

AS 1670.1:2024



STANDARDS
Australia



Fire detection, warning, control and intercom systems — System design, installation and commissioning

Part 1: Fire



AS 1670.1:2024

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- Australasian Fire and Emergency Service Authorities Council
- Australian Building Codes Board
- Australian Chamber of Commerce and Industry
- Australian Industry Group
- Australian Institute of Building Surveyors
- CSIRO
- Deafness Forum of Australia
- Engineers Australia
- Engineers Australia/Society of Fire Safety
- Fire Protection Association Australia
- Hydraulic Consultants Association Australasia
- National Electrical and Communications Association
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Fire detection, warning, control and intercom systems — System design, installation and commissioning

Part 1: Fire

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Preface

This document was prepared by the Standards Australia Committee FP-002, Fire Detection, Warning, Control and Intercom Systems, to supersede AS 1670.1:2018.

The objective of this Standard is to provide uniform minimum requirements for the design, installation and commissioning of fire detection and alarm systems comprising components conforming with the requirements of applicable component Standards.

The major changes in this edition are as follows:

- (a) Defined a building to resolve confusion regarding the minimum requirements on a site with multiple structures.
- (b) Withdrew definition of “fault tolerant” and use of term throughout the document.
- (c) Modified [Clause 2.1.1](#) to clarify the limited application of AS 7240.13 for compatibility.
- (d) Clarified that STI need only be met where live speech is provided.
- (e) Removed the dispensation to meet STI where VADs are installed.
- (f) Lowered the STI requirement in carparks.
- (g) Clarified the STI measurement requirements in SOUs.
- (h) Provided greater flexibility in cable marking.
- (i) Clarified the termination requirements of optical fibre cables.
- (j) Introduced various changes to permit wall mounting of smoke detectors.
- (k) Clarified the requirements of smoke detectors in concealed spaces.
- (l) Adopted air change in place of air exchange to clarify the application of [Table 5.1.5](#).

The terms “normative” and “informative” have been used in this Standard to define the application of the appendices to which they apply. A “normative” appendix is an integral part of a Standard, whereas an “informative” appendix is for information and guidance.

This document incorporates commentary on some clauses. The commentary directly follows the relevant clause, is designated by “C” preceding the clause number and appears in italics in a box. Commentary is for information purposes only.

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Australian Standard®

Fire detection, warning, control and intercom systems — System design, installation and commissioning

Part 1: Fire

1 Scope and general

1.1 Scope

This document sets out requirements for the design, installation and commissioning of fire detection and alarm systems comprising components conforming with the requirements of the appropriate component Standards.

NOTE 1 Where a fire detection and alarm system forms part of a smoke control system in accordance with AS 1668.1, requirements are covered in [Clause 7](#).

NOTE 2 Where a fire detection and alarm system forms part of a special hazard system, requirements are covered in AS 1670.5.

NOTE 3 Maintenance requirements for fire detection and alarm equipment are provided in AS 1851.

1.2 Application

This document requires that detection and occupant warning be provided throughout all areas of the building; however, where systems are installed to solely meet the requirements of the NCC, refer to the NCC for areas to be protected and the type of detection to be installed.

1.3 Normative references

The following documents are referred to in the text in such a way that some or all of the content constitutes requirements of this document.

NOTE 1 Documents referenced for informative purposes are listed in the Bibliography.

NOTE 2 See [Clause 1.8](#) for the list of acceptable editions of the listed relevant normative references.

AS 1603.11, *Automatic fire detection and alarm systems, Part 11: Visual warning devices*

AS 1603.13, *Automatic fire detection and alarm systems, Part 13: Duct sampling smoke detectors*

AS 1603.17, *Automatic fire detection and alarm systems, Part 17: Warning equipment for people with hearing impairment*

AS 1668.1, *The use of ventilation and air conditioning in buildings, Part 1: Fire and smoke control in buildings*

AS 1670.3, *Fire detection, warning, control and intercom systems — System design, installation and commissioning, Part 3: Fire alarm monitoring*

AS 1670.4, *Fire detection, warning, control and intercom systems — System design, installation and commissioning, Part 4: Emergency warning and intercom systems*

AS 1670.5, *Fire detection, warning, control and intercom systems — System design, installation and commissioning, Part 5: Special hazards systems*

AS 2053 (series), *Conduits and fittings for electrical installations*

AS 2118.1, *Automatic fire sprinkler systems, Part 1: General systems*

AS 2118.4, *Automatic fire sprinkler systems, Part 4: Sprinkler protection for accommodation buildings not exceeding four storeys in height*

AS 2118.6, *Automatic fire sprinkler systems, Part 6: Combined sprinkler and hydrant systems in multistorey buildings*

AS 4428.3, *Fire detection, warning, control and intercom systems — Control and indicating equipment, Part 3: Fire brigade panel*

AS 4428.16, *Fire detection, warning, control and intercom systems — Control and indicating equipment, Part 16: Emergency warning control and indicating equipment*

AS 7240.2, *Fire detection and alarm systems, Part 2: Control and indicating equipment (ISO 7240-2:2017, MOD)*

AS ISO 7240-3, *Fire detection and alarm systems, Part 3: Audible alarm devices*

AS 7240.4, *Fire detection and alarm systems, Part 4: Power supply equipment (ISO 7240 4: 2017, MOD)*

AS 7240.6, *Fire detection and alarm systems, Part 6: Carbon monoxide fire detectors using electro-chemical cells*

AS 7240.7, *Fire detection and alarm systems, Part 7: Point-type smoke detectors using scattered light, transmitted light or ionization (ISO 7240 7: 2018, MOD)*

AS 7240.12, *Fire detection and alarm systems, Part 12: Line type smoke detectors using a transmitted optical beam (ISO 7240-12:2014, MOD)*

AS 7240.13, *Fire detection and alarm systems, Part 13: Compatibility assessment of system components (ISO 7240-13:2018 (ED.2.0) MOD)*

AS 7240.15, *Fire detection and alarm systems, Part 15: Point-type fire detectors using scattered light, transmitted light or ionization sensors in combination with a heat sensor (ISO 7240 15: 2014, MOD)*

AS 7240.20, *Fire detection and alarm systems, Part 20: Aspirating smoke detectors*

AS 7240.22, *Fire detection and alarm systems, Part 22: Smoke-detection equipment for ducts (ISO 7240-22:2017, MOD)*

AS 7240.27, *Fire detection and alarm systems, Part 27: Point type fire detectors using a smoke sensor in combination with a carbon monoxide sensor and, optionally, one or more heat sensors (ISO 7240-27:2018, MOD)*

AS/NZS 2243.8, *Safety in laboratories, Part 8: Fume cupboards*

AS/NZS 3000, *Electrical installations (known as the Australian/New Zealand Wiring Rules)*

AS/NZS 3013, *Electrical installations — Classification of the fire and mechanical performance of wiring system elements*

AS/NZS 4130, *Polyethylene (PE) pipes for pressure applications*

AS/NZS IEC 61672-1, *Electroacoustics — Sound level meters, Part 1: Specifications*

AS ISO 7240-5, *Fire Detection and Alarm Systems, Part 5: Point-type heat detectors*

AS ISO 7240-8, *Fire detection and alarm systems, Part 8: Carbon monoxide fire detectors using an electro-chemical cell in combination with a heat sensor*

AS ISO 7240-10, *Fire detection and alarm systems, Part 10: Point-type flame detectors*

AS ISO 7240-11, *Fire detection and alarm systems, Part 11: Manual Call Points*

AS ISO 7240-17, *Fire detection and alarm systems, Part 17: Transmission path isolators*

AS ISO 7240-18, *Fire detection and alarm systems, Part 18: Input/output devices*

AS ISO 7240-23, *Fire detection and alarm systems, Part 23: Visual alarm devices*

AS ISO 7240-24, *Fire detection and alarm systems, Part 24: Fire alarm loudspeakers*

AS ISO 7240-25, *Fire detection and alarm systems, Part 25: Components using radio transmission paths*

AS/CA S009, *Installation requirements for customer cabling (Wiring rules)*

ISO 8201, *Alarm systems — Audible emergency evacuation signal — Requirements*

IEC 60268-16, *Sound system equipment, Part 16: Objective rating of speech intelligibility by speech transmission index*

IEC 60331-25, *Tests for electric cables under fire conditions — Circuit integrity, Part 25: Procedures and requirements — Optical fibre cables*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

NCC, *National Construction Code of Australia*, (BCA, Volume One and Volume Two)

EN 54-22, *Fire detection and fire alarm systems, Part 22: Resettable line-type heat detectors*

EN 54-28, *Fire detection and fire alarm system, Part 28: Non-resettable line-type heat detectors*

1.4 Terms and definitions

For the purpose of this document, the definitions given in the National Construction Code (NCC) and those below apply.

Standards Australia and the ABCB maintain the National Dictionary of Building and Plumbing Terms, which can be found at: www.constructiondictionary.com.au

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

IEC Electropedia: available at <https://www.electropedia.org/>

ISO Online browsing platform: available at <https://www.iso.org/obp>

1.4.1

acoustically distinct space

space within a building where the acoustic properties are consistent i.e. reverberation time and background noise

1.4.2

air damper

motorized mechanical damper that opens or closes to control air as part of a smoke control system

1.4.3

air-handling plant

component part of an air-handling system that includes equipment providing air movement, as well as equipment for the purpose of controlling the direction, rate of airflow, division of airflow or condition of air (i.e. concentration level of contaminants, temperature and humidity)

1.4.4

air-handling system

system for the purpose of directing air in a positive and controlled manner to or from specific enclosures by means of air-handling plant, ducts, plenums, air-distribution devices or automatic controls

1.4.5**alarm acknowledgement facility (AAF)**

configuration of FDCIE in conjunction with equipment for occupant use to provide a delay for an occupant to clear nuisance detector activation before the activation is processed as a fire alarm condition

1.4.6**alarm delay facility (ADF)**

configuration of FDCIE used to reduce nuisance fire alarm conditions by providing a local warning which if not cleared after a defined delay, will escalate to a fire alarm condition

1.4.7**alarm investigation facility (AIF)**

part of FDCIE and associated control unit which in the attended mode, delays a fire alarm condition, to provide time for acknowledgement and investigation by an attendant

1.4.8**alarm verification facility (AVF) Type A dependency**

configuration of FDCIE that provides an automatic reset or equivalent function of an initial alarm signal and that only permits a subsequent alarm signal to initiate a fire alarm condition

1.4.9**amplified loudspeaker**

loudspeaker conforming with AS ISO 7240.24 and an amplifier conforming with AS 4428.16 incorporated in a single enclosure

1.4.10**baseline data**

data derived from the final design, installation and commissioning

1.4.11**building****a building**

structure or series of structures which is designated as a building by the authority having jurisdiction

1.4.12**circulation space**

areas within a building that are used for pedestrian travel

Note 1 to entry: Circulation spaces may include passage ways, corridors, hallways, stairways, lobbies, atriums, open plan offices, enclosed walkways, malls, shops, areas that provide an exit path from a room or into another room, paths of travel to exits in loading docks, designated paths of travel leading to exits from car spaces in car parks, and other paths of travel to exits.

