

Use of Lifts for Evacuation

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1. PURPOSE

The purpose of this guideline is to provide advice to industry on the use of lifts for evacuation. It also serves as a document for operational firefighters to refer to when becoming aware of the issues that may affect their standard operational procedures.

2. SCOPE

This document details Fire Rescue Victoria's (FRV) opinion regarding the use of lifts for evacuation and firefighter access. It outlines the considerations that FRV believes are required to be adequately addressed when an alternative solution incorporates lifts into an emergency management strategy. The guideline considers the design, construction, commissioning, maintenance and management of lift systems for the full life cycle of a building.

Reference should be made to FRV Fire Safety Guideline *GL-07 – Single Fire Isolated Stair in High Rise Buildings* if the use of lifts for evacuation is to be designed in conjunction with a single exit.

This guideline should also be read in conjunction with the Australian Building Codes Board's (ABCB) *Lifts Used during Evacuation Handbook*, 2013.

3. BACKGROUND

FRV has traditionally been supportive of designs which provide equitable evacuation opportunities for all occupants of a building. The use of lifts in a fire emergency prior to the arrival of firefighters is one concept that goes against the prescriptive deemed-to-satisfy requirements of the Building Code of Australia (BCA), and as such, requires careful consideration, proof and demonstration to ensure that any potential modes of failure are identified and adequately addressed. It is also the opinion of FRV that the use of lifts for evacuation should only be considered within fully sprinkler protected buildings, where trained fire wardens and an appropriate emergency management structure are in place.

Whilst FRV is appreciative of the benefits associated with the use of lifts for evacuation, FRV considers that the use of lifts should only be used to compliment an evacuation strategy that concurrently considers the use of fire isolated stairwells as a means of egress.

Since the development of this guideline, the ABCB published a non-mandatory document, *Lifts Used during Evacuation Handbook*, 2013. It is stated in the handbook, which is also in line with this document, that; "*the objective of safely using lifts for evacuations is not intended to diminish the importance of other evacuation measures, including exits, and it is not intended to reduce the number of exits, in particular the number of stairways*".

In the National Construction Code (NCC), Section D, *Access and Egress of Performance Requirement DP7*, has been introduced which states: What DP7 does not specifically state is that it does not list 'Fire Brigade Intervention' specifically as a consideration; however it is considered that Fire Brigade Intervention may be considered within the emergency procedures for the building.

The examination of data by FRV has identified a number of issues that are associated with lift functionality during a fire incident or other related emergency. The issues outlined in previous FRV Fire Safety Guidelines, *GL-31 – Use of lifts for evacuation* (Version 2, 12 April 2016) and *GL-07 – Single-stair high rise building solutions* (Version 4, 9 August 2005), have been re-examined and further expanded on within this guideline.

4. LIFT SYSTEM CONSIDERATIONS

Prior to the development of any project that aims to incorporate the use of lifts into the life safety system of a building, the limitation of the lift systems and their associated control equipment must be understood and addressed.

Liaison between the lift industry and the Australasian Fire and Emergency Service Authorities Council (AFAC) has identified the functions that can and cannot typically be performed by a lift. Such functions, as indicated by the lift industry and outlined below, should be addressed through consultation with the lift designer and manufacturer as part of the analysis of any solution incorporating the use of lifts.

Typical functions lift systems **can** perform are:

- carry their rated loads at contract speed
- run from bottom to top floor in a prescribed time
- communicate with the outside for assistance
- provide emergency lighting in a car in the event of a power failure
- bypass a floor if fully loaded
- know when to open or close doors
- protect door openings to stop doors closing on person/s
- facilitate special fire services control, provided the keys are available
- switch to emergency power, provided it is available
- detect an earthquake of a magnitude that could cause harm
- bypass security systems when on fire service control
- provide information as to the lifts location within the lift shaft.

Typical functions that lift systems **cannot** perform:

- run when overloaded
- run when any door is open or has a faulty contact/lock
- run if doors are distorted by fire
- run if water is in the pit above a certain level
- run if safety gear has operated
- run if there is insufficient power available
- run if door damage effects locks
- run if the machine room temperature is excessive
- run if the lift is under repair
- decide who should use the lift.

Based on these identified limitations, it is FRV's opinion that lifts alone cannot be relied upon to facilitate firefighter access and occupant evacuation in a building.

When the lifts are utilised in an alternative solutions' evacuation strategy, the design team will need to establish specific performance criteria that must be achievable whilst the building is occupied. Similarly, the design team will need to establish evacuation procedures that will complement the alternative solutions' evacuation strategy. The evacuation strategy should also be validated post occupation through the staging of periodic evacuation drills, as well as being included within the buildings' essential safety measures maintenance regime.

5. GENERAL CONSIDERATIONS

Where lifts are proposed for the general evacuation of occupants, theoretically this provides a means of egress for all occupants, including those who may have a disability or mobility impairment. FRV acknowledges that they are not the experts in the design of such systems. However, based on conferences and studies dealing with the use of lifts for evacuation conducted to date and the ABCB's *Lifts Used during Evacuation Handbook*, 2013, a range of deficiencies in current designs have been highlighted. It is the expectation of FRV that designers not only address concerns during desk-top design, but also through robust practical demonstration and ongoing purpose developed maintenance regimes. These concerns relate to the following:

