

English version

**Safety rules for the construction and installation of lifts
Particular applications for passenger and goods passenger lifts
- Part 73: Behaviour of lifts in the event of fire**

Règles de sécurité pour la construction et l'installation des ascenseurs
- Applications particulières pour les ascenseurs de charge
- Partie 73: Comportement des ascenseurs en cas d'incendie

Sicherheitsregeln für die Konstruktion und den Einbau von Aufzügen
- Spezielle Anwendungen für Personen- und Lastenaufzüge
- Teil 73: Verhalten von Aufzügen im Brandfall

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC10.

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Foreword

This document has been prepared by CEN/TC10/WG1/WT4 “Behaviour of lifts in the event of a fire in a building”.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EC Directive(s).

For relationship with EC Directives, see informative Annex ZA, which is an integral part of this Document.

This standard is part of the EN81 series of standards. This is the first edition.

0 Introduction

0.1 This document is a type C standard as stated in EN 1070.

The lifts concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for lifts that have been designed and built according to the provisions of this type C standard.

0.2 At present there are no European and only few national Regulations for lifts which include specifications related to the behaviour of lifts in the case of a fire in a building, except for firefighters lifts and the testing of the fire resistance of landing doors. In some instances, locally required notices can be found such as “Do not use lift in case of fire”.

0.3 This has the consequence, that persons may be able to use lifts whilst a fire is in the building due to the fact that they are not aware of this potential critical situation and the lifts are not taken out of service. In some cases this consequence has led to severe injuries or death of persons because the car stopped at a burning or smoke filled landing, the doors opened and the fire or smoke came into the car. The means for protection at the doors against crushing and shearing (light barriers) have been influenced by the smoke in such a way, that the doors were not able to close again so that the car was not able to leave that landing. In instances where the car has stopped between floors, it is possible that smoke may enter the car through the gaps between the door panels and the door surrounds.

0.4 Public interest for those events found in the media shows, that this risk is no longer acceptable. Different activities on national level and on the European level have caused CEN/TC10 to establish a working team to prepare proposals (resolution 007.1997). The proposals are based on the following assumptions (illustrated in Figure 1):

0.4.1 The requirements need to be able to be fulfilled for passenger and goods passenger lifts with all types of drives.

0.4.2 There needs to be a clear separation between the functioning of the building management system and the lift control system.

0.4.2.1 The building management/fire alarm system initiates the signal to the lift causing a specific reaction of the lift.

0.4.2.2 The lift control system determines the reaction of the lift(s) on receipt of a signal from the building management/fire alarm system which can be either an automatic fire detection and alarm system, or manual recall device, which is interfaced to the lift in order to issue instructions to it.

0.4.3 The lift is in normal function and is available for passenger use.

0.4.4 The fire alarm system is operating as intended.

0.4.5 Dependent upon the fire alarm system in the building and the management of this information, different reactions of the lift(s) are possible.

0.5 Building designers, architects or planners shall consider this standard with care. The provision of even a manual recall device, or a fire detector on each lift landing will greatly improve the level of safety for persons in a building during a fire.

0.6 ISO/PDTR 14798-1 was used as the risk assessment methodology.

0.7 Significant hazards and hazardous situations not dealt with by this standard.

The following significant hazards and hazardous situations are not dealt with within this standard, as they do not fall within the responsibility of the lift installer.

Location of the lift(s) in building, relative to the escape routes, may be difficult due to building design and/or poor signage in the building;

- Fire developing without fire service intervention;
- Ongoing use of a lift after a fire has been detected The use of a lift where a fire is undetected;
- The absence or incorrect signal from the fire alarm system;
- Smoke and/or heat in front of lift landing doors;
- Unsafe environment for waiting passenger(s) to be rescued;
- Entrapment in protected compartment or in front of the lift due to lift not operating and no other escape route available;
- The pressurisation of the lift well or other protected area fails;

- A fire starting in the lift well which may spread to outside areas;

Fire and or smoke that may spread into the machinery space;

- The use of lifts for the evacuation of a building.

