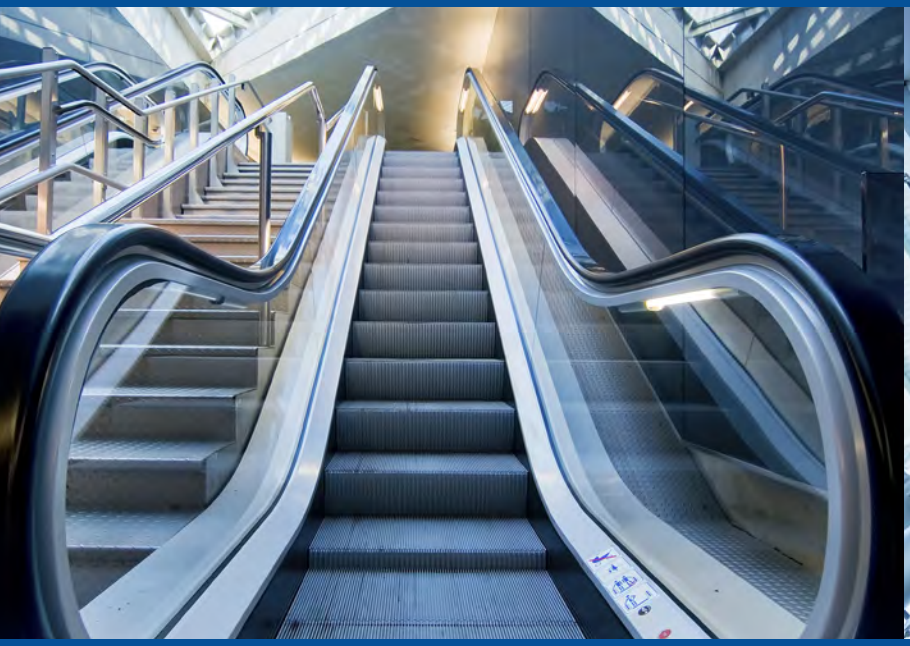
AUSTRALIAN ELEVATOR ASSOCIATION **HANDBOOK**



Lift and Escalators

2015

INTRODUCTION

Forward

The Australian Elevator Association has pleasure in issuing a third version of our Owners Handbook, first published in 2006 and revised in 2009.

The need to update the Owners Handbook after only five years is due to changes in the products provided by our industry and from a change in jurisdictional management of those products.

The introduction of a national Work Health & Safety (WHS) Act, which has been adopted by most states has created a raft of new model WHS legislative package, has been adopted by most states and territories. The package includes Act , regulations, Codes of Practice and Guidance documents. Many of which impact on those involved with lifts or moving walks.

The WHS legislative package reinforces that everyone in the workplace has a work health and safety duty. There are some new concepts and terms. “Person in control of a business or undertaking” and the term and its abbreviation “PCBU” will become more common over time. (See Section 3)

These changes reflect changes in the social expectations and nature of work in our society.

Commonly used terms are changing also, which reflects changes in the social fabric of our society. Lifts are being referred to as ‘elevators’ and as these terms are synonymous both appear in this issue. Lifts (elevators), escalators and moving walks are more often being classified as ‘vertical transport’ and this term is also used in this issue.

In addition, lifts, escalators and moving walks are classified in the WHS legislation and guidance as ‘high risk plant’. Section 5 brings to the fore industry concerns about energy utilisation. Appendix A is a useful guide to understanding how our industry meets the challenge of minimising its use.

As technology is continually changing a section has been dedicated to the latest form of elevator despatch management system known as ‘destination control’. (See Appendix B)

This 2015 edition of the Owners’ handbook is designed to assist owners, installers and service providers alike in understanding their responsibilities in relation to risk management for all types of vertical transport.

AEA invite you to make full use of this valuable resource document.

Referenced documents

The following documents are referred to in this Guide.

ABCB Guide	Information Handbook: Lifts Used During Evacuation 2013
AS1657	Fixed platforms, walkways, stairways and ladders — Design, construction and installation
AS1735	Standards for Lifts, escalators and moving walks
AS4360	replaced with AS/NZS ISO 3100
AS4431	Guidelines for safe working on new lift installations in new constructions
AS4836	Safe working on or near low-voltage electrical installations and equipment
AS/NZ 3000	Wiring Rules
EN81-80	Safety rules for the construction and installation of lifts. Existing lifts. Rules for the improvement of safety of existing passenger and goods passenger lifts
EN 115-2	Safety of escalators and moving walks — Part 2: Rules for the improvement of safety of existing escalators and moving walks
EN 13015	Maintenance for Lifts and escalators- Rules for Maintenance instructions
ISO14798	Lifts (elevators), escalators and moving walks — Risk assessment and reduction methodology
ISO 25743	Lifts (elevators) — Study of the use of lifts for evacuation during an emergency
ISO 25745 parts 1 to 3	Energy performance of lifts, escalators and moving walks
ISO/IEC Guide 2	Standardisation and relative activities — General Vocabulary
ISO Tr 18870	Lifts (elevators) — Requirements for lifts used to assist in building evacuation
NCC 2014	National Construction Code (BCA

CONTENTS

SECTION 1

1 Risk management plan and life cycle

A person conducting a business or undertaking must ensure, so far as is reasonably practicable, that workers and other people are not exposed to health and safety risks arising from the business or undertaking.

A 'person conducting a business or undertaking' is a term that includes all types of working arrangements such as organisations, partnerships, sole traders or small business owners. For example a builder, a construction business, a crane hire company, a franchisee and a self-employed person operating their own business are all persons conducting a business or undertaking.

A person conducting a business or undertaking who has management or control of a workplace must ensure, so far as is reasonably practicable, the workplace, the means of entering and exiting the workplace and anything arising from the workplace is without risks to health and safety.

Officers, such as company directors, have a duty to exercise due diligence to ensure the business or undertaking complies with the Work Health and Safety (WHS) Act and Regulations. This includes taking reasonable steps to ensure the business or undertaking has and uses appropriate resources and processes to eliminate or minimise risks in the workplace.

Workers and other people at the workplace must take reasonable care for their own health and safety, co-operate with reasonable policies, procedures and instructions and not adversely affect other people's health and safety.

1.1 RISK MANAGEMENT PLAN

Each item of "in service" plant should be covered with a Risk Management Plan. This plan should contain a current Hazard and Risk Analysis which identifies how each hazard is managed to economically and adequately reduce risk, taking into account the life cycle of the plant.

The plan also needs to cover matters such as the modernisation of plant, especially as time passes.

Financial aspects must also be covered with a budget and the provision of funds to cover future works.

