

Lift Maintenance & Modernisation

Er. Wang Yu

Principal Engineer,

Electrical and Mechanical Engineering Group

Building and Construction Authority



Objective

Provide MA/FM with the necessary knowledge to better support MCST Councils and Lift Owners in managing their lifts.

Table of Contents

Part 1: Lift Components and Safety Critical Functions

Part 2 : New Building Control (Fixed Installation) Regulations

Part 3 : Maintenance Outcome Inspections and Daily Checks

Part 4 : Lift Modernisation

Part 5 : Ensure lifts continue to function well



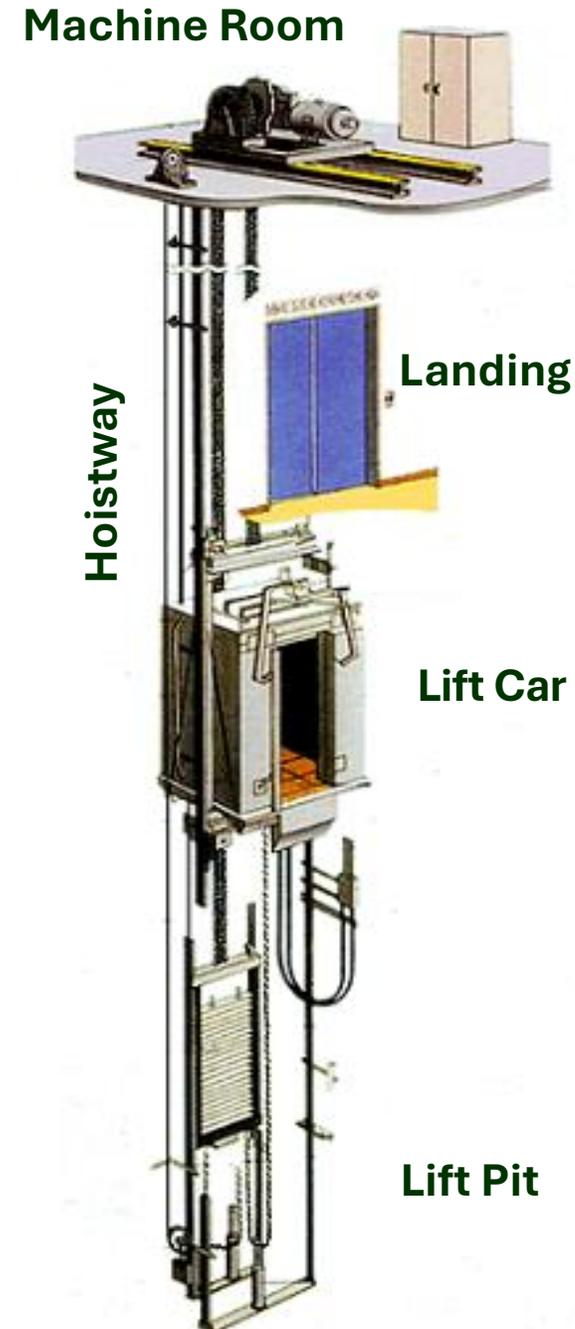
Part 1

Lift Components and Safety Critical Functions

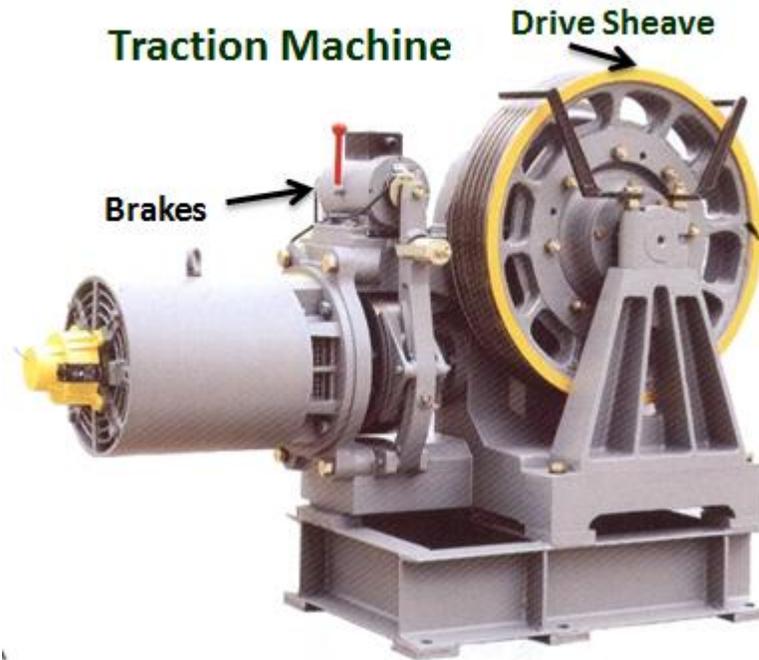


Lift System - General

- Machine room
- Landing (or lift lobby)
- Lift car
- Hoistway (or lift shaft)
- Lift pit



Machine Room



Control Panel



Overspeed Governor



**Automatic Rescue device
(ARD)**



**Emergency
Battery Operated
Power Supply
(EBOPS)**

Hoistway

- ◆ Lift car
- ◆ Counterweight
- ◆ Guide rails
- ◆ Hoisting ropes
- ◆ Governor rope
- ◆ Travelling cables
- ◆ Limit switches
- ◆ Levelling plates