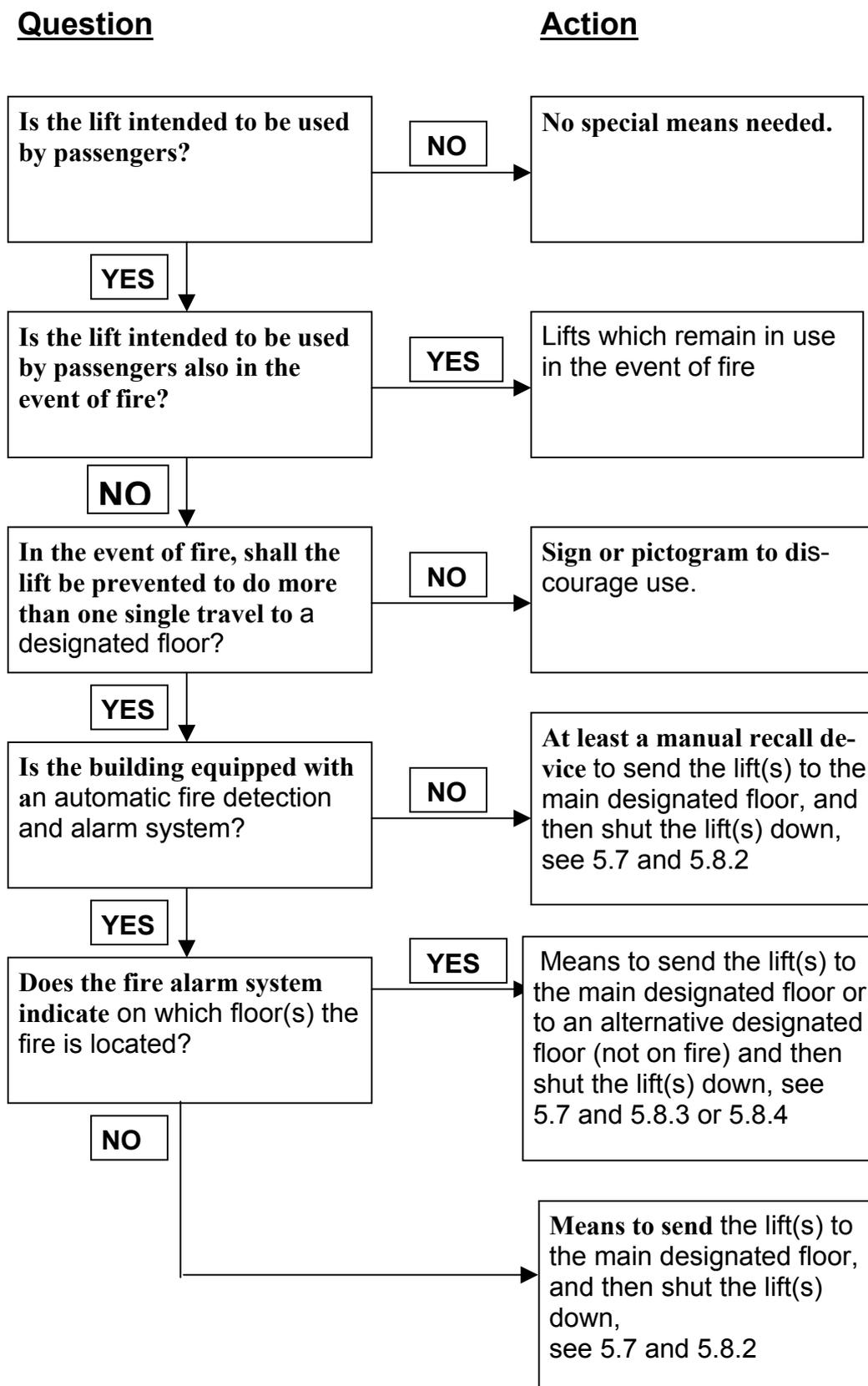


Figure 1 : Flow chart of lift scenarios

1 Scope

This standard specifies the special provisions and safety rules to assure the behavior lifts in the event of fire in the building, but not in the well(s), on the basis of a signal(s) to the lift(s) control system. It applies to new passenger lifts and goods passenger lifts in accordance with EN 81-1/2/5/6/7. However, it may be used as a basis for existing passenger and goods passenger lifts

This standard gives various options for control of the lift in the event of a fire in a building.

This standard does not apply to lifts which remain in use in the event of fire e.g. Firefighters Lifts as defined in EN 81-72.