When plant is altered the parties involved in any work should provide the owner with an updated "safe to operate" statement. Care needs to be taken to ensure that local requirements in relation to registration are met to cover any alteration.

A lift, escalator or moving walk only delivers maximum safety when it is used correctly and those who fail to do this must remain responsible for the consequences of their actions and those of children under their care.

Adults in charge of children should supervise them whilst travelling on escalators and moving walks.

An area warranting special attention is falls from escalator or moving walk related structures

1.2 PERSON IN CONTROL OF BUSINESS OR UNDERTAKING (PCBU)

This section provides a brief understanding of each PCBU's responsibilities as defined in the Work Health and Safety Act and Regulations. (Refer to your States / Territory Local Act and Regulation)

1.2.1 Owner (PCBU)

An owner has a responsibility to ensure that plant is maintained and is` safe for users and workers, including the service provider, paramount in this are that access to and egress from the plant is safe.

Areas of responsibility

- Control risks for users and workers
- Implementation of a Risk Management Plan for the plant (Refer to life cycle of plant)
- Ensure plant is safe
- Ensure plant is registered with the relevant authority
- Ensure that plant is maintained in accordance with a maintenance regime
- Provide a safe work place
- Provide safe access and egress to plant for users and workers
- Keep maintenance records

See Appendix D for a general check list

1.2.2 Service Provider (PCBU)

A service provider has a responsibility to ensure the work place is safe for their workers and has a duty of care to inform the owner of any identified hazards.

Areas of responsibility

- Control risks for users and workers when maintaining the plant
- Inform owner on equipment condition
- Maintain plant as per contract
- Ensure a safe work environment is provided
- Provide SWMS
- Provide adequately trained personnel
- Develop a maintenance regime for the plant
- Provide maintenance records
- Provide annual safety statement

1.2.3 Owner

Matters including but not limited to the following list should be regularly inspected by building owners representatives

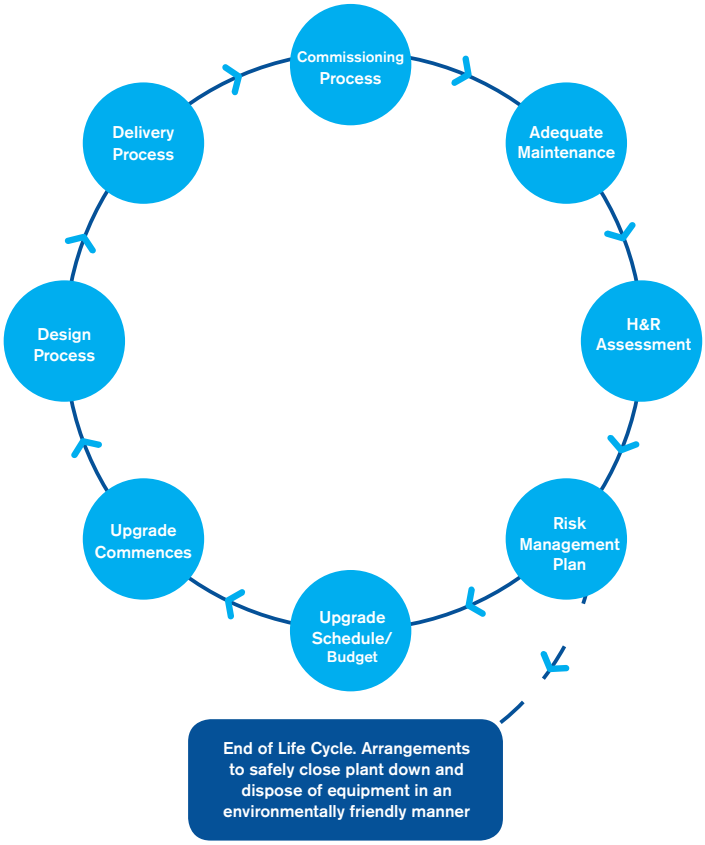
- Floor levels
- Slip and trip hazards
- Smoothness of operation
- Satisfactory operation of the emergency communication device
- Any unusual in-service conditions, like stopping in mid-flight
- Tendencies for doors to 'bump' users
- The adequacy of protection to prevent falls from an escalator or moving walk related structures

There needs to be a system in place to ensure that a service provider is regularly updated with any concerns relating to all items of plant.

1.3 ACCESSIBILITY

Any plant that is required to be "accessible" should comply with the relevant sections of the NCC.

It is suggested that plant life cycle is as per the following diagram



SECTION 2

2 Installation, alteration, modernisation, repair and maintenance

2.1 SAFE WORK METHOD STATEMENTS (SWMS)

Refer to the Original Equipment Manufacturer (OEM), equipment supplier or service provider for relevant SWMS for working procedures relating to installation, alteration, modernisation, repair and maintenance.

For a SWM template, refer to the Safe Work Australia Code of Practice

2.2 INSTALLATION

The Installation process should be carried out in accordance with the OEM's instructions and SWMS. If no OEM instructions are available then procedures for the installation process and SWMS should be developed by a competent person.

Australian Standard AS4431 Guidelines for safe working on new lift installations in new constructions may provide guidance in regards to the installation process.

2.2.1CERTIFICATION

The installer should have processes for the following areas:

1. Installation to be to the manufacturer's instructions and the company's SWMS
2. A competent person should commission and test the installation in line with the designer's instructions
3. The unit should comply with the requirements of AS/NZS3000
4. The certifier should provide documentation that the unit is safe to operate before the unit is placed into service

Note: A certifier may note in the certificate, building items, but it must be clearly understood by all that the certifier's qualifications limit the validity of "safe to operate" to cover only equipment supplied in conjunction with the item of plant's design.

2.3 ALTERATION

The following typical examples could be considered as constituting an alteration which may affect the overall risk management principles of the design.

a) Any increase or decrease of
- The rated speed
- The rated load
- The mass of the car +/- 5%
- The travel

b) The change of machine or the traction sheave

Note: An alteration of design submission may be required for the above items.

2.4 MODERNISATION

Any change in the design that uses new technology or replacement components to improve the reliability and safety of the item of plant and where the risk assessment indicates no increase in risk.

A company engaged in a modernisation should assess the item of plant with regard to the individual components to be modernised.

The company should determine the design (inclusive of component selection, drawing, data, field instructions, installation, commissioning, maintenance and usage) that meets the requirements of the customer without introducing any new risks.

Upon completion of the modernisation and the commissioning procedures, the modernisation company should issue a "safe to operate" statement to the client

Note: Where any part is modified and may impact on the fire rating of that part then an alternative fire opinion may be required

Appendix C provides a list of known hazards which should be addressed as part of any modernisation process

See Modernisation definition on page 22

2.5 REPAIR

Repairs to plant should only be carried out by competent persons.