1.4.13**combination detector**

fire detector incorporating more than one fire sensor within a single housing with each sensor conforming with a separate Standard

1.4.14**connectable device**

device not conforming with a component Standard, the operation or failure of which will not jeopardize the performance of the FDAS (e.g. door hold-open devices, flow switches, BMCS and printer)

Note 1 to entry: See [Clause 2.1.2](#).

1.4.15**contiguous**

sharing a boundary and mutually accessible

1.4.16
control and indicating equipment (CIE)
 component as defined in AS ISO 7240.1

EXAMPLE FDCIE, EICIE and EWCIE

1.4.17
cupboard
 enclosure recessed into a wall or fixed to a wall, having a door(s)

1.4.18
designated building entry point
DBEP
 entry point to a building, which provides firefighters with information identifying the location of the fire alarm

1.4.19
designated site entry point (DSEP)
 entry point to a site, which provides firefighters with information identifying the location of the building from which the fire alarm originated

1.4.20
detection zone
 area protected by one or more detectors which provides a unique common identification at the FDCIE

1.4.21
distributed part of CIE
 parts of an FDCIE or EWCIE which are remotely located from the FDCIE or EWCIE within an FDAS

1.4.22
downstream
 the direction of airflow away from a nominated reference point

1.4.23
duct sampling smoke detector
 component that samples the air moving in a duct and detects smoke in the sample

1.4.24
emergency services personnel
 term used in place of "fire brigade"

1.4.25
emergency zone
 whole or part of a building designated for the controlled evacuation of occupants in an emergency

1.4.26
enclosure
 individual room, space or part thereof

1.4.27
end of line device
ELD
 device installed at the end of a transmission path to provide a signal to CIE in order to supervise the transmission path

Note 1 to entry: The ELD may be incorporated in a device such as a detector or module.

1.4.28
extra-low voltage
ELV <customer cables>
 cable carrying a voltage defined as extra low voltage (ELV) in AS/CA S009

1.4.29**fire alarm condition**

state of the FDCIE when a fire alarm is indicated

1.4.30**fire brigade panel****FBP**

any of the following:

- (a) An FBP conforming with AS 4428.3
- (b) FDCIE providing individual zone controls and indicators

1.4.31**fire compartment**

as defined by the NCC

1.4.32**fire detection and alarm system****FDAS**

equipment including control and indicating equipment, which when arranged in a specified configuration, is capable of detecting and indicating a fire and giving signals for appropriate action

1.4.33**fire detection control and indicating equipment****FDCIE**

component conforming with AS 7240.2

1.4.34**fire fan control panel****FFCP**

part of the FDCIE designed to provide control and indication of air-handling equipment required to operate in fire mode

1.4.35**fire isolated**

separated by fire resisting construction with a minimum FRL of -/60/30

1.4.36**fire-isolated exit**

fire-isolated stairway, a fire-isolated ramp or a fire-isolated horizontal passageway, whether used individually or in combination, which provides egress from a storey or enclosed space to a road or open space

1.4.37**fire mode**

required mode of operation automatically initiated by the FDAS when in the fire alarm condition and intended to initiate smoke control systems within the building

1.4.38**fire-affected zone****fire-affected compartment**

smoke control zone or fire or smoke compartment where fire or smoke has been detected

1.4.39**hot layer**

buoyant layer of hot smoke gases contained by a ceiling or roof above it and characterized by a relatively clear smoke-free zone beneath it

1.4.40**input/output device**

interface component conforming with AS ISO 7240.18 connected to CIE

1.4.41**kitchen exhaust hood**

component part of a kitchen exhaust system intended for collecting the heat, fumes and other aerosols arising from cooking appliances, and whose installation is required by the NCC

1.4.42**level surface**

any surface, roof, or ceiling with a slope of less than or equal to 1 in 10

1.4.43**live speech**

verbal message delivered by the use of an emergency microphone which overrides all other audio signals

1.4.44**low voltage****LV (power)**

voltage as defined in AS/NZS 3000

Note 1 to entry: Generally used for the supply of mains power to equipment.

1.4.45**low voltage****LV (telecommunications)**

LV used for telecommunications where the voltage or current under normal operating conditions or single fault conditions exceeds ES2 limits as defined in AS /NZS 62368.1

1.4.46**low voltage****LV telecommunications transmission path**

LV <customer cable> used for telecommunications where the voltage or current under normal operating conditions or single fault conditions exceeds ES2 limits as defined in AS/NZS 62368.1

1.4.47**main FDCIE**

FDCIE that has been designated to monitor and indicate at least the general status of other FDCIE

1.4.48**major exhaust system**

as defined in AS 1668.1

1.4.49**major supply system**

as defined in AS 1668.1

1.4.50**make-up air**

replacement air for smoke exhaust systems introduced below the hot layer, usually at ambient temperature/density

1.4.51**mechanical services switchboard****MSSB**

mechanical services switchboard supplied by mains or emergency power

Note 1 to entry: The MSSB may incorporate a motor control centre (MCC).

1.4.52
minor exhaust system
as defined in AS 1668.1

1.4.53
minor supply system
as defined in AS 1668.1

1.4.54
motor control centre (MCC)
electrical part of the mechanical services installation that normally controls and monitors mechanical services

Note 1 to entry: The MCC may be incorporated in the mechanical services switchboard (MSSB).

1.4.55
multisensor detector
fire detector conforming with AS ISO 7240.8 or AS 7240.15 or AS 7240.27

1.4.56
networked FDCIE
FDCIE which receives or transmits information from other FDCIE

1.4.57
non-addressable detectors
detectors which are not individually identified at the FDCIE

Note 1 to entry: Previously known as collective or conventional.

1.4.58
non-fire-affected zone/compartment
smoke control zone or fire/smoke compartment where fire or smoke has not been detected

Note 1 to entry: See [Clause 1.4.38](#).

1.4.59
occupied space
space that is readily accessible for occupation, transit or service

Note 1 to entry: The following are not considered to be occupied space:

- (a) Fire isolated ramps.
- (b) Fire isolated passageways.
- (c) Fire isolated stairways.
- (d) Balconies or the like not defined by the NCC as occupiable outdoor areas.
- (e) Occupiable outdoor areas in Class 2,3,4 and 9c SOUs.
- (f) Spaces within SOUs that are not habitable rooms in Class 2, 3 and 4 parts of buildings.

1.4.60
optical beam smoke detector
line type smoke detector using optical beam conforming with AS 7240.12

1.4.61
performance solution
as defined in the NCC

1.4.62**plant room**

room within a building dedicated for the housing of plant or equipment

1.4.63**protected area**

area of a building equipped with an automatic fire detection and alarm system installed in accordance with this document or in accordance with an automatic fire suppression system standard

1.4.64**protected building**

building equipped with an automatic fire detection and alarm system, throughout, installed in accordance with this document, or in accordance with an automatic fire suppression system standard

1.4.65**remote access**

temporary connection of connectable devices to an FDCIE from a location physically distant from the FDCIE where the connection is achieved by, but not limited to, the use of cellular technology, internet-based technology, radio frequency technology, or any combination

Note 1 to entry: Connection of connectable devices to conduct testing and maintenance in accordance with AS 1851 within the same building as the FDCIE is not considered remote access.

1.4.66**required**

indicates a “deemed to satisfy” provision of the NCC

1.4.67**reverberation time**

time, in seconds, taken for a sound within a space to decay by 60 dB after the sound source has stopped

1.4.68**safety services**

as defined by AS/NZS 3000

1.4.69**shall**

indicates that a statement is mandatory

1.4.70**should**

indicates a recommendation

1.4.71**site**

parcel or allotment of land containing one or more buildings under one ownership or management

1.4.72**sloping surface**

any surface, roof, or ceiling with a slope greater than 1 in 10

1.4.73**smoke**

generally visible suspension in air of solid or liquid particles or gases resulting from combustion or pyrolysis and entrained air

1.4.74**smoke compartment**

area within a fire compartment that is required to be separated by barriers such as walls, and/or floors and ceilings having the appropriate resistance to the spread of smoke

1.4.75**smoke control zone**

area or volume as determined for smoke control, which where applicable, is a —

- (a) smoke compartment within a building;
- (b) fire compartment; or
- (c) smoke reservoir contained within construction and including the occupied space below it

1.4.76**smoke damper**

device that operates to restrict the passage of smoke through a duct or opening for the passage of air and operates automatically on receipt of a signal from a remote device

1.4.77**smoke exhaust fan**

fan that exhausts smoke in the event of a fire, in accordance with AS 1668.1, also known as smoke spill fan

1.4.78**smoke exhaust system**

special configuration of elements of an air-handling system, which is used to conduct smoke exhaust air, and extends from the most upstream smoke or fire-resistant barrier that is being penetrated to the point of discharge outside the building

Note 1 to entry: Also known as smoke spill system.

1.4.79**smoke reservoir**

volume within the upper portion of a smoke control zone that is capable of collecting and containing a layer of hot buoyant smoke

1.4.80**sole occupancy unit****SOU**

as defined in the NCC

1.4.81**sound pressure level****SPL**

logarithmic ratio of the acoustic pressure measured to the reference pressure of 20uPa expressed in decibels (dB)

1.4.82**supervised**

monitored for fault conditions in the quiescent condition

1.4.83**suppression systems**

sprinkler systems, gaseous extinguishing systems or other special hazard systems

1.4.84**transmission path**

connection, external to cabinets, between parts of a FDAS for transmission of information or power

Note 1 to entry: Examples include electrical cables, fibre optic cable and electromagnetic radiation (e.g. radio, microwave, and infrared light).