- 5.1. The number and dimensions of fire-isolated exits should not be reduced as part of a design proposing to incorporate the use of lifts into an emergency management strategy. These exits are encouraged to be used as the primary evacuation route for ambulant occupants.
- 5.2. The use of lifts for evacuation should only be considered within fully sprinklered buildings with trained wardens and an appropriate emergency management structure is in place.
- 5.3. A sufficient number of lifts should be provided that facilitate both the evacuation of occupants, as well as firefighter access, with at least one of those lifts dedicated for firefighter use. Upon the general fire alarm, the dedicated firefighter lift is to descend to the ground floor and thereafter should only be operated by fire service personnel via key.
- 5.4. At the time of the writing of the ABCB's *Lifts Used during Evacuation Handbook*, 2013, there was considerable debate amongst lift manufacturers in regards to changing the lift management software. Such an exercise would not only be costly but would require new communication protocols and extensive retesting to avoid the software's integrity from being compromised. The Australian Elevator Association, one of the authors and stakeholders of the handbook's development, went on to recommend that *"changing the software protocols could only be considered when buy-in from the lift manufacturers is obtained and the software permits the modifications to be carried out with confidence"*. It is recommended that if lifts are to be utilised for evacuation, the support and buy-in of both the lift designer and manufacturer are obtained in the first instance. Evidence of this support would then be required by FRV. The number, sequence and design of lifts shall be done in conjunction with the lift/transport engineer and mechanical and fire safety engineers to ensure technical issues, as detailed within the ABCB's *Lifts Used during Evacuation Handbook*, 2013 are considered within the design's reliability, no. of operation (i.e. wind effect, stack effects, smoke/fire separation etc.).
- 5.5. Lift keys that provide firefighter control are to be kept at the relevant fire stations and at a security/emergency liaison point, fire indicator panel (FIP) or fire control room (FCR).

- 5.6. It is envisaged that all lifts will be provided with firefighter control, as well as recall facilities. The lifts, once under the control of firefighters, would be operated from within the lift car. Lift annunciation panels should be provided at ground floor adjunct to the lift landing doors and the FIP/FCR.
- 5.7. Reliable means of communication within the lifts to the FIP/FCR (telephone system, hardwired, fire rated cabling etc.).
- 5.8. Emergency management plans and evacuation strategies should be developed in consultation with FRV and take into consideration the impact of human behaviour upon the assumed evacuation strategy.
- 5.9. It is expected that during the development of the evacuation strategy, FRV will be further consulted and advised of the finalised procedures so that operational staff can be advised.
- 5.10. Appropriate signage and educational programs for all occupants are to be displayed within the lobby areas that provide access to the lifts and stairs, outlining instructions to the building's occupants during an evacuation.
- 5.11. Procedures and safety systems need to be implemented in the case of a fire that is located in areas such as lifts, lift shafts, lift motor rooms and smoke lobbies, which may preclude the lifts being used for evacuation purposes. In addition, lift controls and programming should not allow lifts to go to smoke/fire affected smoke lobbies.
- 5.12. Lifts should be designed to incorporate protection from possible equipment overheating and the products of fire.
- 5.13. Appropriate visual indication should be provided on each floor so that fire wardens and firefighters are provided with the relevant information relating to the status of each lift.
- 5.14. Consideration should be given to locating lift shafts and fire isolated stairs within a protected smoke/fire lobby, providing a 'safe haven' sufficiently sized to accommodate occupants waiting to be evacuated. The use of lifts for vertical transportation will form only a part of the whole evacuation philosophy.
- 5.15. The sequence of lifts upon fire alarm shall be developed in consultation with the fire service. A potential lift sequence may, upon alarm, facilitate immediate recall of all lift cares to the safe discharge level (normally ground floor) for the travelling occupants to disembark. Empty lifts would travel to the floor of fire origin (only if a call is registered on the fire floor landing call button) and subsequent lifts to the floors above. Meanwhile, a dedicated firefighter service lift will descend to the ground floor for use by the fire service.
- 5.16. The lift system, including all mechanisms such as the lift shaft, shall be designed appropriately and incorporated in the buildings' design to minimise the impact of smoke, heat, air pressure, leakage, lift piston effects and human behaviour on lift operation. Integration of lifts with sprinkler and smoke detector activation, and other lift safety systems, shall be an integral component of the system design.
- 5.17. Specific evacuation systems utilised within the building shall be supported by a reliable power supply. Back-up power supplies are also required to be provided.
- 5.18. Lift control programming should be developed in consultation with FRV, with consideration given to providing logical sequences under both automatic and manually generated alarms.

- 5.19. The implementation of an automatic sequential evacuation process is to be considered and the unnecessary evacuation of unaffected floors should be discouraged within the design, unless automatically instigated. Manual control is to also be provided.
- 5.20. The level of lift safety, reliability and availability, including breakdown, maintenance and associated down time, must be considered in fire and other emergency scenarios.
- 5.21. Protection against water ingress to lift shafts and drainage for both lobbies and lift shaft pits are essential for continued operation of lifts.
- 5.22. Management of the lift system in a residential building without the facilitation of wardens is considered to be unreliable and therefore not recommended.
- 5.23. Regular scheduled training and familiarisation exercises for those who are expected to use the lifts in a fire situation (including occupants, firefighters etc.) must be provided for the life of the building.
- 5.24. All lift security features must be overridden when the lift car is in fire service mode.

6. DOCUMENTATION

The overall fire safety design must provide an acceptable level of occupant life safety, as well as firefighter life safety.

For the purpose of the fire service review, the following must be provided **in writing** from the practitioner:

- reason for the use of lifts for evacuation
- redundancies proposed in the design
- comment against this guideline and relevant discussion points
- support and endorsement of the design by the lift designer and manufacturer.

It should be noted that a supporting decision made for one building does not automatically infer the same decision will be made for another. Each building shall be reviewed on its own merits, with all justification documented.

Note: *This is a controlled document and may only be modified by authorised personnel after review by FRV Fire Safety Advisory Group.*