NZS 4512:2010

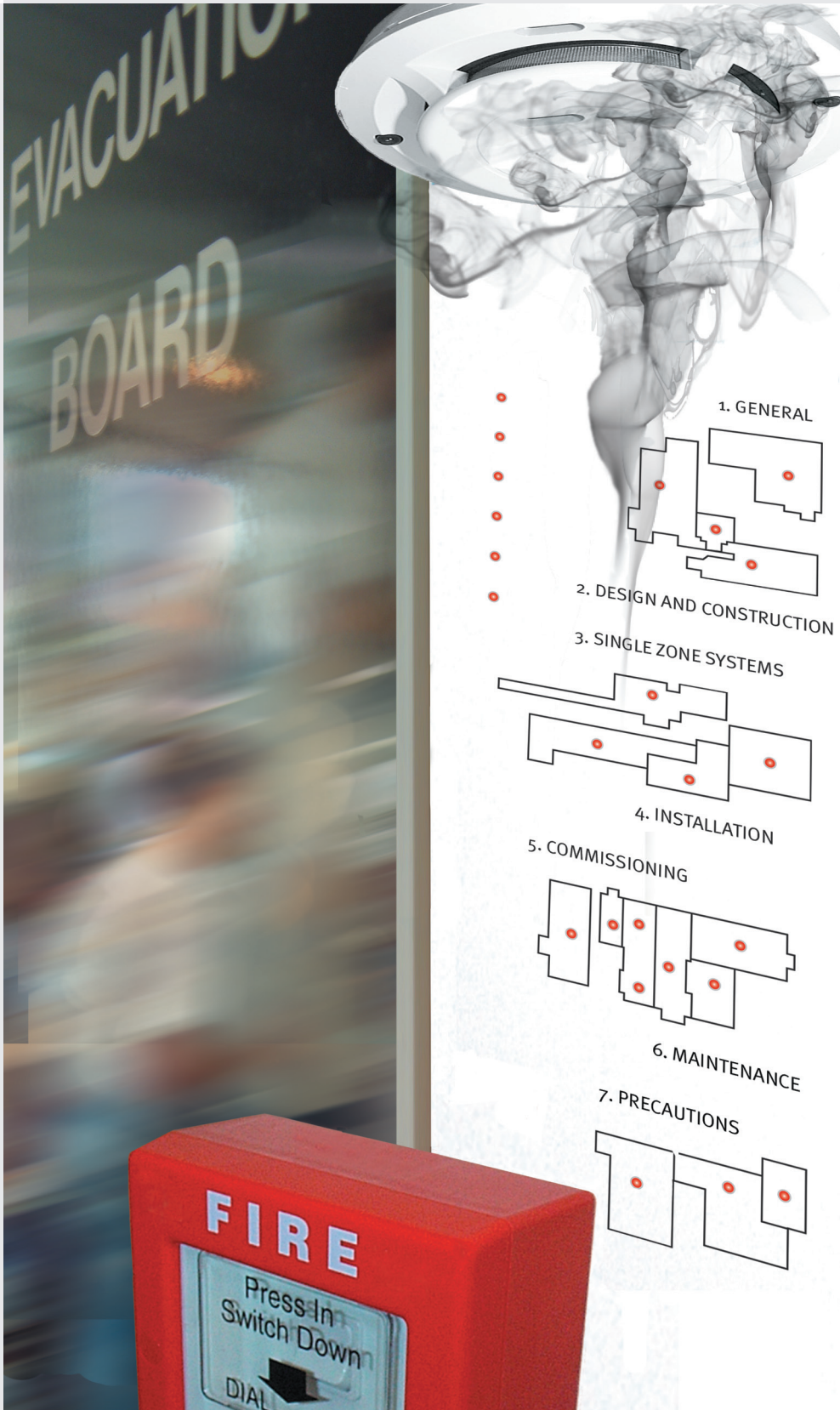
STANDARDS NEW ZEALAND
PAEREWA AOTEAROA

New Zealand Standard

# Fire Detection and Alarm Systems in Buildings

**Superseding NZS 4512:2003**

NZS 4512:2010



# Single User PDF Terms & Conditions

You have material which is subject to strict conditions of use. Copyright in this material is owned by the New Zealand Standards Executive. Please read these terms and conditions carefully, as in addition to the usual range of civil remedies available to Standards New Zealand on behalf of the New Zealand Standards Executive for infringement of copyright, under New Zealand law every person who infringes copyright may be liable to a fine of up to $10,000 for every infringing copy or imprisonment of up to 5 years, or a fine of up to $150,000 or imprisonment not exceeding 5 years.

You have access to a single-user licence to read this non-revisable Adobe Acrobat PDF file and print out and retain ONE printed copy only.

We retain title and ownership of the copyright in this PDF file and the corresponding permitted printed copy at all times.

Under this license use of both the PDF file and the single permitted printed copy of this PDF file you may make are restricted to you. Under no circumstances are you permitted to save, sell, transfer, or copy this PDF file, the one permitted printed copy of this PDF file, or any part of either of them.

You undertake that you will not modify, adapt, translate, reverse engineer, decompile, disassemble or create derivative works based on any of the downloaded PDF file, nor will you merge it with any other software or document, even for internal use within your organization.

Under no circumstances may this PDF file be placed on a network of any sort without our express permission.

You are solely responsible for the selection of this PDF file and any advice or recommendation given by us about any aspect of this PDF file is intended for guidance only and is followed or acted upon entirely at your own risk.

We are not aware of any inherent risk of viruses in this PDF file at the time that it is accessed. We have exercised due diligence to ensure, so far as practicable, that this file does not contain such viruses.

No warranty of any form is given by us or by any party associated with us with regard to this PDF file, and you accept and acknowledge that we will not be liable in any way to you or any to other person in respect of any loss or damage however caused which may be suffered or incurred or which may arise directly or indirectly through any use of this PDF file.

Regardless of where you were when you received this PDF file you accept and acknowledge that to the fullest extent possible you submit to New Zealand law with regard to this licence and to your use of this PDF file.

## COMMITTEE REPRESENTATION

This Standard was prepared under the supervision of the P 4512 Committee, the Standards Council established under the Standards Act 1988.

The committee consisted of representatives of the following nominating organisations:

Department of Building and Housing
Fire Protection Association of New Zealand
Fire Protection Contractors' Association of New Zealand
Institution of Fire Engineers
Insurance Council of New Zealand
New Zealand Chapter of the Society of Fire Protection Engineers
New Zealand Fire Equipment Manufacturers' Association Incorporated
New Zealand Fire Service

## ACKNOWLEDGEMENT

Standards New Zealand gratefully acknowledges the contribution of time and expertise from all those involved in developing this Standard.



Published by Standards New Zealand, the trading arm of the Standards Council, Private Bag 2439, Wellington 6140. Telephone: (04) 498 5990, Fax: (04) 498 5994, Website http://www.standards.co.nz.

*AMENDMENTS*

| *No.* | *Date of issue* | *Description* | *Entered by, and date* |
|---|---|---|---|
| | | | |

NZS 4512:2010

New Zealand Standard

# Fire Detection and Alarm Systems in Buildings

**Superseding NZS 4512:2003**



ISBN 978-1-86975-145-6

# NOTES

# CONTENTS

**Appendix**



**Figure**



**Table**

# REFERENCED DOCUMENTS

Reference is made in this document to the following:

### NEW ZEALAND STANDARDS

| | |
|---|---|
| NZS 4514:2009 | Interconnected smoke alarms for houses |
| NZS 4515:2009 | Fire sprinkler systems for life safety in sleeping occupancies (up to 2000 $m^2$) |
| NZS 4541:2007 | Automatic fire sprinkler systems |
| NZS 7702:1989 | Specification for colours for identification, coding and special purposes |
| NZS ISO/IEC 17025:2005 | General requirements for the competence of testing and calibration laboratories |

### JOINT AUSTRALIAN / NEW ZEALAND STANDARDS

| | |
|---|---|
| AS/NZS 3000:2007 | Electrical installations (known as the Australian/New Zealand Wiring Rules) |
| AS/NZS 3013:2005 | Electrical installations – Classification of the fire and mechanical performance of wiring system elements |
| AS/NZS 3100:2009 | Approval and test specification – General requirements for electrical equipment |
| AS/NZS 4130:2009 | Polyethylene (PE) pipes for pressure applications |
| AS/NZS 5000:- - - - | Electric cables – Polymeric insulated |
| Part 2:2006 | For working voltages up to and including 450/750 V |
| Part 3:2003 | Multicore control cables |
| AS/NZS ISO/IEC 17020: 2000 | General criteria for the operation of various types of bodies performing inspection |
| AS/NZS 61000:- - - - | Electromagnetic compatibility (EMC) |
| Part 4.3:2006 | Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test |