1.4.85**transmission path fault**

condition in the transmission path that prevents the correct transfer of information or power

1.4.86**upstream**

in the direction of airflow towards a nominated reference point

1.4.87**zone pressurization system**

air-handling system that is required to provide zoned smoke control utilizing a pressurization system designed to establish a pressure differential between the fire-affected compartment and adjacent fire or smoke compartments in accordance with AS 1668.1

1.4.88**zone smoke control dampers**

air dampers associated with a particular fire or smoke compartment or zone, which form part of a zone pressurization smoke control system

1.4.89**zone smoke control system**

smoke control system that is zoned and required to respond to the spread of smoke

1.5 Abbreviations

AAD	Audible alarm device
AAF	Alarm acknowledgement facility
ADF	Alarm delay facility
ASD	Aspirating smoke detectors
ASE	Alarm signalling equipment
AVF	Alarm verification facility
AIF	Alarm investigation facility
BMCS	Building management control system
CIE	Control and indicating equipment
DBEP	Designated building entry point
DSEP	Designated site entry point
ECO	Emergency control organization
ELD	End of line device
ELV	Extra low voltage
EICIE	Emergency intercom control and indicating equipment
EWICIE	Emergency warning control and indicating equipment
FBP	Fire brigade panel
FDAS	Fire detection and alarm system

FDCIE	Fire detection control and indicating equipment
FFCP	Fire fan control panel
FSER	Fire safety engineering report
LV	Low voltage
MCC	Motor control centre
MCP	Manual call point
MSSB	Mechanical services switchboard
NCC	National Construction Code (the relevant part of Building Code of Australia)
PSE	Power supply equipment
RT	Reverberation time
SHCIE	Special hazards control and indicating equipment
SOU	Sole occupancy unit
STI	Speech transmission index
STIPA	Speech transmission index for public address
SPL	Sound pressure level
TP	Transmission path
TPI	Transmission path isolator
VAD	Visual alarm device
VWD	Visual warning device

1.6 Measurements

1.6.1 Tolerances

If a specific tolerance or deviation limit is not specified in a measurement, requirements or test procedure, then a tolerance of $\pm 5\%$ shall be applied.

Measurement of STI shall not be subject to the above tolerance.

Where SPL is measured, a tolerance of ± 0.5 dB shall be applied.

1.6.2 Spacing

When determining the location of detectors, measurement shall be taken from the centre line of the point type detector or ASD sampling point.

1.7 System design

1.7.1 General

The automatic fire detection and alarm system shall be designed to the requirements of [Clauses 1 to 6](#). For smoke control systems, [Clause 7](#) applies.

The system design shall include the details and documentation for both installation and commissioning of the system.

NOTE This document requires various labels on components of the FDAS. [Appendix J](#) provides a check list of lettering heights for reference only.

1.7.2 Baseline data

The design, installation and documentation of the final design shall be provided.

Commissioning documentation shall be provided as validation of the final installation.

This baseline data will facilitate the routine service of the system and validation of its ongoing performance.

The baseline data shall include, but not be limited to, the following:

- (a) Site identifier.
- (b) Address.
- (c) Building number or name (if applicable).
- (d) System scope: an alteration to an existing system or a new system.
- (e) *Type of system* — non-addressable, addressable, addressable/analogue or any combination.
- (f) *Design reference* — (as applicable) AS 1670.1, NCC Deemed to Satisfy or performance solution(s).
- (g) The Fire Safety Engineering Report (FSER) reference if performance solution(s) is applied.
- (h) Evidence that the components used within the system meet the required component Standards.
- (i) Evidence that the equipment is compatible in the configuration as installed.
- (j) Final design drawings (“as built”) showing the installed system layout (building plans), equipment type, locations, reference SPL, zone number, device ID and transmission paths.

NOTE 1 See example in [Appendix D](#) using symbols in [Figure D.1](#).

- (k) Systems interface diagram.
- (l) Fire compartmentation and smoke control zone drawings where [Clause 7](#) is applicable.
- (m) A description of the required operation of all —
 - (i) air handling systems in each smoke control zone where [Clause 7](#) is applicable;
 - (ii) occupant warning systems; and
 - (iii) Fire detection system.
- (n) A cause and effect matrix which shall include the following:
 - (i) Detail all smoke detection and smoke control zone input criteria of the system and the resultant output operational requirements of all interfaced systems.
 - (ii) Detail the full automatic functionality of the smoke detection and smoke control system from “end-to-end”.
 - (iii) Be in the form of a document that presents in a grid type cross reference detailing each smoke detection and smoke control zone input (including any suppression

system inputs to the FDCIE) on one axis with the corresponding output functionality for each smoke control zone input on the other axis.

- (iv) Identify the design and installation standards, any performance solutions that apply and the last date of revision and the author.
- (o) List of all system components, their location, type, unique system designation and descriptor.
- (p) List of each system component having a fixed service life, nominating the service date.
- (q) List of any connectable devices.
- (r) Manuals for all CIE and system components (as applicable).
- (s) Aspirating smoke detection design calculations including transport times for each sampling pipe branch.
- (t) Building occupant warning system (AS 1670.1) type of system or Grade as applicable.
- (u) Emergency warning system (AS 1670.4) type (if applicable).
- (v) Amplifier rated output; impedance (Ω) and power (W) (if applicable).
- (w) Measured impedance (Ω), power load (W) and reference SPL of each loudspeaker transmission path (if applicable).
- (x) Completed Designer's Statement, Installer's Statement and Commissioning Statement.

NOTE 2 See examples in [Appendix E](#), [Appendix F](#) and [Appendix G](#) respectively.

- (y) Power supply requirements including:
 - (i) Mains nominal voltage and source (if applicable).
 - (ii) Standby time (72 h or 24 h where externally monitored).
 - (iii) Standby power source, nominal voltage and capacity and the compensation factor used if installed outside an average temperature of 15°C–30°C.
 - (iv) System quiescent current including fire alarm monitoring loads (if applicable).
 - (v) System alarm current, including occupant warning system load.
 - (vi) Load current of each connectable device transmission path.
 - (vii) PSE main power source maximum rated load current during quiescent condition and during fire alarm condition (refer to AS 7240.4).
 - (viii) PSE charger maximum standby battery capacity supported (refer to AS 7240.4).
- (z) The service life of the autonomous power source of devices conforming with AS ISO 7240.25.

Copies of FDAS documentation and baseline data shall be consolidated and housed in or adjacent to the FDCIE without interfering with the system wiring. Where this is not possible a label shall be provided on the FDCIE or the FDAS zone block plan identifying the location where it is stored within the building.

1.7.3 Alterations to existing system

Alterations (including site specific data) to existing installations shall be designed and installed to the requirements of this document.

NOTE 1 This only applies to equipment and transmission paths which are added, removed, relocated or replaced.

Power supply requirements shall be recalculated and upgraded as necessary to ensure the system can accommodate any additional loads.

The alteration, including detectors, alarm devices and MCPs shall be compatible, only used within the limitations detailed in the component hardware documentation. The alteration shall perform the required functions in accordance with this document.

NOTE 2 See [Appendix A](#).

Where existing wiring is required to be joined at the FDCIE, fixed terminal strips utilizing clamp-type connectors shall be used. Where these joints are made outside the FDCIE, they shall be housed in a cabinet and labelled “FIRE” in a contrasting colour to the background with lettering size of not less than 5 mm.

In addition to updating the documentation detailed in [Appendix A](#), the zone block plan (see [Clause 3.7](#)) shall be revised to include the alterations.

The alterations shall be tested to demonstrate correct operation and ensure that it does not affect the operation of the existing installation.

1.7.4 Fire alarm monitoring

Where an FDAS requires connection to a fire dispatch centre the requirements of AS 1670.3 shall apply.

1.8 Application of normative references

[Table 1.8](#) lists the Standards which have more than one edition that may be used to meet the requirements of this document.

Table 1.8 — Acceptable editions of Standards

Standard	Acceptable edition(s)
AS 7240.24	2018 and 2015

2 System configuration

2.1 Components

2.1.1 General

FDAS components shall conform to at least one of the component Standards listed in the normative references in [Clause 1.3](#). FDAS components shall be installed in the format detailed in the hardware documentation including any limitations of use identified and the compatibility of the components with CIE.

Components installed within the FDAS shall be compatible in the configuration in which they are installed. Where evidence of compatibility is not provided within the component hardware documentation or product listing certificate, AS 7240.13 shall be used to confirm the compatibility of components.

NOTE Components should be appropriate for the environment in which they are installed, as they may be exposed to extreme temperatures, dampness, dust, corrosion, vibration, shock, and flammable or explosive atmospheres.

