

BCA's COP for Mechanised Car Parking Systems - Interpretation & Acceptable Practices

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Objectives

To brief on the interpretation and the acceptable practices for BCA's COP for Mechanised Car Parking Systems (MCPS). It can be retrieved from:

<https://www1.bca.gov.sg/regulatory-info/lifts-escalators>

Man-Machine Interface

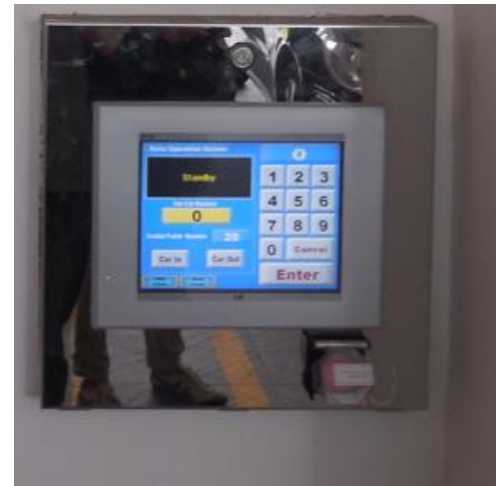
Man machine interface - for a Mechanised car parking system, means all parts of the Mechanised car parking system other than a part of the Mechanised car parking system that

(a) is designed for the storage of a vehicle;
and

(b) is not intended to be accessible by any person operating or using the Mechanised car parking system

This includes, but is not limited to,

- The transfer area and control panel,
- Control logic that regulates all interactions between driver and MCPS (including Side doors).



Regulated MCPS

Automatic



Semi-automatic



For semi-automatic system, the driver needs to communicate the location of the stored vehicle to the MCPS control system.

Manual



For manual system, it is hold to run

Equipment not regulated as MCPS

Showroom



Warehouse



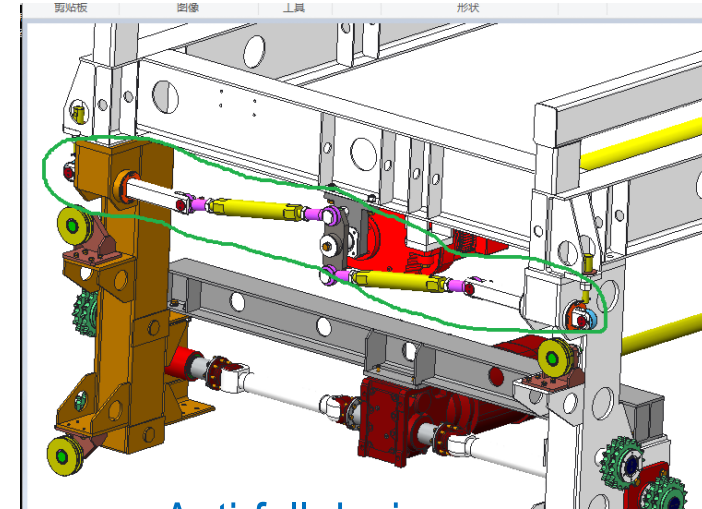
Not accessible to public, only workers

Workshop car lift



Definitions

- 1) **Authorised Person** - A person that is authorized to access transfer area of the MCPS, including driver who has parked or is intending to park his vehicle in the MCPS
- 2) **Anti-fall device** - A mechanical or structural mean that prevents the lowering of the load carrier in event of failure of mechanical elements such as gearbox, shaft, motor brake, wire rope, chain, wire rope drum, hydraulic etc.
- 3) **Transfer area** -The area of the MCPS where the driver will enter to park or retrieve his vehicle. This includes any area that the driver can stand at within the MMI of the MCPS.
- 4) **Load carrier** - The platform on which the vehicle is supported (1) before the parking sequence is initialised, and/or (2) after the retrieval sequence is completed.
- 5) **Man-machine interface** - All aspects of the MCPS that involve interaction between the user and the system.