See Repair definition on page 22

2.6 MAINTENANCE

Guidance on who is competent to conduct maintenance and inspection of lifts, escalators and moving walks

Background

The Work Health and Safety Regulations (WHS) require that, plant must be maintained, inspected, and if necessary, tested by a competent person. If practicable this should be done according to the manufacturer's instructions.

For a competent person to perform inspection of lifts, escalators or moving walks they:

- Should have a trade qualification in a mechanical associated trade, electrical trade or associate engineering qualification
- Should have a comprehensive understanding of relevant design and safe use/maintenance standards this would include the relevant design standard used
- Should have a minimum of 5 years experience in the lift industry

2.6.1 MAINTENANCE PROVIDER

The Maintenance provider should:

Maintain plant so that with consideration to fair wear and tear, original or altered design parameters are maintained in relation to

- Performance
- Safety
- Provide advice in relation to their expertise as is reasonably required by the owner
- Provide "Adequate Maintenance" statements
- To attend to calls for service
- To repair equipment as specified in individual contracts
- Advise, according to commercial arrangements in relation to Hazard and Risk and Risk Management
- Planning

A maintenance program should be developed and undertaken in accordance with the standard EN13015 "Maintenance for lifts and escalators - Rules for maintenance instructions." Contact Standards Australia for a copy of this if required.

EN13015 Scope

This European Standard specifies the elements necessary for the preparation of the instructions for the maintenance operations, which are provided for new installed passenger lifts, goods passenger lifts, accessible goods only lifts, service lifts, escalators and passenger conveyors.

SECTION 3

Licensing and plant registration

3.1 DESIGN REGISTRATION

All High Risk plant (lift, escalator and moving walks) must be Design Registered with the relevant authority before it is placed on site.

Refer to your local Statutory Body for details

3.2 PLANT REGISTRATION

A current Item Registration Certificate issued by the relevant authority must be obtained before a lift, escalator or moving walk can be placed in general service.

Where an item of plant is to be used prior to practical completion during the construction period of a building i.e. as a “Builders Lift” then it is recommended that any specific requirements for Item Registration be confirmed with the local statutory authority.

3.3 LICENSING

Refer to local State / Territory regulations for Guidance.

SECTION 4

4 Hazard and Risk

4.1 HAZARD AND RISK

Risk assessment consists of risk analysis and risk evaluation. ISO 14798 is a guideline for risk assessment.

The objective of risk assessment is to describe principles and set procedure for a consistent and systematic risk assessment methodology relevant to all forms of vertical transport. Risk assessment is a tool used to identify risks of harm resulting from various hazards, hazardous situations and harmful events. It offers ways to develop strategies and corrective actions to eliminate or reduce the risks such that the residual risk is at a level acceptable to prevailing community standards. This methodology is useful in assessing design, operation, testing and the use of plant equipment and should always be performed by a balanced team approach.

Risk analysis includes:

- determination of the subject of analysis
- identification of scenarios: hazardous situations, harmful events and effects
- risk estimation of the severity and probability of occurrence of a harmful event

Risk evaluation is undertaken to determine if any corrective measures need to be undertaken to eliminate or reduce the risk. The methodology identifies three risk levels (High, Medium and Low) and specifies actions that must be taken for each risk level. The risk is evaluated by identifying the corresponding risk group based on the risk level estimated in the risk analysis.

Risk reduction is achieved by implementing one or more of the following:

FIRST
Eliminate the hazard

The best way to eliminate a risk is to completely remove the potential hazard from a design; however it is often the case that it is impractical to completely eliminate hazards, particularly for something constructed a long time ago.

SECOND
Minimise the risk of the hazard

If a hazard cannot be eliminated, and if the risk is not adequately controlled, then the design should be modified to minimise the risk of the hazard by the following

1. Substitution
2. Modification
3. Engineering controls
4. Isolation of the hazard

THIRD
Administrative controls (Policies, Procedures)

If risks cannot be adequately minimised through the previous techniques then these techniques should also be applied.

FOURTH
Personal protective equipment

This options is the least desirable means of controlling a risk because they rely on a persons behaviour.

It is also important to consult with the OEM designer when considering new risk control measures, because new risk treatments can have unforeseen effects upon safety and can introduce additional hazards.

Once the risk reduction process has been completed the risk should be re-estimated to ensure that the residual risk now falls within an acceptable risk group. If a new risk is created by the risk reduction measures then the process should be repeated on the new risk until it is eliminated or the residual risk has been reduced to an acceptable level.

This process ensures that a proactive approach is undertaken to identify and reduce risks when equipment is being designed, or installation and maintenance methods are being developed to reduce the probability of a harmful event.

Refer to EN81-80 for existing lifts

4.1.1 EN81-80 SCOPE

4.1.1.1 This European Standard gives rules for improving the safety of existing lifts with the aim of reaching an equivalent level of safety to that of a newly installed lift by the application of today's state of the art for safety.

NOTE Due to situations such as the building design etc. it may not be possible in all cases to reach today's state of the art for safety.

4.1.1.2 This standard applies for permanently installed

a) Electric lifts, with traction or positive drive

b) Hydraulic lifts; serving defined landing levels, having a car designed for the transportation of persons or persons and goods and moving between guide rails inclined not more than 15° to the vertical

4.1.1.3 This standard includes the improvement of safety of existing passenger and goods passenger lifts for:

a) users

b) maintenance and inspection personnel

c) persons outside the well, machine room and the pulley room (but in their immediate vicinity)

d) any authorised persons

4.1.1.4 This standard is not applicable to:

a) lifts with drive systems others than those defined in EN 81-1 or EN 81-2

b) lifting appliances such as paternosters, mine lifts, theatre lifts, appliances with automatic caging, skips, lifts and hoists for building and public works sites, ships' hoists, platforms for exploration or drilling at sea, construction and maintenance appliances

c) installations where the inclination of the guide rails to the vertical exceeds 15°

d) safety during transport, installation, repairs and dismantling of lifts

e) fire fighting operation

However, this standard can usefully be taken as a reference basis.

Refer to EN115-2 for existing escalators and Moving Walks

4.1.2 EN115-2 SCOPE

4.1.2.1 This European Standard gives rules for improving the safety of existing escalators and moving walks with the aim of reaching an equivalent level of safety to that of a newly installed escalator and moving walk by the application of today's state of the art for safety.

NOTE: Due to situations such as the existing machine or building designs, it may not be possible in all cases to reach today's state of the art for safety. Nevertheless the objective is to improve the level of safety wherever possible.