2.1.2 Components

The system shall comprise components conforming with the following:

- (a) Fire detectors, selected to suit the particular hazard and risk to life or property, or both, conforming with at least one of the following:
 - (i) AS ISO 7240.5, Fire detection and fire alarm systems, Part 5: *Point-type heat detectors*.
 - (ii) AS 7240.6, *Fire detection and alarm systems, Part 6: Carbon monoxide fire detectors using electro-chemical cells*.
 - (iii) AS 7240.7, *Fire detection and alarm systems, Part 7: Point-type smoke detectors using scattered light, transmitted light or ionization*.
 - (iv) AS ISO 7240.8, Fire detection and alarm systems, Part 8: *Point-type fire detectors using a carbon monoxide sensor in combination with a heat sensor*.
 - (v) AS ISO 7240.10, Fire detection and alarm systems, Part 10: *Point-type flame detectors*.
 - (vi) AS 7240.12, *Fire detection and alarm systems, Part 12: Line type smoke detectors using a transmitted optical beam*.
 - (vii) AS 7240.15, *Fire detection and alarm systems, Part 15: Point-type smoke detectors using smoke and heat sensors*.
 - (viii) AS 7240.20, *Fire detection and alarm systems, Part 20: Aspirating smoke detector*.
 - (ix) AS 7240.22, *Fire detection and alarm systems, Part 22: Smoke-detection equipment for ducts*.
 - (x) AS 7240.27, *Fire detection and alarm systems, Part 27: Point type fire detectors using a smoke sensor in combination with a carbon monoxide sensor and, optionally, one or more heat sensors*
 - (xi) AS 1603.13, *Automatic fire detection and alarm systems, Part 13: Duct sampling smoke detectors*.
 - (xii) EN 54-22, *Fire detection and fire alarm systems — Part 22: Resettable line-type heat detectors*.
 - (xiii) EN 54-28, *Fire detection and fire alarm system — Part 28: Non-resettable line-type heat detectors*.
- (b) Fire detection control and indicating equipment (FDCIE) in accordance with AS 7240.2, with associated FBP as defined in [Clause 1.4.30](#).
- (c) Power supply equipment (PSE) in accordance with AS 7240.4.
- (d) Occupant warning equipment as specified in [Clause 3.17](#) and if installed, supplementary warning equipment for people with hearing impairment in accordance with AS 1603.17.
- (e) Manual call points (MCP) in accordance with AS ISO 7240.11, except the colour specified in [Clause 3.11](#).
- (f) Visual alarm devices (VAD) in accordance with AS ISO 7240.23 and located in accordance with the area of coverage rating, if installed.
- (g) Visual warning devices (VWD) in accordance with AS 1603.11, if installed.
- (h) External visual alarm device in accordance with AS ISO 7240.23.

- (i) Fire alarm mimics in accordance with the relevant clauses of AS 7240.2 or AS ISO 7240.18, if installed. Fire alarm mimics shall not be able to reset or disable an alarm or silence occupant warning. For light emitting indicator mimics, at least the control of the indicators shall be in accordance with the relevant parts of these Standards.
- (j) Input/output devices in accordance with AS ISO 7240.18, if installed.
- (k) Transmission path isolators (TPIs) in accordance with AS ISO 7240.17, if installed.
- (l) Audible alarm devices (AAD) in accordance with AS ISO 7240.3, if installed.
- (m) EWCIE to AS 4428.16 and associated loudspeakers in accordance with AS ISO 7240.24, or amplified loudspeakers (see [clause 1.4.9](#)), if installed.
- (n) Audio splitters in accordance with AS 4428.16, and where field mounted, also in accordance with AS ISO 7240.18.

2.1.3 Provision of FDCIE

Each building shall be protected by an FDCIE which is capable of independent operation, including occupant warning without reliance on FDCIE, EICIE or EWCIE in any other building.

A separate building need not have an FDCIE where the following requirements are met:

- (a) Travel distance from the DBEP of the building containing the FDCIE is less than 100 m from the entry point to the separate building.
- (b) Separate building is accessible to the fire appliance without using another DSEP.
- (c) Separate building is protected by only a single detection zone on the building FDCIE or total floor area of the separate building does not exceed 500 m² and the number of storeys does not exceed two.

2.1.4 Connectable devices

Where connectable devices such as data terminals, colour graphic displays and building monitoring and control systems (BMCS) are connected to the FDAS, the following requirements shall be met:

- (a) The operation of the FDAS shall not be reliant on the connectable devices.
- (b) Failure of any connectable devices shall not adversely affect the correct operation of the FDAS.
- (c) All transmission path connections and interfaces to connectable devices shall be installed in accordance with AS/CA S009.

NOTE AS/CA S009 states that it should be read in conjunction with AS/CA S008.

- (d) Compatibility of the connectable devices with the FDCIE shall have been assessed.
- (e) Connectable devices shall not have access to update firmware or software configurations at Access Level 3 or Access Level 4 as specified in AS 7240.2 unless these are manually enabled at the FDCIE.
- (f) Remote diagnostics, maintenance and testing shall be permitted where the system provides a means to manually terminate remote access at the FDCIE. In any case, remote access shall be automatically terminated within 1 h of inactivity. The access level requirements of AS 7240.2 shall apply as if these functions were being performed at the FDCIE.
- (g) Remote access shall not be capable of the following functionality:
 - (i) Activate, disable, silence, or reset the FDCIE or FFCP.

- (ii) Activate, disable, silence or reset the occupant warning systems.

Where a manufacturer asserts product connectability and compatibility based on either prediction or inhouse testing and assessment to meet the above requirements, the manufacturer shall provide a product technical statement detailing the methodology, assessment protocols and calculations upon which such assertions are made.

Where a product technical statement is not provided AS 7240.13 shall be used to confirm that connectable devices meet the above requirements.

NOTE Refer to the NCC evidence of suitability requirements for product technical statements.

2.2 Designated entry point

2.2.1 Designated building entry point (DBEP)

A DBEP shall be the primary occupant entry point for each building and identified with an external alarm indication in accordance with [Clause 3.8](#).

For buildings which incorporate either a Fire Control Centre (FCC) or Fire Control Room (FCR) as defined by the NCC, this shall be the DBEP.

NOTE Where a building incorporates an FCC, FCR or multiple primary occupant entry points, the fire authority should be consulted.

At the DBEP the location of a fire alarm shall be indicated on a Fire Brigade Panel (FBP) as defined in [Clause 1.4.30](#). The FBP shall be installed in accordance with [Clause 3.6](#).

2.2.2 Designated site entry point (DSEP)

Where multiple buildings are networked to a main FDCIE monitored in accordance with AS 1670.3, at least one DSEP shall be provided on a site unless each building is individually identified at the fire dispatch centre. Where physical barriers segregate a site, a separate DSEP shall be provided for each segregated area.

NOTE For monitored sites, the location of the DSEP should be agreed with the fire authority.

At the DSEP the building(s) in alarm shall be indicated by at least one of the following means:

- (a) An FBP.
- (b) A fire alarm mimic panel in accordance with [Clause 2.1.2\(i\)](#) and identifies the building in fire alarm without exiting the fire appliance.
- (c) An external alarm indication in accordance with [Clause 3.5](#) on each protected building within the segregated area. Such an indication shall be clearly visible from the DSEP without exiting the fire appliance.

Only buildings that are readily accessible from the DSEP by the fire appliance shall be indicated.

A plan showing all buildings and vehicle routes on the site shall be at the DSEP. The DSEP shall be shown on the plan for all buildings associated with the DSEP. Only information relevant to the emergency services personnel shall be included on the plan.

2.3 Detection zone limitations

A detection zone shall be not more than 2 000 m² of contiguous floor area which is confined to one storey. The distance between any points on the floor within a detection zone shall not exceed 100 m.

A single detection zone of non-contiguous floor area shall be determined as contiguous where the distance between each adjacent area entrance does not exceed 10 m measured to the centre of the entrance.

Each fully enclosed stairway shall be treated as a separate detection zone regardless of total floor area and storeys covered. See [Clause 3.22.9](#).

Protected areas with no access from inside the building shall be displayed as separate detection zones from those having internal access.

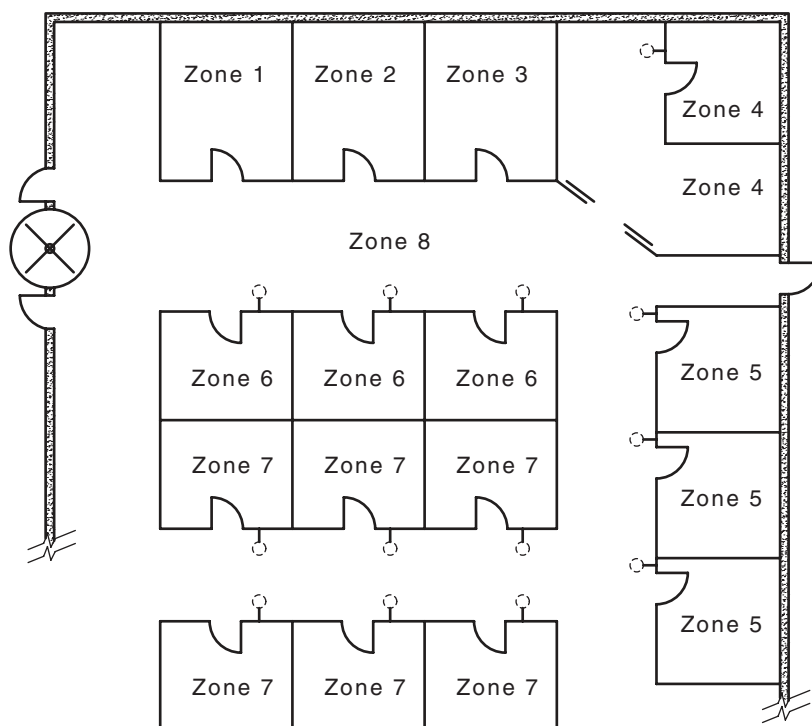
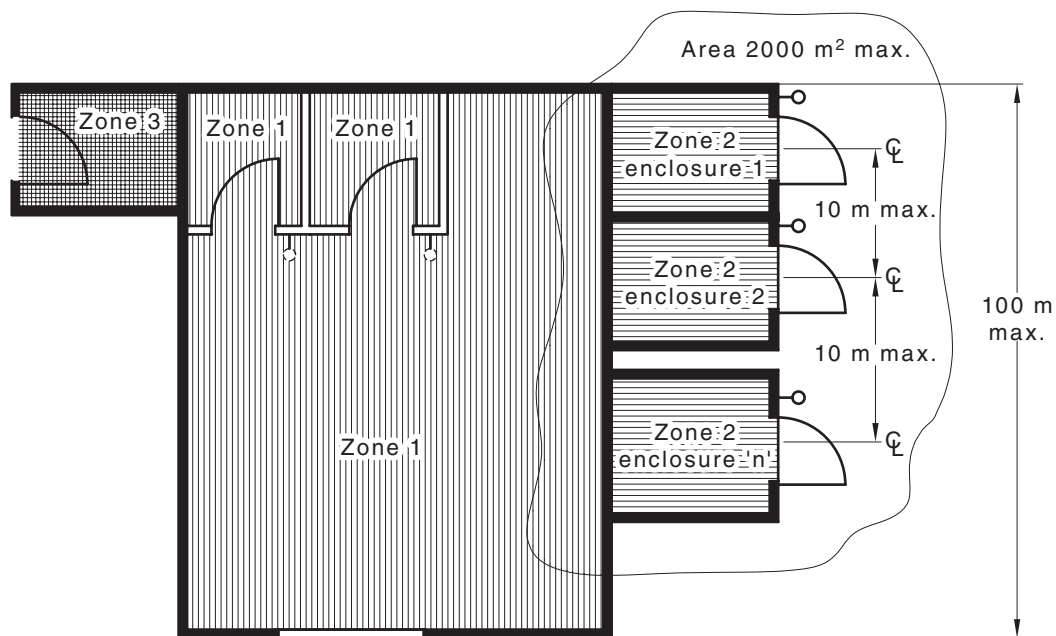
NOTE For a typical example of zone allocation, see [Figure 2.3](#).

