



Code of Practice

**for installation, operation, and maintenance of
vertical platform lift with enclosed platform and automatic sliding doors**

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1. Introduction

In recent years, BCA has observed the rising demand of vertical platform lifts with enclosed platform and automatic sliding doors, particularly in landed houses. Such lifts do not fully comply with EN81-41, which is an acceptable solution for vertical platform lifts (without full enclosure) under the BCA's Approved Documents.

These lifts are typically of motor room-less configuration with large platform size, without sufficient required pit depth and overhead clearance. Hence, these lifts also do not comply with SS550, which is an acceptable solution for conventional passenger lifts with enclosed platform and automatic sliding doors.

Although the platform enclosure in such lifts eliminates the risk of users getting caught in the gap between the platform and the lift shaft, it introduces new safety risks including lack of ventilation and communication in a mantrap situation. Other safety hazards include unintended car movement, fire risk, unintentional access to controller, obstructed emergency escape path, and lack of safe working platform and refuge space for workers if the design of the lift has not considered these issues.

This Code of Practice aims to address the safety hazards arising from such lifts.

2. Scope

This Code of Practice specifies the safety requirements for vertical platform lifts with enclosed platform and automatic sliding doors (VPL(Enclosed)). These lifts are intended for use by persons, including persons with impaired mobility, with or without wheelchair, for a rated speed limited to 0.15m/s.

3. Referenced Standards

The following documents, in whole or in part, are normatively referenced in this Code of Practice.

SS550:2020, *Code of practice for installation, operation and maintenance of electric passenger and goods lifts*

EN81-41:2010, *Safety rules for the construction and installation of lifts – Special lifts for the transport of persons and goods Part 41: Vertical lifting platforms intended for use by persons with impaired mobility*

EN81-20:2020, *Safety rules for the construction and installation of lifts – Lifts for the transport of persons and goods Part 20: Passenger and goods passenger lifts*

EN81-21:2022, *Safety rules for the construction and installation of lifts – Lifts for the transport of persons and goods Part 21: New passenger and goods passenger lifts in existing building*

4. Terms and Definition

For the purpose of this Code of Practice, please refer to EN81-41:2010 and SS550:2020 for all the relevant terms and definitions.

5. Safety Requirements

Except as otherwise provided for in this Code of Practice (COP), all VPL(Enclosed) shall minimally be designed, installed and operated in accordance with the requirements of EN81-41:2010 – Safety rules for the construction and installation of lifts – Special lifts for the transport of persons and goods. Part 41: Vertical platforms intended for use by persons with impaired mobility (hereafter referred to as “EN81-41:2010”).

In addition to the requirements of EN81-41:2010, VPL(Enclosed) shall be designed, installed and operated in accordance with the requirements stated in paragraphs below to address additional hazards that are not covered by EN81-41:2010. Where parts of EN81-41:2010 conflict with the requirements stated in paragraphs below, the provisions stated in this section shall prevail.

5.1. General

5.1.1. Rated speed

The rated speed of the lift shall be limited to 0.15m/s.

5.1.2. Hold to Run and emergency stop

- i. The hold-to-run function from EN81-41:2010 Clause 5.5.15.2 can be exempted if car door is provided according to Clause 5.1.5 of this COP.
- ii. The emergency stop function from EN81-41:2010 Clause 5.5.15.5 can be exempted if car door is provided according to Clause 5.1.5 of this COP.

5.1.3. Type testing of safety components

- i. Safety components shall be type-tested as required under SS550:2020.
- ii. For Programmable Electronic System in Safety Related Applications for Lift (PESSRAL) for control, protection or monitoring based on one or more programmable electronic devices, including all elements of the system such as power supplies, sensors and other input devices, data highways and other communication paths, and actuators and other output devices, it must meet minimum safety integrity level as required in SS550:2020 Table A.1.

Note: Programmable Electronic System in Safety Related Applications for lift (PESSRAL) is also known as “safety related Electrical, Electronic and Programmable Electronic devices” (“E/E/PE”).

5.1.4. Well

- i. The lift well shall be designed according to S550:2020 Section 5.2.5. The requirements shall include but are not limited to:
 - a) The horizontal distance between the car sill and inner surface of the lift well shall not exceed 150mm.
 - b) Ventilation openings shall be provided for totally enclosed well.