Anti-fall device



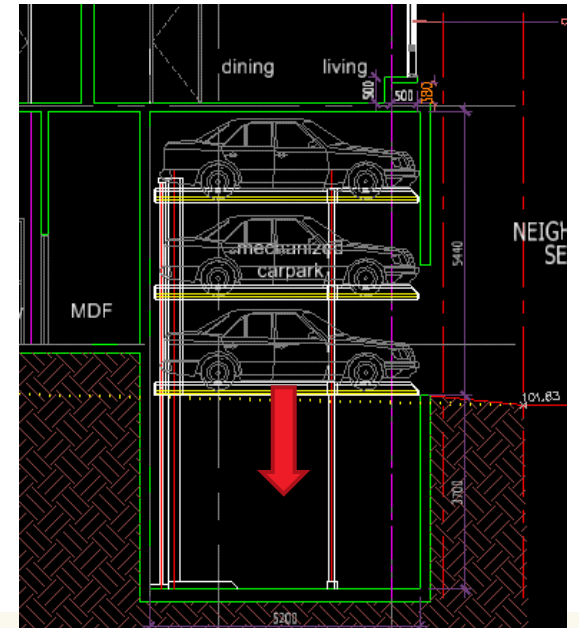
Load carrier



Transfer area

Primary Hazards

- 1) **Access control** – Possible injury if a member of public enters the transfer area when the MCPS is moving
- 2) **Within Transfer Area** – Tripping hazard and falling into the gap
- 3) **Load Carrier** – Possible suspension failure resulting in falling from height during the parking process
- 4) **Control** – Starting of retrieval process when a driver is in the transfer area



Access to the MMI of MCPS

3.1 **Access** to the transfer area of MCPS shall be **restricted to authorised person**. Means shall be provided to prevent unauthorised person from entering the transfer area of the MCPS e.g. by lock, or restrictions in access code, magnetic card, or key operated switch.



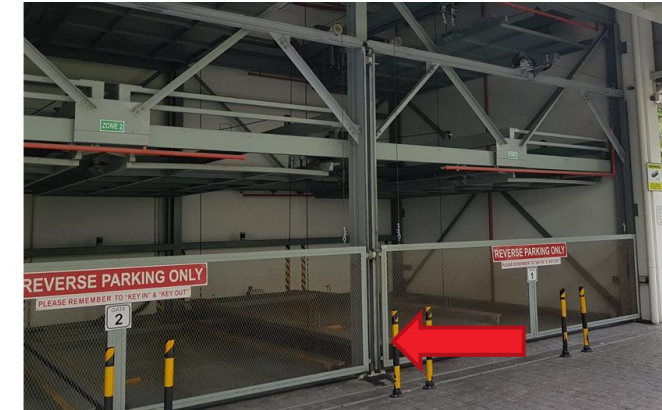
3.2 **Main entrance** shall be so designed, constructed and installed such that, when the fully closed door is subjected to a force of 300N, applied on an area of 5cm² at right angles to and approximately at the centre of each panel, it shall resist a permanent deformation and an elastic deformation not greater than 15mm. All other doors shall comply with local building code requirements.



Access to the MMI of MCPS

3.3 For an Automatic/semi-automatic system, the opening of the main entrance, side and maintenance door shall stop the MCPS immediately and cause the MCPS to remain stopped. Re-starting can only be done after an authorised maintenance person has checked and ensure it is safe to re-start.

3.4 Means shall be provided to prevent the main entrance and side door from opening when the MCPS is in operation. The mean shall resist a force of 1000N in the direction of the movement of the door. Retaining means shall not be electromagnetic, pneumatic and hydraulic devices, and shall be positively locking to prevent unauthorised opening of the door in the event of loss of power.



