Guidance Note

Fire Industry Association

Leading Excellence in Fire Since 1916

FIA Application Guidance BS 7273-4:2015+A2:2023

Contents

1. Introduction

BS 7273-4:2015+A2:2023 describes types of interfaces between a fire detection and fire alarm (FD&A) system and various forms of door release mechanism.

Door release mechanisms are intended to help prevent smoke and fire spreading whilst ensuring that people can get out of a building in a fire emergency.

BS 7273-4 is complex, and anyone designing, installing or maintaining door release mechanisms might need to refer to it, and possibly to BS 5839-1, for detailed information.

2. Typical applications

- Electromagnetic door holders that release self-closing fire doors in an emergency.
- Door closers that allow fire doors to either swing freely on their hinges or be retained, but to close in an emergency.
- Electromagnetic locks on doors that prevent unauthorised access, but release in an emergency.
- Powered sliding doors that open in an emergency.

The term ‘release mechanism’ is used to describe all the above.

3. Detector siting and spacing

If the fire strategy calls for Category L1 to L3 systems, the guidance in BS 5839-1 does not change.

If the fire strategy calls for Category L4 & L5, the guidance in BS 7273-4 [clause 12] should be applied in addition to the guidance in BS 5839-1.

The need for and spacing of fire detectors to control release mechanisms depends on whether doors in escape routes are kept open or not, and whether doors to rooms on to escape routes have intumescent strips and smoke seals or not.

Manual fire alarms (Category M) are not suitable to control release mechanisms.

4. Risk assessment

A risk assessment needs to be carried out for EACH door (fire door, secure door or access door) to identify the most appropriate Category of actuation (this will ideally be in the client’s specification).

This is in addition to the fire risk assessment for the whole building.

Where a door matches more than one category (see clause 7, below), the highest applies.

5. Critical signal path

The 'critical signal path' is all the interconnections and communications [i.e., hard-wired, audio or radio] between a fire alarm system and the input terminals on, or within (a) device(s) provided to open, release or unlock a door, or between the fire alarm control and indicating equipment (CIE) and other control equipment by which such devices are controlled. i.e., the thick red line in Fig 1.

6. Scope

BS 7273-4 is the 'bridge' between a FD&A[1] or other control system and door release mechanisms. It provides recommendations for the design, installation, commissioning, and maintenance of electrical control arrangements for the actuation of mechanisms that unlock, release or open doors in the event of fire.