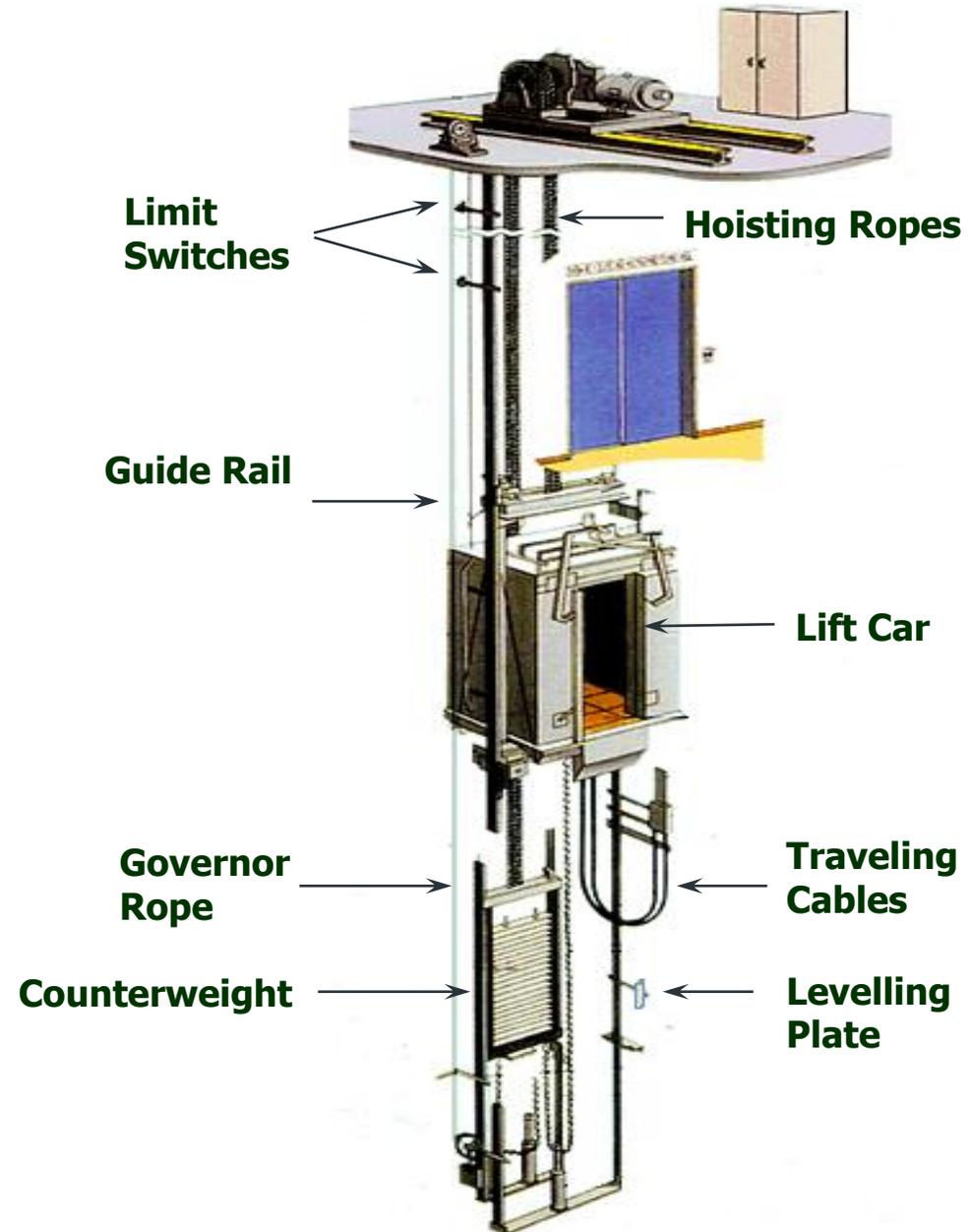


Image courtesy - Singapore standards
SS550



Part 2 Building Control (Fixed Installations) Regulations

NEW

Implemented 1 October 2025



Building Control (Fixed Installations) Regs

Design

Installation

Operation & Maintenance

Alteration & Replacement



Standards



Type testing of lift model and safety components.

Qualified Person (QP) prepare and certify plans to be submitted for approval.

• **Fixed installation contractor** carry out FI works in accordance with approved plans.

• **QP supervise** the contractor's examination, inspection, testing & commissioning (EITC) of FI after completion.

Periodic maintenance; Owner appoint **service contractor to maintain** according to prescribed requirements.

Renewal of PTO annually: **QP supervise** the contractor's examination, inspection & testing of FI.

Owner notify BCA in writing before work commences.

QP prepare and certify plans to be submitted for major A/R works, supervise contractor's EITC of FI after works completion.

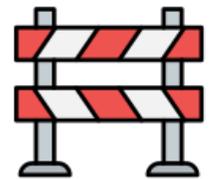
BMSM (Lift, Escalator and Building Maintenance) Regs 2016 has been repealed

To tighten L&E safety standards right from the start:

- Design of lifts to be approved before installation in accordance to approved plans → **minimise non-compliances downstream, difficult to rectify later on.**
- Major alteration & replacement to require plan approval before works commences.