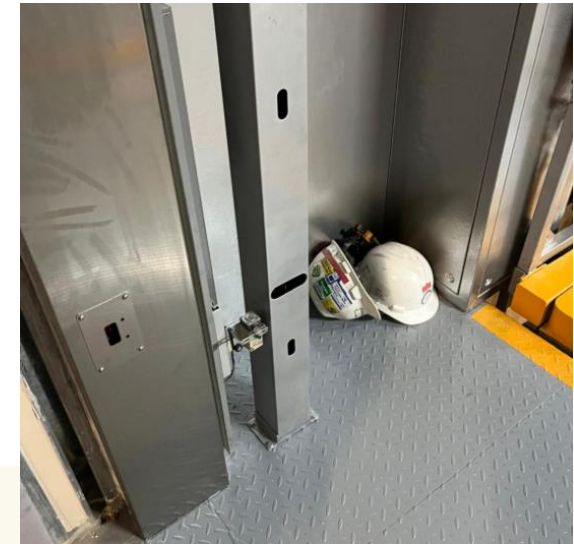
Access to the MMI of MCPS

3.5 If the MCPS is equipped with a side door, it shall open outwards without any lock from inside the transfer area and should be self-closing. The door shall only be able to be opened by means of a key from outside of the MCPS. It shall also be equipped with an electrical safety switch to prevent operation of the MCPS when the door is opened. The door shall have a minimum opening of 1.0m width and height of not less than 2.1m.

Note: If the MCPS has provision for handicap personnel, the side door opening shall be 1.2m in width.

3.6 The main entrance shall be equipped with door protective devices e.g. light beam or light curtain that is activated when an obstruction is detected. The main entrance shall re-open upon activation of door protective devices.

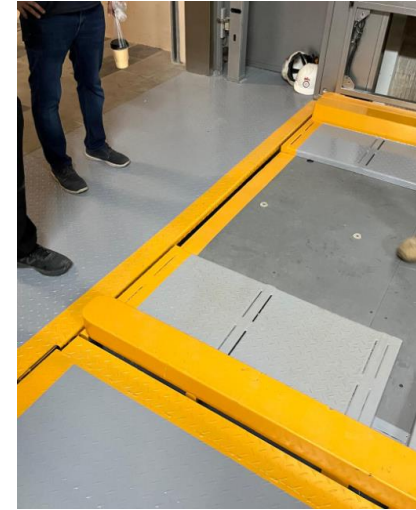
3.7 There shall be at least one emergency exit in the transfer area.