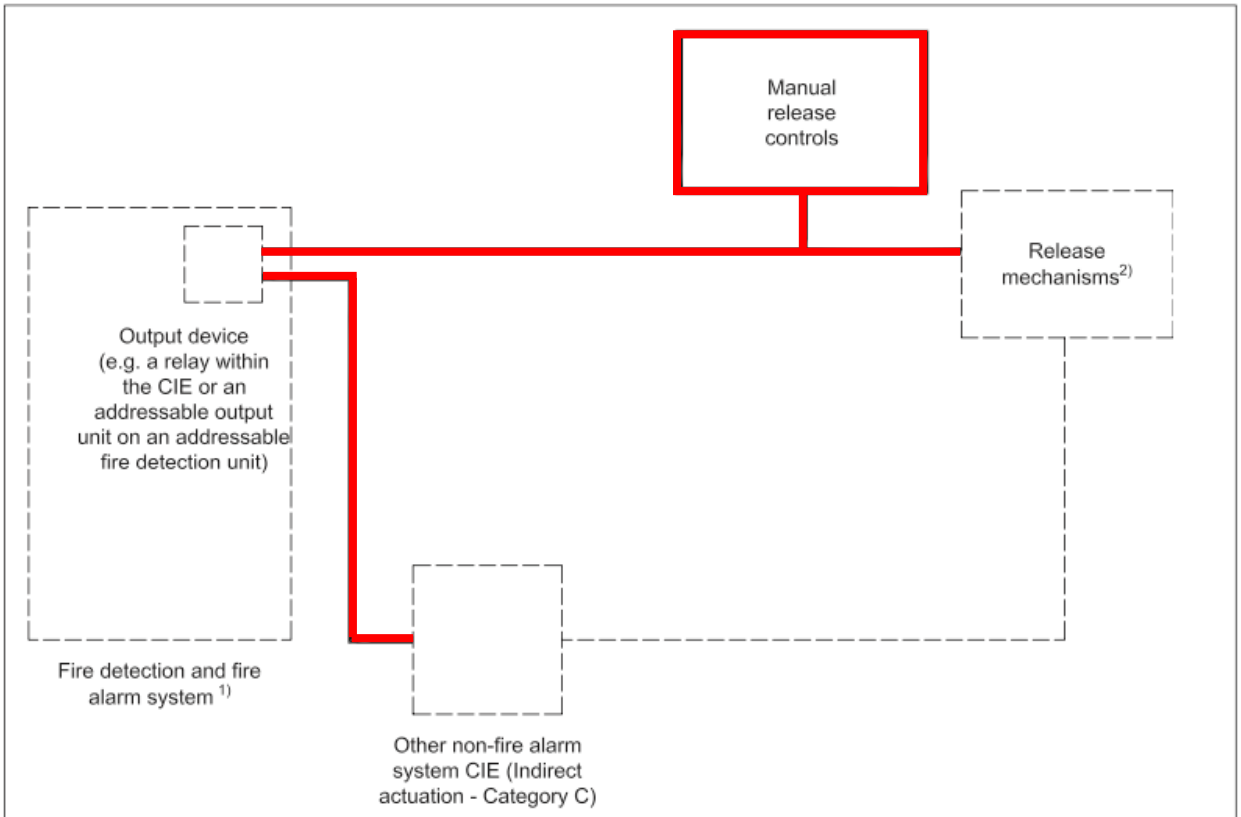
It applies to "all aspects of the interface between these mechanisms and a fire detection and fire alarm system, including interfaces that incorporate acoustic coupling and radio transmission."

It does not apply to the equipment that "holds, releases, locks, or unlocks doors, or that facilitate the opening of powered sliding doors".

It does not apply to "products used within the fire detection and fire alarm system that initiate the signal to actuate door locking or release mechanisms, nor to aspects of the fire detection and fire alarm system related to giving warning in the event of fire".

[1] FD&A = Fire Detection and Fire Alarm System

[Fig 1] The thick red line shows what is within the scope of the standard.



Key

Within the scope of this standard

Outside the scope of this standard

1) Any special recommendations for provision and siting of fire detectors and manual call points are within the scope of this standard.

2) The effect of failures of power supply for the devices is within the scope of this standard.

7. Categories of actuation [4 & table 1]

Critical (Category A) is safer than Standard (Category B), and Standard is safer than Indirect (Category C).

However, some Indirect release mechanisms can be used in Standard applications and some Indirect radio activated release mechanisms can be used in Critical applications, so this nomenclature is confusing. It is better to refer just to Critical, Standard and Indirect.

Release mechanisms must activate (fail safe) when any of the conditions specified below occurs.

7.1 Critical actuation – (Category A)

The CIE indicates a fault that is relevant to the door in question.

Open or short circuit of the critical signal path. [Table 1 a)]

Reduction of power supply voltage that would prevent the release mechanism operating. See BS EN 1155[2] for details [Table 1 b)].

Failure of a relevant critical radio signal path. [Table 1 g) 1)]

Short or open circuit of a transmission path between the CIE & radio transmitter. [Table 1 g) 2)]

The simultaneous failure of the normal and standby power supplies on any relevant part of the FD&A system. [Table 1 c)]

A short or open circuit between separate CIE, if the fault could prevent correct operation of the release mechanism. [Table 1 e)]

Disablement of any single manual call point, fire detector or detection zone on which the release mechanism depends [Table 1 f)]

7.2 Standard actuation – (Category B)

Open or short circuit of the critical signal path. [Table 1 a)]

Reduction of power supply voltage that would prevent the release mechanism operating. See BS EN 1155 [Table 1 b)]

Failure of a relevant critical radio signal path. [Table 1 g) 1)]

Short or open circuit of a transmission path between the CIE & radio transmitter. [Table 1 g) 2)]

[2] BS EN 1155, building hardware – Electrically controlled exit systems for use on escape routes – requirements and test methods.