5.1.5. Sliding car door

- i. Sliding car door shall be designed according to S550:2020 Section 5.3. The requirements shall include but are not limited to:
 - a) Door panels shall meet mechanical strength and testing requirements stipulated in SS550:2020 Section 5.3.5.3.
 - b) Door gaps shall not exceed 6 mm by design and up to 10 mm due to wear, with all sharp edges chamfered in the opening direction of movement.
- ii. For automatic power-operated doors, the requirements shall include but are not limited to:
 - a) A protective device (e.g., light curtain) shall be installed. The protective device shall be capable of detecting obstacles not smaller than 50mm in diameter. The protective device shall also keep the door(s) open when obstructed and automatically initiate re-opening during the closing movement or upon the activation of a door re-open button when the car is at the landing.
 - b) Coverage of the protective device (e.g., light curtain) shall be from 25mm above the car door sill to 1600mm above the car door sill.
 - c) The protective device shall have its nudging mode de-activated if nudging mode is provided.
 - d) Effort needed to prevent the door closing shall not exceed 150N.
 - e) The car door shall not open by more than 50mm under a 1000N opening force when the car is outside the door zone, but possible to be opened with less than 300N force if within the door zone.
- iii. If glass doors are to be used:
 - a) The glass shall be of laminated toughened type, with edges grounded to not cause injury.
 - b) Gaps between door panels and frame/glass shall not exceed 4 mm by design and up to 5 mm due to wear at its most unfavourable point.

5.1.6. Sliding landing door

- i. Sliding landing door shall be designed according to S550:2020 Section 5.3. The requirements shall include but are not limited to:

- a) Door panels shall meet mechanical strength and testing requirements stipulated in SS550:2020 Section 5.3.5.3.
- b) Door gaps shall not exceed 6mm, with all sharp edges chamfered in the opening direction of movement.
- ii. If glass doors are to be used:
 - a) The glass shall be of laminated toughened type, with edges grounded to not cause injury.
 - b) Gaps between door panels and frame/glass shall not exceed 4 mm by design and up to 5 mm due to wear at its most unfavourable point.
- iii. Door locking mechanism shall be engaged by at least 7mm, and able to resist a pull-open force of 300N.
- iv. Landing doors shall self-close to its locking position by means of weight or spring when the car is outside the unlocking zone.

5.1.7. Emergency and test panel

- i. Emergency and test panel and its operations shall be provided as required under SS550:2020 Clause 5.2.6.6. The requirements shall include but are not limited to:
 - a) Emergency and test panel shall be enclosed and located outside the lift well. At this location, it shall either have direct observation of the lift machine or display devices and it shall be possible to test the safety gears, ascending car overspeed protection, unintended car movement protection and other relevant tests remotely.
 - b) Emergency and test panel shall allow for the testing of each brake set independently.
 - c) Emergency and test panel shall be provided with a key-operated lock, capable of being reclosed and relocked without a key. and accessible to only authorised persons.
 - d) Emergency and test panel shall be provided with means to safely carry out emergency operations (manual rescue).

5.1.8. Location of controller

- i. Location of controller should take into consideration the accessibility, maintainability and possible fire hazard.

5.1.9. Protection against electrical leakage

- i. Residual Current Device shall be provided as required under SS550:2020 Clause 5.10.1.2.3, with rated residual operating current not exceeding 30mA for power circuits involving socket, light and fan.

5.1.10. Car and counterweight buffers

- i. The design and construction of the buffer shall be such that it can absorb within the limits of their stroke, the whole of the kinetic energy of the car carrying its rated load, or of the counterweight, when the speed of impact is the maximum tripping speed of the overspeed governor.
- ii. Except for configurations that are not subjected to uncontrolled motion at the terminal floor, for e.g., direct plunger hydraulic drive and screw and nut drive, the lift shall be provided with buffers with a minimum stroke of 40mm or bumper.

5.1.11. Data plate

- i. All data plates shall be accessible and clearly visible from the maintenance area.
- ii. Data plates shall indicate the information required under the relevant Clauses in SS550:2020. This information shall include but is not limited to:
 - Name and manufacturer of the component
 - Type of component and type examination certificate number
 - Parameters (for e.g., tripping speed) for which the component is adjusted to.