Fixed Installation (FI) Owners- Key Duties

- Ensure that the FI is kept in good working condition at all times (except during periods of maintenance or when there is no PTO).
 - Appoint supervisor QP to supervise FI works contractor's examination, inspection, testing and commissioning (EITC) of FI for application of 1st PTO.
 - Ensure that the FI is periodically maintained and examination, inspection, testing (EIT) is carried out in accordance with the Regulations.
 - Appoint FI service contractor to maintain the FI.
 - Appoint specialist professional engineer (SPE) and FI service contractor to conduct EIT on the FI for renewal of PTO.
- Ensure that no works done to the FI renders the FI unsafe.
 - Ensure that the FI is not operated if it is unsafe to do so.



Building Control (Reportable Matters) Regs

- Prescribe the reportable **safety incidents** and **safety risks** of the fixed installations

Reportable **safety incidents** may include, but are not limited to, occurrences such as:

- (a) injury/fatality associated with the operation of the FI, or
- (b) failure or abnormal operations of FI components.

For example:

- Lift car ascending or falling suddenly in an uncontrolled manner
- Abnormal entanglement of lift wire ropes

Reportable **safety risks** may include, but are not limited to:

- (a) a FI component or software that does not conform to or perform as per required, or
- (b) inappropriate use of a FI component under conditions that would pose safety risks

For example:

- Improper design in the circuitries
- Missing or damaged bolts of geared machines in Lifts

Building Control (Reportable Matters) Regs

- When reportable matter must be notified:
 - i) Within **72 hours** after becoming aware of safety risks.
 - ii) Within **6 hours** after becoming aware of safety incidents.
- Prescribe the manner of reporting and info to be reported. E.g. reporting is done using
 - FormSG (<https://form.gov.sg/67da6812018539882154da5d>) or
 - Phone call (Safety Incident Hotline 9088 7289 or 9782 7296)
- Report must contain information such as the **name and address of reporter** as well as **location and details** of reportable matter.
- Ensure that the lift or escalator is shut down and cordoned off to preserve the site

More info can be found at:

<https://www1.bca.gov.sg/regulatory-info/lifts-escalators/lifts-and-escalators-legislation/incident-notification>



Part 3

Maintenance Outcome Inspections and Daily Checks



Maintenance Outcome - Lift

1. Door open control
2. Door protective devices
3. Lift car door and lift landing door
4. Lift car emergency alarm
5. Lift car intercom
6. Lighting and ventilation fan
7. Emergency power supply for lift car
8. Emergency lighting and ventilation fan
9. Movement of lift car
10. Housekeeping of lift
11. Lift machine and drive
12. Brakes of lift machine and drive
13. Direct current machine
14. Overspeed governor
15. Main ropes and compensation ropes
16. Compensation rope and compensation rope sheave tie-down and tensioning
17. Buffer
18. Controller and electrical system
19. Guide shoes or rollers of lift car and counterweight
20. Guide rail for lift car and counterweight
21. Safety gear
22. All lift parts
23. Stopping or level accuracy

Maintenance Outcome - Escalator

1. Signage and indicator
2. Anti-climbing, anti-sliding, access restriction and deflecting device
3. Emergency stop switch
4. Handrail system
5. Housekeeping of escalator
6. Driving machine
7. Brakes and auxiliary brakes
8. Safety Switches
9. Excessive speed and unintentional reversal protection
10. Operational clearance
11. Any escalator parts
12. Controller and electrical system

Daily checks to ensure safe operations of lift and escalator

- BCA issued a circular on 4 September 2023 to advise owners of duties to ensure safe operations of lifts and escalators
- Daily checks on lifts
 - a. Car Door open buttons are working as intended.
 - b. Car Door edge protection devices (e.g., safety edges, light curtains) are operational.
 - c. Alarm bell and intercom system are functional.
 - d. Lift lighting and ventilation fan are in operation.
 - e. Lift car floor and landing floor are level
- Daily checks on escalators
 - a. The handrail belts are properly tensioned.
 - b. The difference between the speed of the handrail belts and the steps is between 0 and +2%.
 - c. The escalator steps and comb are free from debris.
 - d. The sides of the escalators are free from any sharp protrusions that could potentially cause injury to the users.

Door open control

Check

Ensure that when the door open button in the stationary **lift car** is pressed, the lift doors must **reopen and stay open**.



Door open button check - lift car

Door protective devices

Check

Ensure that upon activation of any door protective devices and sensors (e.g. lift curtain, door safety edge), the doors **must reopen**.

