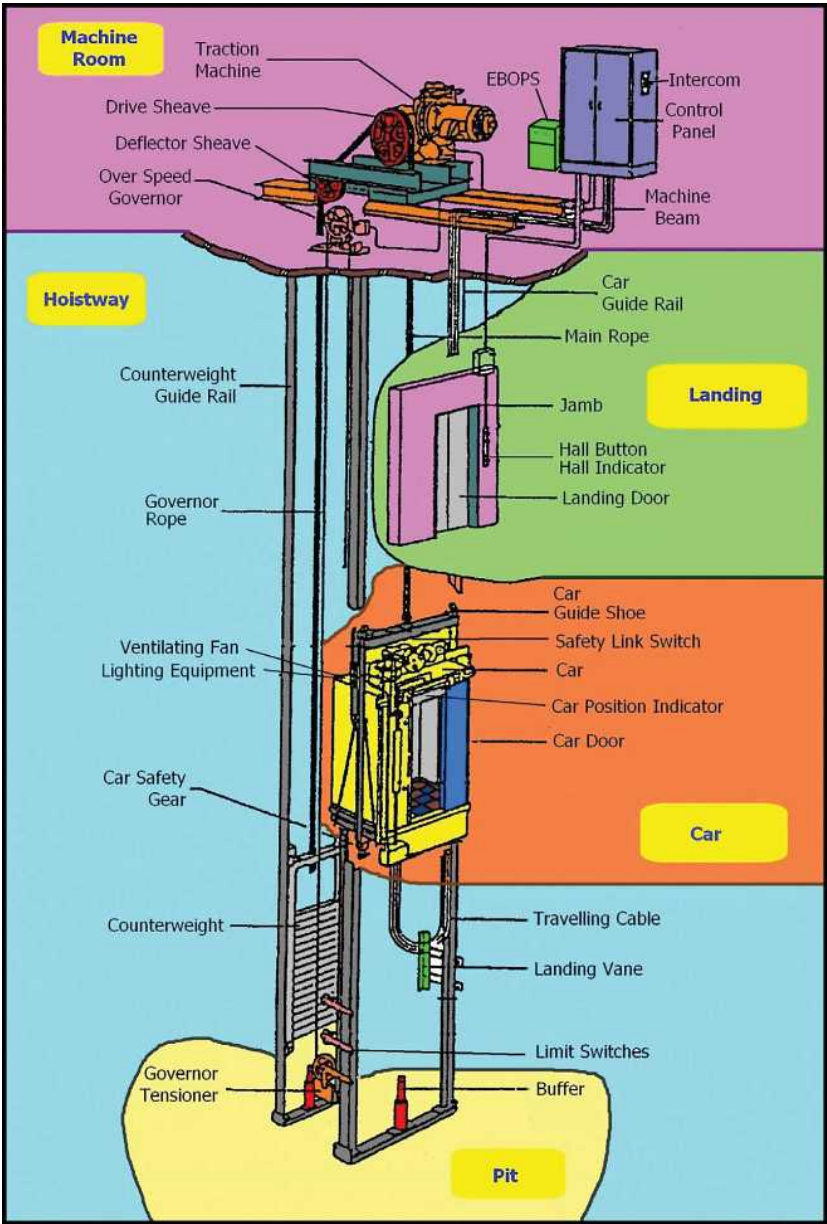
4.2	Working in Lift pit	Struck by moving object (Lift car or counter-weight)	Fatal	1) Activate pit switch to disable lift operation. 2) Install counterweight screen (as per SS550)	4	2	8	1) Turn on pit light. 2) Put up safety sign.	4	1	4	Service Supervisor/ Technician		
		Hit by falling objects.	Head injury.	1) Put up notice at lift landing. 2) Turn on pit light. 3) Lock motor room to prevent other party working near rope openings in the lift motor room.	4	2	8	1) Prohibit working on different levels at the same time.	4	1	4	Service Engineer/ Supervisor/ Technician		
		Slip and fall in lift pit floor.	Bodily injury.	1) Clean up any oil/ grease on the floor 2) Wear safety shoes.	3	1	3	Nil	3	1	3	Service Supervisor/ Technician		
		Inhalation of anti-rust aerosol spray vapour	Eye and nose irritation	1) Spray direction away from the eyes, nose and other co-workers. 2) Wear approved type of safety goggles and masks.	3	1	3	Nil	3	1	3	Service Supervisor/ Technician		

