TECHNICAL SPECIFICATION

ISO/TS 18870

First edition
2014-08-15

Lifts (elevators) — Requirements for lifts used to assist in building evacuation

Ascenseurs — Exigences pour les ascenseurs utilisés en cas d'évacuation de bâtiments

Reference number
ISO/TS 18870:2014(E)

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Published in Switzerland

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 178, *Lifts, escalators, and moving walks*.

Introduction

This Technical Specification has been prepared in response to ISO/TC 178 Resolution 273/2007 in which the Technical Committee requested that WG 6 undertake to write a specification for lift features that if incorporated into an appropriate lift would enable it to be used in safety to evacuate persons from a building that was suitably designed.

This work results from a detailed study undertaken by TC 178/WG6 into the feasibility of using lifts for evacuation of persons. The study ISO/TR 25743 indicated that it was feasible to use lifts, provided that certain features were incorporated in the lift and also in the building.

Lift engineers and other specialists have been involved in the production of this specification.

It has been recognized that lift engineers are not experts in building design or fire engineering. The writing of this Technical Specification does not indicate if it is acceptable or permitted to use lifts for building evacuations. It only indicates the features required should those persons responsible wish to make such a decision. This Technical Specification does not define, in any detail, building features that will have to be provided in conjunction with a lift intended to be used for evacuation. Its aim is to make clear to those persons involved in building design and fire engineering the issues that they shall address to enable the lift to be used safely.

There are many reasons why a building might need to be evacuated, such as a fire, explosion, chemical or biological attack, flooding, storm damage, earthquake, etc. Not all of these are relevant to every building and other hazardous situations, while existing, are so unlikely to occur that they can be disregarded. Designers of buildings have to determine if a particular hazard is sufficiently great as to require addressing.

If, for example, a small office block is being designed that will be located in a mid-town area, it is within the realm of possibility that it could be subjected to an explosion or chemical attack (terrorism). It is not, however, very likely to be the case unless it has some particular reason to make it vulnerable. In most cases, the risk of these events is probably so low as to make it unnecessary for them to be addressed.

If the building is to be the headquarters of National Security, this will increase the likelihood of it being subjected to some form of attack. It might be necessary to consider the effects of an explosion in or close to the building or a chemical agent being introduced into the building.

Clearly, a building constructed in an area where earthquakes do not normally occur need not have provisions made for such an event.

If a building is to be built in the centre of a major city to form a prestigious landmark, it might be essential to consider all likely events that could occur.

The designer of the building has to determine, by risk assessment or other methods, what hazardous events needs to be reasonably addressed. Once this is completed, ISO/TR 25743 can be used to understand the lift and building features that might be required for each evacuation scenario envisaged.

A lift or lifts can enable disabled persons to evacuate a building in relative ease, but if it is thought, lifts could play a role in general evacuation, they might or might not make a significant contribution to reducing the general evacuation time. It will depend on the building size, number of lifts, etc.

This Technical Specification defines lift requirements to address common hazards that all users could be exposed to if lifts are used for evacuation.

Even if it is thought that lifts could play a part in a general evacuation, it might prove to be uneconomical. It is not suggested for lifts to replace or change the requirements for escape stairs, and that using lifts instead of stairs can increase evacuation times in many building designs. The intention is to allow lifts to play a positive role in assisting and improving the efficiency of the building evacuation strategy.

This Technical Specification is divided into sections covering the key items that have to be addressed. There is no priority intended from the order in which the items are listed.

Lifts (elevators) — Requirements for lifts used to assist in building evacuation

1 Scope

This Technical Specification 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 this Technical Specification 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.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4190-5, *Lift (Elevator) installation — Part 5: Control devices, signals and additional fittings*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
Alternative Evacuation Exit Floor
AEEF
level defined by the building designer to be used for evacuation when systems or management determine it should be used

3.2
Building Management System
BMS
system capable of making appropriate decisions based on information sent to it

3.3
chemical incident
introduction of a gas, chemical, bacterial agent, or substance into the building

3.4
building management
persons or organization responsible for ensuring the day-to-day safe efficient running of the building and for ensuring the building is safely evacuated in line with the evacuation strategy

3.5
ETA
estimated time of arrival of the lift

3.6
fire
combustion of material producing, heat, sometimes smoke, and/or flame

3.7
Fire Command Centre
FCC
room or area provided in the building where information is displayed showing the status of a fire detection system and lifts, etc. and where management can receive audible and visual information to determine what actions to take if lifts are to be used