### INTERNATIONAL STANDARDS

| | |
|---|---|
| ISO 7240: - - - - | Fire detection and alarm systems |
| Part 5:2003 | Point-type heat detectors |
| Part 6:2004 | Carbon monoxide fire detectors using electro-chemical cells |
| Part 7:2003 | Point-type smoke detectors using scattered light, transmitted light or ionization |
| Part 8:2007 | Carbon monoxide fire detectors using an electro-chemical cell in combination with a heat sensor |
| Part 10:2007 | Point-type flame detectors |
| Part 11:2005 | Manual call points |
| Part 12:2006 | Line type smoke detectors using a transmitted optical beam |
| Part 15:2004 | Point-type fire detectors using scattered light, transmitted light or ionization sensors in combination with a heat sensor |
| Part 20:2010 | Aspirating smoke detectors |

| | |
|---|---|
| Part 27:2009 | Point-type fire detectors using a scattered-light, transmitted-light or ionization smoke sensor, an electrochemical-cell carbon-monoxide sensor and a heat sensor |
| ISO 9001:2008 | Quality management systems – Requirements |

**AMERICAN STANDARD**

| | |
|---|---|
| ASTM B117-09 | Standard practice for operating salt spray (fog) apparatus |

**AUSTRALIAN STANDARDS**

| | |
|---|---|
| AS 1603:- - - - | Automatic fire detection and alarm systems |
| Part 1:1997 | Heat detectors |
| Part 2:1997 | Point type smoke detectors |
| Part 7:1996 | Optical beam smoke detectors |
| Part 8:1996 | Multi-point aspirated smoke detectors |
| Part 14:2001 | Point type carbon monoxide (CO) fire detectors |
| AS 1670: - - - - | Fire detection, warning, control and intercom systems – System design, installation and commissioning |
| Part 4:2004 | Sound systems and intercom systems for emergency purposes |
| AS 1851:2005 | Maintenance of fire protection systems and equipment |
| AS 2220:- - - - | Emergency warning and intercommunication systems in buildings |
| Part 1:1989 | Equipment design and manufacture |
| AS 7240: - - - - | Fire detection and alarm systems |
| Part 5:2004 | Point-type heat detectors |
| Part 6:2006 | Carbon monoxide fire detectors using electro-chemical cells |
| Part 7:2004 | Point-type smoke detectors using scattered light, transmitted light or ionization |
| Part 8:2007 | Carbon monoxide fire detectors using an electro-chemical cell in combination with a heat sensor |
| Part 10:2007 | Point-type flame detectors |
| Part 12:2007 | Line type smoke detectors using a transmitted optical beam |
| Part 15:2004 | Multisensor fire detectors |
| AS 60529:2004 | Degrees of protection provided by enclosures (IP Code) |
| SAA HB 20:1996 | Graphical symbols for fire protection drawings |

**BRITISH STANDARDS**

| | |
|---|---|
| BS EN 54:- - - - | Fire detection and fire alarm systems |
| Part 5:2001 | Heat detectors. Point detectors |
| Part 7:2001 | Smoke detectors. Point detectors using scattered light, transmitted light or ionization |
| Part 10:2002 | Flame detectors. Point detectors |
| Part 11:2001 | Manual call points |
| Part 12:2002 | Smoke detectors. Line detectors using an optical light beam |
| Part 20:2006 | Aspirating smoke detectors |
| BS EN 50130:- - - - | Alarm systems. Electromagnetic compatibility |
| Part 4:1996 | Product family standard: Immunity requirements for components of fire, intruder and social alarm systems |

| | |
|---|---|
| BS EN 60068-2:- - - - | Environmental testing |
| Part 1:2007 | Tests. Test A. Cold |
| Part 2:2007 | Tests. Test B. Dry heat |
| Part 6:2008 | Tests. Test Fc. Vibration (sinusoidal) |
| Part 78:2002 | Test methods. Test Cab. Damp heat, steady state |
| BS EN 61672:- - - - | Electroacoustics – Sound level meters |
| Part 1:2003 | Specifications |

**OTHER PUBLICATIONS**

| | |
|---|---|
| Department of Building and Housing | New Zealand Building Code Handbook and Compliance Documents |
| UL 268:2009 | Smoke detectors for fire protective signalling systems |
| UL 521:2002 | Heat detectors for fire protective signalling systems |

**NEW ZEALAND LEGISLATION**

Building Act 2004

Building Regulations 1992

Building (Forms) Regulations 2004

Electricity (Safety) Regulations 2010

Fire Safety and Evacuation of Buildings Regulations 2006

Fire Service Act 1975

New Zealand Building Code Handbook and Compliance Documents

Radiocommunications Regulations 2001

## LATEST REVISIONS

Amendments to referenced New Zealand and Joint Australian/New Zealand Standards can be found on http://www.standards.co.nz.

## REVIEW OF STANDARDS

Suggestions for improvement of this Standard will be welcomed. They should be sent to the Chief Executive, Standards New Zealand, Private Bag 2439, Wellington 6140.

# FOREWORD

This Standard provides a complete specification for the design, manufacture, installation, and maintenance of building alarm systems, whether operated manually or automatically, in the event of fire. It is intended that this revised and updated Standard will continue to be used as an integral part of the Acceptable Solutions of the Compliance Documents to the New Zealand Building Code (NZBC), and also to facilitate New Zealand Fire Service approval of evacuation schemes under the Fire Safety and Evacuation of Buildings Regulations.

This Standard does not specify what type of alarm system is required for a particular building. Instead, based on declared functional requirements determined by the system owner, it provides an integrated set of rules for the correct design, manufacture, installation, and maintenance of the system.

This Standard is applicable to fire alarm systems in buildings, except for single station or interconnected smoke alarms for houses which are covered in NZS 4514.

This edition is a limited technical revision of, and supersedes, NZS 4512:2003. It incorporates material from formal interpretations issued to that Standard, changes to the NZBC Compliance Documents, plus a number of enhancements, corrections, and clarifications requested by users. Appendix M provides a list of all non-editorial changes for this revision. The process for formal interpretations has also now been included in the document.

The intention of this revision to NZS 4512:2003 is to ensure that the Standard remains a dynamic document that adapts with the challenges and changes experienced by the fire protection industry. This revision will help prevent the loss of life and provide better protection of buildings for all New Zealanders.

No significant changes have been made in equipment design requirements; the majority of changes relate to installation, documentation, procedures, and inspection – primarily focused on getting things 'right first time' and clarifying areas of ambiguity or practical difficulty. Adjustments to some general requirements have been made for special situations and challenging environments.

The impracticality of traditional high-voltage insulation ('Megger') testing of leakage to earth in the presence of electronic detection devices and modern (for example analogue addressable) circuitry techniques has been acknowledged. System manufacturers are now required to specify test methods appropriate to their equipment.

Qualification and competency requirements for fire alarm contractors have been clarified and updated to reflect both the life-safety-critical nature of fire detection systems, and the advancement of formal NZQA Fire Detection and Alarms qualifications since the 2003 edition. It was noted by the committee that an overwhelming majority of installations were being undertaken by qualified contractors voluntarily certified under an industry-based scheme. While stopping short of mandating such a scheme, guidelines have been provided for the assessment of competence and qualifications. The (Appendix J) Certificate of Completion now includes more information and is clearer about what the various signatories are certifying. These updated provisions reflect the well-established quality assurance principle that one cannot inspect quality into a product but must instead build quality into a process.

As always, the provisions of the Standard have been based on a combination of field experience, the desire to reduce unwanted alarms, best practice, pragmatic conservatism, cost-effectiveness, and sound engineering.

Within the limited-revision project scope, alignment with suitable overseas or international Standards practice has been sought, however this has not been at the expense of reliability and cost-effectiveness in fire protection. In particular new ISO 7240 series detector Standards have been recognised, as has the increasing prevalence of electronic detectors with normally-open electromechanical signalling relay outputs, which are now permitted. An alternative double-action method of operation is also now permitted for manual call points.

In recognition of advances in cabling Standards and practices, and the increased use of networked connections, adjustments have been made to cable specifications which should ease installation and reduce costs.

## OUTCOME STATEMENT

Application of this Standard will help prevent loss of life and provide optimum fire protection for New Zealand buildings through up-to-date specifications for the design, manufacture, installation, and maintenance of fire detection and alarm systems.