Transfer area

4.1 The transfer area shall have an illumination of at least 200 lux.

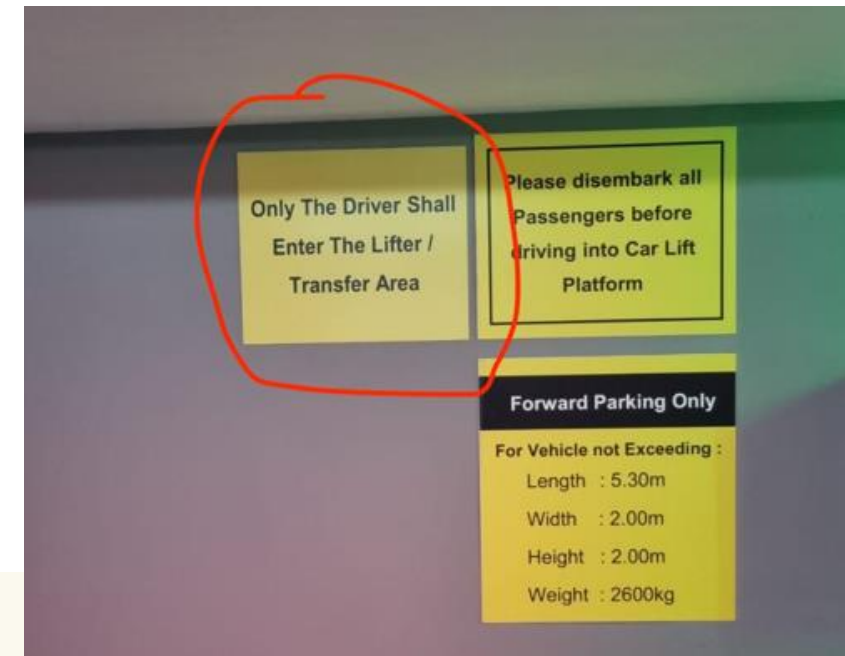
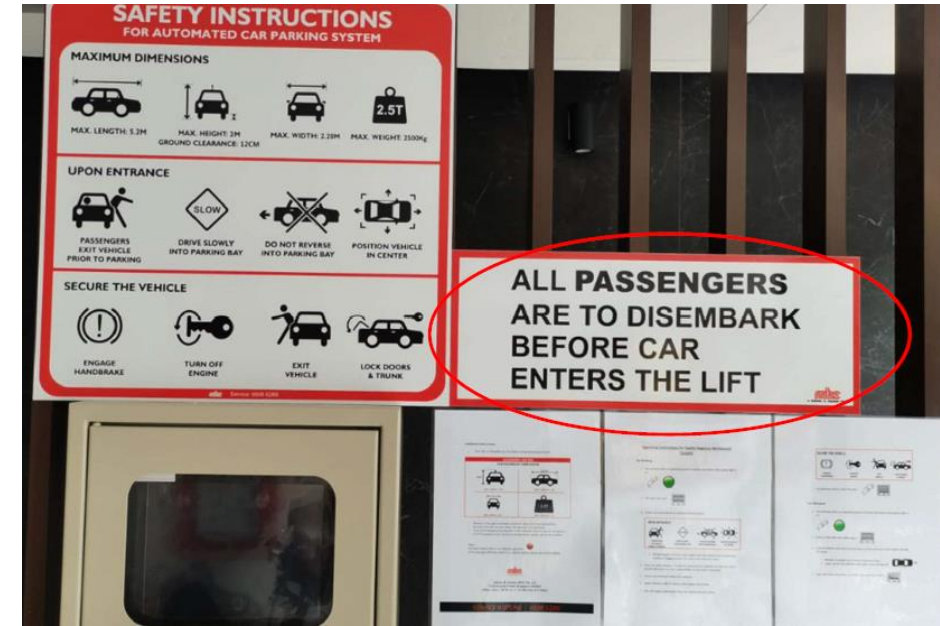
4.2 The surface of the transfer area, excluding the load carrier and platform, shall be as flat and smooth as possible to prevent any tripping hazard. Where openings are unavoidable, they should not allow spherical objects larger than 40mm in diameter to fall through. Demarcation should be used to warn the driver of the opening.



Transfer area

4.3 There shall be a provision of a signage to indicate that only the driver is allowed in the transfer area and passengers shall disembark from the vehicle outside of the transfer area. The signage shall be located outside of the transfer area and be clearly visible.