The maximum number of detectors in a detection zone shall not exceed 40 unless the identity and the location of all detectors in alarm can be individually displayed on the FBP.

Detectors shall be grouped into zones with addressable detectors being individually displayed. Detectors displayed individually shall not be identified as separate detection zones unless representing the only detector within an enclosure.

Where a mezzanine level, is open to and accessible from the storey with which it is associated, and is treated as part of the detection zone for that storey, the total protected area and the number of detection devices shall not exceed the detection zone limits specified in this document.

A concealed space not exceeding 500 m² and accessible from the storey with which it is associated may form part of the detection zone for that storey. The total protected area and the number of detection devices shall not exceed the detection zone limits specified in this document.



Key

- = Remote indicator (required only when doors kept locked)
- = Remote indicator

NOTE For information on the provision of remote indicators see to [Clauses 3.4](#) and [3.13](#).

Figure 2.3 — Examples of zone allocations

2.4 Networked FDCIE

Where FDCIE receives or transmits information to or from other CIE, the following requirements apply:

- (a) Where a main FDCIE monitors other FDCIE, the main FDCIE shall display at least a general alarm and general fault. In this case the fault indication shall include the general disablement condition from each of the other FDCIEs.

NOTE Where practicable, display the detection zone in alarm, fault and disablement (isolate).
- (b) A fire alarm condition on an FDCIE shall be indicated at the main FDCIE FBP or any other FDCIE, where required, and activate any required output signals within 10 s. Faults, disablements and power supply failure from FDCIE and external EWCIE shall be indicated at the main FDCIE within 100 s.
- (c) Where FDCIE monitors an EWCIE, the FDCIE shall display at least a general fault and disablement, from each EWCIE.

NOTE 2 The disablement indication may be combined with the general fault indication.
- (d) FDCIE, that provides only general indications to the main FDCIE, shall protect not more than —
 - (i) one storey of the building in which the main FDCIE is located; or
 - (ii) one separate building.
- (e) Where an FDCIE with more than one detection zone is networked to another FDCIE the requirements of [Clause 2.6](#) shall be met.
- (f) On any site, not more than two FBP shall need to be interrogated to determine the detection zone in alarm.
- (g) A fire alarm condition on an FDCIE shall only be reset or disabled from the main FDCIE or from the FDCIE on which the fire alarm condition was initiated.
- (h) Where the main FDCIE indicates only the general conditions of another FDCIE the condition shall only be reset at that other FDCIE. The other FDCIE shall also clear the general condition of the main FDCIE.
- (i) FDCIE protecting a building shall be capable of independent operation, including occupant warning without reliance on FDCIE, EICIE or EWCIE in other buildings.
- (j) FDCIE protecting a part of a building and requiring attendance by emergency services personnel shall be provided with an FBP and a VAD in accordance with [Clause 3.5](#) at the entrance to the protected area.
- (k) FDCIE not requiring interrogation by emergency services personnel shall be labelled “FIRE” in no less than 20 mm high letters.
- (l) All detection zones served by an FDCIE shall be readily accessible from the area served by that FDCIE unless the zone in alarm is identified at the DBEP.

2.5 Distributed parts of FDCIE

Where parts of FDCIE are installed in locations remote to the FDCIE, the following shall apply:

- (a) Requirements of [Clause 2.4](#) shall not apply. The additional network transport time of 10 s shall not apply. Where distributed parts of CIE form a single FDCIE, alarms shall be annunciated within 10 s as specified in AS 7240.2.

- (b) Where the distributed part of FDCIE requires operation by the emergency services it shall meet the requirements of [Clause 3.6](#).
- (c) Where the distributed part of FDCIE does not require operation by emergency services it shall be fire isolated from occupied spaces, accessible for service and labelled "FIRE" in 20 mm letters.
- (d) A single fault in the transmission path(s) between distributed parts of FDCIE shall not prevent an alarm signal from distributed parts of FDCIE.
- (e) A failure of a distributed part of FDCIE shall not inhibit the correct operation of other distributed parts of FDCIE.

The requirements of this clause shall also apply to EWCIE.

2.6 Transmission path faults

A single transmission path fault shall not prevent the operation of more than one of the following:

- (a) One detection zone.
- (b) One detection zone indication at the DBEP.
- (c) One building alarm indication at the DSEP.
- (d) One area of occupant warning covering not more than one level and not more than 2000 m².

NOTE 1 In a large single enclosure of a building, such as a factory, warehouse or carpark, the area covered by a single transmission path may be increased to 4 000 m².
- (e) One smoke control zone, including detection and the control and indication of one fan associated with the smoke control zone.
- (f) One addressable output device not forming part of Items (a) to (e).

Detection and occupant warning devices may share a common TP provided that no more than 40 devices are affected by a single fault and the requirements of (a) and (d) continue to be met. Any combination of devices is acceptable.

NOTE 2 Combination detectors may be counted as a single device.

NOTE 3 Where VADs and AADs share a common housing they may be counted as a single device.

A transmission path fault shall indicate visually and audibly at the main FDCIE and any other FDCIE that receives an alarm via that transmission path.

3 Installation requirements

3.1 General

Components and other equipment shall be installed in locations that will not prejudice their performance and reliability. Components shall be installed so that the correct performance is maintained. Where the sensitivity of fire detectors can be varied, the sensitivity shall be set within the limits of the appropriate Standard to which the fire detectors were assessed. Access for servicing all components shall be provided.

NOTE 1 Where special installation arrangements are needed, recommendations in the component documentation for that application should be followed. CIE are required to have a minimum rating of IP30 in accordance with IEC 60529 but some hostile environments may need a higher rating.

NOTE 2 Detectors that can be contaminated by construction works should not be fitted unless suitably protected until the construction works are completed.

3.2 Nuisance alarm mitigation methods

3.2.1 General

AAF, ADF, AIF attended mode, AVF Type A dependency, Type B dependency, Type C dependency shall not be used on the same detection device. Limitations of use are specified in the relative clauses.

NOTE 1 Type A, B and C dependencies are described in AS 7240.2.

Functions operated by FDCIE software and hardware shall be in accordance with the requirements of AS 7240.2.

NOTE 2 Access levels are defined in AS 7240.2.

I/O devices including AAF and AIF control units which are installed external to the FDCIE shall be in accordance with AS ISO 7240.18.

C3.2 High levels of nuisance alarms occur in residential accommodation caused by cooking, smoking, aerosols and steam from showering, etc. Possible solutions may be to locate smoke detectors away from potential sources of nuisance alarm, provide adequate air extraction or choose a smoke detection incorporating alarm mitigation technology. Where these are insufficient, several FDAS configurations provide options to delay the response to transient causes.

AAF provides a trained occupant with the ability to mitigate the effects of nuisance smoke detector activations by acknowledging the event as a nuisance alarm (see [Clause 3.2.2](#)). An acknowledgement period setting of 30 s (maximum allowable time is 60 s) is considered adequate for most residential SOUs. An investigation period of 90 s to clear the cause is considered appropriate for protected areas with normal levels of ventilation and accessibility. For less adequate ventilation, up to the maximum allowable time of 180 s may be required. This often makes it unsuitable for use in short-term residential accommodation where the occupant is not aware of its function.

For SOUs unlikely to have trained occupants, the use of ADF (see [Clause 3.2.3](#)) may be a more effective solution as it does not require acknowledgement, but is backed up by the use of heat detection.

For commercial accommodation with a normally attended station, AIF used in the attended mode (see [Clause 3.2.4](#)) provides an output signal for the attendant to acknowledge the receipt of an automatic fire detection alarm and to investigate the source of the alarm, followed by either a reset of a nuisance alarm or to bypass the delay by the operation of an MCP. AVF is for general use to automatically mitigate the effect of very short-term events but is rarely effective for residential accommodation.

3.2.2 Alarm acknowledgement facility (AAF)

3.2.2.1 General

Each AAF shall control only one sole occupancy unit. The AAF control unit shall be located within the sole occupancy unit it serves.

Alarms initiated from the following shall not be subject to AAF:

- (a) Heat detection.
- (b) MCP.
- (c) Networked FDCIE.
- (d) Fire detectors installed in hazardous locations.

(e) Fire suppression systems.

The AAF visual indicator on the AAF control unit shall meet the visibility requirement of AS 7240.2 specified for general indicators. An AAF shall be capable of being associated with one or more detectors. Each AAF shall operate independently of any other AAF.

The FDCIE shall be capable of operating at least two AAFs simultaneously. If alarms are detected in excess of the maximum number of AAFs that can be processed simultaneously by the FDCIE, then the excess alarms shall not be delayed.

3.2.2.2 AAF sounder

The AAF sounder shall operate when an alarm is detected in at least one associated detector. The sounder shall produce a sound pressure level of at least 75 dB(A) at a distance of 1 m. Where the sounder forms part of an occupant warning system, the sound pressure level shall meet the requirements specified in this document.

3.2.2.3 AAF visual indicator

The AAF shall be fitted with a red visual indicator. The visual indicator shall illuminate when an alarm is detected in at least one associated detector. The indicator may flash periodically in a non-alarm state. Where the indicator forms part of the fire detector, the indicator on the fire detector satisfies the indicator requirements.

3.2.2.4 Acknowledgement period

When an alarm is detected by an associated detector, the fire alarm condition at the FDCIE shall be delayed for an acknowledgement period.

The acknowledgement period shall be adjustable at Access Level 3 to a maximum of 60 s, in increments not greater than 30 s.