4.1.2.2 This standard includes the improvement of safety of existing escalators and moving walks for:

a) users

b) maintenance and inspection personnel

c) persons outside the escalator or moving walk (but in its immediate vicinity)

d) authorised persons

4.1.2.3 This standard is not applicable to:

a) safety during transport, installation, repairs and dismantling of escalators and moving walks

b) spiral escalators

c) accelerating moving walks

However, this standard can usefully be taken as a reference basis.

SECTION 5

Energy and working on electrical equipment

5.1 ENERGY

Energy Savings Possibilities – Lifts, escalators and moving walks

Most modern lift and escalator systems and even some older systems are very energy efficient for the work produced.

Nevertheless it may be possible to further decrease energy consumption, especially for older equipment.

AEA supports the efforts of the ABCB and the Green Building Council of Australia in encouraging well founded and improved energy efficiency measures for buildings

Refer to Appendix A

5.2 WORKING ON OR NEAR ENERGISED ELECTRICAL EQUIPMENT

Work should not be undertaken on energised electrical equipment, other than for testing, unless there is no reasonably practicable alternative and if undertaken should be subject to a comprehensive risk assessment and the development of a safe work method statement.

Guidance on isolation and safety measures can be found in AS/NZS 4836 - Safe work on low-voltage electrical installations. Or alternatively Energised Electrical Circuits are defined according to the definition set out in the current edition of AS/NZS3000.

5.2.1 Assessment

Energised electrical equipment in this document covers situations where the potential difference to earth is greater than 120VDC (ripple free) and/or 32VAC

5.2.2 Responsibility

- PCBU's are responsible for ensuring that their staff is fully conversant with the developed safe work method statement
- Employees carrying out work on electrical equipment are responsible for ensuring they abide by the requirements of this and other applicable safety instructions

5.2.3 Definitions

- Working on Electrical Equipment means making adjustments to, and /or adding, removing or replacing components and or wiring whilst the equipment is de-energised
- Testing Electrical Equipment means using approved testing devices to establish either the presence or absence of electrical energy
- Approved Testing Device means any metrology equipment carrying the stamp of Standards Australia or a European or USA approval authority. (They aren't any definitions in their current form)
- Risk: Inadvertent contact with electrical energy
- Controls: Use of Line workers gloves; insulated tools
- Controlled Consequence: No injury from contact with electrical energy possible

SECTION 6

6 Use of lifts in an emergency and safe access to lift pits

6.1 USE OF LIFTS IN AN EMERGENCY

Reference the ABCB (Australian Building Code Board) document titled "Information Handbook: Lifts Used During Evacuation 2013").

This book was developed in consultation with the AEA and other parties as an additional solution that enables people (particularly those with a disability or health condition) to egress a building, or part of a building, using lifts.

The objective of safely using lifts for evacuation is not intended to diminish the importance of other evacuation measures such as emergency stairs and is not intended to reduce the number of exits, particularly the number of emergency stairways.

This Information Handbook is to complement the NCC objective of fire safety and primarily focuses on the fire safety systems and lift reliability systems needed for the success of an overall evacuation strategy.

ISO has published standards specifically on the requirement for lifts used to assist in building evacuation.

Refer to ISO/TS 18870 and ISO/TR 25743 – 2010

6.1.1 ISO/TS 18870 Abstract

ISO/TS 18870:2014 details requirements for passenger carrying lifts, which are installed in buildings having a suitable comprehensive building evacuation strategy. It does not define building requirements that will have to be provided as part of the overall evacuation strategy for the building.

Excluded from ISO/TS 18870:2014 are the following: details of a building evacuation strategy; details of building features to reduce risks or eliminate hazards; national building requirements which might demand special features.

6.1.2 ISO/TR 25743 Abstract

ISO/TR 25743:2010 investigates and highlights the main risks associated with using lifts (elevators) for the evacuation of persons in various types of emergency.

The types of emergency under study arise from fire, flood, earthquake, explosion, biological or chemical attack, gas leakage, lightning or storm damage in the building being studied or a building adjacent to it..

The purpose of ISO/TR 25743:2010 is to provide a process for making decisions relevant to the design of lifts and buildings, in order to determine if a given design can enable the lifts involved to be used with an acceptable level of safety.

6.2 SAFE ACCESS TO LIFT PITS

6.2.1 SAFE ACCESS TO EXISTING LIFT PITS

6.2.1 Compliant Structures

For most lifts operating in Australian buildings the means of safe access to the pit floor will comply

USE OF LIFTS IN AN EMERGENCY AND ACCESS TO SAFE LIFT PITS

with the current version of either AS1657, AS1735, EN81, A17.1 and those safe access means will consist of stairs, walkways and/or ladders.

Those standards set out the requirements for various structures which are intended to provide a means of unaccompanied and safe access for inspection or maintenance personnel, which is particularly suited to lifts. AS1657 defines safe access by various means including ladders where the vertical distance between levels is up to 6.0m

An appropriate lift pit access means will have been designed and constructed with due consideration of the need for unaccompanied personnel to get safely to and from the pit floor for maintenance or inspections, and with proper consideration of risks associated with lift equipment that can move, and other constraints inherent in a lift installation.

6.2.2 Non-compliant structures

For any buildings and lifts that do not have appropriate pit access means, it is suggested that the owner together with the lift service provider, consider applying the risk management principles so that a comparable level of risk control is achieved.

Various WHS legislation and guidelines outline well known risk control hierarchies that should be considered when seeking to control risks to a greater degree.

6.2.3 Use of personal protective equipment in lift pits

Because of the inherent safety risks associated with the use of personal protective equipment such as harnesses, fall arrestors, industrial rope access systems and the like, and because of the serious additional risks associated with using those devices for a person in the vicinity of an elevator that can move; the AEA strongly recommends that their use be avoided when accessing lift pits.

6.2.4 Pit access doors

Whenever possible, and especially when buildings are being designed or constructed, the AEA recommends that pit floor access doors or hatches be provided, particularly when a lift pit depth is more than 2.0m. The location, size and locking of any pit access doorway should be determined by the architect in consultation with the lift equipment designer.

6.2.5 Three points of contact

When pit access doors are not practicable and ladders are used, ladder access methods should provide for three points of contact when climbing, meaning that it is only necessary to remove one foot or one hand from a ladder and surrounding area at any time. For example; AS1657 table G2 gives advice on the use of rung ladders as summarised below in Table 2.

TABLE 2

Elevator pit depth range	Use of rung ladder system including restricted access* and 3 points of contact and when ladder incline is;	
	75° to 90° (vertical)	70° to 75°
0m to 3.5m	Acceptable #	Acceptable #
3.5m to 4.5m	Acceptable #	Acceptable #
4.5m to 6.0m	AS1657 suggests alternate methods. AEA recommends pit access door.	Acceptable #
Greater than 6.0m	AEA recommends pit access door.	