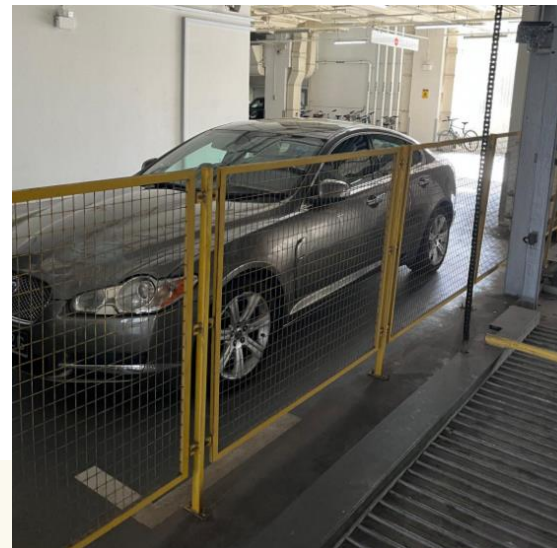
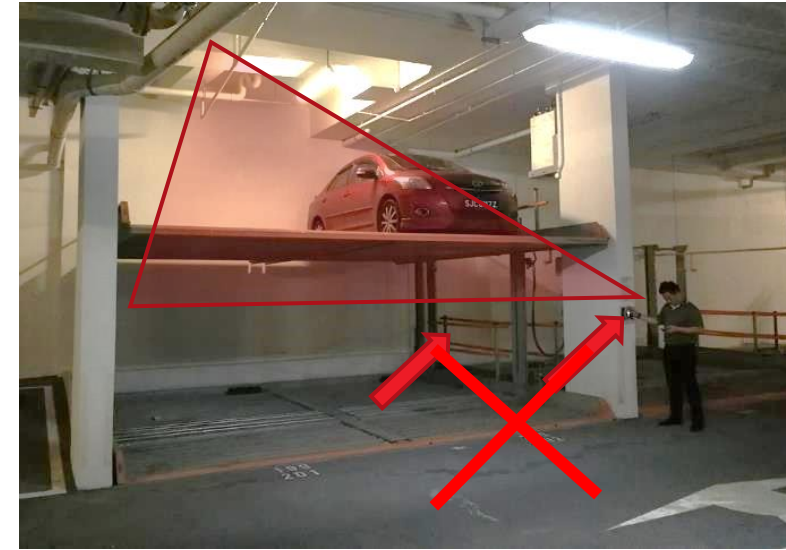
4.4 Where there is a risk of falling more than 1.0m in height from the transfer area, barricade according to local building code requirement shall be provided to prevent falling from height.



Transfer area

4.5 A path shall be clearly marked to show the driver the way out of the MMI of the MCPS from his vehicle to the door access.

4.6 For manual systems, all the sides except the entrance and exit shall be barricaded. The barricade shall be installed in a manner to sufficiently prevent any personnel from being endangered by the moving parts of the MCPS or interfering with the safe operation of the MCPS or reaching the MCPS equipment. Effective means, such as intrusion sensor, to prevent person from being injured by the moving parts can also be used for this purpose.



Transfer area

4.7 CCTV shall be installed with coverage of the whole transfer area and the control panel outside of the transfer area. The minimum specifications -.

- a. Capacity to record 24 hours a day, 7 days a week;
- b. Frame rate of at least 6 frames per second;
- c. Video resolution of at least 352 x 240 pixels or CIF CCTV resolution; and
- d. Storage of video footage of at least 30 days.



Load carrier design

5.1 The carrier shall be designed so that the driver can alight in a safe manner without any sudden or jerky movement of the system.

5.2 An anti-fall device shall be installed to prevent the lowering of the load carrier during the parking process when the driver is inside or alighting from the vehicle. The device shall act directly on the load carrier or not through any mechanical transmission device such as gear box, chain, wire rope, drive shaft, hydraulic etc.



Load carrier design

5.3 To prevent tripping, the height different between the top of the platform side upturn and the transfer area shall preferably be less than 150mm. Demarcation shall be used to warn the driver of the height different.