Note: The automatic recall of a firefighters lift is still possible and defined in EN 81-72.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 54-1	1996	Fire detection and fire alarm systems- Part 1: Introduction
EN 54-2	1997	Fire detection and fire alarm systems – Part 2: Control and indicating equipment
EN81-1	1998	Safety Rules for the Construction and Installation of Lifts Part 1 : Electric Lifts
EN81-2	1998	Safety Rules for the Construction and Installation of Lifts Part 2 : Hydraulic Lifts
EN81-5		Safety Rules for the Construction and Installation of Lifts Part 5: Screw Lifts
EN81-6		Safety Rules for the Construction and Installation of Lifts Part 6: Chain Lifts
EN81-7		Safety Rules for the Construction and Installation of Lifts Part 7: Rack & Pinion Lifts
EN81-72		Safety Rules for the Construction and Installation of Lifts Part 75 Firefighting Lifts
EN 292-1	1991	Safety of machinery – Basic concepts, general principles for design- Part 1:Basic terminology, methodology
EN 1070	1999	Security of machinery - Terminology

ISO/PDTR 14798-1 – Lifts (elevators), escalators and passenger conveyors – Risk Analysis methodology – Part 1 : General

ISO 8421-3 : 1989 - Fire protection – Vocabulary – Part 3: Fire detection and alarm

3 Terms and Definitions – Symbols and abbreviated terms

For the purposes of this document, the definitions given in EN~~1070~~ EN81 Parts 1/2/5/6/7 and EN54 Parts 1/2 apply:

Additional definitions specifically needed in this document are added below:

3.1 Building owner: The natural and legal person(s) responsible for the building.

3.2 Fire security strategies: The arrangements that have been put in place for the evacuation of the building in the event of fire.

3.3 Interface:

Hardware or Software designed to communicate information between:

- hardware devices
- software programs
- devices and users

3.4 Fire alarm interface:

Interface specially dedicated to the communication of fire alarm messages by the use of an electrical signal(s). The creation of the the fire alarm messages can be done either:

- manually or
- semi-automatically or
- automatically.

3.5 Lift Control Interface:

The boundary to the lift control system.

Interface specially dedicated to receive electrical signal(s) from the fire alarm interface.

3.6 Protocol:

A set of rules governing the format of messages that are exchanged between devices e.g. when applied to serial communication lines for data transmission.

3.7 Fire alarm systems for the behaviour of lift in the event of fire

The following definitions are derived from ISO 8421-3 1989.

3.7.1 Automatic fire detection and alarm system: A fire alarm system (as defined in **3.7.3**) comprising of components for automatically detecting a fire, initiating an alarm of fire and initiating other action as appropriate.

3.7.2 Fire alarm control and indicating equipment: Equipment through which fire detectors (as defined in **3.7.4**) may be supplied with power and which:

- (a) is used to accept a dedicated signal and actuate a fire alarm signal,
- (b) is able to pass on the fire detection signal through fire alarm routing equipment to the fire-fighting organisation or to automatic extinguishers,
- (c) is used to monitor automatically the correct functioning of the system.

3.7.3 Fire alarm system: A combination of components for giving an audible and/or visible and/or other perceptible alarm of fire. The system may also initiate other actions such as initiating the lift control system. For the purposes of this standard 'Fire alarm system' is a generic term which includes 'automatic fire detection and alarm system' (as defined in **3.7.1**) and 'manual recall device' (as defined in **3.11**).

3.7.4 Fire detector: Part of an automatic fire detection system that contains at least one sensor which monitors a suitable physical or chemical phenomenon, in order to signal to the fire alarm control and indicating equipment (as defined in **3.7.2**).

3.8 Building management system: Measure(s) to coordinate all systems in the building.

3.9 Lift control system: A system which responds to input signals from a processor or ~~op-~~
~~erator~~ person and which generates output signals causing the lift under control to operate in the desired manner.

3.10 Designated floor: A floor determined by the building designer that allows persons leaving the lift to exit the building or area of the building during a fire. Normally the ground floor level.

3.11 Manual recall device: A manually operated device which, upon operation, activates an electrical signal, causing the lift under control to operate in the desired manner.

4 List of significant hazards

This clause contains all the significant hazards, hazardous situations and events, as far as they are dealt with in this standard, identified by risk assessment as significant for lifts and which require action to eliminate or reduce the risk.