*Elevators normally provide restricted access to pit ladders.
Regardless of information in AS1657, AEA always recommends a pit access door as the safest means of access when elevator pits deeper than 2m.
A 70° to 75° inclined ladder may not be practical for many elevators.

APPENDIX A: ENERGY

ENERGY

The main approaches for achieving optimal energy efficiency, particularly for existing lifts, are based on two simple principles: turn devices off when not needed; and efficiently use those devices so that they do not consume more energy than necessary when needed.

The provision of adequate maintenance is imperative to ensure efficiency is maintained on an ongoing basis.

The energy consumed by lifts is insignificant when compared to the energy consumed by large heating, air conditioning and lighting systems.

Nevertheless, many building owners should endeavour to reduce the energy that a building consumes, and the following outlines some of the possibilities in which owners can achieve energy savings in their vertical transport systems and associated building infrastructure.

Lift car light controls

1. Lights inside a lift car continuously lit may be unnecessary

Modern lifts include automatic car light controls. Lights are on when the lift is being used and switch off automatically when the lift is idle. Lights automatically switch on when the lift moves. Check with the service provider that this feature is available and switched on.

For existing lifts retrofit automatic lighting controls.

2. Consider changing the light source

Modern LED lamps provide adequate lighting levels for a fraction of the energy consumption of traditional lamps.

Machine room vents and fan

Waste heat is normally removed from machine rooms by the ingress of cool air mass that displaces warmed air. The ability to move that air mass depends primarily on the smallest area that the air has to flow through and the speed at which the air flows through it. Small area vents will require higher speed air and that will require more fan power and the fan to operate more frequently.

Provide larger area vents and if needed larger area fans, so that ventilation can occur more naturally and so that when the fan is used that the machine room can cool more quickly. But be careful not to allow ingress of contaminants that could damage equipment (e.g.; salty air).

Machine room temperature control

Machine room temperature control systems that are set-up to constrain machine room air temperatures between narrow limits will consume more energy, particularly if air heating or cooling is needed.

Adjust thermostats to allow machine room temperature to follow ambient temperatures more closely, subject to equipment and human environmental requirements.

Motor generators – in existing lifts

Generators create the DC power required for a lift machine.

As this is only required when the lift operates, as a minimum, owners should ensure that generators shut down when not required.

Since the advent of alternating current (AC) electronic drives and variable frequency drives, motor generators have become obsolete for lifts.

Consider installing modern electronic drives. Note that modern drives are associated with modern controls, which provides opportunity for many modernisation benefits such as increase performance and reliability in addition to energy saving.

Escalators and moving walks

When an escalator or moving walk is not conveying passengers it is using energy.

Consider reducing the speed or shutting it down. This will reduce the amount energy consumed. The unit will automatically restart as a passenger approaches.

REFER TO ISO 25745

Parts 1 Energy performance of lifts, escalators and moving walks

ISO/FDIS Part 2: Energy calculation and classification for lifts (elevators)

ISO/FDIS Part 3: Energy calculation and classification of escalators and moving walks

ISO 25745 -1 Abstract

ISO 25745-1:2012 specifies:

a) methods of measuring actual energy consumption of lifts, escalators and moving walks on a single unit basis

b) methods of carrying out periodic energy verification checks on lifts, escalators and moving walks in operation

ISO 25745-1:2012 only considers the energy performance during the operational portion of the life cycle of the lifts, escalators or moving walks.

APPENDIX B: CONTROL SYSTEMS

CONTROL SYSTEMS

Conventional control

In most every generic conventional control form, there is a simplistic approach to interface with humans which requires the use of buttons that are pushed to activate calls onto the control system. Car floor destination control buttons are located within the car and on the landing either up or down buttons or both are provided in the lobby, usually adjacent to the elevators.

This interface of push buttons has been in use for more than 60 years, and people are familiar to this, it remains as the most common form of elevator group to human interface in use today.

The conventional control system dispatches cars to service the registered landing or car calls, however there is no known numbers of passengers waiting behind each landing call and their destination is not known prior to entering the elevator car.

This can lead to long waits on lobbies for service and overcrowding in cars due to people loading the first arriving car in the lobby.

Modern conventional control systems use advanced processors to manage call allocation and servicing of calls via a group controller using demand based dispatching system algorithms. The allocation of landing calls is carried out via the group control that has the ability to see all landing calls on the system, and the actual position of each lift car within the group.

The group control does not have any control over the individual lifts systems other than dispatching of the car to a landing call on the system.

The individual lift processor controls the direction of travel; coordinates with the hardware to monitor of safety circuits and doors, position of the car control the actual movement, speed patterns, and communicate these to the group control processor.

Advantages of conventional control

- Easy user interface with simplistic up, down and car call buttons
- Well accepted by public because of familiarity
- The ease of consultants to understand handling capacity, this is due to well-established industry planning parameters
- Assigned calls can be changed even if a car has broken down in the group, so service will still be provided by re-allocation to another lift car
- Call allocation frequently optimised for least cost solution using iterative algorithms
- If building has many new visitors, they do not need re-education of elevator use
- Assignment of cars can change up to few seconds prior to answering allocated call. (This cannot be achieved with destination control)

Disadvantages of conventional control

The main problem with conventional elevator dispatching systems is that the passenger approaches knowing where they want to go but not knowing which elevator is to transport them.

People when waiting in the main lobby for service , enter the first available car that arrives , then the next car is entered and so on, this behaviour creates multiple destination stops and increased journey times within each car and can also lead to overcrowding.

It is possible with conventional control that each car will stop at every floor, which increases the waiting time in the lobby and will have a reduction in handling capacity

Also in peak periods they rush towards the nearest arriving car and try to load the car to a capacity higher than it is set for which is generally 80%. This can add delay due to overload functioning and door cycling because of passengers alighting from the crowded car, all this increases dispatching time.

- The system has unknown passenger destination, prior to passengers entering car
- The dispatcher cannot plan passengers demand
- Bunching of elevators occur, which leads to reduced handling capacity
- Leap frogging of cars
- Direction of travel change, the elevator needs to complete up run or down run of the building prior to changes in direction, which are not based on passengers demand
- Arrival rates undetermined
- Queuing in lobbies
- Crowded cars, doors open people rush in when car arrives in lobby
- Difficult to access car operating panel in crowded cars
- Too many buttons on panel in large buildings
- Inability to assign correct car in the instance of lower or higher floors served in the elevator core with multiple elevator car groups
- Double deck elevator conventional system operates on odds and even floor service entire day

APPENDIX B: CONTROL SYSTEMS

› This often equates to passengers waiting in either deck with closed doors whilst the other deck services the desired car or hall call

Destination Control

An alternate system of elevator dispatch is destination control (DEST C) or hall call allocation (HCA), where in the generic model there are no longer any up or down landing buttons on the main lobby, nor car buttons, in some OEM systems, in lieu of this interface there exists a numeric keypad which is generally located away from the actual lift doors.