NEW ZEALAND STANDARD

# Fire detection and alarm systems in buildings

## PART 1 GENERAL

### 101 Scope

#### 101.1 General

This Standard specifies the requirements for fire detection and alarm systems in buildings. It applies to their design, installation, extension, modification, commissioning, testing and maintenance.

#### 101.2 Application

This Standard applies to the following fire alarm systems:

(a) Multi-zone (manual or automatic) – see Part 2;

(b) Single-zone (manual or automatic) – see Part 3.

#### 101.3

Equipment installed to this Standard is intended to operate within the temperature range 0 °C to 40 °C. Special precautions will be necessary for more adverse conditions.

#### 101.4

This Standard specifies performance and test requirements for electrical and electronic fire alarm systems. Alternative technologies that do not comply with the specific requirements but give equivalent performance are not necessarily prohibited. In such cases, appraisal testing will need to demonstrate this to the satisfaction of the relevant authority.

### 102 Objective

The objective of this Standard is to provide specifiers, users, manufacturers, suppliers, installers, and maintenance persons with requirements to enable a fire warning from a fire alarm system in a building to operate at the earliest practicable moment to facilitate appropriate emergency measures.

## 103 Interpretation

**103.1**

For the purposes of this Standard, the word 'shall' refers to requirements that are essential for compliance with the Standard, while the word 'should' refers to practices that are advised or recommended.

**103.2**

The terms 'Normative' and 'Informative' have been used in this Standard to define the application of the Appendix to which they apply. A 'Normative' Appendix is an integral part of a Standard while an 'Informative' Appendix is only for information and guidance.

**103.3**

Defined terms are no longer in italics.

### 103.4 Formal interpretations

**103.4.1**

Requests for interpretations, rulings or clarifications received by Standards New Zealand directly shall be reviewed by a subcommittee of the Fire Detection and Alarm Systems in Buildings Committee (P 4512) which prepared this Standard for the Standards Council established under the Standards Act.

NOTE – The Alarms and Detection Fire Formal Interpretation Committee which was constituted to deal with queries and interpretations of a number of fire protection Standards has jurisdiction to interpret the wording of the current published edition of the relevant Standard only. Matters not mentioned in the Standard are outside the scope of this committee and should be dealt with according to normal business practice.

Requests for formal interpretations, or queries about the interpretation process, should be sent to the General Manager Solutions, Standards New Zealand, Private Bag 2439, Wellington 6140; or fireinterpretations@standards.co.nz. An administration fee will be collected by Standards New Zealand for the processing of a request.

**103.4.2**

Formal interpretations shall be made when:

(a) An interpretation of a clause within this Standard is required;

(b) There is ambiguity in this Standard and clarification is required;

(c) Clarification of wording in this Standard is required because it does not achieve the intent agreed to by the committee; or

(d) Fire detection and alarm system failures have been demonstrated and therefore the provisions of this Standard are inadequate, and a recommendation on amending the Standard is required and is submitted back to Standards New Zealand for consideration.

## 104 Definitions

For the purposes of this Standard the following definitions shall apply:

| | |
|---|---|
| **Accredited inspection body** | An organisation that has been independently accredited by an internationally recognised accreditation body to AS/NZS ISO/IEC 17020 (Type A) as competent to inspect to NZS 4512 |
| **Addressable fire alarm system** | An automatic fire alarm system that can identify at the control unit the status of the individual detectors or manual call points, or the status of groups of detectors or manual call points that are part of a common zone |
| **Alarm transport system** | An alarm communications system offering a communication link between two points without necessarily having a dedicated signal path between the two points |
| **Alerting device** | A device that gives warning to the occupants of the building that the fire alarm system has been actuated. An alerting device may comprise an audible or visual alarm or a combination of both |
| **Ambient sound level** | The time-average A-weighted sound pressure level measured over a typical noisiest 10-minute period of normal use $L_{Aeq(10min)}$ ignoring transient effects (such as shower or vacuum cleaner) |
| **Analogue detector** | A detector which automatically provides information on the level of the fire phenomenon that it monitors to the control unit which determines the significance of that information |
| **Ancillary services** | See 203 |
| **Appraisal certificate** | A certificate, containing detailed testing results supporting a technical opinion that a specifically identified fire alarm system complies with the requirements of this Standard, and which has been issued by a laboratory accredited for that purpose. Laboratories which have been appropriately accredited to NZS ISO/IEC 17025 by an internationally recognised accreditation organisation are deemed to satisfy this requirement |
| **Aspirating smoke detector** | A smoke detector having an aspirator mechanism to induce airflow via the pipe network into the detection chamber |
| **Audible alarm** | A sound signal indicating an alarm condition |
| **Automatic fire alarm system** | A fire alarm system that can automatically initiate an alarm in response to a fire |
| **Basement** | Has the same meaning as in the New Zealand Building Code Handbook |
| **Building** | Has the same meaning as in the Building Act |

| | |
|---|---|
| **Building consent** | Has the same meaning as in the Building Act |
| **Building consent authority (BCA)** | Has the same meaning as in the New Zealand Building Code Handbook |
| **Co-located** | Two pieces of equipment are co-located when they are separated by a distance of no more than 5 m and have common access |
| **Combustible** | Has the same meaning as in the New Zealand Building Code Handbook |
| **Compliance schedule** | Has the same meaning as in the Building Act |
| **Concealed space** | Has the same meaning as in the New Zealand Building Code Handbook |
| **Control unit (or Zone control unit)** | A cabinet containing equipment for controlling the fire alarm system in one or more zones, and which may also incorporate an indicating unit |
| **Declared functional requirements** | The purpose or purposes, from those listed in this Standard, intended by the owner to be performed by the fire alarm system (see 105) |
| **Defect warning** | See signals |
| **Demarcation point** | The place of first termination of a transmission circuit after entering a building, as designated by the telecommunications service provider |
| **Detector** | A device that operates automatically at predetermined conditions associated with fire and which initiates a fire alarm. See also analogue detector, aspirating smoke detector, fixed temperature detector, flame detector, heat detector, line-type detector, point-type detector, rate of rise detector and smoke detector<br><br>NOTE – More than one definition can apply to a detector. |
| **Emergency warning and inter-communication system (EWIS)** | A system which provides emergency warning incorporating alerting devices and loudspeaking voice facilities, and which may also incorporate an intercommunication feature |
| **Escape route** | Has the same meaning as in the New Zealand Building Code Handbook |

| | |
|---|---|
| **Evacuation scheme** | Has the same meaning as in the Fire Safety and Evacuation of Buildings Regulations |
| **Exitways** | Has the same meaning as in the New Zealand Building Code Handbook |
| **Fire** | Has the same meaning as in the New Zealand Building Code Handbook |
| **Fire alarm** | See 204 |
| **Fire alarm signal** | See signals |
| **Fire alarm system** | An installation of apparatus, which performs specified fire-related functions in response to the operation of a detector, manual call point or other input. It includes manual call points, detectors (optional), control and indication equipment, alerting devices, interconnections, fittings, labels and energy sources. Where the system is connected to a remote receiving centre, it will also include remote signalling devices |
| **Firecell** | Has the same meaning as in the New Zealand Building Code Handbook |
| **Fire detection and alarm system** | See fire alarm system |
| **Fire door** | Has the same meaning as in the New Zealand Building Code Handbook |
| **Fire resistance rating (FRR)** | Has the same meaning as in the New Zealand Building Code Handbook |
| **Fixed temperature detector** | A detector designed to operate when the temperature at the detector exceeds a predetermined value |
| **Flame detector** | A detector designed to operate in response to the occurrence of flame |
| **Heat detector** | A detector designed to operate when the temperature at the detector exceeds a predetermined value |
| **Household unit** | Has the same meaning as in the New Zealand Building Code Handbook |