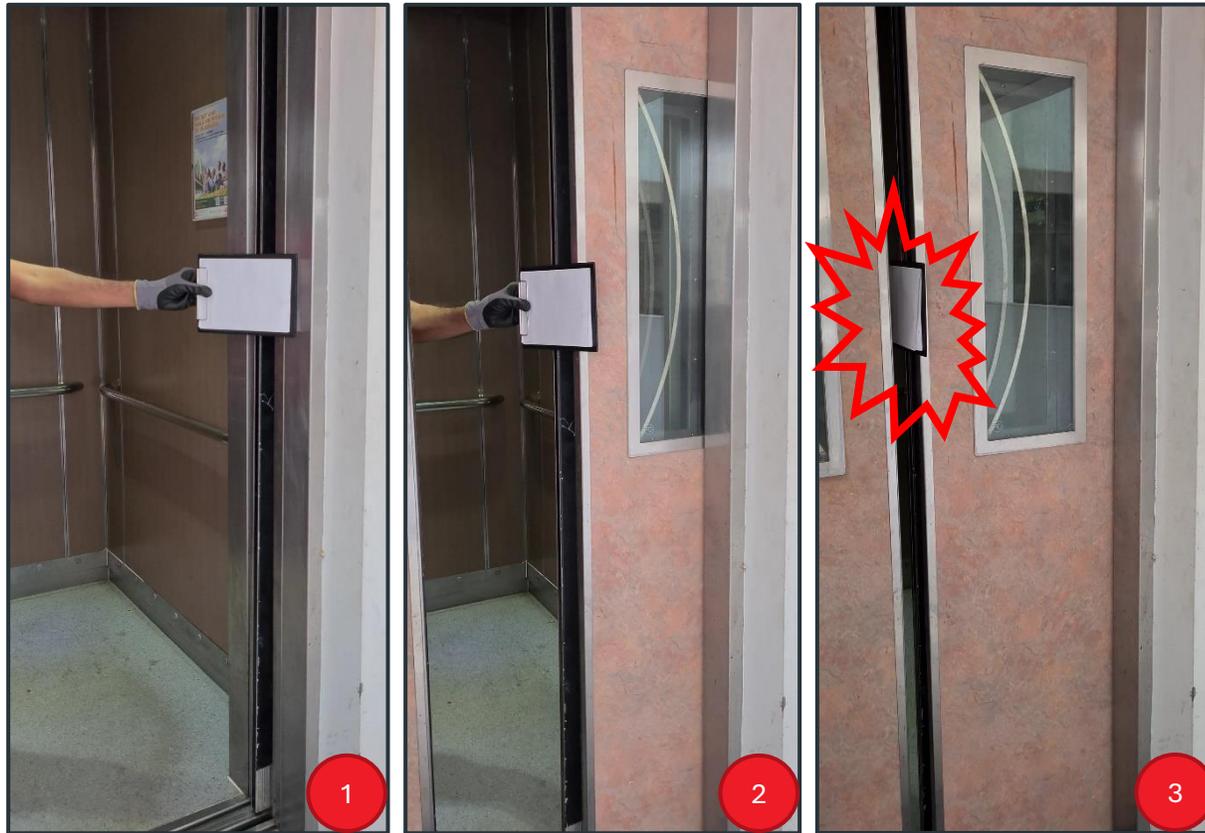


Light curtain



Door safety edge

Door protective devices



Prevent

Faulty door protective devices and sensors could potentially hurt lift users if the doors do not reopen upon activation.

Faulty door protective device

Lift car intercom

Check

Test the intercom system to make sure that the voice communication can be heard both ways.



Intercom system

Lift car emergency alarm

Check

Press the lift car emergency alarm to check if it can be heard from outside the lift well and at the designated floor.



Alarm button check

Lighting and ventilation fan

Check

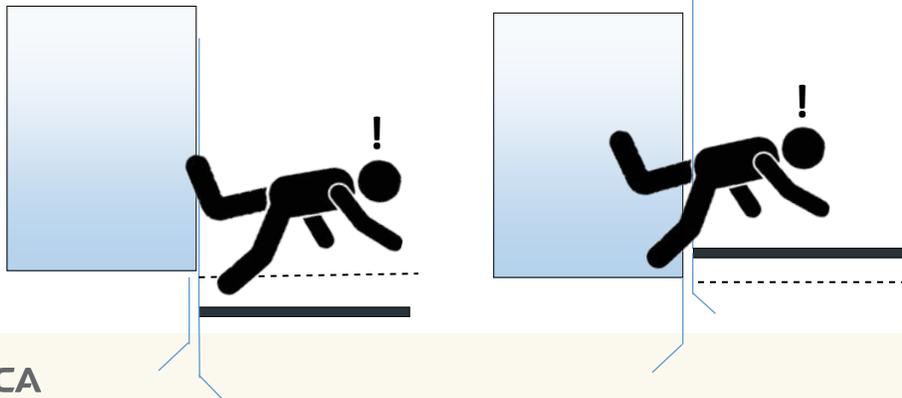
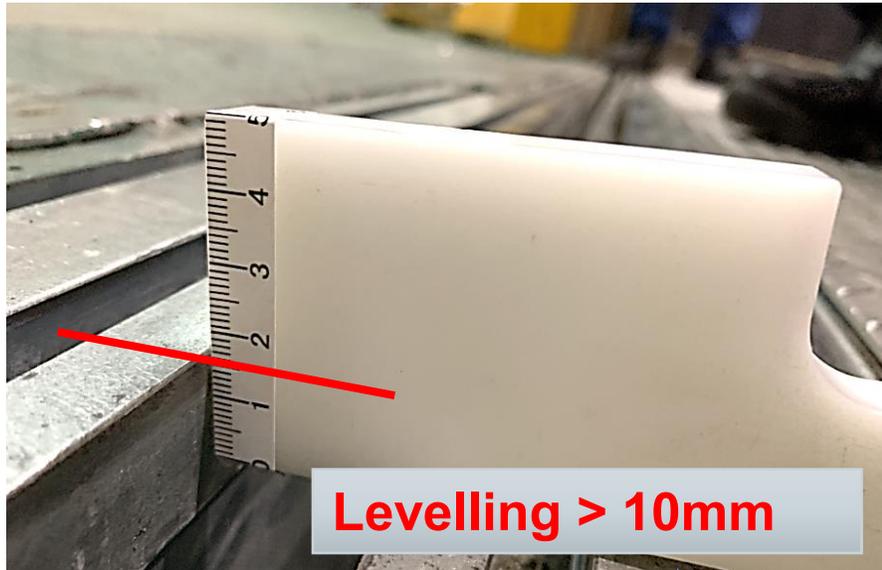
Ensure the lighting and ventilation fan for the lift car are functioning properly.