3.8
fire compartment
fire separated area
area within a building bounded by walls, floor, and ceiling constructed from fire resisting material so as to provide resistance to fire for a defined period

3.9
fire warden
person appointed by the building management to assist in managing the evacuation of a floor or area of building during an emergency

3.10
hazardous area
area where due to heat, smoke, gas, etc. the environment is considered dangerous to persons

3.11
hazard detection system
system of sensors capable of automatically detecting fire, smoke, gas, etc

3.12
impaired mobility
difficulty in using stairs because of a physical impairment

3.13
lift evacuation time
time a person spends using a lift to evacuate

Note 1 to entry: It is expressed in s.

Note 2 to entry: This is measured from initiation of evacuation service for a given floor plus the time spent travelling to the floor plus the time to open doors, load the car return nonstop to main exit for evacuation, open doors, and empty lift car.

3.14
Main Evacuation Exit Floor
MEEF
floor designated by the building designer where persons should exit lifts to leave the building

Note 1 to entry: This might or might not be the normal exit floor or ground floor of the building.

3.15
required lift evacuation handling capacity
number of persons who can be moved to the main evacuation exit floor in a five-minute period, expressed as a percentage of the total number of persons to be evacuated by lifts

Note 1 to entry: This is not to be confused with normal lift handling capacity.

3.16
required lift evacuation time
time measured from start of the lift evacuation service to completion of the evacuation of a floor or number of floors

3.17
safe area
safe floor
area of the building, where it is known that heat, smoke, etc. are not present and where it will be safe for people to wait, travel in, or leave the lift

3.18
total lift evacuation time
time required to move all persons requiring evacuation by lifts to the *Main Evacuation Exit Floor* (3.14)

Note 1 to entry: This time is measured from start of evacuation service with lift(s) at MEEF to evacuation of all persons and return of lifts to the MEEF.

3.19
building sign
information display provided by the building, not the lift, informing building users of the location of evacuation lifts available for use

4 Automatic evacuation lift specification

4.1 Determining the number and size of lifts

To calculate the number and size of lifts required to provide an adequate evacuation service, the handling capacity of a given lift or group of lifts shall be determined. To calculate lift handling capacity, the lift designer will require certain information as detailed in Annex B.

Any other building specific information that might affect the handling capacity or assist the lift designer in understanding the issues related to the evacuation strategy should also be provided.

It shall be recognized that there is always a reasonable possibility that a lift or lifts might not be available for some reason. This might occur due to planned maintenance, repairs, etc. An allowance should be made in the handling capacity calculations to take account of this. This shall be done by assuming that in a building with multiple lifts, at least one lift will not be available at any given time and should therefore be removed from any calculation.

In determining the size of the lift, it should be assumed that if a lift car arrives at a floor and there is not enough space for people to enter, there is a risk of panic and/or overloading. This might occur where a wheelchair is in the lift consuming a relatively large amount of floor area in relation to its load. To avoid this situation, the size of lift car chosen should be suitable to accept a wheel chair while still providing room for a number of additional occupant(s).

A lift contractor will be able to calculate the number of lifts and their speed provided that the information contained in Annex B is provided.

4.2 Protection of lift equipment

Lift shafts and machine rooms or machinery spaces located outside the shaft should be fully enclosed. The temperature in the enclosures should be maintained to acceptable levels for the equipment, as determined by the lift supplier in consultation with the building management.

Water can come from a number of sources including fire hoses although it is not anticipated that hoses will be deliberately directed at the lift or its equipment.

To avoid unnecessary failures from the ingress of water, a number of provisions shall be made. Sensors in the lift pit shall monitor for the presence of water. For example,

a) if water is detected below the level of pit equipment, sheave, etc. so as not to affect operation; for this condition, a warning shall be sent to the FCC and any BMS, but lifts shall continue to operate, and/or

b) if the water reaches sheaves or other equipment, the lift shall be removed from service (see 4.5).

4.3 Waiting and travelling environment for users

To ensure the safety of users, lift machine spaces, lift shaft, and landing areas outside the lift should be monitored for the presence of smoke or high temperatures likely to harm persons or cause failures of the lift equipment.

The lifts shall not monitor these conditions but respond appropriately to information sent to them by those providing the monitoring equipment.

When an unsafe condition is detected at a floor, the lift shall be prevented from stopping at the relevant floor or floors.