5.2. Pit Access and Safety

5.2.1. Pit safety clearance

- i. A manually positioned blocking device shall be provided when there is insufficient pit clearance according to EN81-41:2010 Clause 5.1.4.2.1. Minimum clear space of 500mm as stated under EN81-41:2010 Clause 5.1.4.2.1 shall be extended to 1000mm.
- ii. The manually positioned blocking device and its intended function and operation shall be designed in accordance with the requirements in EN81-21:2022. Means for the activation of the blocking device from the landing shall be provided. Proper electrical monitoring shall also be provided for interlocking and control to ensure that the lift car does not move when the blocking device is activated and prevent lift operation when the blocking device has not been reinstated properly.

5.2.2. Pit access

- i. When the platform is in the position according to EN81-41:2010 Clause 5.1.4.2.2, a clear opening with minimum width of 800mm and height between 1000mm and 1500mm shall be provided to enter and leave the working area easily and safely.

5.3. Car Top Safety and Refuge Space

5.3.1. General

The following Clauses in EN81-41:2010 are not applicable for VPL(Enclosed) with car roof:

- i. Clause 5.9.5
- ii. Clause 7.3.1.6.5

Except for lift without car roof or ceiling, the following SS550:2020 Clauses shall be applied:

- i. Car roof shall be provided according to SS550:2020 Clause 5.4.7 to 5.4.8. The requirements shall include but are not limited to:
 - a) The car roof shall be able to support the maximum number of persons that will be expected to work on the car roof, with a minimum strength to support 2 persons.
 - b) The car roof shall also be able to withstand a minimum force of 2000N on an area of 0.30m x 0.30m at any position on the car roof without permanent deformation.
 - c) An inspection control station shall be permanently installed on the car roof. This shall be designed according to SS550:2020 Clause 5.12.1.5.
 - d) A balustrade shall be provided according to the dimensions given in SS550:2020 Clause 5.4.7.4 if the distance from the outer edge of the car roof to the wall of the well exceeds 0.30m.

5.3.2. Car top refuge space

- i. Refuge spaces on car roof and clearances in headroom shall be designed according to SS550:2020 Clause 5.2.5.7. The requirements shall include but are not limited to:
 - a) Refuge space on car roof shall be able to accommodate at least 2 persons.
 - b) A sign shall be placed on the car roof stating the maximum number of persons allowed and the type of posture. This sign shall be readable by persons at the landing.
- ii. Working areas in the car or on the car roof shall be designed according to SS550:2020 Clause 5.2.6.4.3 and Clause 5.2.6.4.5.
- iii. Protection means (for e.g., counterweight prop) shall be provided in the case where there is insufficient car top safety clearance. The manually positioned blocking device and its intended function and operation shall be designed in accordance with the requirements in EN81-21:2022. Means for the activation of the blocking device from the landing shall be provided. Proper electrical monitoring shall be provided for interlocking and control such that maintenance control and movement of the lift car is only possible after the activation of the protection means, and resumption of normal operation is allowed only when the protection means is reinstated properly.

5.3.3. Emergency trap doors

- i. Emergency trap doors shall be provided on the car roof according to SS550:2020 Clause 5.4.6. The requirements shall include but are not limited to:
 - a) Dimensions of the opening shall be a minimum of 0.40m x 0.50m.
 - b) Means for manual locking shall be provided. The locking shall be monitored by an electric safety device.
- ii. There should not be any obstruction in the emergency escape path between car cage and car top.