Check for steady lighting and ventilation fan is operating at adequate strength



Prevent

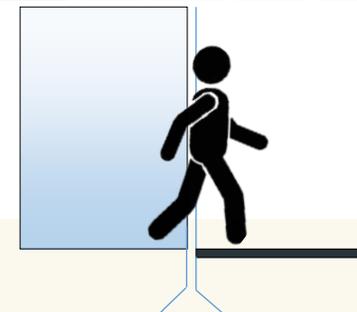
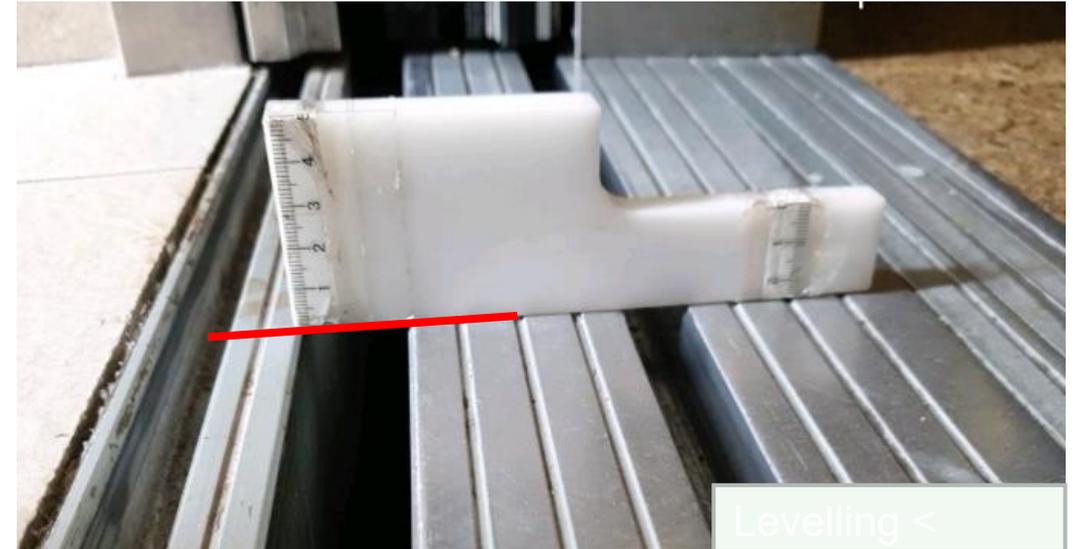
Prevent poor leveling as it is a tripping hazard.



Stopping or level accuracy

Check

Make sure that the stopping accuracy between the lift car and landing floor level **must be $\pm 10\text{mm}$** .



Handrail's tension

Check

Check that the handrail belts are properly tensioned. When handrail is pulled, the handrail should **not** slip or stop.

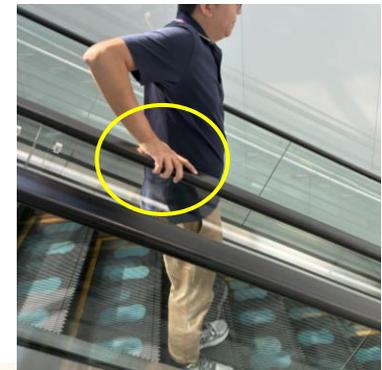
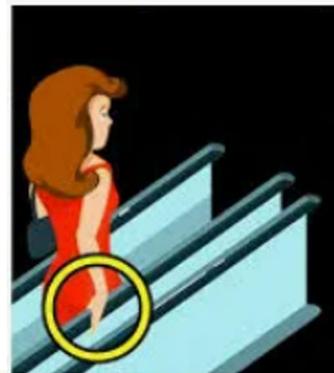


Conduct handrail pull test to check for any slippages

Handrail's speed

Check

The speed difference between the handrail belts and the steps ranges from 0% to +2%. When travelling the full length of the escalator, the hand position should not shift back by more than half an arm's length.



Escalator's steps and combs

Check

The escalator steps and combs are free from debris and are generally in good condition.



The escalator step edge is clearly demarcated with **yellow lines**



Sufficient lighting near the comb area and the combs are in good condition



Missing demarcation plates on escalator step



Consecutive broken teeth on escalator comb

No Sharp Protrusions

Check

The sides of the escalators are **free from any sharp protrusions** that could potentially cause injury to the users.