Table 1 Significant hazards dealt with in this standard

Significant hazards or hazardous situations for lifts in the event of fire	Relevant clauses EN 292-1	Requirements and clauses in this standard
1. Mechanical hazards	4.2	5.2 / 5.3 / 5.7.5 / 5.7.6
1.5 Trapping hazard	4.2.1	5.4 / 5.5
1.6 Impact hazard	4.2.1	5.7.1 / 5.7.2
3. Thermal hazard (Contamination by heat or smoke)	4.4	5.1 / 5.7.1(a)(b)(c) / 5.7.2 / 5.7.3 / 5.7.4 / 5.7.9 / 5.8.2 / 5.8.3
Confusion	Not listed	5.4 / 5.7.7

5 Safety requirements and/or protective measures

5.1 General:

In principle it is not intended that lifts should be used in the event of fire. Therefore, it is desirable that lifts are taken out of normal service in the event of fire, by making use of the following provisions.

5.2 The lift shall operate in accordance with **5.7** and **5.8** on receipt of an electrical signal(s). The electrical signal(s) shall be provided either by an automatic fire detection and alarm system or manual recall device. Where a manual recall device is provided, it shall be

- (a) bi-stable in operation,
- (b) clearly marked such to avoid any error about its position and
- (c) protected from misuse e.g. by placing it behind a glass panel or located within a secure area.

Note: The decision as to whether an automatic fire detection and alarm system or manual recall device is selected is the subject of negotiation at the design/planning stage of the building.

5.3 Where a lift is stopped due to:

- (a) the operation of an electrical safety device or
 - (b) a fault condition e.g. the exceeding of a temperature or a time limit or
 - (c) the activation of special controls e.g. inspection control, electrical emergency control etc.
- any signal coming from the fire alarm system shall not over-ride the stopped position.

5.4 All lifts shall prominently display the pictogram in the car, see Figure 2. The size of the pictogram shall be at least 30mm.