5.4. In Car Safety

5.4.1. Ventilation and Lighting

- i. Lift car shall be provided with ventilation fan(s) according to SS550:2020 Clause 5.4.9. The requirements shall include but are not limited to:
 - a) The effective area of ventilation apertures may be located in the upper or lower part of the car and shall be at least 1% of the available car area. The gaps around the car doors may be considered in the area calculation of the ventilation aperture, limit to 50% of the required effective area.
 - b) The ventilation apertures shall not allow a straight rigid rod of 10 mm in diameter to pass through the car walls from the inside.
 - c) The ventilation fan shall have an airflow rate that is equal to 20 number of time that the total air volume in the lift car is replaced in an hour.
 - d) In the event of a power failure, there shall be minimally one fan connected and switched over automatically to rechargeable emergency supply (ARES).
- ii. Lift car shall be provided with electrical lighting according to SS550:2020 Clause 5.4.10. The requirements shall include but are not limited to:
 - a) The lift car shall be permanently installed with electrical lighting with light intensity of at least 100 lux on the control devices and at 1m above the floor at any point not less than 100mm from any wall. When taking the lux level readings, the light meter should be oriented towards the strongest light source.
 - b) At least two light sources (for e.g., lamp, bulb) shall be connected in parallel for the lighting in the lift car.
 - c) Emergency light(s) shall be connected to ARES and be able to provide a lighting intensity of at least 5 lux automatically during the following situations:
 - at each alarm initiation device in the car and on the car roof;
 - in the centre of the car 1m above the car floor;
 - in the centre of the car roof, 1m above the car roof if the light switch is in the ON position).

5.4.2. Car loading capacity

- i. For use in private single residential unit, the requirements below shall be met:
 - a) The dimensions of the car platform and minimum car rated load shall comply with EN81-41:2010 Clause 5.1.8.2 and Table 2 of the same Clause.
 - b) If cabin doors are provided according to 5.1.5 the minimum door opening width must also meet width requirement in Table 2 of EN81-41:2010 Clause 5.1.8.2 to facilitate access of wheelchair.
 - c) If (a) and (b) are not met, the car loading capacity (rated load and maximum available car area) shall comply with Table 6 of SS550:2020.
- ii. For use in public places, or as common lifts in premises with limited access such as condominium, the car loading capacity (rated load and maximum available car area) shall comply with Table 6 of SS550:2020.
- iii. Usage by at least lone wheelchair user (EN81-41:2010 Table 2) should be taken into account when deciding the maximum allowable number of passengers, which is to be shown on the capacity plate. If the lift is intended for use to carry persons, other than wheelchair user with or without assistant, the car loading capacity (rated load and maximum available car area) shall be designed accordingly to Table 6 of SS550:2020 to prevent overloading of the lift car by persons using the lift.

5.4.3. Emergency rescue

- i. Means shall be provided to bring the lift car to a level where rescue can take place during emergency, including power failure and controller fault.
- ii. Except for lifts serving two storeys with shallow pit (of less than 500mm in depth), a car apron shall be provided according to SS550:2020 Clause 5.4.5. The requirements shall include but are not limited to:
 - a) Each car sill shall be provided with an apron. The apron shall be extended minimally to the whole width of the clear landing entrance, which it faces.
 - b) The vertical section of the apron shall be extended downwards by a chamfer. The angle formed between the chamfer with the horizontal plane shall be at least 60°.
 - c) The projection of this chamfer to the horizontal plane shall be not less than 20mm. For any projections on the face of apron (e.g. fixings) shall not be more than 5mm. For projections that exceed 2mm, they shall be chamfered at least 75° relative to the horizontal.
 - d) The vertical height of the apron shall be at least 0.75m.
 - e) The apron shall resist without permanent deformation larger than 1mm and elastic deformation larger than 35mm when a force of 300 N, being uniformly distributed over an area of 5 cm² in either round or square section, is applied perpendicularly from the landing side to the apron at any point along the lower edge of the vertical section.

- f) Alternatively, a retractable car apron can be installed if a permanent car apron could not be provided due to insufficient pit depth. The retractable apron shall comply to the requirements in 5.4.3(ii)(a) to (e) when it is fully extended.

5.5. General requirements for VPL(Enclosed) with either Traction or Hydraulic drive

5.5.1. Working areas in the car or on the car roof

Mechanical device shall be provided accordingly to the requirements in SS550:2020 Clause 5.2.6.4.3. The requirements shall include but are not limited to:

- i. Where maintenance or inspection work is to be performed from inside the car or from the car roof, which the maintenance and inspection work can cause danger to persons due to any type of unintended and uncontrolled car movement, the following requirements shall apply:
 - a) Provision of mechanical device to prevent dangerous movement of the lift car shall be provided.
 - b) An electric safety device in conformity with SS550:2020 Clause 5.11.2 shall be provided to prevent all movements of the lift car unless the mechanical device is set in its inactive position.
- ii. When the mechanical device is set in its active position with forces exerted on it which does not allow it to be disengaged, the following means to leave the well shall be catered for:
 - a) Via the landing door by a clear and unblocked opening of at least 0.50m x 0.70m above the car door header/door drive; or
 - b) Via the car by going through an emergency trap door in the car roof according to SS550:2020 Clause 5.4.6. Ladder, steps and/or hand hold(s) shall be provided for safe access into the car; or
 - c) Via an emergency door as SS550:2020 Clause 5.2.3.