7.3 Indirect actuation – (Category C)

Open or short circuit of the critical signal path. [Table 1 a)]

Reduction of power supply voltage that would prevent the release mechanism operating. See BE EN 1155 [Table 1 b)]

Failure of a relevant critical radio signal path. [Table 1 g) 1)]

Short or open circuit of a transmission path between the CIE & radio transmitter. [Table 1 g) 2)]

Short or open circuit between the CIE and any non-fire alarm equipment on which the correct operation of the release mechanism depends [Table 1d)]

7.4 Annex B gives guidance on selection of the Category

Refer to table B.1 for self-closing fire doors.

Refer to table B.2 for electronically locked doors on means of escape.

Refer to table B.3 for powered sliding doors on means of escape.

7.5 Use of critical actuation release mechanisms (Category A)

Critical actuation is when the release mechanism activates in any of the conditions listed below

Self-closing fire doors [B.1]

a. Where a fire door is held open in a compartment wall that separates buildings. [B.1.1]

b. Where a fire door is held open on a stairway in places of public entertainment and in buildings where people sleep, such as hotels, HMOs, care homes, etc (but not in hospitals). [B.1.2]

c. Where a fire door is held open on the only stairway serving a building with more than one storey above or below ground (but not in dwellings). [B.1.3]

d. Where a flat entrance door is held open, such as in sheltered and extra-care housing (free-swing door holders are often used). [B.1.8]

e. National Fire Chief's Council recommendation additional to this standard - Where a fire door is held open and forms part of an emergency escape route in premises with phased horizontal evacuation[3].

[3] NFCC PPRU-L001/2022 Acoustically operated door release mechanisms (AADRM) for holding open fire doors, page 4.

Electronically locked escape doors [B.2]

f. In premises occupied by or open to the public such as shopping centres, hotels, boarding houses, museums, places of entertainment and transport terminals. [B.2.2]

g. In hostels with long-term occupants, in residential care facilities and in hospitals. [B.2.3]

h. In a school. [B.2.4]

7.6 Use of standard actuation release mechanisms (Category B)

Standard actuation systems can be used in most applications where a critical system is not required.

Standard actuation is when the release mechanism will operate under any of the conditions listed below:

Self-closing fire doors [B.1]

i. Where a fire door is held open on a stairway or fire-resisting lobby that forms part of a means of escape that is not covered by 2 or 3 above. [B.1.4 & 5]

j. Where a fire door dividing a corridor is held open. [B.1.6]

k. Where a fire door is held open in a dwelling, except within a staircase enclosure in an HMO. [B.1.7]

l. For any other fire door that is held open. [B.1.9]

Electronically locked escape doors [B.2]

m. In places of work with few occupants and where staff are trained [B.2.1]

Powered sliding escape doors [B.3]

n. In places of work with few occupants and where staff are trained [B.3.1]

o. Provided that the door can be opened manually. In premises occupied by or open to the public, e.g. shopping centres, hotels, boarding houses, museums, places of entertainment and transport terminals, long-term hostels, residential care premises, hospitals and schools. [B.3.2, 3 & 4]

7.7 Use of indirect actuation release mechanisms (Category C)

Indirect actuation systems can be used in most applications where a critical system is not required.

In some cases, such as in places of work, failure of the wiring must cause the release mechanism to activate.

In some cases, such as in hospitals, where sounders might not be fitted, acoustically actuated systems are not acceptable, but radio actuated systems can be used. [B.2.1, B.3.1].

Indirect actuation is when the release mechanism will operate under any of the conditions listed below:

Self-closing fire doors [B.1]

16. Where a fire door is held open on a stairway or fire-resisting lobby that forms part of a means of escape that is not covered by 2 or 3 above, provided that failure of the critical signal path or wiring from the non-fire alarm control equipment to the release mechanisms will cause the release mechanism to activate. [B.1.4 & 5]

Electronically locked escape doors [B.2]

17. In places of work with few occupants and where staff are trained (but not acoustically activated systems) [B.2.1]

Powered sliding escape doors [B.3]

18. In places of work with few occupants and where staff are trained but not acoustically activated systems [B.3.1]

19. Provided that the door can be opened manually. In premises occupied by or open to the public, e.g. shopping centres, hotels, boarding houses, museums, places of entertainment, transport terminals, long-term hostels, residential care premises, hospitals and schools. [B.3.2, 3 & 4]

All types of indirect actuation

p. Where a fire door dividing a corridor is held open. [B.1.6]

q. Where a fire door is held open in a dwelling, except within a staircase enclosure in an HMO. [B.1.7]

r. For any other fire door that is held open. [B.1.9]

Acoustically activated release mechanisms cannot provide feedback so are always Category C.