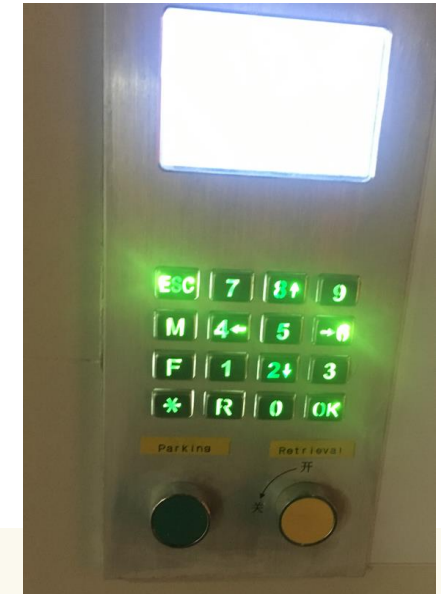
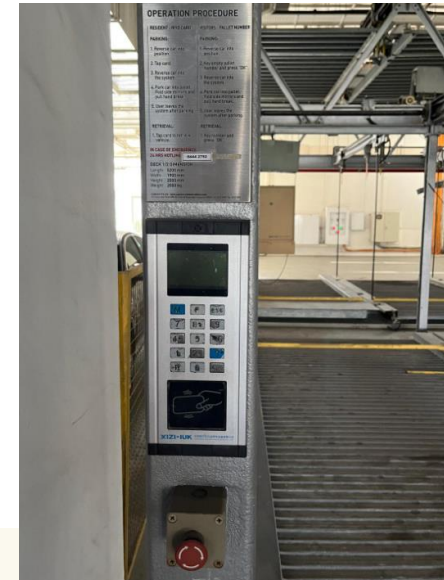
Control

6.1 Automatic/Semi-automatic system

6.1.1 Initializing the storage and retrieval of the vehicle shall only be possible from a control panel located outside the transfer area.

6.1.2 Control panel shall be constructed, mounted and secured to minimise the risk of unintended or unauthorised operation. It shall also be installed in a fixed location.

6.1.3 If the MCPS is installed with more than one control panels, they shall be mutually interlocked, so that the initializing the storage and retrieval of the vehicle shall only be possible using one control panel at a time.



Control

6.1 Automatic/Semi-automatic system

6.1.4 There shall not be any control devices to initiate the storage and retrieval of the vehicle inside the transfer area or within the reach of the driver from inside the vehicle.

6.1.5 Sensor shall be installed to detect the presence of any person in the transfer area. Additional sensor, e.g. Motion sensor shall be installed to enhance to detection of the presence of any person. Upon activation of any of the sensors, the systems shall not operate.

Note: This requirement may not apply to semi-automatic systems.

6.1.6 Emergency stop shall be provided inside the transfer area, at all the control panels outside of the transfer area and shall be clearly identifiable and visible.

6.1.7 The reset of the emergency stop shall only be done by authorised maintenance person.



Control

6.2 Manual system

6.2.1 The motion of the load carrier shall only be initiated using a hold-to-run control.

6.2.2 The hold-to-run control shall be located in a manner that the driver has an unobstructed view of the load carrier and the driver is not exposed to any moving part of the MCPS during its operation.

6.2.3 The hold-to-run control shall be constructed, mounted and secured to minimise any risk of unintended or unauthorised operation. It shall also be installed in a fixed location.

6.2.4 When the load carrier is in motion, there shall be light or audio signal to warn person in the vicinity.

6.2.5 When more than one manual system MCPS are installed together, each manual MCPS shall be equipped with its own control panel, or if consolidated to a single panel, only one MCPS can be operated at a time.



Control

6.3 When the emergency stop is pressed, the MCPS shall stop immediately and remain stationary until an authorised maintenance person resets the emergency stop.

6.4 If there is any risk that a user will be trapped inside the transfer area and there is no means to escape, alarm device shall be installed where the risk exist. Such device must be powered by an emergency backup power supply.



Annex - Inspection and Testing of MMI of MCPS

B2.1.1 Cycle test each pallet/lot with maximum loading capacity and check for abnormal operation of mechanical devices, deformation to the pallet and structural element.

B2.4.1 Check the holding capacity of the brake by loading the load carrier to maximum capacity and hold it for 10 minute. After 10 minute, there shall not be any displacement from the point when the vehicle was loaded.

B.2.4.2 Check that during landing, the load carrier levels at the correct position

B.2.5.4 Check that the motion sensor has the correct sensitivity and there no dead zone inside the MMI of the MCPS

B.2.5.5 Safety Sensor – Ensure that the operation of any of the switch shall render the MCPS inoperative and remain in stop position.