At present day, several companies have their versions of destination control.

Some companies have only destination keypads or terminals on every floor and there are not any car call buttons within the car.

However there are many variations to generic destination control, as such, some companies have a combination of keypads on the main lobby, and the car buttons are still within the car.

All the major companies that have this new system of dispatch have a commonality. This commonality is the system knows where the passenger destination is before entering the car and passengers are grouped into the cars for same destinations or adjoining floors.

By the grouping of the passengers into the same lift car for dispatch allows the system user to travel more directly with fewer stops in between which results in an overall reduction of empty car movements within the lift core and allows quicker returns of the lift car to the system for subsequent dispatching which helps during peaks. This equates for a more efficient use of the elevator group:

Benefits Include

› Elevator space is optimised by the grouping of passengers

› Less crowding of elevators

› Less power used by the lifts in this system

› Allows for faster availability of cars to main lobby

› Has increases in efficiency on the system traffic performance compared to conventional control system of similar sized group of three cars or more

› Reduced Waiting times Better Car assignment fewer stops for passenger

› Allows special access controls for individuals

› Allows for Disabled access with better car space and Voice assist

› Passenger destination is known well in advance of movement in car which allows for loading of like passengers into same car for onward journey, this allows fill capacities to be further utilised. Similar to fill scheduling via other Auto –Concierge transport means, such as airlines etc.

› Plans traffic movements due to knowledge of destination of user prior to entering car

› Call allocation frequently optimised for least cost solution using iterative algorithms

› Reduces energy consumption due to higher handling capacity of system, which equates to more efficiency

› Increases in handling capacity particularly with modernisation of existing building which were severely under elevatored

› Reduction in empty car movements

› Destination control is generally a “Greener” system than conventional due to increased handling capacity with fewer elevators

APPENDIX C: HAZARD AND RISK

HAZARD AND RISK

Reference should made to EN81-80 for detailed Hazards

The following table which has been produced by the Australian Elevator Technical Committee. In preparing this Hazard and Risk Check List, the AEA drew upon major world codes and various standards, most significantly EN81-80:2003. All significant risk issues raised by this standard were considered and these and other issues more specific to local conditions and requirements are included in this check list.

No.	Hazard/Hazardous Situation
1	Presence of harmful materials
2	Drive system with inconsistent stopping/levelling accuracy
3	No or inadequate control functions in case of fire
4	Well enclosures with perforate walls
5	Partially enclosed well with too low enclosure
6	Inadequate locking devices on access doors to well and pit
7	Inadequate vertical surface below landing door sills
8	Counterweight / balancing weight without safety gear in case of accessible spaces below well
9	No or inadequate partition of counterweight / balancing weight travel path
10	No or inadequate pit screen for several lifts in the same well
11	No or inadequate partition for several lifts in the same well
12	Insufficient safety spaces in headroom and pit
13	Unsafe pit access
14	No or inadequate stopping devices in the pit or in the pulley room
15	No or inadequate access to lift well and pit.
16	No or inadequate lighting of the well, pit or top of car
17	No alarm system in pit and on car roof
18	No or unsafe means of access to machine and pulley room
19	Slippery floor in machine or pulley room
20	Insufficient clearances in machine room
21	No or inadequate protection on different levels in machine pulley room
22	Inadequate lighting in machine or pulley room
23	Inadequate means of handling equipment
24	Perforate landing doors and car doors
25	Inadequate design of landing door fixings
26	Inadequate glass in doors
27	No or inadequate protection against dragging of fingers on sliding car or landing doors with glass
28	No or inadequate lighting on landings
29	No or inadequate protective devices on power operated doors
30	Unlocking of landing door without a special tool
31	Well enclosure with perforate walls near door locks
32	No automatic closing device on sliding doors
33	Inadequate fire resistance of landing doors
34	Large car area in relation to rated load
35	Inadequate length of car apron

36	Unsafe locking of car roof trap door
37	Insufficient strength of car roof
38	No or inadequate fall protection on car roof
39	Insufficient ventilation in car, shaft and machinery space.
40	Inadequate lighting in car
41	No or inadequate backup lighting in car
42	No or inadequate protection means on sheaves, pulleys and sprockets against injury
43	No or inadequate protection against rope/chains leaving the sheaves, pulleys or sprockets
44	No or inadequate protection means on sheaves, pulleys or sprockets against introduction of objects
45	No or inadequate safety gear and/or overspeed governor on electric lifts
46	No or inadequate slack rope switch for governor rope
47	No protection means against ascending car overspeed on traction drive lifts with counterweight
48	Inadequate design of lift machine for electric lifts
49	Protection of hydraulic lifts against freefall, excessive speed and creeping
50	No or inadequate buffers
51	No or inadequate final limit switches
52	Large gap between car and wall facing the car entrance
53	Excessive distance between car door and landing door
54	No or inadequate emergency operation system
55	No shut-off valve
56	No independent starting contactors
57	No or inadequate slack rope/chain device
58	No run-time limiter
59	No or inadequate low pressure device
60	Insufficient protection against electric shock and/or marking of electrical equipment; missing notices
61	No or inadequate protection on lift machine motor
62	No lockable main and auxiliary switches
63	No protection against phase reversal
64	No or inadequate inspection control station and stopping device on car roof
65	No or inadequate communication system between machine room and car
66	No or inadequate load control on car
67	Missing notices, markings and operating instructions
68	No or unsafe means of access to machinery space, landings and control equipment located in lift well.
69	No or unsafe means of access to landings, machinery and control equipment located in enclosures alongside lift well
70	No remote control or adequate access is available to governors located in the lift well.
71	Poor condition of caisson
72	Poor condition of ram and oil seals in hydraulic lifts
73	Passenger lifts have vertical bi-parting doors
74	Residual current devices (RCD) not fitted to light and power circuits
75	Socket outlets are not provided in machinery space, on top of car and in the lift pit.
76	Access for persons with disability not provided

APPENDIX D: CHECKLIST

Item to be Considered	√ or Comment
Is the design of your plant verified and registered?	
Is the original “Safe to Operate” STO statement on file	
Is there 24/7 access to all parts of the plant in case of an emergency?	
Is your plant, where required, registered on an ongoing basis?	
Is your service provider’s “Adequate Maintenance” statement current?	
If my service provider is not the Original Equipment	
Manufacturer (OEM) am I sure correct procedures are in place?	
Is the Risk Management Plan (RMP) for my plant current?	
Is there a current Hazard and Risk Analysis (HRA) in place?	
Does the RMP clearly state how risks are managed as identified by the HRA?	
Is there an upgrade budget and fund in place?	
If my plant has been altered is there a STO on file covering the changes?	
If my plant has been altered has the correct registration procedures been followed?	
Are the users of my plant adequately aware of safe user practice?	
Does my building satisfy the relevant plant code/legislation?	
Are my people regularly inspecting the plant for obvious defects?	
Is there a procedure in place to regularly advise the service provider of defects?	