Skirt panel



- No sharp edge and protrusion at the sides of the escalator
- Skirt brush is properly secured with no excessive wear



Skirt brush



- **Sharp protrusions** that could potentially cause injury to the users.

Skirt panel



Part 4

Lift Modernisation

Section 1 : Ageing Lifts and their issues

Section 2 : Lift Modernisation

Section 3 : Plan Early and Budget Well



Issues with Ageing Lifts



Increased Frequency of Breakdowns

- **System-level deterioration** involving Various component
- Longer service interruptions impacting occupants, especially those with mobility needs



Escalating Maintenance Costs

- Recurring repairs increase expenses
- Sourcing replacements becomes harder with system age

Underlying Factors

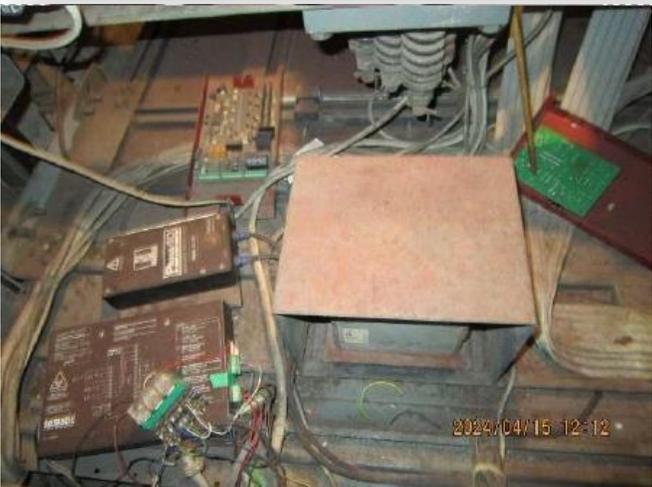
- Mechanical and Electrical/Electronic (M&E) components are prone to **deterioration**
- Tech advancement also causes **obsolescence** (e.g., printed circuit boards)

Case study: Obsolete components not readily available



- **40 years old** condominium
- **The controller and many other parts are obsolete**
- Jerks and excessive mis-levelling are common with **frequent breakdowns**
- Contractor ultimately informed owner they must **terminate the maintenance contract** due to unavailable parts

Case study: Frequent breakdowns due to wear and tear



- **Frequent faults** and **prolonged repair times** at 30 years old condominium
- Residents were dissatisfied and felt that the contractor was no longer competent to maintain the lifts
- Funds were spent on two independent lift audits to find out cause of frequent faults
- Lift audits found **that the frequent breakdowns were due to wear and tear but parts replacement was challenging due to obsolescence**

What is Lift Modernisation

A **system-level** upgrade of the entire lift **with new technology, better safety features**, and aesthetic enhancements to improve overall performance, safety, and appearance.

Modernisation



Repeated Repairs

Why timely modernisation of lifts is preferred over repeated repairs?



Compliance with the latest standards



Improved performance and reliability



Energy efficiency & additional features



lower maintenance cost



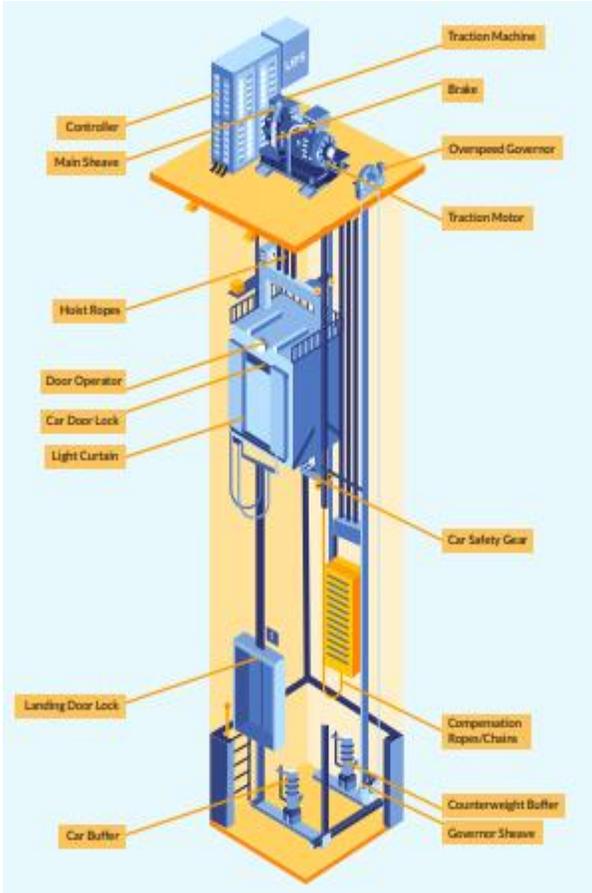
Enhanced Image of the estate

Case study: “Inadequate” Lift Modernisation

- 20 years old condominium with 12 lifts
- MCST spent more than \$800k to upgrade the lifts in 2023 (18th year mark)
 - Upgrade of controller and other electronic components;
 - Car interior aesthetic improvement; and
 - Only overhaul of traction machine
- However, **frequent lift breakdowns still occurred**
- **MCST incurred additional \$200+k in subsequent year** to replace the other lift parts and **residents suffered lift disruption twice**

Recommendations for Lift Modernisation

Modernisation should involve a **comprehensive system-level rejuvenation**, including all major M&E components, to meet current design standards.