8. Acoustically activated release mechanisms [15]

The critical signal path for acoustically activated door release mechanisms (AADRMs) cannot be monitored, so the CIE cannot activate them if a fault occurs in the FD&A system.

This means that AADRMs are only suitable for indirect actuation (Category C) systems and some standard actuation (Category B) systems, where a risk assessment has identified that doors releasing on a fault signal could cause risk to occupants of the building.

There are situations where AADRMs are not suitable, such as where sleeping accommodation leads onto, or forms part of, a protected escape route; where phased horizontal evacuation is in place; or where doors form part of fire compartment walls.

It is essential that acoustically activated AADRMs are commissioned and tested with the sounder(s) on which they will rely for actuation to make sure that sound pressure levels are adequate when any doors between the AADRM and the sounder are fully closed.

9. Radio actuated release mechanisms [16]

Whilst not suitable for every installation, when integrated correctly with fire alarm CIE, radio systems can form part of a critical actuation (Category A) system providing that they conform to Table 1 b) and g).

A site survey must be carried out to ensure that the radio signal is sufficient and gives adequate coverage and link budget[4].

In the event of a loss of mains power it is important to reduce the risk of occupants being injured by doors suddenly releasing. There should either be at least a ten second audible warning local to the door or radio transmission equipment should have at least six hours of standby battery.

It is essential that radio activated AADRMs are commissioned and tested with all doors fully closed between the AADRM and the sounder. This ensures that the radio signals are sufficient to activate the release mechanism.

AADRMs and radio actuated release mechanisms are usually battery operated, and batteries need to be replaced at 12-month intervals.

10. Combined radio and acoustically activated release mechanisms

Combinations of radio and acoustically activated systems can be used for self-closing fire doors provided they conform with BS 7273-4 clauses 15 and 16. They should not be used with release mechanisms for electronically secured doors or powered sliding doors.

[4] A link budget is a calculation made when designing a radio system to make sure that the received power will have an adequate signal to noise ratio for reliable operation.

11. Hold-open and free-swing release mechanisms

BS 7273-4 makes no distinction between hold open and free-swing release mechanisms, but it is useful to understand the difference.

Hold open release mechanisms are designed to keep doors open in a fixed position until a signal is received or removed to release the door. They are commonly used on corridor doors to improve throughflow, to reduce the risk of doors being wedged and to help with ventilation.

Free swing release mechanisms allow doors to swing freely on their hinges, making them much easier to operate, and are useful where occupants may struggle with the resistance of a standard door closer such as in care homes, sheltered schemes and on classroom doors.

12. Variations [6]

Like most installation standards, BS 7273-4 is a Code of Practice, not a Specification. This means that it provides guidance on best practice but that variations can be acceptable in some circumstances.

A risk assessment should be conducted by a competent person to identify what the risk is and how it could be mitigated. The variation must be agreed by all interested parties including the Fire and Rescue Service. The variation can then be added to any specifications and should be detailed on any commissioning documents.

Variations must not be used as a ‘get out of jail free’ card and should only be used as described above.

For example,

Table B.1.8 says that, where a flat entrance door is held open, the release mechanism should form part a critical actuation (Category A) system, whilst also stating that hold-open devices are commonly regarded as unacceptable in ‘general needs’ blocks of flats.

Mrs Jones has lived in her flat for a long time and doesn’t want to leave. She struggles to open the door to her home, which is a fire door, because of the force of the door closer, and so gets someone to disengage the arm. She can now access the property easily, but the fire door is no longer compliant or safe.

A free-swing release mechanism would be the ideal solution but, because it is a general needs block, there is no communal FD&A system to operate it.