| | |
|---|---|
| **Indicating unit** | Equipment incorporating devices for indicating the zone (or sector on a sector indicating unit) where an alarm has originated. An indicating unit may incorporate a zone index, and may be integral to or separate from a control unit. A fire alarm system may have several indicating units<br><br>NOTE – The principal fire service attendance point is designated the main indicating unit, and will incorporate a zone index and firefighter's controls. |
| **Isolate** | See signals |
| **Latching** | A detector, circuit or system state that is held in the operating condition until manually reset, even after the removal of the cause of operation |
| **Line-type detector** | A detector in which the sensitive element extends along its length |
| **Listed** | Equipment, components and materials that have been approved and listed for fire protection purposes by a recognised test and approval body, and which conform with the requirements of this Standard<br><br>NOTE – The Fire Protection Association of New Zealand maintains a register of listed equipment, components and materials. |
| **Manual call point** | A manually operated device that initiates a fire alarm |
| **Manual fire alarm system** | A fire alarm system, which initiates an alarm in response to the operation of a manual call point |
| **Manufacturer** | Unless specifically stated otherwise the company which either manufactures or imports the control unit of a fire alarm system, and is responsible for designating types and makes of components which may be connected to the control unit and the correct method of connection |
| **Multi-zone fire alarm system** | A fire alarm system where detectors and/or manual call points are located in more than one zone |
| **Non-combustible** | Has the same meaning as in the New Zealand Building Code Handbook |
| **Non-latching** | A detector, circuit or system state that automatically resets on the removal of the cause of operation |
| **Owner** | Has the same meaning as in the New Zealand Building Code Handbook |

| | |
|---|---|
| **Person** | Has the same meaning as in the New Zealand Building Code Handbook |
| **Point-type detector** | A detector in which the sensitive element is a compact unit of small area |
| **Rate of rise detector** | A detector designed to operate when the rate of temperature rise at the detector exceeds a predetermined value |
| **Rated temperature** | The operational temperature of a detector's fixed temperature element as specified by the detector manufacturer |
| **Remote receiving centre** | A monitoring centre for taking immediate action as a result of a fire alarm and/or other off-normal signals |
| **Residual sound level** | The A-frequency-weighted time-average SPL $L_{Aeq(1min)}$ measured when an audible alerting deice is not operating, over 1-minute selected to represent the highest sound levels normally experienced at a location |
| **Sector** | An area containing one or more zones and able to be covered by one control unit |
| **Sector indicating unit** | A cabinet containing equipment for controlling two or more sectors and normally incorporating an externally visible display |
| **Signals** | |
| **Defect warning** | A signal indicating an equipment fault condition |
| **Fire alarm** | A signal indicating a fire condition |
| **Isolate** | A signal indicating that the system is isolated from the remote receiving centre |
| **Single-zone fire alarm system** | A limited type fire alarm system for use where all detectors and/or manual call points are located in only one zone |
| **Smoke detector** | (a) Ionisation type responds to the presence of gaseous or invisible products of combustion causing a change in ionisation currents within the detector;<br>(b) Photoelectric type responds to the scattering or absorption of light by suspended particles |

| | |
|---|---|
| **Sound pressure level (SPL)** | Twenty times the logarithm to the base ten of the ratio of the root-mean-square of a given sound pressure to the reference value of 20$\mu$P, expressed in decibels (dB), symbol *L*. Subscripts denote the specific settings for measurement.<br>$L_{Aeq(1min)}$ – A-frequency-weighted 1-minute time-average SPL<br>$L_{Aeq(10min)}$ – A-frequency-weighted 10-minute time-average SPL<br>$L_{AFmax}$ – Maximum A-frequency-weighted F-time-weighted SPL |
| **Staged evacuation** | The evacuation of persons from one part of a building to another part of the building, prior to outside the building, should that be necessary<br>NOTE – Refer to the Fire Safety and Evacuation of Building Regulations and the Fire Service Act. |
| **Stairway** | Has the same meaning as in the New Zealand Building Code Handbook |
| **Territorial authority (TA)** | Has the same meaning as in the New Zealand Building Code Handbook |
| **Visual alarm** | A steady or flashing visual indication of an alarm condition |
| **Zone** | An area uniquely defined by the equipment to assist firefighters in searching for a fire or controlling evacuation |
| **Zone control unit** | See control unit |
| **Zone index** | A combination of diagrams, symbols, and text forming part of an indicating unit, to identify the location of, and general access to, individual zones<br>NOTE – A zone index is often called a ‘mimic panel’ (if located remotely from the control unit) or a ‘fire alarm panel’ if integral with a control unit. |

## 105 Declared functional requirements

In order to establish which requirements of the Standard apply to a particular fire alarm system, the intended functions of that system shall be nominated by the owner as the system's declared functional requirements taking into account all regulatory, contractual, insurance, or other obligations. The declared functional requirements should at least define the requirements in terms of the following:

(a) To transmit an alarm to summon New Zealand Fire Service assistance;

(b) To monitor, and signal to a remote location, the presence of faults;

(c) To automatically operate alerting devices;

(d) To indicate the zone of an operated detector or manual call point;

(e) To initiate certain ancillary fire-related functions;

(f) To transmit an alarm to summon some other specified emergency fire-related assistance;

(g) To detect heat, smoke, pre-combustion aerosols, or other fire-related phenomena. Such phenomena shall be characteristic of a fire and shall use appropriate design criteria to minimise the occurrence of unwanted alarms;

(h) Where the declared functional requirements include item (a), the alarm system shall signal directly to a New Zealand Fire Service remote receiving centre (by means of a non-verbal message) in accordance with Appendix A.

NOTE – Where it is a declared functional requirement to facilitate staged evacuation as per the Fire Service Act Section 21A, it is strongly recommended that prior consultation be undertaken, and agreement be established in writing, between the building owner and the New Zealand Fire Service to define the performance requirements necessary to gain evacuation scheme approval.

## 106 Types of fire alarms

Types of fire alarms referred to in this Standard are described in Appendix B.

## 107 Compliance

**107.1**

Only fire alarm systems, which conform in every respect with this Standard, shall be deemed to comply with this Standard. The installation shall therefore:

(a) Be undertaken by competent and qualified personnel (see 109) who have access to all relevant technical instructions published by the manufacturer;

(b) Be in conformity with the manufacturer's instructions;

(c) Be in conformity with all other requirements of this Standard;

(d) Use only listed equipment and components;

(e) Be certified as being compliant by an accredited inspection body.

NOTE – It is the building consent authority's decision whether or not to accept the above certification.

**107.2**

Any addition to, or modification of, a fire alarm system originally installed to this Standard shall also comply with the requirements of this Standard and shall be compatible with the system originally installed.

**107.3**

It is necessary, for continued compliance with this Standard, that the fire alarm system installed in accordance with this Standard shall be inspected, tested, repaired, and maintained in accordance with the requirements of this Standard.

**107.4**

A fire alarm system installed in compliance with any Standard then current which was subsequently superseded by this Standard (for example pneumatic systems) may be deemed to comply with this Standard provided that:

(a) It remains in good working order;

(b) It is tested and maintained monthly, and annually surveyed in accordance with this Standard;

(c) Any deficiencies found as a consequence of 107.4(b) are remedied; and

(d) Any alterations to the fire alarm system comply with this Standard to the extent permitted by the technology of the original system.

In order to maintain compliance with this Standard, all fire alarm systems should, as far as possible, be inspected, tested, repaired, and maintained in accordance with this Standard.

NOTE – Where full compliance with the current version is not possible, detailed compliance schedule requirements should be submitted to the territorial authority to replace the normal requirement.

**107.5**

Although it may be technically feasible to interchange components of one manufacturer's fire alarm system with those of another manufacturer, this is not permissible unless such options form part of the manufacturer's published instructions.

## 108 Legislative requirements

Attention is drawn to the need to comply with all relevant legislative requirements including but not limited to:

(a) Building Act;

(b) New Zealand Building Code;

(c) Electricity (Safety) Regulations;

(d) Radiocommunications Regulations;

(e) Fire Service Act; and

(f) Fire Safety and Evacuation of Buildings Regulations.

## 109 Workmanship, competency, and qualifications

All work relating to the design, manufacture, installation, commissioning, and maintenance of fire alarm systems shall be carried out in a thorough and workmanlike manner in accordance with sound trade practice.

All work carried out under this Standard shall be performed competently by, or effectively supervised by, appropriately qualified personnel.

Qualification to the applicable industry training programme recognised by the New Zealand Qualifications Authority is the level necessary to satisfy the requirement to be qualified.

Equivalent qualifications shall be permitted. Appendix L provides guidance for assessment of competence and qualifications.

NOTE –

(1) The applicable qualification for installation, commissioning, and maintenance is the New Zealand Qualifications Authority National Certificate in Fire Detection and Alarms (Level 4).

(2) The applicable qualification for testing is the New Zealand Qualifications Authority National Certificate in Fire Detection and Alarms (Testing) (Level 3).

(3) The applicable qualification for inspection is the New Zealand Qualifications Authority National Certificate in Fire Protection Systems Technology (Inspection and Testing) (Level 4).