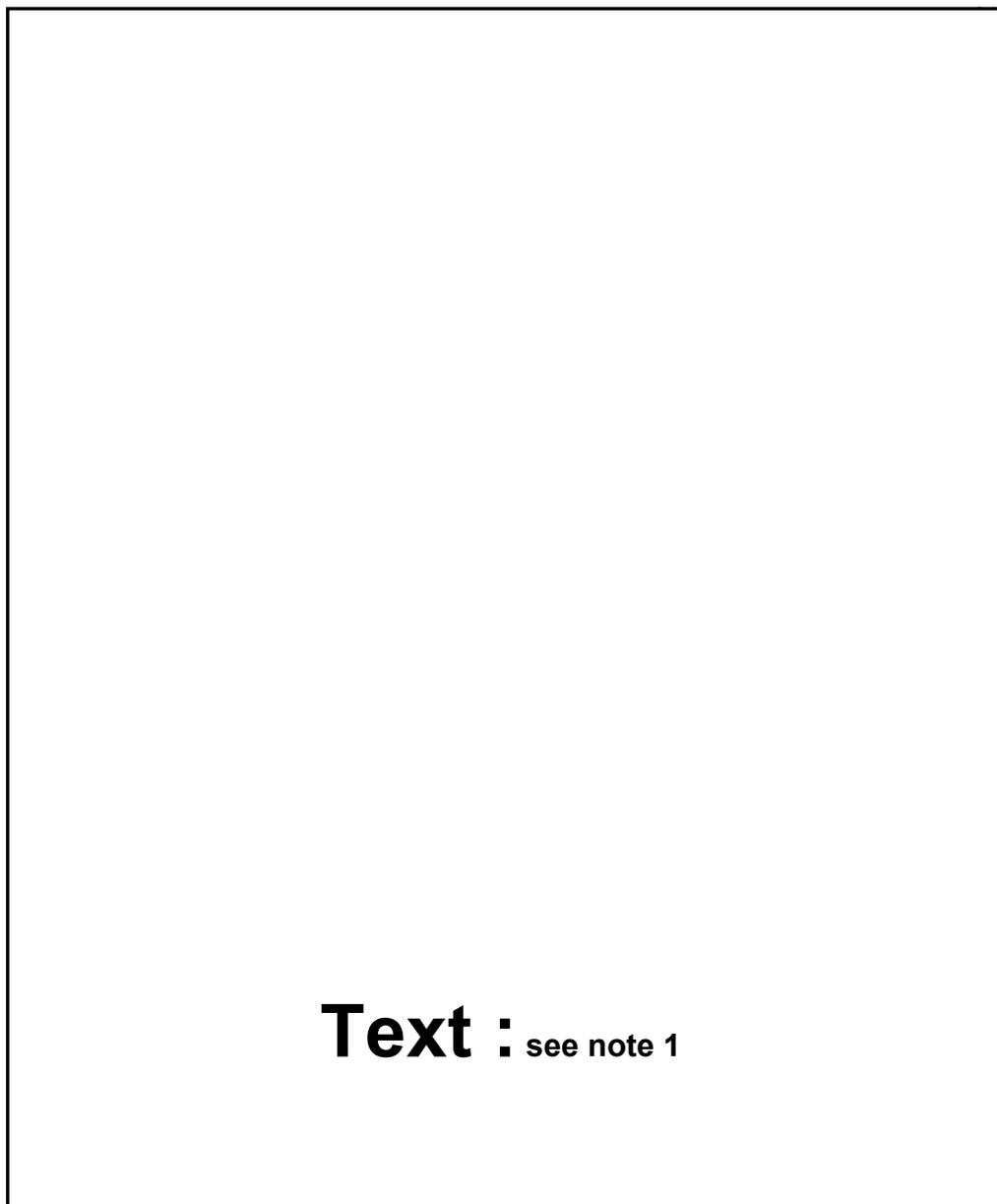


Figure 2: Pictogram “Do not use the lift in the event of fire!”

NOTE 1: If necessary the following text can be added to the pictogram: “Do not use the lift in the event of a fire”

NOTE 2: This pictogram can also be used for display at lift landings

5.5 Provision of alarm and lift interfaces

Figure 3 illustrates who provides the relevant alarm and lift(s) interfaces.