If an unsafe condition is detected in the well or machinery space, the lift shall be removed from service at the first available safe area.

The lift shall inform the FCC and any BMS that it is no longer available for service.

4.4 Removal or suspension of lifts from evacuation service

Where a lift receives a command from a BMS or manual signal to stop or suspend service to a floor or area of the building, any stop shall be a controlled stop at a safe area. A controlled stop means allowing the lift to slow down and stop at a floor in the normal manner.

Where a lift or lifts are instructed to suspend service, the lift(s) shall inform the FCC and any BMS once it is no longer available for service.

4.5 Lift system reliability

Lift reliability is an important issue but it should be noted that this specification already calls for many features that will increase reliability, such as water protection. The lift will also have an automatic recovery system that minimizes the risk to passengers if a stoppage occurs. For this reason, no further additional provisions are required.

Loss of a bank of lifts is much more serious but is only likely to occur due to loss of the power supply. For this reason, it is vital that secondary (emergency supplies) are provided (see Annex A).

4.6 Automatic recovery system

Whenever a lift containing passengers has stopped for some reason, it needs to be, if possible, automatically recovered to a safe floor. If it is not close enough to a safe floor to open its doors, it should be provided with a means to enable it to attempt an automatic recovery and during this process both car and landing doors should be locked closed and passengers should be informed that a recovery is taking place.

Whenever a car stops, it is a natural reaction for passengers to try and pull the car door open. For this reason, car doors should be locked shut during automatic recovery operation. The doors should remain locked shut until it is determined that the car has recovered to a floor.

During any recovery or attempted recovery, passengers shall be kept informed of what is going on. This information shall be both audible and visual.

A recovery attempt might fail for some reasons, therefore, passengers should be informed of any recovery or failure to recover. If it is not possible to recover the lift and passengers are trapped, they should be provided with visual and audible information that the alarm has been automatically raised and they will be rescued shortly. They shall also be able to communicate with those in charge of evacuation.

If a lift fails for some reason, it shall

a) determine if the lift contains passengers and is outside a door zone,

b) automatically lock the car doors if outside the door zone,

c) inform the FCC and any BMS that it has stalled with passengers and will attempt a recovery to the main floor,

d) inform passengers that automatic recovery is to take place, and

e) establish a hands-free communications link between itself and the FCC.

Those in charge of evacuation or a BMS shall inform the lift system of an alternate safe floor if the main floor is unsafe.

If this information is not received within 20 s, recovery shall be made to the main floor. The automatic recovery system shall permit recovery under the following conditions:

— failure of a control system;

— failure of the drive system excluding the machine;

— failure of a landing or car door lock circuit, provided that the closed condition of doors is monitored. This means additional monitoring of the position of door panels is required;

— failure of a safety circuit controlling car speed or over speed. This means the self-rescue system shall employ its own independent speed-monitoring device.

If automatic recovery fails for any reason, the lift shall automatically inform those in charge of evacuation and any BMS.

NOTE A failure of the main driving motor or brake is not considered likely and therefore not addressed.

4.7 Remote lift car surveillance

At times of emergency, it is vital to be able to see that lifts do not contain trapped passengers who might be incapacitated.

A means to display the entire floor area of the car shall be provided.

Whenever the means is made operative, a sign shall illuminate in the car stating “LIFT UNDER SURVEILLANCE” and an audible message shall be given stating the same message.

The means shall be activated automatically whenever the lift is running on evacuation service. At least one viewing terminal shall be located in the FCC and clearly marked “LIFT CAR SURVEILLANCE” with the lift designation identified.

4.8 Communication system requirements

As a minimum, a two-way communication system shall be available for passenger use to permit direct communications between the lift car and an FCC (see 4.13). National regulations might have additional requirements for the communication system.

Each lift shall be provided with a communication system allowing communication between the FCC, any lift machine room or emergency and inspection panel in the case of machine room-less lift.

Operation of the communication device in the lift car shall be simply by means of a single button, operation of which shall connect the system to the FCC. Further operation of the device in the lift car shall be hands-free and permit simultaneous two-way speech.

The button shall be mounted in the lift car-operating panel or adjacent to it (within 100 mm). Its size, marking, and location should meet the requirements for buttons within ISO 4190-5.

It shall be possible to establish communication with the car from the machine room, any emergency and inspection panel or FCC, again by use of simple buttons.