3.2.2.5 AAF control

The AAF control shall use a momentary action.

When activated during the acknowledgement period, the AAF control shall —

- (a) inhibit a fire alarm condition at the FDCIE; and
- (b) activate the investigation period timer; and
- (c) silence the AAF sounder.

Activation of the AAF control outside the acknowledgement period shall not cause the initiation of an investigation period.

3.2.2.6 Investigation period

An investigation period shall be initiated upon the first activation of the AAF control during the acknowledgement period. Repeated or continuous activation of the AAF control during the alarm investigation period shall not alter the duration of the investigation period. The investigation period shall be adjustable at Access Level 3 from 0 s to 180 s in increments not greater than 60 s.

If the alarm in all associated detectors is cleared during or by the end of the investigation period, then the fire alarm condition is not generated at the FDCIE. When the alarm in the associated detector is cleared, the AAF indicator is extinguished. If the alarm remains in any associated detector after the conclusion of the investigation period, then a fire alarm condition shall be generated by the FDCIE.

3.2.2.7 Mounting facilities

The AAF control unit shall be designed to facilitate mounting of the control at a height of 1 m from the floor. Suitable mounting hardware shall be provided with the AAF control unit.

3.2.2.8 Marking

The AAF control shall be marked with the words "PRESS TO ACKNOWLEDGE NUISANCE ALARM" or similar in letters not less than 3 mm high. The letters shall be in a contrasting colour to the background.

3.2.3 Alarm delay facility (ADF)

ADF shall only be used with smoke detectors within SOUs of Class 2, 3, and 4 buildings and meet the following requirements:

- (a) Each ADF shall control only one residential SOU.
- (b) The FDCIE shall be capable of operating at least five ADF simultaneously.
- (c) Each ADF shall incorporate at least one AAD producing a minimum SPL of 85 dB(A) at 1 m, within the SOU. VADs shall also be activated in SOU designated for the hearing impaired.
- (d) Smoke detectors subject to ADF shall be either a combination detector incorporating a heat detector or have a heat detector mounted within 3.5 m of the smoke detector.
- (e) Heat detection shall not be delayed by ADF.

NOTE Areas protected by a sprinkler system installed in accordance with , FPAA101H or the AS 2118 series meet the heat detector requirements of Items (d) and (e).

The ADF shall be initiated by an alarm condition on any of the associated smoke detector(s) within the SOU. When an ADF alarm is activated, the delay period shall commence, the visual indicator on the detector in alarm will illuminate, and the associated AAD within the SOU will sound. The delay period shall be adjustable from 0 s to 300 s in increments not greater than 60 s.

If the alarm condition of all associated smoke detectors is cleared before the expiration of the alarm delay period then —

- (i) the ADF shall automatically reset without generating a fire alarm condition at the FDCIE;
- (ii) the visual alarm indicator on the smoke detector shall extinguish; and
- (iii) the AAD shall silence.

If the alarm condition remains in any associated smoke detector after the conclusion of the delay period, a fire alarm condition shall be generated by the FDCIE. The visual alarm indicator on the detector shall latch.

Where the AAD forms part of the occupant warning system it shall meet the requirements of [Clause 3.17](#). A label shall be provided in a visible place within the SOU on or adjacent to the exit door in 5 mm high letters, indicating that ADF is provided. The letters shall be in a contrasting colour to the background.

3.2.4 Alarm investigation facility (AIF)

3.2.4.1 General

Alarms initiated from the following shall not be subject to alarm investigation facility delays:

- (a) MCP.
- (b) Alarm signals between networked FDCIE.

- (c) Fire detectors installed in hazardous locations.
- (d) Fire suppression systems.
- (e) Detection zones that cannot be accessed and reset within the AIF investigation time.

AIF shall be in accordance with the general requirements for Delays To Outputs of AS 7240.2. Where the FDAS is monitored in accordance with AS 1670.3, approval of the emergency services shall be obtained.

C3.2.4.1 *AIF has limited acceptance by the emergency services. The implementation of AIF will require the agreement of the fire authorities in all instances.*

3.2.4.2 Operation

Any AIF shall operate in accordance with the following:

- (a) The AIF shall only apply to alarms initiated by automatic fire detection devices (not manually operated devices, e.g. MCPs).
- (b) The AIF shall have a control to select between unattended and attended modes of operation. The attended mode shall operate a yellow/amber visual indicator. In the unattended mode the AIF shall be disabled and no associated outputs delayed. In the attended mode the AIF shall operate as follows:
 - (i) An alarm subject to AIF shall activate the visual alarm indication and alarm sounder of the FDCIE and start the acknowledgement timer while the outputs are delayed.
 - (ii) If the acknowledgement timer times out, the delayed outputs shall activate.
 - (iii) The acknowledgement time shall be adjustable at Access Level 3 up to a maximum of 30 s.

NOTE 1 This should be set at the value agreed with the emergency service at time of commissioning.
 - (iv) If the alarm is acknowledged during the acknowledgement time period, the audible alarm indication shall be silenced. The investigation timer shall start.
 - (v) If the investigation timer times out, the delayed outputs shall activate.
 - (vi) The investigation time shall be adjustable at Access Level 3 up to a maximum of 300 s.

NOTE 2 This should be set at the value agreed with the emergency service at time of commissioning.
 - (vii) If a second alarm occurs at any time during the AIF time, the delayed output shall activate.
 - (viii) If the alarm is reset during any of the AIF times, the AIF timers are cancelled and delayed outputs will not activate.
- (c) A manual acknowledgement control shall be provided at the location where the detection zone alarm is displayed. The audible alarm indication (buzzer) silence control of the FBP shall be used for this purpose and or a separate acknowledgement control. The audible alarm shall resound if a fire alarm condition results. If a separate AIF acknowledgement control is provided, then it shall be labelled "AIF ACK", or "AIF ACKNOWLEDGE".
- (d) A manual control shall be provided to reset the initial alarm during the AIF time.

- (e) The reset control of the FBP may be used for this purpose without there being a silenced alarm output.
- (f) The AIF function shall be able to be selected or programmed on a zone by zone basis.

3.2.5 Alarm verification facility (AVF) Type A dependency

Where AVF is used, it shall meet Type A dependency as specified in AS 7240.2.

NOTE 1 It is recommended that the AVF cancellation time is limited to 300 s.

The following shall not be subject to AVF:

- (a) MCPs.
- (b) Alarm signals between networked FDCIE.
- (c) Detectors used to activate fire suppression systems.
- (d) Detectors installed in hazardous areas, e.g. explosive gas or combustible dusts.
- (e) Fire suppression systems connected to an FDCIE.
- (f) Optical beam smoke detectors where a beam-interrupt fault overrides the alarm state.
- (g) Detectors that take more than 60 s to become functional after a reset.

NOTE 2 Since the provision of AVF delays the initiation of an alarm signal, it is desirable that it only be provided where other efforts to eliminate nuisance alarm signals have been unsuccessful.

3.2.6 Type B dependency

Type B dependency as specified in AS 7240.2. A fire alarm condition shall be initiated by at least any two detectors having entered the alarm state.

Detectors shall be located such that the distance from any point of the protected area to detectors to initiate Type B dependency do not exceed the maximum spacing for the type of detector used. The additional detectors required to initiate a confirmation alarm shall also meet the same spacing requirements.

The following shall not be subject to Type B dependency:

- (a) MCPs.
- (b) Alarm signals between networked FDCIE.
- (c) Optical beam smoke detectors where a beam-interrupt fault overrides the alarm state.

3.2.7 Type C dependency

Type C dependency as specified in AS 7240.2.

NOTE Type C dependency requires alarms from two separate detection devices

3.3 Control of connectable devices

3.3.1 General

Transmission paths to connectable devices shall be electrically isolated, fuse protected or current-limited, to prevent a fault from inhibiting the operation of FDCIE functions or the transmission of an alarm signal.

3.3.2 Supervision

Each transmission path shall be supervised by the FDCIE for any fault condition that prevents correct operation. Such faults shall cause the FDCIE to initiate an audible and visible fault indication.

NOTE Where devices default to their fire alarm state on a transmission path fault, they need not indicate a fault on the FDCIE.

3.4 Detector alarm indication

Individual alarm indication shall be provided for each detector and continue to indicate until the detector is reset. Indication shall be provided by one or more of the following means:

- (a) An indicator integral with the detector.
- (b) An indicator remote from the detector in accordance with [Clause 3.13](#).
- (c) Individual alarm indication at the FBP.

Where the detector alarm indicator flashes periodically (for example, when the detector is polled by the FDCIE), the alarm condition indication shall be clearly distinguishable from any other condition.

3.5 External alarm

An external wall mounted VAD shall be located on the front façade of the building or the façade on which the DBEP is present. The VAD should be installed as close as practicable to the DBEP and shall be not more than 10 m from the DBEP.

The VAD shall —

- (a) Flash whenever the FDCIE is in the fire alarm condition.
- (b) Cease flashing when the fire alarm condition is reset.
- (c) Flash red and be visible from the fire appliance approaching from at least two directions.
- (d) Have a minimum rating of C3–7.5 or W2.4–6.
- (e) Labelled with signage “FIRE” in white capital letters on a red background. The lettering height shall not be less than 50 mm using a bold, sans-serif font. The colour and material of the sign shall be weather and fade resistant.

NOTE Suitable red and white colours are specified in the ISO 3864 series.

3.6 Control and indicating equipment (CIE)

3.6.1 Location

CIE shall be installed in a location which meets the following requirements:

- (a) FDCIE serving other than the detection zone in which it is installed shall be installed in an area not used for the storage of combustible materials.
- (b) The CIE shall always be installed in an area protected by the FDAS except where it is installed external to the building. See [Clause 3.1](#).
- (c) Operation of the CIE shall not obstruct the evacuation of the building.
- (d) CIE shall be located in an area that presents a low risk of damage to the equipment and injury to personnel in an emergency.

- (e) FBP, EWCIE and FFCP shall be co-located at the DBEP and—
 - (i) not be mounted in any room containing sprinkler control valves, pumps or motors;
 - (ii) have controls and indicators not less than 750 mm and not more than 1 850 mm above floor level; and
 - (iii) have unobstructed access to controls and indicators.
- (f) Ambient light level in the vicinity of the CIE shall be such that visual indications can be clearly seen, controls easily operated and any instructions or legends can be easily read.