Annex 2: Sample of work Authorisation Form

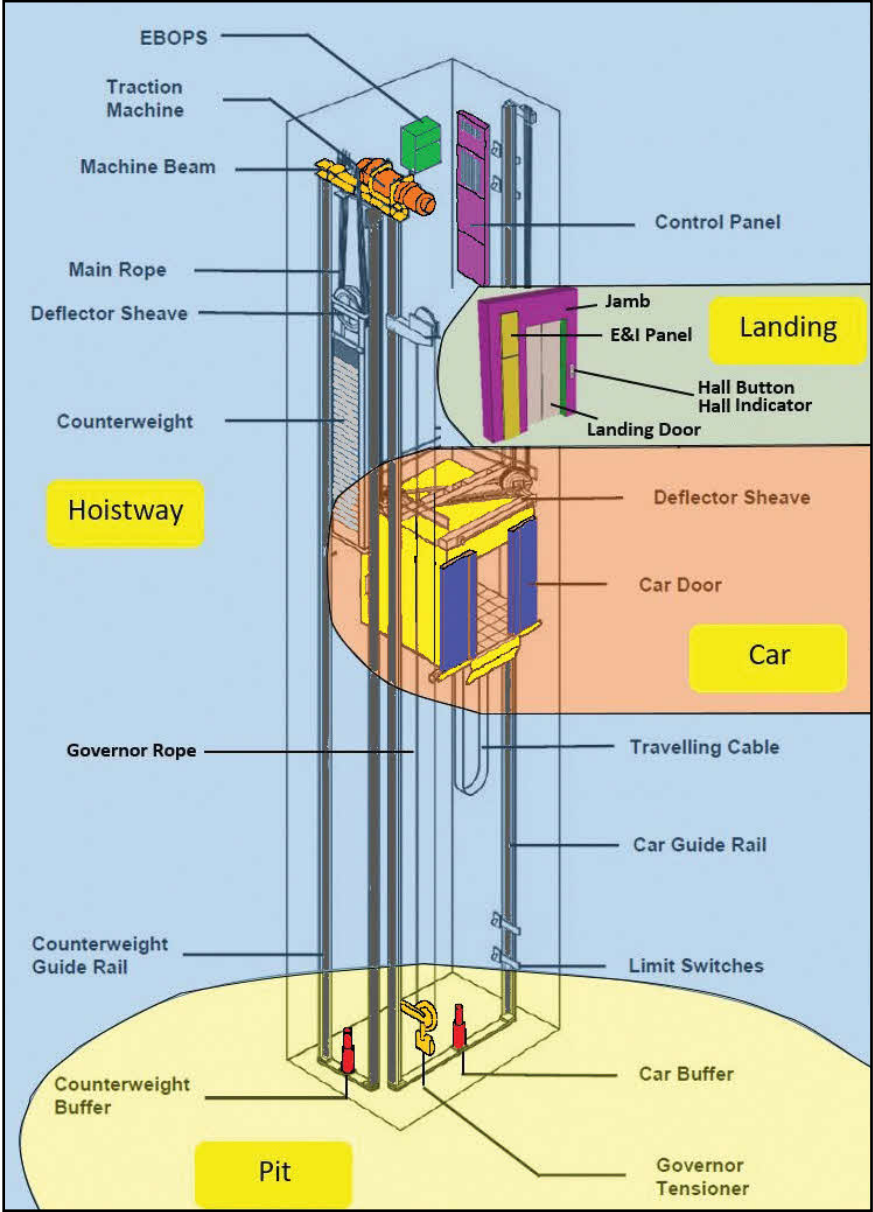
Purpose of the authorisation form:				
☐ Working at Height	☐ Hot Work	☐ Lifting Operation	☐ Others:	
WA No.	Job no.	Project Name	Block No	Lift No
	From (dd/mm/yyyy)	To (dd/mm/yyyy)	No. of Workers	
1) Applicant(s) shall comply with WSH Act, WSH Subsidiary Legislations, NEA Legislations, Code of Practices etc 2) Work Authorisation (WA) is to be submitted 3 working days in advance (minimum). The maximum validity of a WA is 7 days. It is non-automatic renewable. Applicant has to resubmit WA for approval. Daily WA shall apply whenever applicable. 3) WA is to be approval by Authorised Manager before commencing of work. 4) Approved WA to be available at site, preferably displayed prominently where work is carried out. 5) WA will be revoked & shall be considered invalid if any safety non-compliance/lapse is found and communicated.				
Part 1 : Application - To Be Completed By Applicant (Work activities to be carried out by lift contractor/sub-contractor)				
Description of lift maintenance (Non-Routine):				
Safety Requirements – General Safety				
1) Conduct Risk Assessment. 2) Conduct daily toolbox meeting. 3) Set up fencing at work area and display “No Entry” / “Danger-Keep Out” warning sign. 4) Appropriate PPE are to be worn: • Helmet/ Hard Hat/ Body Harness/ Restraint Belt/ Safety Shoes • Others as required per work activities 5) Adequate lighting /ventilation are provided where required 6) Others: _____				
Applicant				
Name				
Company				
Signature				
Date				
HP				
Site Supervisor				
Signature				
HP				