(4) The applicable qualification for fire detection and alarms system design, when developed, will be at Level 4 or higher in the New Zealand Qualifications Authority framework.

## 110 Reliability

The construction of all built-up equipment shall be carried out with high inherent reliability as the major objective. Fire alarm systems operate continuously in a wide range of conditions and applications.

# PART 2 DESIGN AND CONSTRUCTION – MULTI-ZONE FIRE ALARM SYSTEMS

NOTE – The equipment design requirements for single-zone fire alarm systems are set out in Part 3.

## 201 Type and function

**201.1**

The intended function of any particular fire alarm system shall be that declared by the owner in accordance with the list of functional requirements in 105.

**201.2**

Fire alarm systems shall automatically indicate the existence of malfunctions listed in 208.

**201.3**

Automatic fire alarm systems shall include manual call points to supplement the automatic fire-detecting devices.

**201.4**

In addition, the alarm system may be used to initiate ancillary functions set out in 203.1.

**201.5**

The fire alarm systems required for buildings are:

(a) Those stated on the building consent for the buildings in which they are installed; or

(b) Existing types of system in unaltered buildings.

NOTE – This Standard does not specify which fire alarm system functions are required in any particular building. See also 105, 106, and 108.

## 202 Zones

To assist in locating a fire or other cause of alarm initiation it is necessary to divide the buildings into zones. All the detectors and manual call points in one zone shall be associated with the appropriate indicator on the control unit zone index. All alerting devices in one zone shall operate together except as permitted in Type 5 systems (see 406.11).

## 203 Ancillary services

**203.1**

The control unit may be designed so that, in addition to giving an alarm on the operation of a detector or manual call point, it will initiate but not power other fire-related functions such as the actuation of ventilating systems, emergency lighting, lift control, or other building services.

**203.2**

Such additional equipment shall be connected to the fire alarm system through a relay, relays, or other similarly effective isolating devices and arranged so that the additional equipment cannot adversely affect the system or prejudice the performance of the system. Such equipment other than the isolating devices shall be contained in a separate compartment.

**203.3**

Voltages in excess of 32 V a.c. (r.m.s.) and 50 V d.c. associated with ancillary services shall not enter the control unit.

**203.4**

The monitoring of pressure switches or flow switches in ancillary fire safety systems, for the purpose of operating indicators on an index or summoning service in the event of a defect, may utilise a fire alarm system circuit or address provided the circuit or address is configured not to generate a fire alarm.

**203.5**

The fire alarm system shall not be used to monitor the functioning or failure of any element of the ancillary services not directly related to fire safety. Indicators in accordance with 210.5 and manual controls for ancillary services should be provided on or adjacent to the index (see 402.8.2).

## 204 Fire alarm

**204.1**

The operation of one or more detectors or manual call points shall result in a fire alarm being given by:

(a) Alerting devices in the building;

(b) A visual indication on the indicating unit for each zone in which a detector or manual call point device operates;

(c) Initiation of a fire alarm signal to a remote receiving centre where a communication link to such a centre is provided;

(d) The foregoing requirements shall be optional for detectors installed additional to the basic coverage, to initiate supplementary actions and smoke detectors installed for local alarm, in compliance with 406.11. (See also Appendix C.)

**204.2**

The fire alarm as given by 204.1(b) and (c) shall continue in operation until manually reset. The fire alarm initiated by additional detectors per 204.1(d) may reset automatically once the device originating the alarm is reset. Resetting facilities shall be in accordance with 206.2.

**204.3**

The visual signal specified in 204.1(b) shall also be given on any repeater indicating unit, which may be provided to suit fire service access.

**204.4**

When audible alerting devices incorporate voice facilities and are also used as part of a public address system, the fire alarm shall override any other signal except those which properly override the fire alarm. (See 218.8.)

**204.5**

The operation of a manual call point for a period greater than 1 second (s) shall cause the system to latch into the fire alarm condition.

NOTE – A short delay is desirable to prevent false alarms due to contact bounce caused by shock or vibration.

**204.6**

The delay in equipment response to a detector or manual call point operating shall not exceed 15 s. The system shall latch in the fire alarm condition after the delay period.

NOTE – Such delays should be minimised.

**204.7**

An alarm verification facility shall be provided whereby a point-type smoke detector circuit shall operate twice before a fire alarm is signalled unless an analogue detection algorithm is used to provide an equivalent function. Upon the first operation, the detector circuit shall be held reset for a period not exceeding 15 s. During an ensuing period of not less than 90 s and not more than 120 s, further detector operation shall signal a fire alarm without further delay. In this instance, the time period of 204.6 is measured from the second operation. The accumulated delay of 204.6 and 204.7 shall not exceed 30 s.

**204.8**

A fire alarm shall not be given by an equipment defect external to the control units unless the condition exactly reproduces the effect of the operation of a detector or manual call point.

**204.9**

A fire alarm shall not be given by an open circuit (resistance greater than 50 kΩ) or a short circuit (resistance less than 50 Ω) on any zone circuit to a detector or manual call point.

**204.10**

A fire alarm shall not be cancelled by the operation of detectors or manual call points in another zone.

**204.11**

A fire alarm shall override any defect warning signal specified in 208, to the extent that the nature of the defect does not prevent the signalling of the fire alarm.

**204.12**

The fire alarm signal to the remote receiving centre shall latch and shall not be overridden by any subsequent condition.

**204.13**

When remote transmission of a fire alarm is initiated, the switching of heavy loads (such as alerting devices) from the same power source shall be delayed for at least 2 s (but note 204.6).

## 205 Silencing switches

**205.1**

The fire alarms as specified in 204.1(a) shall continue to operate until either the system is restored to normal or a silencing switch is operated.

**205.2**

Two silencing switches shall be incorporated, one inside and the other outside the control unit cabinet. Operation of the outside silencing switch shall result in a defect warning.

**205.3**

The switch inside the cabinet shall be so arranged that it is not possible to leave the alerting devices inoperative when the cabinet is closed and the system is in the normal operational condition.

NOTE – An acceptable arrangement for the switch inside the cabinet is a control on the outside of the cabinet that becomes operable only when the cabinet is open.

**205.4**

The switch outside the cabinet shall be operable by a 'Bulgin 6083/C' patterned key and shall be clearly designated 'SILENCE ALARMS. BRIGADE USE ONLY'. On restoration of this switch to the normal position, fire alarms from activated zones, detectors or manual call points shall be isolated from indicating and generating further fire alarms until the system is manually reset, and any remotely-signalled fire alarm shall be replaced by a defect signal. All non-isolated zones and devices shall continue to function as normal including the remote signalling of fire alarms and the activation of alerting devices. The key shall not be removable in the silence position. Operation of this switch shall not prevent the operation of the alerting devices by any other source.

NOTE – Restoration of the external silence alarms switch will isolate the activated device. This could cause ancillary services (such as smoke extract or stairwell pressurisation systems) to return to normal operation. Where this is undesirable, the ancillary services control system should latch into the fire operation mode and have a fire mode indicator and manual reset facility.

**205.5**

Any other system (for example, a sprinkler Fire Brigade Alarm (FBA)), which can actuate the alerting devices, shall incorporate on, or adjacent to its control unit, an external 'Bulgin 6083/C' patterned key switch, clearly designated 'SILENCE ALARMS. BRIGADE USE ONLY'. Operation of this switch shall not prevent the operation of the alerting devices by any other source. In addition, operation of this switch shall not generate a defect warning via the fire alarm system.

## 206 Manual reset facilities

**206.1**

It shall not be possible to reset the system to normal without having first restored the operated detectors or manual call points.

**206.2**

Resetting shall be accomplished only by the operation of self-restoring type switches mounted inside the cabinet or by other devices fulfilling the same function.

## 207 Evacuation and alert switches

**207.1**

A key-operated switch, operable by a 'Bulgin 6083/C' patterned key, shall be provided for manually activating all of the alerting devices in the building without initiating a call to a remote receiving centre. This shall be used for trial evacuation. The switch shall be labelled 'EVACUATION'.

**207.2**

Where a particular building has a staged evacuation, or where a staged evacuation is part of the evacuation scheme, a key-operated switch, operable by a 'Bulgin 6083/C' patterned key, shall be provided for manually activating the alert signal in the building without initiating a call to a remote receiving centre. This shall be used for trial alerting. The switch shall be labelled 'ALERT'.

**207.3**

Where there is provision for alerting by zones (staged evacuation), appropriate facilities should be provided to allow firefighters to start the evacuation alarm in each zone.