ABBREVIATIONS AND DEFINITIONS

Abbreviations

AEA	Australian Elevator Association
AS	Australian Standards
AS/NZS	Australian New Zealand Standards
COP	Code of Practice
ISO	International Standards Organisation
MRL	Machine room less Lift
OEM	Original Equipment Manufacturer
PPE	Personal Protection Equipment
PCBU	Person conducting a business or undertaking
RCD	Residual Current Device
STO	Safe to Operate
SWMS	Safe Work Method Statement
WHS	Work Health and Safety

Definitions

Alteration

Any change in the design that uses new technology or replacement components to improve the reliability and safety of the lift, and where the risk assessment indicates a new risk or an increase in risk. Typical examples could include the following:

(a) Any increase or decrease of
  (i) the rated speed
  (ii) the rated load
  (iii) the mass of the car ±5%; and
  (iv) the travel

(b) The change of machine, brake or the traction sheave by one of a different type size or rating

Balustrading

The enclosure at either side of the moving steps of an escalator or moving tread way of a moving walk and the decking or deck board adjacent to the moving handrails.

Buffer

A device designed to absorb the impact of the lift car or counterweight.

Car

The load-carrying unit including car frame, car platform, car enclosure, and car doors.

Car entrance

The opening in the car enclosure through which normal access is available between the lift car and landings.

Car Safety Device

See Safety Gear.

Car Top Balustrade

A mechanical device to protect against fall hazards on the car top.

Certification

The necessary process of ensuring that a product functions, at the time the commissioning process is complete, in accordance with the designer's instructions.

Certifiers

A qualified and competent person. This would normally require a trade or engineering qualification, with at least five years Lift Industry experience.

Conformance

The fulfilment of a product, process or service of specified requirements.

Comb

The pronged portions of the comb plates, in an escalator or moving walk, at the landings that mesh with the step or pallet tread grooves.

Comb plates

The supporting plates at the landings for the combs, in an escalator or moving walk.

Competent person

A person whom has acquired knowledge through suitable methods (or a combination of these) to perform the task at hand, these methods could include, training, qualification and / or experience.

Control equipment

Those components of a lift / escalator / moving walk by means of which motion, direction of travel, speed, and stopping are controlled.

Controller

A device or group of devices comprising the principal components of the control equipment of the lift, escalator or moving walk.

Counterweight

A moving weight employed to balance portion of the moving load of a lift. 'Traction' lifts have counterweights that have a mass equal to the empty lift cabin plus a percentage of the car load capacity. The counterweight dramatically reduces the driving forces needed and therefore it reduces the lift power requirements and energy consumption.

Designer

A person with the necessary competence and responsibility to ensure that the design of a product is adequate to meet the required Conformance

Escalator

A power-driven, inclined, continuous stairway used for raising or lowering standing passengers.

Elevator

See: Lift

Governor

An automatic device that in the event of the speed exceeding a predetermined limit brings a lift car or counterweight to rest by operating the safety gear.

Landing

That portion of a floor, balcony or platform that is used to receive and discharge passengers and/or goods or materials.

Landing button.

A button or other manual device located at a landing.

ABBREVIATIONS AND DEFINITIONS

Landing entrance

The opening in a lift well enclosure affording ordinary access between the landing and the lift car and which is opened and closed by a door.

Lift

A device within or attached to a building or structure, comprising a platform or car running between approximately vertical guides and used for the purpose of raising or lowering passengers and/or goods or materials.

NOTE: Also known as elevator.

Lift well

A shaft for the travel of one or more lifts.

Lift well, enclosure

Any structure that separates the lift well from its surroundings.

Machine

The power unit that applies the energy necessary to raise and lower a lift car or to drive an escalator or moving walk.

Machine room

The enclosed space or, if self-contained, the room used to house the driving machine (of a lift, escalator, or moving walk) and any associated equipment that is required to be similarly located.

MRL (Machine room less Lift)

A lift whose machine and drive is located within the lift well and doesn't have an external machine room.

Modernisation

Any change in the design that uses new technology or replacement components to improve the reliability and safety of the lift, escalator or moving walk, and where the risk assessment does not indicate a new risk or an increase in risk.

Moving walk

A power-driven device of which the passenger carrying surface (i.e. the tread way) remains parallel to its direction of motion and is uninterrupted.

Passenger

For lifts a person who is carried by a passenger lift and for escalators and moving walks a standing person who is transported by an escalator or moving walks.

Performance Based

Performance based means that the product is designed to a code that specifies outcomes rather than details the means.

PESSRAL

Programmable electronic systems in safety related applications for Lifts.

PESSRAE

Programmable electronic systems in safety related applications. Escalators and moving walks.

Pit

The space in the lift well below the level of the bottom-landing sill.

Plant, High Risk

A lift, escalator or moving walk.

Product

An item or collection of items associated with the total lift or escalator assembly.

Repair

The carrying out of work which is in addition to routine maintenance and is necessary to ensure that the equipment continues to function. Where component replacement is involved this would usually involve like for like replacement.

In situations where like for like replacement is not possible and a component used whilst different to the original, fulfils the same function and does not substantially change the in-service operation or safety of the subject unit.

Risk Management

The process of identifying hazards and controlling the associated risks - Refer to AS/NZS ISO 3001.

Suspension Medium

A medium by which any car or counterweight is suspended.

Safety Gear

A mechanical device, attached to the car frame, or to the counterweight frame, to stop and hold the car or counterweight under one or more of the following conditions: predetermined over speed, free fall, or if the suspension ropes slacken.

Safe to Operate

The process of Conformance, Verification and Certification by the OEM or service provider or a competent person.

Safe work method statement

A statement that:

(a) Describes how work is to be carried out

(b) Identifies the work activities assessed as having safety risks

(c) Identifies the safety risks

(d) Describes the control measures that will be applied to the work activities, and includes a description of the equipment used in the work, the standards or codes to be complied with, the qualifications of the personnel doing the work and the training required to do the work

Service Provider

The maintenance contractor, installation contractor, modernisation contractor or repairs contractor.

Shaft

A vertical or inclined way or opening.

See Lift Well.