By applying a variation, the responsible person might specify a free-swing AADRM operated by BS 5839-6 smoke detectors fitted on either side of the door. Mrs Jones can now open the door easily and so the risk of tampering is reduced, giving the door the best possible chance of preventing the spread of fire.

13. Typical connections for release mechanisms

Clauses 9, 10 and Annex C give examples of typical connections between the fire alarm system and door release mechanisms.

Features of the CIE described in Table 1 will determine whether a particular arrangement complies with the Category A, B or C.

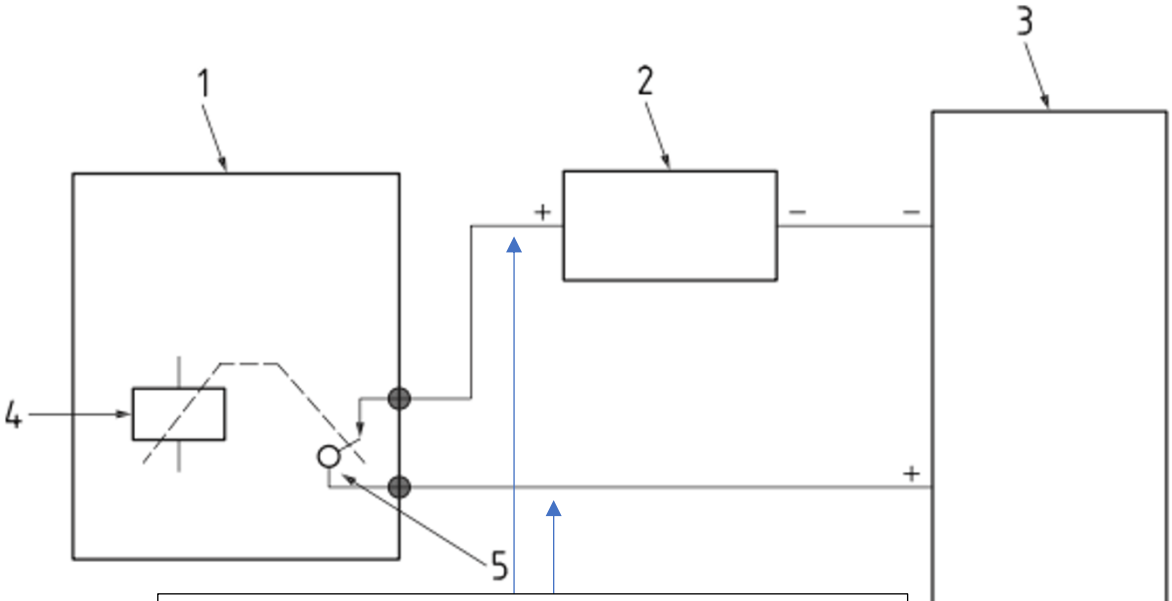
13.1 Connection via relay(s) at the CIE

a. Common fire relay only; the power supply is interrupted in the event of a fire signal.

b. Common fire relay and a fault relay that opens on failure of the primary and secondary power supplies.

Note: If the CIE can be configured such that the common fault relay operates when there is a disablement, the fire and fault configuration is suitable for critical actuation (Category A).