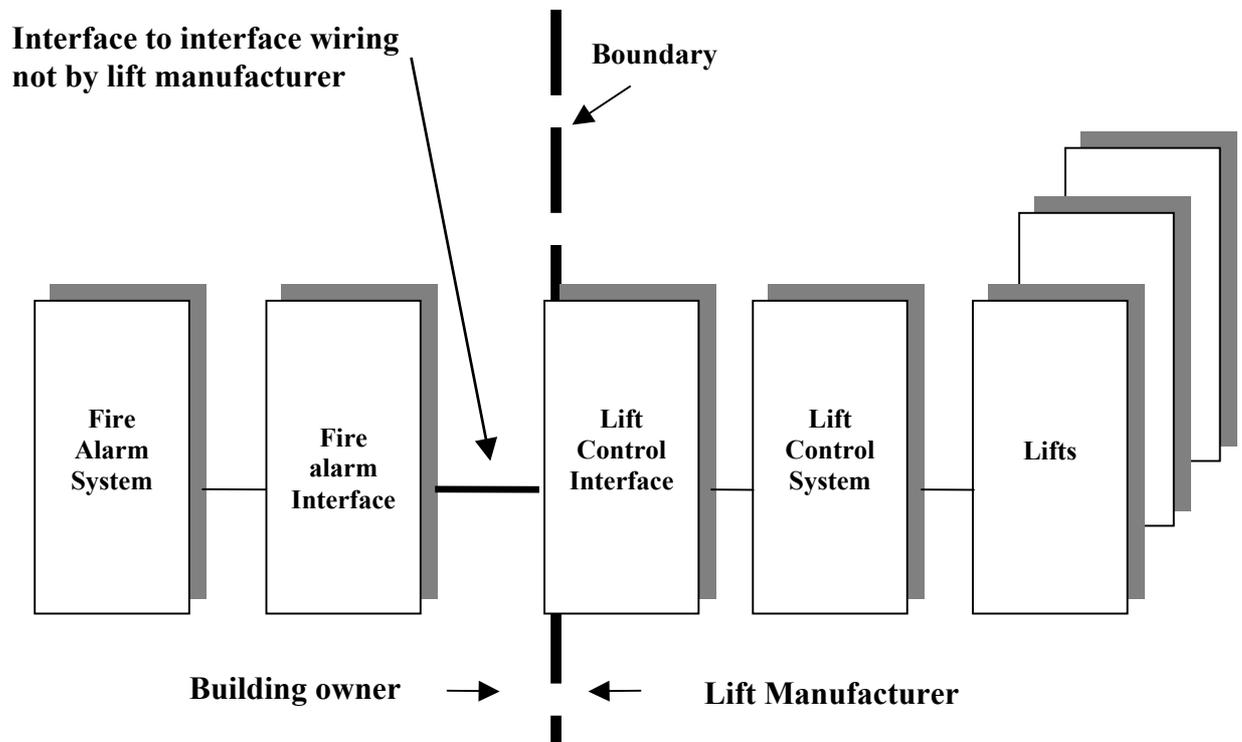


Figure 3 - Interfaces

5.6 Interface requirements between the fire alarm system and the lift control system

The interface shall be one of the following types:

5.6.1 Discrete interface

A discrete interface is normally realised by voltage free closed contacts.

NOTE: Contacts providing voltage free signals to the lift control system shall be provided by the supplier of the alarm system.

Where required, contacts providing output signals (e.g. lift status) shall be provided by the lift manufacturer.

5.6.2 Serial interface

A serial interface is normally realised by the hardware protocol via an RS 422 A (EIA Standard RS 422 A) or (CCITT recommendation V11).

A serial interface is normally realised by the transmission of information in the form of serial signals prepared by a software protocol. The hardware used is a RS 422 A (EIA Standard RS 422 A) or (CCITT recommendation V11) connect via a twisted four-core wire.

5.6.3 Interface with groups of lifts

An interface for a group of lifts is normally realised by an IEC protocol provided by the lift manufacturer/installer to the fire alarm system supplier performing a flexible differentiated response of the individual lift control systems in the group.

It is also possible to install a single serial interface as described in 5.6.2, for one group of lifts.

5.7 Reaction of the lift on a signal from the fire alarm system

The principle of the reaction of the lift(s) in the event of fire is to return the car to a designated floor and allow any passengers to exit.

When an electrical signal is received from the fire alarm system (see clause 3.7.3) the lift(s) shall react as follows:

5.7.1 Landing and car call control buttons as well as the “door re-open button” shall be rendered inoperative and all registered calls shall be cancelled.

The lift(s) shall follow the automatic command initiated by the received signal in the following way:

- (a) A lift with automatic power operated doors, when parked at a landing, shall without delay close the doors and travel non-stop to the designated floor.
- (b) A lift with manually operated or non-automatic power operated doors, if parked at a landing with open doors, remains immobilised at that landing. If the doors are closed, the lift travels non-stop to the designated floor.
- (c) A lift travelling away from the designated floor shall stop and reverses at the nearest possible floor without opening the doors and travel non-stop to the designated floor.
- (d) A lift travelling towards the designated floor shall continue its travel non-stop to the designated floor.
- (e) A lift, in the event of becoming blocked between floors due to:
 - (i) the operation of an electric safety device, shall remain immobilised

(ii) the interruption of the power supply, shall on restoration of the power supply continue its travel non-stop to the designated floor. Any subsequent correction journey, if necessary, shall be prevented unless it can be non-stop to the designated floor.

5.7.2 Door reversal devices, which may be affected by heat or smoke, shall be rendered inoperative to allow the doors to close. The rendering inoperative of any door reversal device shall initiate an audible signal which shall sound when the doors are closing. The protection given by the last paragraph of clause **7.5.2.1.1.3** of EN 81-1/2 shall remain.

5.7.3 The overload device as defined in clause **14.2.1.5 b)** of EN 81-1/2 shall be rendered inoperative.

5.7.4 The automatic recall system for hydraulically driven lifts as defined in clause **14.1.5b** of EN 81-2 shall be rendered inoperative.

5.7.5 The breakdown of a lift in a group shall not affect the travel of other lifts to the designated floor.

5.7.6 When the car(s) arrives at the designated floor, it shall park with its automatically operated doors open and be removed from normal service. Manually operated doors shall be unlocked and the lift removed from normal service.

NOTE: Where doors are not allowed to remain open, means shall be provided to allow the fire service to check whether the car is present and persons are not trapped (see clause **0.2.5** of EN81-1 and EN81-2).

5.7.7 The lift will automatically be reset to normal operation by an electrical signal from the fire alarm system when it is reset.

NOTE: Where a fire alarm system prevents the lift from being used, a means to bridge the system allowing the lift to be put back into service, shall be provided on the alarm system itself.