5.5.2. Unintended car movement protection

- i. The unintended car movement protection is catered as a protection means for situations involving unintended car movement with doors open within the door zone away from the landing, excluding movements resulting from loading/unloading operation.
- ii. The unintended car movement protection shall stop or prevent unintended car movement away from the landing with car doors not in closed position and landing door not in closed and locked position due to any single failure of the lift machine or drive control system on which the safe movement of the car depends.
- iii. The unintended car movement protection shall be provided according to SS550:2020 Clause 5.6.7.

5.5.3. Protection against free fall, excessive speed and creeping

- i. For traction lift, the protection and tripping means shall be provided according to SS550:2020 Table 11.
- ii. For hydraulic lift, the protection and tripping means shall be provided according to SS550:2020 Table 12.

5.5.4. Counterweight safety gear

- i. In the case where there is occupancy beneath the pit floor, counterweight safety gear shall be provided according to SS550:2020 Clause 5.2.5.4.
- ii. The tripping means shall be one of the following and provided according to SS550:2020 Table 11:
 - a) Overspeed governor;
 - b) Tripping by breakage of suspension means; or
 - c) Tripping by safety rope.

5.6. Further requirements for VPL(Enclosed) with Traction Drive

5.6.1. Braking system for VPL(Enclosed) with Traction Drive

- i. The braking system requirements for VPL(Enclosed) with traction drive shall be designed according to the relevant clauses under SS550:2020 Section 5.9.2.2.
- ii. The emergency operation for manual rescue for VPL(Enclosed) with traction drive shall be designed according to the relevant clauses under SS550:2020 Section 5.9.2.3 and 5.9.2.4.

5.6.2. Suspension means using steel wire ropes or suspension belts

For VPL(Enclosed) with traction drive that uses steel wire ropes or suspension belts as a suspension mean, the suspension means shall be designed according to the relevant clauses under SS550:2020 Section 5.5.1. The requirements shall include but are not limited to:

- i. If suspension belts are used, the belts shall be made of composite materials with steel as one of the core material and have properties not inferior to that of steel wire ropes.
- ii. The nominal diameter of the ropes shall be at least 6mm.
- iii. The tensile strength of the wire and the other characteristics shall be in compliance with EN 12385-5 or ISO 4344:2004 or other equivalent standards.
- iv. The exhibition of rope data and manufacturer's certificate shall comply to the requirements in SS550:2020 Clause 5.5.1.2 (c) and (d) respectively.
- v. The minimum number of ropes/belts shall be 3.

- vi. The ratio between the pitch diameter of sheaves and the nominal diameter of the ropes/belts shall be at least 40. For suspension belts, it refers to the nominal diameter of the embedded steel cord.
- vii. The safety factor of the suspension means shall not be less than 12 in the case of traction drive with three ropes/belts or more.
- viii. The junction between the rope/belt and the rope/belt termination shall resist at least 80% of minimum breaking load of the rope/belt.
- ix. Rope/belt traction shall fulfil the requirements in SS550:2020 Clause 5.5.3.
- x. Continuous belt monitoring system shall be installed in lift using suspension belts. The belt monitoring system shall continuously monitor condition of the steel cords within the PU coating via direct measurements (for e.g., electrical resistance/inductance) of the cord's physical parameters. The monitoring system shall stop the lift operations in the event of deterioration in any of the embedded steel cords, loss of residual strength, belt breakage or any other dangerous situation which will cause the belts to fail.

5.6.3. Ascending car overspeed protection

- i. The ascending car overspeed protection is catered as a protection means for situations involving excessive speeding in the up-direction travel of the lift car. The ascending car overspeed protection shall be made up of speed monitoring and speed reducing elements, which shall detect overspeed in the ascending direction of the lift car and shall cause the lift car to stop or at least cause a speed reduction to a level, which the counterweight buffer is catered for.
- ii. The ascending car overspeed protection means shall be provided according to SS550:2020 Clause 5.6.6.