Common fire relay only

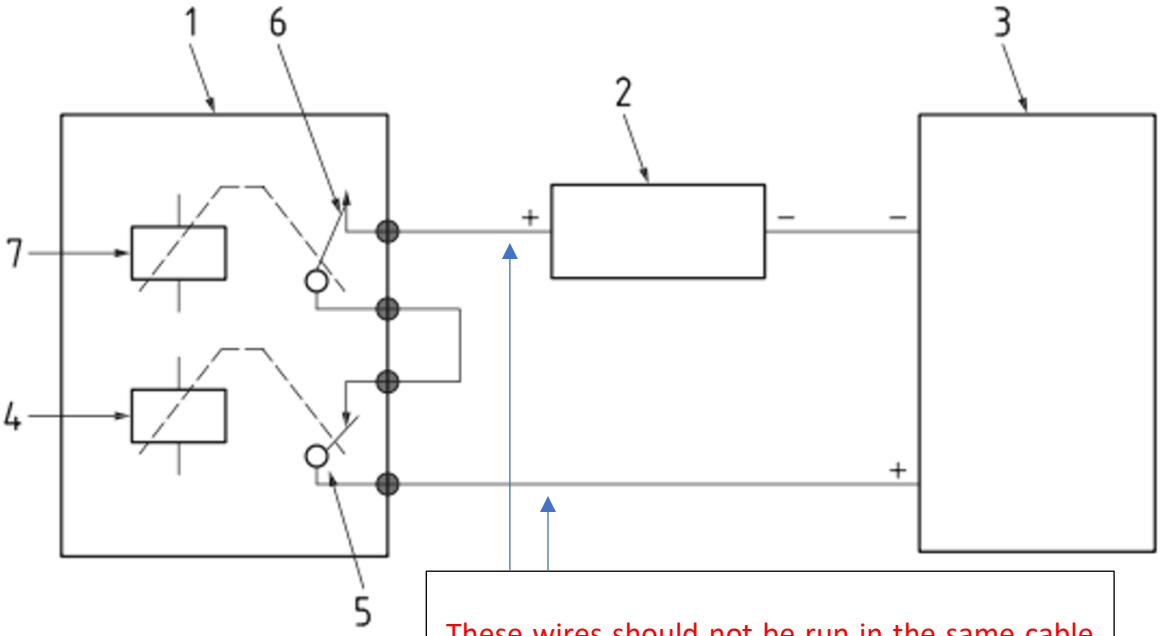


These wires should not be run in the same cable sheath because, if they are damaged and a short-circuit fault occurs, opening the common fire relay will have no effect and the release mechanism will remain energised (unless its power supply fails).

Key

1. Fire alarm CIE
2. Power supply for release mechanism
3. Release mechanism
4. Common fire relay
5. Normally closed contacts, opening on alarm

Common fire relay and fault relays



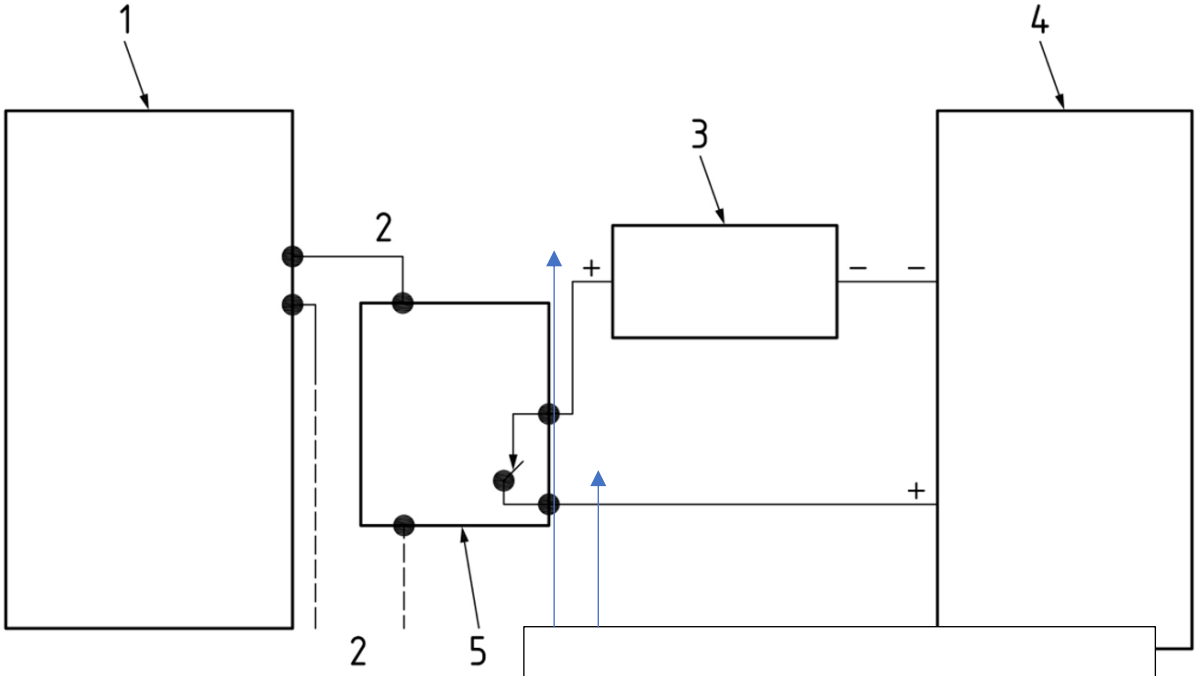
These wires should not be run in the same cable sheath because, if they are damaged and a short-circuit fault occurs, opening the common fire relay will have no effect and the release mechanism will remain energised (unless its power supply fails).