## 208 Defect warning

**208.1**

A defect warning shall be given in the event of any of the following occurring:

(a) The average cell voltage (measured with quiescent load current and without assistance from the battery charger) falling below 2.03 V in an unsealed lead acid battery. For other battery types, this threshold voltage should equal the battery manufacturer's specified 50 % capacity value measured at the quiescent load;

NOTE – A typical defect warning voltage for a 12 V sealed lead acid battery is 12.2 V.

(b) Abnormally high or low impedence condition (for example an open or short circuit) of the zone circuit to a detector or manual call point which would prevent that detector or manual call point from initiating a fire alarm as specified in 204;

(c) Removal of any detector or manual call point from a circuit;

(d) Absence of any plug-in zone circuit board or relay that control the alerting devices;

(e) Operation of the silencing switch outside the control unit cabinet;

(f) Abnormally high or low impedance condition (for example an open or short circuit) on the circuit wiring to alerting devices (including wiring to loud speakers);

(g) Abnormally high or low impedance condition (for example an open or short circuit) on the connection to any evacuation switch (see 207) remotely located from the zone control unit;

(h) Abnormally high or low impedance condition (for example an open or short circuit) on the connection to any indicating units remotely located from the control unit;

(i) Failure of an addressable device on an addressable fire alarm system, unless the condition exactly reproduces the effect of the operation of a detector or manual call point;

(j) Repeated failure of a watchdog to re-start a software program (see 224.1);

(k) Failure of a software configuration to pass the data check procedures (see 224.2);

(l) Failure of any monitored aspect of an aspirating smoke detector or system;

(m) A fault condition on an associated EWIS.

A defect warning does not need to be given during a fire alarm.

**208.2**

A defect warning shall be given by a visual indicator on the indicating unit and by the initiation of a defect warning signal transmitted to the remote receiving centre. Where such a communication link is not provided, an audible warning shall be provided from a device situated within or external to the control unit (see 208.5 and 402.7).

**208.3**

The delay in equipment response to the occurrence of a defect condition shall not exceed 60 s.

**208.4**

The defect warnings shall automatically cancel on removal of the defect.

**208.5**

The audible device specified in 208.2 used for giving a defect warning shall be distinctive and of a different character from the audible fire alarm signal.

**208.6**

Provision may be made for cancelling the audible defect warning by means of a monitored or self-restoring switch external to the control unit. Where such provision is made, the removal of the defect shall automatically reset the audible defect warning circuit.

## 209 Manual isolation from remote receiving centre

Facilities shall be provided for manually isolating the normal alarm functions of the system from the remote receiving centre. A mechanism shall also be incorporated to guard against the system inadvertently being left in the isolate mode. Isolating of the system shall initiate an isolate signal being transmitted to the remote receiving centre.

## 210 Indicating units and indicators

**210.1**

Indicators shall be lamps, shutters, light-emitting diodes (LEDs), liquid crystal displays (LCDs), message screens, or other suitable devices appropriate to the system.

**210.2**

Where incandescent filament lamps are used for fire indication, each indicator shall consist of two lamps connected in parallel; the failure of either lamp shall be evident during routine testing.

**210.3**

The operation of one indicator shall not prevent the proper and separate operation of indicators of a minimum of four other zones.

**210.4**

The operation of any alerting device or the transmission of a signal to a remote receiving centre shall not be prevented by any incandescent lamp defect.

**210.5 Indicating units**

**210.5.1**

Indicating units shall incorporate:

(a) A fire alarm indicator for each zone, coloured red;

(b) A common defect warning indicator, coloured amber or yellow; and

(c) A common normal condition indicator, coloured green.

**210.5.2**

Supplementary alarm indicators from an associated system, when installed (for example sprinkler flow switch, sprinkler operated, etc.) shall be coloured red.

**210.5.3**

Ancillary services operated indicators, where required, shall be coloured amber or yellow. Indicators associated with firefighters' emergency services controls (such as air handling) may be coloured according to their function, provided they are clearly separated and distinctive from all other indicators.

**210.5.4**

All indicators shall be clearly labelled.

### 210.6 Indicators

**210.6.1**

Indicators on indicating units, whether forming part of a control unit or not, shall, when operated, clearly and unambiguously indicate their function at a viewing distance of up to 2 m, at any viewing angle up to 30° from the optical centre line, and when illuminated at an incident light level up to 3000 lux.

**210.6.2**

Where indicating units are physically separate from the control unit, the indicators on the control unit need not comply with the 2 m viewing requirement.

### 210.7

Where an alphanumeric display is provided for fire service use, it shall meet the following requirements:

(a) A display which is legible and readable in all light conditions (0-3000 lux minimum range);

(b) Letters and numerals with a minimum font height of 4.5 mm;

(c) A display capacity of at least one alarm;

(d) A single operation required to access the next alarm indication. The last indication shall be followed by the first;

(e) Alarm signals retained in chronological order of receipt;

(f) Alarm signal buffer storage with a capacity of not less than 99 alarms, or all possible alarms, whichever is the lesser. Alarms from isolated zones or detectors shall not reduce this requirement;

(g) A display service life expectancy of not less than 10 years;

(h) The following minimum information, clearly identified and simultaneously displayed:

(i) Zone location. A minimum of 23 characters shall be allocated for the description of the alarm zone location

(ii) Zone status (the condition of an alarm zone). Only the following terms (in full or abbreviated, case immaterial, as follows) shall be used: alarm, defect (Def) or fault (Flt), isolated (Isol), acknowledged (Ack'd or Ackd)

(iii) Alarm type (in full or abbreviated, case immaterial) as appropriate: eg smoke, heat, flame, carbon monoxide (CO), flow switch (FSW), manual call point (MCP), pressure switch (PSW), sprinkler (SPR)

(iv) Total number of zones in alarm;

NOTE – Additional information may be displayed such as zone number, alarm, sequence number, detector number, and time.

(i) A display test facility;

(j) An acknowledgement facility which when operated shall cause the zone status indication to display an acknowledgment of the alarm signal displayed. The acknowledge function shall not cause any change of status of any output signal, such as alerting device or remote signalling.

## 211 Electrical supply

**211.1**

The supply to the control and indicating equipment shall consist of either a mains-powered battery charger and a rechargeable battery or alternatively a non-rechargeable battery which may be provided with a mains supply unit. The mains-powered supply or battery charger may be mounted within, or external to, the equipment cabinet, but its wiring and construction shall provide adequate electrical safety protection for compliance with the Electricity (Safety) Regulations even when the cabinet door is open. The voltage at which the control and indicating equipment operates shall not exceed 50 V d.c. or 32 V a.c.

NOTE – This is not intended to preclude the use of industry standard signalling voltages such as the 100 V line levels commonly used to drive loudspeakers. Where such voltages are used, attention is drawn to the need for the installation and servicing to comply with the Electricity (Safety) Regulations.

**211.2**

Alerting devices and multi-point aspirating smoke detector systems may be powered either:

(a) From the same battery as the control and indicating equipment; or

(b) From an independent battery supply provided that each battery supply is independently monitored in accordance with 208, and any rechargeable battery has its own charger in accordance with 212.

Where the type of alerting device is not suited to being powered by either of the above means an alternative power source may be used. This shall be an independent source of equivalent reliability.

**211.3**

The electrical supplies to a fire alarm system shall be exclusive to the system.

**211.4**

The wiring from any battery shall be protected by overcurrent devices of appropriate rating.

**211.5**

The fire alarm system equipment shall perform all its required functions over the whole voltage range of the nominal battery voltage ± 20 % and the standard mains voltage ±10 %.

NOTE – For the purposes of this Standard the nominal voltage is defined as 2 V for lead acid cells.

**211.6**

Complete failure of the electrical power supply of the control unit shall not initiate a fire signal.

NOTE – See A3 for power supplies for transmitting devices.

## 212 Battery charger

**212.1**

The charger for a rechargeable battery shall be capable of restoring the capacity stated in 213.1 within a period of 24 hours (h) while carrying any non-alarm load normally supplied by that charger (see 503(f)).

NOTE – The non-alarm load is the sum of all quiescent current and defect warning equipment currents. The maximum alarm load is the sum of the load currents with all zones in alarm mode and all alerting devices operating.

**212.2**

The charger is not required to carry any of the alarm load.

**212.3**

Automatic output control shall maintain the charge within the levels specified by the battery manufacturer.

**212.4**

Automatic control shall also limit the output current to the maximum rated value of the unit when lead acid batteries discharged to 1.85 V per cell are connected to the system.