Part 2: Maintenance Staff		Verified by
☐ Acknowledge the above work activities shall be carried out in accordance with method statement and safe work practices.		Name
☐ Handover by Building Owner/ Managing Agent is in order and inspected.		Designation
☐ Other instructions/ comments:		Signature
		Date
		Verified by
☐ Satisfaction of the safety provision taken by applicant		Name
☐ DO NOT COMMENCE WORK : To be inspected prior to approval		Designation
Schedule Inspection : Date : _____ Time : _____		Signature
Safety Person In-Charge : _____ HP : _____		Date
WA is revoke by : _____ (Name/Designation) on _____		
Part 4: Approval by Authorised Manager / Authorised Competent Person		
Work Authorisation is:		
Approved / Not Approved		
Part 5: Notification of Handover to Building Owner/ Completion of Work by Applicant or Lift Contractor		
☐ Handover to Building Owner/ Managing Agent is in order and inspected.		Name
☐ WA has expired and to submit new PTW application.		Designation
☐ Acknowledgement that the above work activity is completed.		Signature
		Date

Annex 3: An illustration of a typical lift installation with machine room



Annex 4: An illustration of a typical lift installation without machine room



Acknowledgements

Organisation	Contributors
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Schindler Lifts Singapore Pte Ltd	Mr Justin Chia
Otis Elevator Company (Singapore) Pte Ltd	Mr Ren Chang
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Metal Industries Workers' Union	Mr Timothy Phang
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Workplace Safety and Health Council	Mr Han Kin Sew

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Useful References

- Singapore Standard SS550: Code of practice for installation, operation and maintenance of electric passenger and good lifts, Singapore
- Code of Practice for Working Safely at Height
- EN 81-20 and EN 81-50 – NEW LIFT STANDARDS
- BS 7255:2012 Code of practice for Safe working on lifts, United Kingdom
- BS EN 13015: 2001 +A1:2008 Maintenance for lifts and escalators—Rules for maintenance instructions, United Kingdom
- Code of Practice for Safety at Work (Lift and Escalator), Labour Department, Hong Kong.
- Guide on Safety in Lift Repair & Maintenance, Labour Department, Hong Kong
- Code of Practice for Safety at Work (Lift and Escalator). Occupational Safety and Health Branch, Labour Department (<http://www.labour.gov.hk/eng/public/os/lift.exe>)
- Safety Code for Elevators and Escalators. ASME A17.1-2013 / CSA B44-13

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