Key

1. Fire alarm CIE
2. Power supply for release mechanism
3. Release mechanism
4. Common fire relay
5. Normally closed contacts, opening on alarm
6. Normally closed contacts, opening on fault
7. Common fault relay

13.2 Connection via an I/O unit connected to a fire detection loop

Loop isolators must be installed on either side of the I/O unit.



These wires should not be run in the same cable sheath because, if they are damaged and a short-circuit fault occurs, opening the common fire relay will have no effect and the release mechanism will remain energised (unless its power supply fails).

Key

1. Fire alarm CIE
2. Power supply for release mechanism
3. Release mechanism
4. Common fire relay
5. Normally closed contacts, opening on alarm

13.3 Indirect actuation options

c. Actuation of electrically powered hold-open devices by an acoustic signal (the audible fire signal in the building).

d. d) Actuation of electrically powered hold-open devices by a radio signal (or discontinuation of a radio signal).

e. e) A combination of acoustic and radio interconnection is also possible (e.g., an acoustic signal can be used to trigger a radio transmitter).

14. Self-contained fire door release mechanisms

14.1 Advantages

Simplicity and speed of installation. They do not require any cables or mains power so are cost-effective.

Some systems can meet the highest Category under BS 7273-4 so can be installed on critical actuation, Category A doors.

14.2 Disadvantages

Release mechanisms that use batteries will need them replacing periodically. Failure to replace them will indicate a fault and ultimately no longer retain the door.

Not suitable for noisy environments because of the risk of false activations.

15. Power supplies

Power supplies for release mechanisms do not need to be certified to EN 54-4 because they do not normally incorporate standby batteries so they will stop providing power to the release mechanism in the event of a loss of mains power, causing the door to be released.

No power should be drawn from the fire detection and fire alarm system to maintain release mechanisms in the non-fire state, other than for indicators and interface devices.

Any power drawn by indicators and interface devices should be taken into account when calculating the standby time.

Calculation of the maximum alarm load should include any current supplied to release mechanisms and associated equipment during a fire alarm condition.

Battery powered release mechanisms need to last at least 12 months, including weekly testing and on an allowance for false alarms based on the number of fire detectors. [13.3]

16. Interconnections

Cables need to have at least 1 mm^2 conductors and be protected from damage.

Provided that the critical signal path fails safe its cables do not need to be fire-resisting.

However, if any circuits of the critical signal path do not fail-safe, at least standard fire-resisting cables and related installation methods must be used. [14.6]

17. Certificates

The only model certificate in BS 7273-4 is for commissioning. If other certificates, such as for design, are required, the model certificates in BS 5839-1 or 6 might be used as a guide.

18. Time delays

BS EN 13637[5] includes tests for exit systems with time delays before the release mechanism activates.

Grade 1 is for up to 15 seconds.

Grade 2, which only applies to release mechanisms connected to a central control, allows for two delays: an initial delay of up to 15 seconds, followed by a delay of up to 180 seconds.

19. Testing and maintenance [21]

Door release mechanisms of all kinds must be visually checked to identify wear and tear and tested weekly by triggering the FD&A system, with faults logged in the fire alarm logbook.

The organisation responsible for maintaining the FD&A system should also carry out an annual check of the manual release controls.

Failure to periodically test and release doors that are held open risks warping the door.

[5] Building hardware – Electrically controlled exit systems for use on escape routes

DISCLAIMER

The information set out in this document is believed to be correct in the light of information currently available, but it is not guaranteed and neither the Fire Industry Association nor its officers can accept any responsibility in respect of the contents or any events arising from use of the information contained within this document.

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