3.6.2 Covering door

Where the FDCIE is obscured by a door, that door shall be marked in a contrasting colour to the general colour scheme with the words “FIRE PANEL” in letters not less than 50 mm high. There shall be no other lettering on the door. The door shall only be lockable where the emergency services personnel have been provided with a key.

Where the door reduces the FDCIE sounder sound level below the FDCIE requirement, means shall be provided to give the required sound level outside the covering door.

3.6.3 Clearance

A minimum clearance of 1 m in front and 0.5 m to each side shall be maintained from CIE cabinets that require operation by emergency service personnel, as shown in [Figure 3.6.3](#).

Where the door opens to at least 135° the 0.5 m hinge side clearance may be reduced accordingly.

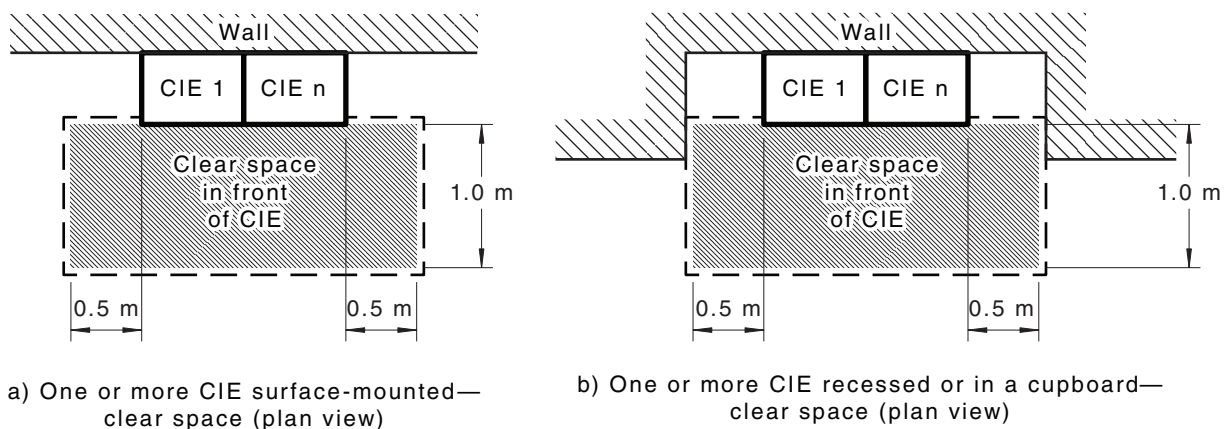


Figure 3.6.3 — Control and indicating equipment — Personnel workspace

3.7 Zone block plan

A zone block plan of the installation shall be securely mounted and easily accessible at FBP. The plan shall be in the form of a permanent diagram that is water resistant and fade resistant. The lettering shall be a minimum of 3 mm and include the following information:

- (a) The layout of the building in which the FDAS is installed.
- (b) The area covered by each zone.
- (c) The location of all FDCIE, SHCIE, FFCP and EWCIE.
- (d) The location of the FBP and marked “YOU ARE HERE”.

- (e) The location of any fire suppression system controls.
- (f) The location of the building's main electrical switchboard.
- (g) The year of original installation and the date of the latest revision to the block plan.
- (h) A notice stating, "In the event of a fire ring 000 to ensure fire service response" except the lettering height shall be not less than 5 mm.
- (i) Location where baseline data are stored. A label on the FDCIE meets this requirement.
- (j) Statement identifying the design criteria used including NCC references, NCC referenced Standard(s) and performance solution as applicable.

The plan shall be installed in the correct orientation of the building and include the north point symbol.

3.8 Carbon monoxide (CO) fire detector labelling

Where CO fire detectors are installed, a clearly visible label shall be provided on or immediately adjacent to the FBP. Lettering height shall be a minimum of 5 mm and in a contrasting colour.

The label shall include the following text:

- (a) NOTE: CO FIRE DETECTORS INSTALLED.
- (b) IN CASE OF ALARM, CHECK AREA THOROUGHLY. IF NO FIRE IS APPARENT, CHECK ADJACENT AREAS.
- (c) SPECIAL MAINTENANCE REQUIREMENTS APPLY. REFER TO THE DETECTOR DOCUMENTATION.

3.9 Fire suppression system alarms

3.9.1 Alarm output to FDCIE

The alarm initiating devices from each suppression system shall be indicated as a separate latching detection zone at the FDCIE.

Flow switches and pressure switches initiating systems such as smoke control or EWIS are alarm initiating devices.

Flow switches and pressure switches shall be provided with time delay facilities to prevent nuisance activation, due to surges in the water supply, latching on the FDCIE (see [Clause 7.4](#)).

NOTE 2000m² area limitation does not apply to detection zones monitoring suppression systems.

3.9.2 Consultation between parties

Where suppression systems are connected to the FDCIE, the FDCIE shall implement the functions specified by the cause and effect matrix provided as part of the suppression system design.

C3.9 Coordination between designers to this document and designers of the suppression system to AS 2118 is necessary to ensure that required overall FDAS operation is achieved.

3.9.3 Fire suppression system control

The control of any suppression system other than those in accordance with the AS 2118 series shall be provided by a separate SHCIE in accordance with AS 1670.5.

3.10 Equipment cabinets

3.10.1 Mechanical protection

Mechanical protection of equipment shall be to at least the same degree as required for the transmission path used (see [Clause 3.21](#)).

3.10.2 Labelling

Interface devices or isolation relays external to the CIE cabinet shall be installed within a protective cabinet. The cabinet shall be marked or labelled with the word “FIRE” in letters not less than 20 mm high in a contrasting colour to the background.

3.11 Manual call point (MCP)

3.11.1 General

MCPs may be used for the following functions:

- (a) To initiate a fire alarm condition.
- (b) To initiate building occupant warning system.
- (c) To initiate non-evacuation emergency signal.
- (d) As an electric door lock release.
- (e) For the operation or inhibition of other functions.

MCPs shall be mounted between 750 mm and 1 200 mm above floor level. A clear space of 300 mm on both sides and 600 mm directly in front shall be provided in an arc in front of the MCP.

Where MCPs are subject to outdoor use, they shall —

- (i) conform to the solar radiation test of AS ISO 7240.11; and
- (ii) have an IP rating appropriate to the location.

3.11.2 MCP for fire alarm

MCPs intended to initiate a fire alarm condition shall be red. The activation of an MCP shall not extinguish a previously lit visual alarm indicator. At least one MCP shall be installed in a clearly visible and readily accessible location in the circulation space of the main entrance of the building and shall initiate a fire alarm condition.

Red fire alarm MCP not connected to a fire alarm monitoring centre shall have a label on or adjacent to MCP with the words “AFTER ACTIVATION CALL 000”.

3.11.3 MCP for emergency evacuation

An MCP required to initiate emergency evacuation shall be white. The front face shall be marked with the word “EVACUATE” in letters not less than 5 mm high.

3.11.4 MCP for non-evacuation emergencies

An MCP required to initiate warning of other emergencies not intended to initiate the immediate evacuation of occupants shall not be red, white or green.

The front face shall be marked with the word “EMERGENCY” in letters not less than 5 mm high and labelled with the specific emergency as applicable. Alternatively the specific emergency may be marked on the front face.

3.11.5 MCP for electric lock release

An MCP required for emergency release of electric locks shall be green. The front face shall be marked with the words “DOOR RELEASE” in letters not less than 5 mm high.

3.11.6 MCP for activation or inhibition of other functions

An MCP required for operation or inhibition of any other function shall not be red, white or green. The front face shall be clearly labelled to indicate its function in letters not less than 5 mm high.

3.11.7 MCP operation

MCP detailed in [3.11.2](#), [3.11.3](#), [3.11.4](#) and [3.11.6](#) require two distinct actions in accordance with either —

- (a) AS ISO 7240.11 Type B; or
- (b) AS ISO 7240.11 Type A, fitted with a user operable protective cover or flap.

MCP detailed in [3.11.5](#) require a single action.

3.12 Power supply equipment (PSE)

3.12.1 General

All parts of the FDAS shall use PSE conforming with AS 7240.4 except components using radio transmission paths, which conform with AS ISO 7240.25.

Where more than one PSE is used, each PSE shall be provided with its own PSE fault indication. A fault shall indicate at the associated FDCIE. A general fault shall indicate at a main FDCIE.

Where the power supply is shared with other CIE, it shall include overload protection and the means to individually disconnect the power to each CIE. Separate overload protection and disconnect facilities are not required for a AS 4428.16 Grade 3 EWCIE.

The PSE shall provide at least two power sources for the supply of power to the FDAS: the main power source and the standby power source.

3.12.2 Main power source

All PSE, including the standby power source charger, shall be connected to the AC mains in accordance with AS/NZS 3000.

NOTE This connection is not considered to be a transmission path as defined in this document.

The PSE main power source shall be capable of operating the FDAS. Switching from one main power source to another main power source shall not cause any change in status or indications, other than those relating to the PSE.

3.12.3 Standby power source

The system shall be provided with a standby power source capable of operating the system if the main power source becomes unavailable.

The standby power source shall consist of rechargeable stationary batteries, in accordance with the PSE hardware documentation specified in [Clause 2.1.1](#), as suitable and compatible with the CIE and PSE.

Where the standby power source is not adjacent to the PSE cabinet, the standby power source shall be protected for overload at the source.

3.12.4 Power supply equipment rating

All FDAS devices, facilities or equipment, external or internal, that utilize the PSE in either the quiescent state or alarm state shall be included in the calculations of the power source rating.

The quiescent load of the FDAS shall include any connectable devices and all fault and disablement indication loads.

The worst case of the following loads shall not exceed the power supply equipment rating:

- (a) The total load of the FDCIE with five detection devices in alarm state in each of the two detection zones including all loads that will operate in the fire alarm condition, such as occupant warning systems if sharing the PSE, or the quiescent load of the FDAS including battery charging, whichever is greater.
- (b) Where the system is a suppression system, and the SHCIE serves a single suppression risk, the load shall be calculated in accordance with Item (a) above. Where the SHCIE serves multiple risks, then the load shall be calculated on the two highest load risks in an activated state, or 20 percent of the total connected systems in an activated state whichever is the greater, unless varied by the suppression system design.