**212.5**

For lead acid batteries the 'float' voltage (with the system connected for normal usage) shall be maintained within 2.20 ± 0.03 V per cell unless different voltages are specified by the battery manufacturer.

**212.6**

The battery charger current shall be automatically inhibited for a specific period at regular intervals to allow the battery voltage to be sampled without the assistance of the battery charger. A fire alarm shall not be given by a battery failure during these tests. Two tests shall be carried out as follows:

(a) A short duration test to check that the battery is connected. This test shall inhibit the battery charger current for a brief period so that a defect warning is given if the battery is disconnected or if the battery fuse is blown. A continuous defect warning shall be generated for the duration of the fault. The interval between the tests shall not exceed 30 s;

(b) An extended test period to check battery capacity. This test shall inhibit the battery charger current for a duration between 30 min and 90 min. The interval between these tests shall not be less than 20 h, nor greater than 72 h. A defect warning shall be given within 60 s should the battery voltage fall below the level specified by 208.1(a) and shall latch until the end of the extended test period. At the end of the test period the defect signal shall be unlatched.

## 213 Rechargeable batteries

**213.1**

The nominal capacity at 20 °C of any battery normally supplying a non-alarm load shall be sufficient to supply the non-alarm load for a period of at least 24 h when the system is connected to a remote receiving centre or 72 h when no such connection is made. Thereafter it shall be capable of supplying the maximum alarm load for at least 30 min (see 503(e)).

**213.2**

The nominal capacity of a battery which supplies alarm load shall be sufficient to supply that load for at least 30 min.

**213.3**

A battery which supplies alarm load only may be used as a back-up for a battery supplying non-alarm load but not vice-versa. No reduction in capacity is permitted.

**213.4**

The battery shall be suitable for continuous operation under float charge conditions and shall meet the requirements of 220.

**213.5**

The battery shall be designed for stationary use and a minimum service life of 5 years.

**213.6**

For batteries with non-sealed cells, the level of electrolyte shall be readily and easily adjusted, and gas vents shall be designed to effectively prevent electrolyte loss.

## 214 Non-rechargeable batteries

The nominal capacity of the non-rechargeable battery shall be sufficient to supply the non-alarm load for a period of at least 12 months. Thereafter it shall be capable of supplying the maximum alarm load for at least 30 min.

## 215 Construction of control and indicating equipment

**215.1 Construction**

Cabinets shall be designed and constructed to meet the requirements of 110 and provide:

(a) Adequate strength and rigidity;

(b) Protection from dust or other foreign materials which would adversely affect the operation of the equipment;

(c) Adequate access for maintenance purposes;

(d) Access by key. This key shall be common to all systems installed by a manufacturer;

(e) A means of preventing the resetting of isolating switches by inadvertent cabinet door closure. This may be by the use of door latches or other mechanisms appropriate to the system.

### 215.2 Manual controls

**215.2.1**

All manual controls shall be of robust construction, positive in operation, and designed and positioned to avoid accidental operation.

**215.2.2**

Controls for switching off part of the equipment, resetting or isolating shall not be accessible to unauthorised persons.

### 215.3 Internal wiring

**215.3.1**

Conductors shall have adequate current-carrying capacity and mechanical strength.

**215.3.2**

All wiring shall be neatly run and firmly held in position.

**215.3.3**

Any wiring between hinged and fixed sections of the control and indicating equipment shall be carried out with stranded conductors in such a manner that hinged sections can be opened without impediment and without placing tension on the wiring, and so that wear to insulation of the wiring is minimised.

**215.3.4**

Wire-ways shall be smooth and free of sharp edges, burrs, moving parts and the like which could cause abrasion of the conductor insulation.

**215.3.5**

Holes in metal partitions through which insulated conductors pass shall have either smoothly rounded bushings or smooth well-rounded edges.

**215.3.6**

All connections shall be of a standard that meets the reliability requirements of 110 (for example soldered, wire wrapped).

### 215.4 Electrical components

**215.4.1**

Lamps that have two filaments in one envelope shall not be used.

**215.4.2**

All friction contact surfaces shall be of a noble metal or its equivalent. If the surfaces are plated or flashed with gold, the coating shall have a minimum thickness of 0.004 mm. In any case the surface shall be sufficient to withstand normal maintenance and servicing requirements.

**215.4.3**

All contacts of relays and other electromechanical devices shall be fitted with dustproof covers.

### 215.5 Circuit design

**215.5.1**

Circuits shall be designed so that the control and indicating equipment will perform all its functions under the test requirements of 220.

**215.5.2**

Equipment design shall ensure that the operating conditions of the components shall not exceed the limits specified by the component manufacturer.

### 215.6 Termination of external wiring

External wiring shall be terminated on purpose made connections suitably labelled and via entry-exit wire-ways of adequate size to prevent damage to the fully equipped control unit.

## 216 Detection system

**216.1**

Heat detectors shall comply with Appendix D, UL 521, BS EN 54-5, ISO 7240-5, AS 7240.5, or AS 1603.1.

**216.2**

Smoke detectors shall comply with AS 1603.2, AS 1603.7, AS 1603.8, AS 7240.7, AS 7240.12, ISO 7240-7, ISO 7240-12, ISO 7240-20, UL 268, BS EN 54-7, BS EN 54-12, or BS EN 54-20.

**216.3**

Flame detectors shall comply with AS 7240.10, ISO 7240-10 or BS EN 54-10 and/or shall be approved by Factory Mutual (FM) or Loss Prevention Certification Board (LPCB).

**216.4**

CO detectors shall comply with AS 1603.14, AS 7240.6 or ISO 7240-6 and/or shall be approved by UL (Underwriters Laboratories) or LPCB (Loss Prevention Certification Board) as suitable for fire detection.

**216.4A**

Combination or multi-sensor fire detectors shall comply with ISO 7240-8, ISO 7240-15, ISO 7240-27, AS 7240.8 or AS 7240.15.

In the foregoing clauses, other national adoptions of the EN 54 series of Standards are an acceptable alternative.

**216.5**

All detectors, except for line-type heat detectors, shall provide a visual indication of operation. This indication shall latch in the alarm condition until manually reset from the control unit, unless the detector is used only for a non-latching local alarm (for example 406.11).

**216.6**

Where a detector uses a mechanical contact to initiate a fire alarm that contact shall be closed in its normal condition, opening to initiate the fire alarm. This shall not preclude the use of a normally-open electromagnetic relay contact to signal a fire alarm, provided the contact is contained in an environmentally protected housing.

**216.7**

A detector shall not rely on the melting of a eutectic alloy to initiate a fire alarm, except as permitted under 101.4, 107.4 or where sprinkler heads are used as detectors. This shall not preclude the use of line-type heat detectors constructed as a sheathed and supervised two-conductor cable where melting of an insulating separator shorts the conductors to initiate an alarm.

**216.8**

With all detectors or allied devices connected to the zone terminals of the control unit, a 50 kΩ resistance placed across the circuit shall neither prevent a fire being signalled nor initiate a fire signal.

**216.9**

The detection system shall not initiate a fire alarm in response to a decrease in the ambient temperature of 1 °C per minute.

**216.10**

The detection system shall not initiate a fire alarm due to the cumulative effect of a number of detectors when these detectors are individually in the non-alarm condition.

**216.11**

Detectors for use in exposed conditions or other wet environments shall either have a degree of protection to at least IP54 of AS 60529 or be encapsulated to prevent the entry of water to any corrodible part of the detector including the field wiring terminations.

## 217 Manual call points

Manual call points shall comply with the requirements of Appendix E.

## 218 Alerting devices

**218.1**

All alerting devices shall be rated for a minimum 1 h continuous use. Electrical devices shall function satisfactorily within ± 20 % of the nominal battery voltage.

**218.2**

For positions exposed to the weather or in other wet environments the alerting devices shall have a degree of protection to at least IP24 of AS 60529.

**218.3**

Colour finishing of the visible sections of alerting devices shall either be red (approximating shade no. 537 of NZS 7702), or else the device or associated sounder grille shall be labelled 'FIRE' in the same shade. (See also the readability requirements of 406.9.) These requirements do not apply to audible alerting devices which produce a verbal message, or to alerting devices located on or behind a detector.

**218.4**

Visual alerting devices shall:

(a) Be either coloured red or incorporate a white strobe with the word 'FIRE' coloured red illuminated;

(b) Be visible through at least 180°;

(c) Pulse or rotate at a rate between 0.5 Hz and 5 Hz.

**218.5**

Alerting device labelling shall be clear and permanent, and shall include details as follows:

(a) Alerting device manufacturer's name, trade name or trademark, and type;

(b) Nominal electrical characteristics (such as the operating voltage and current).