Mechanical Parts: ✓

Examples:

- 1 Traction machine and Brakes;
- 2 Ropes/belts; 3. Sheave; 4 Buffers
- 5 Safety Gear and Governor;
- 6 Landing/car door locks etc;

Elect/Electronic Parts: ✓

Examples:

- 1 UPS batteries; 2 Traction motor drive; 3 Car door motor drive; 4 Switches/sensors used in safety circuits; 5. Main Controllers /Car door controller and PCBs* etc

Structural Parts:

(subject to Condition Assessment)

Examples:

- 1 Guide rail; 2 Landing door; 3 car frame;
- 5 Car top handrail; 6 Pit ladder etc

Additional Features: ✓

Examples:

- ACOP and UCMP****, Remote Monitoring and Diagnostics (RM&D), Regenerative Drive, etc

Modernisation Plan – Fund Preparation



Plan Ahead and Build Reserves

- Lift modernisation is a significant expense
- Recommended to budget min. **\$120k** per lift
- Increase sinking fund contribution or special levy if inadequate funds
- Regularly obtain cost updates from contractor to ensure that the budget planned is sufficient

Consult a Lift Consultant / Contractor

- Modernisation cost depends on factors like the number of floors, speed, capacity, and brand etc.
- Engage a **lift consultant** to advise and manage the lift modernisation exercise
- Obtain quotations from **lift contractors** for budgeting



LIFT MODERNISATION

STRATA
INSIGHTS

AND WHY MANAGEMENT CORPORATIONS
(MCST) SHOULD PRIORITISE IT

BETTER PERFORMANCE - REDUCE BREAKDOWNS; IMPROVE UPTIME



Older lifts, especially those over 20 years old, face parts obsolescence and frequent breakdowns, leading to increasing repair costs and longer downtimes.

Rejuvenating ageing lifts through modernisation could improve performance with improved uptime and reduced downtime, as breakdown rate decreases and replacement parts are readily available.

EQUIPPED WITH LATEST TECHNOLOGY AND SAFETY FEATURES



Modernisation enhances overall performance - safer and more reliable. Modernised lifts could be fitted with Remote Monitoring and Diagnostics (RM&D) solutions for 24/7 performance monitoring, enabling predictive maintenance for better lift performance. In addition, the older lifts could be enhanced with safety features in the latest lift standards required for new lifts.

LOWER OPERATING COSTS



Modernised lifts would also be equipped with efficient green features to reduce energy consumption and operating costs.

IMPROVED RESIDENT SATISFACTION AND PROPERTY VALUE



Modernised lifts enhance overall living experience and add to property value. Clear communication about the process can boost resident support and satisfaction.

TAKE ACTION



- ✓ **Start building sinking funds** now to avoid potential hefty special levies downstream;
- ✓ **Consult your Management Council or Managing Agent** about existing plans to modernise the lifts or initiate discussions;
- ✓ **Discuss and support the lift modernisation proposal** at the General Meeting.



For detailed recommendations on modernisation items and planning, refer to the BCA's Guide on Implementing a Maintenance Control Plan (MCP)

go.gov.sg/bca-mcp-guide

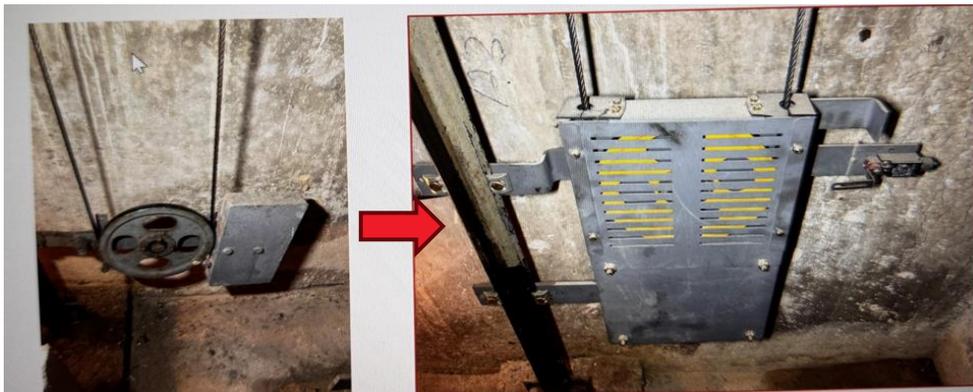


Case Study : Well-planned Lift Modernisation



- 33 years old condominium
- Discussed with lift contractor in 2016 for lift modernisation and executed in 2023
- Collected \$120k per lift set aside in Sinking Fund (no Special Levy required)
- ✓ Modern design enhances the estate's image
- ✓ Smooth rides during operation
- ✓ Precise leveling eliminates tripping risks
- ✓ Substantial savings in electricity consumption

Early planning = Better outcome





Part 5

Ensure lifts continue to function well

Maintenance Control Plan (MCP)

Remote Monitoring and Diagnostic (RM&D)

Outcome-Based Contracting (OBC)



Maintenance Control Plan (MCP)

A set of **maintenance details** prepared by the contractor/supplier for the owner's **lifecycle management** of their lifts. This includes information on part replacement criteria for safety-critical components for planning and ensuring lifts can operate safely.