The requirement of the PSE including battery support shall apply to an integral PSE and any external PSE that supply power to the systems. PSE shall be capable of operating the FDAS connected to it continuously at maximum load with the standby source disconnected.

3.12.5 Standby power source capacity

The capacity of the standby power source shall be such that, in the event of failure of the PSE main power source, the standby power source is capable of maintaining the FDAS connected to it in normal working (quiescent) condition for at least 72 h. After 72 h, there shall be remaining capacity to provide power for the main power source load determined in [Clause 3.12.4](#) for 30 min.

Connectable devices, such as door holders, shall be included where the design requires them to operate on the standby power source. Where the PSE produces a power supply failure signal, and this signal is continuously monitored externally, either on site or remotely, the minimum standby requirement may be reduced to 24 h.

The power supply failure signal shall be produced when the standby power supply voltage falls to the minimum operating voltage of the FDAS or the final voltage of standby power source battery, whichever is the greater.

3.12.6 Battery capacity calculation

When calculating battery capacity, allowance shall be made for the expected loss of capacity over the useful life of the battery. A new battery shall be at least 125 percent of the calculated capacity requirements, based on a loss of 20 percent of its capacity over the useful life of the battery.

The battery capacity requirement shall be determined as follows:

- (a) Determine the quiescent load current I_Q .
- (b) Determine the alarm current I_A .

(c) Determine the capacity de-rating factor (F_C) of the battery when discharged at the alarm load rate taking into account the minimum operating voltage of the connected CIE and the battery manufacturer's data. Where more than one CIE is connected to the battery, the highest minimum operating voltage of any of the CIEs shall be used. A value of two for F_C shall be deemed to satisfy these requirements.

(d) The 20 h discharge battery capacity (C_{20}) at 15°C to 30°C shall be determined as follows:

$$C_{20} = 1.25((I_Q \times T_Q) + F_C(I_A \times T_A))$$

where

C_{20}	=	battery capacity in Ah at 20 h discharge rate
I_Q	=	total quiescent current
T_Q	=	quiescent standby power source time (72 h or 24 h)
F_C	=	capacity de-rating factor
I_A	=	total current in alarm state
T_A	=	alarm load standby power source time (normally 0.5 h)
1.25	=	compensation factor for expected battery deterioration

Where the load fluctuates, the worst case average over the required period shall be used.

Where the average battery temperature is outside 15°C to 30°C the battery data shall be used to determine any further compensation factor to be applied.

NOTE 1 For examples of power source calculations see [Appendix C](#).

NOTE 2 Normally energized connectable devices, such as door holders, may be disconnected when the system is operating from the standby power source.

NOTE 3 The use of alternative power sources such as UPS or generators is outside the scope of this document.

3.12.7 PSE selection

The PSE shall be selected to provide the main power source requirements in [Clause 3.12.4](#) and be rated for the battery capacity determined in [Clause 3.12-5.6](#).

3.12.8 Batteries

3.12.8.1 General

The battery cabinet shall be such that the batteries are readily accessible for inspection.

NOTE The batteries may be located within the PSE or FDCIE cabinet where this configuration formed part of the PSE hardware documentation.

Batteries shall be secured from unauthorized access by a secured door. Where a key is used to access the batteries, it shall be identical with other keys required for access to the control and indicating equipment or located within the CIE cabinet.

Batteries shall not be stacked without the provision of supporting shelves unless they are designed to be installed in that configuration.

3.12.8.2 Battery cabling

Where the battery cabinet is not adjacent to the PSE cabinet, battery cabling external to the cabinet shall have a minimum rating of WS51W, in accordance with AS/NZS 3013, with the mechanical rating upgraded dependent upon the risk of mechanical damage.

The battery shall not be tapped for intermediate voltages.

The connecting leads to the battery shall be clearly identified to reduce the possibility of reverse connections to the battery.

NOTE 1 This cabling is not considered to be a transmission path as specified in this document.

NOTE 2 For mechanical protection requirements, see [Appendix B](#).

3.13 Remote indicators for fire detectors

3.13.1 General

All remote indicators shall be labelled with the wording “FIRE” and a location descriptor.

NOTE Examples of location descriptors of remote indicators are as follows:

- (a) In roof.
- (b) In concealed space.
- (c) In cupboard.
- (d) In room.
- (e) Return air.
- (f) Supply air.

Remote indicators for rooms, cupboards or similar spaces shall be installed adjacent to the door giving access to the detector(s). The indicator shall be visible from the path of normal entry to the door and illuminate within 10 s of the integral alarm indicator on the detector.

Where a common remote indicator for multiple detectors within a single room or sole occupancy is used the requirements for integral indicators shall still be met.

3.13.2 Concealed spaces

Remote indicators are required for concealed spaces unless the detector location is indicated at the FDCIE or the concealed space is accessible and —

- (a) has a height exceeding 2 m and is trafficable by personnel; or
- (b) is beneath removable flooring (such as computer flooring).

Remote indicators shall be installed in an accessible area as close as practicable to the detector.

Where a detector is mounted under removable flooring such as in a computer room and the detector location is not indicated at the FDCIE, a label shall be affixed to the ceiling or ceiling grid immediately above the detector indicating the location of the detector below.

3.13.3 Restricted access

Where detectors are installed in locked areas, each area shall be identified by one of the following:

- (a) A separate detection zone.

- (b) An individual identification at the FBP.
- (c) A labelled remote indicator installed outside the entry to the area, see [Figure 2.3](#).

3.13.4 Air-handling system

Integral alarm indicators on smoke detectors located in air-handling systems shall be clearly visible. Where this condition cannot be met, remote indicators shall be provided.

3.14 Smoke and fire door control

3.14.1 General

Where smoke doors, fire doors and fire shutters are held open but are required to be self-closing, they shall close in accordance with the following:

- (a) The automatic closing operation shall be initiated by the activation of a smoke detector. The detectors shall be located on each side of the fire wall or smoke wall not more than 1.5 m horizontal distance from the opening. If smoke detectors are not suitable for the atmosphere, any other detector deemed suitable in accordance with this document shall be used, see [Appendix L](#).
- (b) Except for smoke doors, where any other required suitable fire alarm system, including a sprinkler system, is installed in the building, activation of the system in a fire compartment separated by the fire wall shall also initiate the automatic closing operation.

NOTE 1 For detectors required in egress paths, see [Clause 3.22](#).

NOTE 2 Detectors installed to release fire and smoke doors on a single level and located within a common circulation space may be connected to a single detection zone.

- (c) Non-latching manual release switches shall be provided for door hold-open devices and be visible and accessible with the door(s) in the open position. The release switch shall be labelled "DOOR RELEASE" unless it is integral with the hold-open device. The lettering height shall be a minimum of 5 mm and in a contrasting colour.
- (d) Where more than one door panel is fitted to one opening, one switch shall release all door panels simultaneously.

NOTE 3 In some situations, a door release delay may be required to ensure the safe operation of the door.

3.14.2 Sliding fire doors and fire shutters

If a doorway in a firewall is fitted with a sliding fire door or a fire shutter that is open when the building is in use, it shall be controlled by the FDAS. On alarm, the following shall apply:

- (a) The door/shutter shall be released by deactivation of an electromagnetic device.
- (b) The closing sequence shall be delayed for 10 s to 15 s following the activation of the warning system detailed in Item (c) below.
- (c) An AAD shall be located near the doorway, and a VAD flashing red be located on each side of the doorway. The VAD shall be selected for a minimum direct view distance of 5 m.
- (d) Signs shall be installed on each side of the doorway located directly over the opening stating "WARNING — SLIDING FIRE DOOR" or "WARNING — FIRE SHUTTER" as appropriate, in capital letters not less than 50 mm high in a colour contrasting with the background.

Where the door/shutter forms part of a smoke control system in accordance with [Clause 7](#), smoke detectors shall be used.

Where the door/shutter closes on loss of mains power the normal closing sequence including operation of the AAD and VAD is required.

Where any other required suitable fire alarm system, including a sprinkler system conforming with NCC, is installed in the building, activation in either fire compartment separated by the firewall shall also de-activate the electromagnetic device and activate the warning system.

3.15 Electric lock release

Where doors are released upon a fire alarm condition the control shall be failsafe and meet the requirements of [Clause 3.3.1](#).

NOTE For the failsafe requirements for electric locks, refer to NCC Part D.3 Construction of exits.

3.16 Suppression system monitoring devices

Monitoring devices such as valve tamper switches shall be indicated at the FDCIE. This indication shall be a supervisory condition and clearly distinguishable from a fire alarm condition.

3.17 Building occupant warning systems

3.17.1 General

One of the following shall provide occupant warning of a fire alarm condition:

- (a) An Emergency Warning System (EWS) installed in accordance with AS 1670.4.
- (b) An occupant warning system installed in accordance with this document and comprising at least one of the following:
 - (i) An EWCIE conforming with AS 4428.16, connected to compatible loudspeakers in accordance with AS ISO 7240.24 or amplified loudspeakers (see [Clause 1.4.9](#)).
 - (ii) Audible alarm devices conforming with AS ISO 7240.3.
 - (iii) A combination of Items (i) and (ii).

Where using building occupant warning systems in accordance with Item (b), [Clauses 3.17.2](#) to [3.17.5](#) apply.

3.17.2 Evacuation signals

The evacuate signal shall be broadcast to all occupied spaces of the building.

The evacuate signal shall —

- (a) be broadcast to all occupied spaces simultaneously unless phasing is specified in the emergency plan and loudspeaker transmission paths are installed in accordance with AS 1670.4;
- (b) be in accordance with ISO 8201;
- (c) be synchronized throughout an area and adjacent area except where the sound pressure level from an adjacent area is at least 30 dB lower;
- (d) include words “Fire” and “Evacuate” or a pre-recorded speech message, where signals are transmitted from an EWCIE;
- (e) not be preceded by an alert signal unless specified in the emergency plan and loudspeaker transmission paths are installed in accordance with AS 1670.4; and