5.8 Options for designated floor(s)

5.8.1 General

Any new lift shall be provided with one of the options below when a fire alarm system is fitted.

The building owner shall determine, in accordance with national regulations, the evacuation strategy for the building. (see Annex A Informative). If there is no automatic fire detection and alarm system provided, then at least one manual recall device shall be located at the main designated level floor (usually the ground floor). The operation of this device shall cause the lift(s) to react as described in **5.7.**

The following options are possible:

5.8.2 Single designated floor

Where the building evacuation strategy (see Annex A Informative) allows only a single designated floor, the lift(s) shall only travel to that floor in accordance with **5.7** on receipt of a single electrical signal from the fire alarm system.

This option can leave a residual risk of fire or smoke being at the designated floor.

Where buildings have only one fire detector at one floor, then that floor cannot be the designated floor.

5.8.3 Alternative designated floor

Where the building evacuation strategy (see Annex A Informative) allows an alternative designated floor, the lift control system shall receive an additional electrical signal from a fire alarm system, e.g. from a fire detector located at the main designated floor. This additional signal shall direct the car to the alternative designated floor when the main designated floor is on fire.

In all circumstances the lift(s) shall react as described in **5.7**.

5.8.4 Variable designated floors

Where the building evacuation strategy (see Annex A Informative) allows variable designated floors, the electrical signals from the fire alarm system and the reaction of the lift(s) to those signals shall be the result of detailed consultation between the lift installer, the provider of the fire alarm system and the building planner.

6. Verification of safety requirements and/or protective measures

Safety requirements and/or protective measures of clauses 5 and 7 shall be verified according to the Table 2 below.

Table 2 – Verification Table

Sub clause	Visual inspection ¹	Compliance with the lift design ²	Measurement ³	Design document check ⁴	Functional-Test ⁵
5.1					
5.2	X	X			
5.3					X
5.4	X				
5.5				X	
5.6				X	
5.7		X			X
5.7.1	X			X	X
5.7.1a, b, c, d, e	X	X			X
5.7.2					X
5.7.3			X		X
5.7.4					X
5.7.5					X
5.7.6					X
5.7.7	X	X			X
5.7.8		X			X
5.7.9		X			X
5.8.1	X				X
5.8.2 6)		X		X	
5.8.3 6)		X		X	
5.8.4 6)		X		X	
7	X				

1) the result of the visual inspection is only to show that something is present (a marking, a control panel, an instruction handbook) , that the marking required satisfies the requirement and that the content of the documents delivered to the owner is in accordance with the requirements.

2) the results of the compliance with the lift design is to prove that the lift is built according to the design and that the components/devices comply with the design documents.

3) the result of the measurement is to show that the stated measurable parameters have been met.

4) the result of the design document check is to prove that the design requirements of the standard have been matched “ on paper” in the design documentation (layout, specification)

- 5) the results of the functional test is to show that the lift works as intended, including the safety devices
- 6) verification is depending of the type of fire alarm system in the building

NOTE: Where the Installer uses a type tested product the test and inspections will be as defined in the product documentation

7 Information for use

Instructions have to be passed to the building owner describing the behaviour of the lift in the event of fire and the need to maintain the fire alarm system in good working order.

ANNEX A (INFORMATIVE)

Aspects of Building Evacuation Strategies

The design of the building evacuation strategy in the event of fire and the role to be played by lift(s) requires detailed consideration during the design stage of the building.

The degree of complexity of any such strategy will vary greatly between different types of buildings.

At one end of the scale there will be a simple building of low rise, low density population and with minimal fire risk. Such buildings may not have a fire alarm system and only a simple building evacuation strategy.

At the other end of the scale there will be buildings with high density populations, complex layout, sophisticated fire detection systems and detailed strategies. Typical of such buildings are airports or super high rise office buildings.

The behavior of lifts in the event of fire must be developed from detailed studies, in order to determine exactly what operation the lift(s) is to perform.

ANNEX ZA (NORMATIVE)

Relationship of this European Document with EC Directives

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EC Directive(s):

Lift Directive 95/16/EC

Compliance with this document provides one means of conforming with the specific essential requirements of the Directive concerned and associated EFTA regulations.

WARNING: Other requirements and other EC Directives may be applicable to the product(s) falling within the scope of this document.