Travelling cable (trailing cable)

Flexible cable providing electrical connection between a lift car and a fixed point or points.

Verification

The process by which a product is confirmed to satisfy the Conformance process.

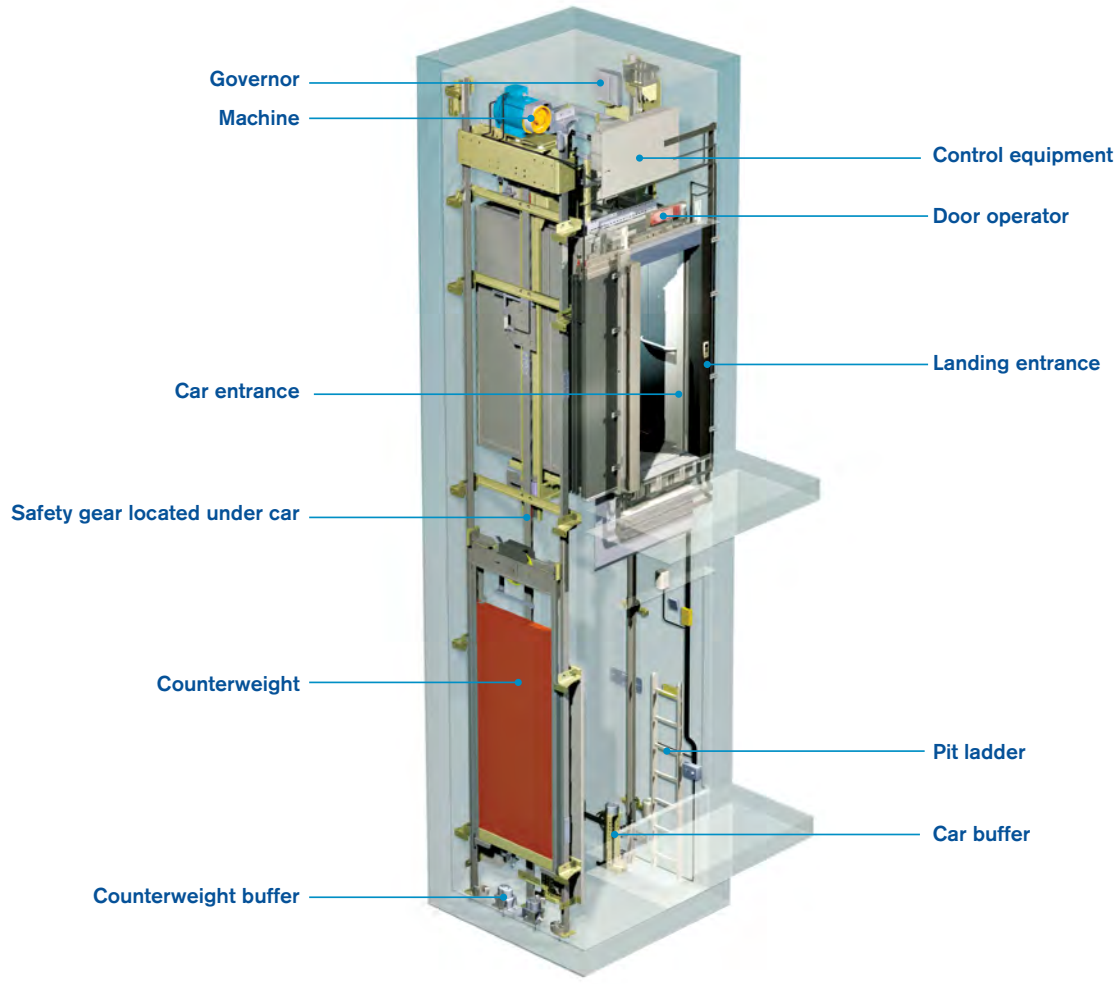
Verifier

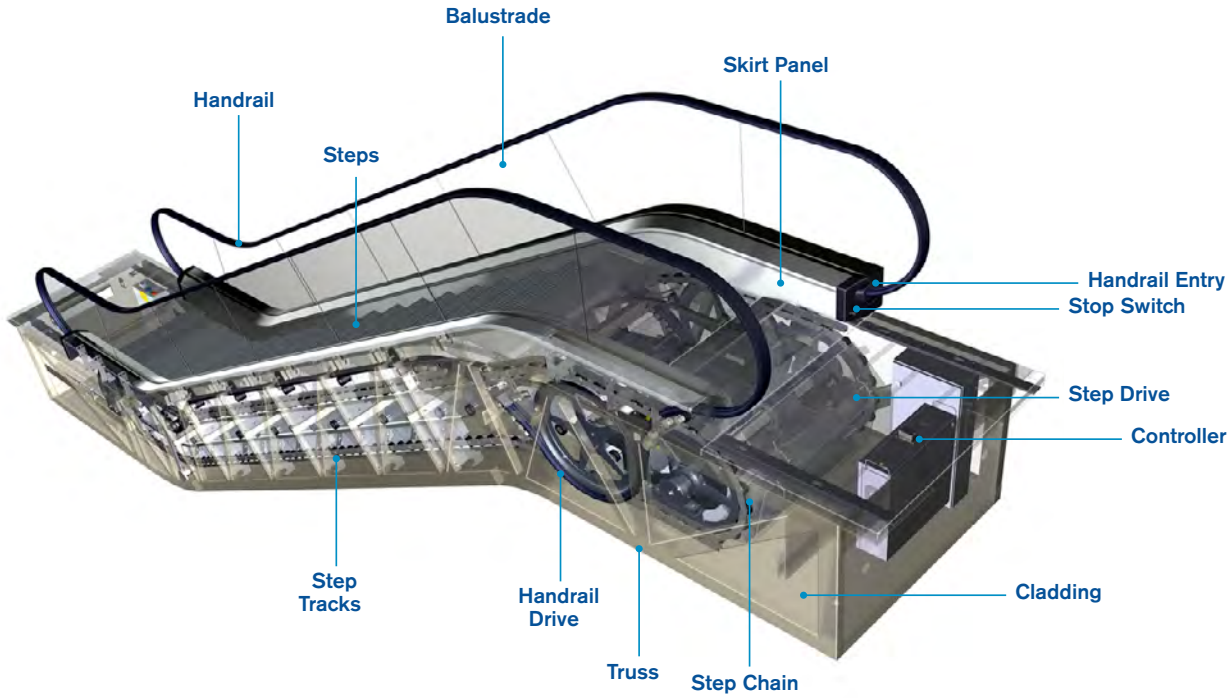
The verifier is a competent person who has the necessary qualifications, training and experience to carry out this duty.

Vertical Transport

A general term that encompasses lifts, escalators and moving walks.

MRL (Machine room less Lift)





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