Objective of MCP



Fund set aside for parts replacement



Easy to review and decide parts replacement proposal



Reduced downtime due to early parts procurement



Detailed repair and replacement records

Key Components of MCP



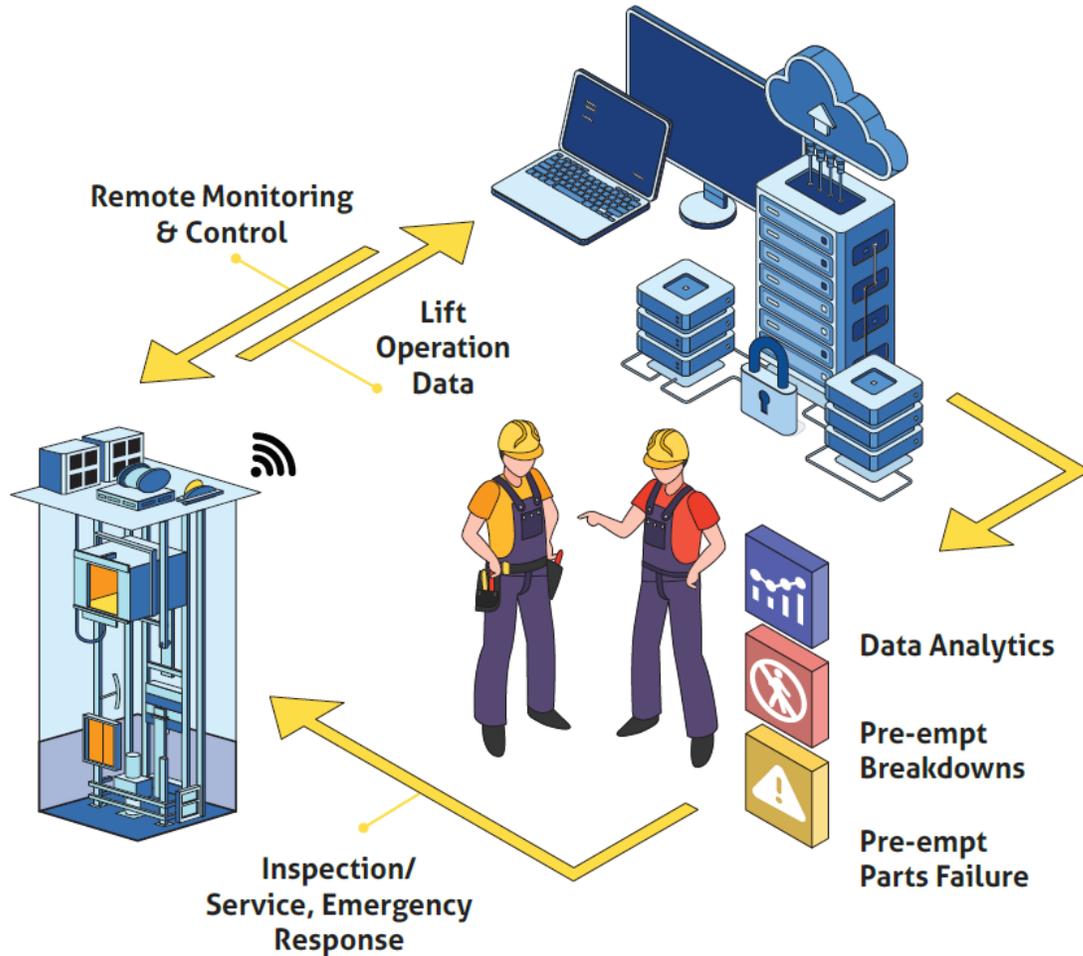
Replacement Criteria of Parts with Indicative Cost and Lead Time



Condition Assessment of Safety Critical Parts for Ageing Lifts



Remote Monitoring & Diagnostics (RM&D)



- A technology that uses **IoT** to **continuously monitor** lift operations and **provides diagnosis with Artificial Intelligence (AI)**



24/7 monitoring of safety-critical and reliability aspects



- Predictive maintenance
- Targeted and efficient rectifications
- Increase lift uptime



Effective life cycle management driven by usage and performance data

Outcome-based Contracting (OBC)

Lift owners specifying contract requirements in terms of expected **performance** levels, rather than fixed amounts of resources (e.g. manpower)



- Clear set of contract terms based on **service standards** and **performance** for transparent exchange between stakeholders
- Encourage accountability and reward reliability



- **Collaborative partnership** between owners and contractors (win-win situation)

Available Resources



<https://go.gov.sg/lift-owner-guide>

Good Practices Guide for
Lift Owners



<https://go.gov.sg/bca-mcp-guide>

Guide to Implement
Maintenance Control Plan
(MCP)



<https://go.gov.sg/outcome-based-contracting-for-lift-maintenance-contracts>

Guide on Specifications for
Outcome-Based Lift
Maintenance Contracts

Start planning for lift modernisation



Over 20 years: plan and act soon

- Conduct an assessment of the lifts
- Ensure that you have sufficient sinking funds
- Seek mandate through AGM or EOGM



Newer lifts: start early to prepare smoothly



For more information on lift modernisation:

jake_ang@bca.gov.sg OR
wang_yu@bca.gov.sg





Thank You



@BCASingapore