**218.6**

Audible alerting devices:

(a) Shall produce a standardised evacuation signal (including verbal message) complying with Appendix F;

(b) May incorporate loudspeaking voice facilities in order to provide opportunity for, or better means of, evacuation control and testing;

(c) Where they are able to provide an alert signal, shall produce a standardised alert signal (including verbal message) complying with Appendix F. Alternatively a pulsed version of the signal of 218.6(a) with (non-pulsed) verbal message complying with Appendix F may be used.

Where an EWIS is used to provide the alerting devices, the equipment shall comply with AS 2220.1 provided that the d.c. power supply system and battery capacities also comply with this Standard (211 to 214), and the alerting device signals are as specified in 218.6(a) and (c). The brigade silence alarms and evacuation switches (205.4 and 207.1) shall control the EWIS.

**218.7**

Where the audible alerting devices incorporate voice facilities, the devices may also be used for ancillary services, for example public address announcements.

**218.8**

If public address equipment is used as the alerting device, the following additional conditions shall be satisfied:

(a) The fire alarm signal shall be a standardised evacuation signal (including verbal message) complying with Appendix F, and shall be easily distinguishable from all management signals;

(b) The fire alarm signal shall be automatically transmitted over the public address system taking priority over, and overriding every other facility of, the public address system except as specified in 218.8(c);

(c) The system may, if required, be fitted with an additional microphone for fire purposes designated as 'fire microphone'. This microphone shall only be operable after the fire alarm system has been activated and shall be fitted with a self-restoring 'press to talk' switch;

NOTE – This limitation on the availability of the fire microphone ensures that the initial transmission of the fire alarm signal cannot be inadvertently inhibited by use of the fire microphone for other purposes.

(d) The public address system shall use a monitored power supply to the requirements of 211.2;

(e) The circuit wiring to the system loud speakers shall be monitored for defects (see also 208.1(f));

(f) During mains power failure the public address equipment is automatically restricted to the provision of an audible fire alarm signal and the use of the 'fire microphone' if provided;

(g) The public address equipment shall be subjected to the environmental test requirements of 220;

(h) The fire alarm signal shall not be used for any other purposes.

**218.9**

Any other fire protection system that complies in all respects with the requirements of the published technical Standard for such systems (for example sprinkler, deluge, gas flooding) may be connected to operate the alerting devices without initiating a fire alarm from the fire alarm system, provided that evacuation of the building is an appropriate and prudent response to the activation of the other fire protection system. In such cases the interconnection between the two systems shall be supervised by the fire alarm system, and a defect warning shall be provided in the manner of 208.1(b) (see also Appendix C).

**218.10**

If the alerting devices are used for other purposes (for example school class change) the following additional conditions shall be satisfied:

(a) The fire alarm signal shall be easily distinguishable from all other signals (for example by sound character, cadence or continuous sound);

(b) The fire alarm signal shall take priority over and override all other signals;

(c) The battery charger and batteries shall be adequately sized to account for the additional working load.

## 219 Addressable fire alarm systems

An input circuit of an addressable fire alarm system shall be permitted to be extended to cover more than one zone provided the following additional conditions are satisfied:

(a) The control unit shall divide the annunciation from the detectors or manual call points on the addressable circuit into zones no larger than the area required by this Standard (see 401);

(b) The addressable system design shall incorporate fault tolerance such that a single short circuit or break anywhere on the addressable circuit between the control unit and any detector or manual call point shall result in loss of coverage of no more than one zone as defined by this Standard;

(c) Any fault on an addressable circuit which would prevent a detector or manual call point from initiating a fire alarm as specified in 204 shall result in a defect warning signal.

## 220 Environmental tests

### 220.1 General

A sample of the control and indicating equipment shall be subjected to the following environmental tests made in accordance with BS EN 60068-2. To take account of the conditions to which the equipment may be subjected in practice, the procedures specified in NZS 4512 differ in certain respects from the procedures specified in BS EN 60068-2. Where no specific information is given in NZS 4512, the methods indicated in the appropriate Parts of BS EN 60068-2 shall be followed.

### 220.2 Quiescent condition

The quiescent condition means that the control and indicating equipment is connected to its designated power supplies and all components such as lamps or switches are in the normal operating condition. All incoming and outgoing connections which are provided shall be connected to the appropriate equipment or dummy loads up to the maximum number or size specified by the manufacturer. Where alternative equipment is specified, that which imposes the greater load shall be used.

### 220.3 Preliminary test

In order to reduce the probability of a defective component failing during an environmental test and therefore being mistaken for a design error, the equipment shall be operated in its quiescent condition before starting the environmental test programme. At the end of a 20 h period of continuous operation in its quiescent condition, the equipment shall be subjected to the functional tests of 220.5. If, during a test of 220.5 the equipment functions incorrectly due to a defective component, any such component shall be replaced by one of the same type and manufacture, and the equipment repeatedly operated in its quiescent condition and tested as above until it has completed 20 h of continuous operation followed by correct functioning during the tests of 220.5.

### 220.4 Preconditioning and recovery procedure

Before and after each environmental test, the temperature of the control and indicating equipment shall be allowed to stabilise in an environment having any combination of temperature, humidity and pressure within the following limits:

| | | | |
|---|---|---|---|
| Temperature | 15 °C | – | 25 °C |
| Relative humidity | 45 % | – | 65 % |
| Air pressure | 860 mbar | – | 1060 mbar |

The ambient temperature and humidity shall be substantially constant during preconditioning, during recovery and while a functional test is carried out. Batteries used shall be allowed to become charged to their normal state.

### 220.5 Functional tests

These tests shall consist of the following operations made in the order in which they are listed:

(a) Operation of a detector, manual call point, or electrical equivalent, to ensure that the control and indicating equipment functions correctly;

(b) Operation of 'SILENCE ALARMS' switch to ensure correct functioning;

(c) In multi-zone control and indicating equipment, operation of another alarm circuit connected to a different zone from that in 220.5(a) to ensure that the equipment functions correctly;

(d) Operation of the switches which would isolate the remote receiving centre to ensure correct functioning;

(e) Operation of the reset controls to ensure correct functioning; and

(f) Removal of all energy supplies in order to ensure correct functioning of defect signalling (see 208.1(a), 211.6 and A3.4).

### 220.6 Inspection

At the conclusion of each environmental test, the control and indicating equipment shall be opened and inspected for damage consequential to that test.

### 220.7 Test procedure

For each environmental test specified in 220.8 the control and indicating equipment shall be subjected to the following tests in the order in which they are listed. At the beginning of each of 220.7(a) to (g), the control and indicating equipment shall be in its quiescent condition:

(a) Preconditioning procedure;

(b) Functional tests;

(c) Preconditioning procedure;

(d) The appropriate test environment of the severity, and for the duration, stated;

(e) Functional tests made at the end of the environmental test period while in the test environment;

(f) Recovery procedure;

(g) Functional tests; and

(h) Inspection.

### 220.8 Test environments

The control and indicating equipment shall be subject to the following tests in the order in which they are listed. The interval between each test shall not be more than 3 days:

(a) Dry heat as in BS EN 60068-2-2. The equipment shall be introduced into a chamber which shall be at the ambient temperature of the laboratory. The chamber shall then be adjusted to a temperature of 40 ± 2 °C with an absolute humidity not exceeding 20 g of water vapour per cubic metre of air (corresponding approximately to 30 % relative humidity at 40 °C). After temperature equilibrium in the chamber has been reached, the equipment shall be exposed to these conditions for 16 h continuously. While it is being adjusted the temperature in the chamber shall not change by more than 1 °C per min averaged over a period of not more than 5 min;

(b) Damp heat as in BS EN 60068-2-78. The equipment shall be introduced into a chamber which shall be maintained at a temperature of 40 ± 2 °C and a relative humidity of 93 % ± 3 %. The equipment shall be exposed to these conditions for 4 days continuously;

(c) Cold as in BS EN 60068-2-1. The equipment, while being at the ambient temperature of the laboratory, shall be introduced into the chamber which shall also be at that temperature. The temperature within the chamber shall be adjusted to 0 ± 2 °C. While it is being adjusted, the temperature in the chamber shall not change by more than 1 °C per min averaged over a period of not more than 5 min. The equipment shall be exposed to the low temperature conditions for a period of 2 h after temperature stability has been reached. The equipment shall remain in the chamber during the recovery period;

(d) Vibration operational test as in BS EN 60068-2-6. The equipment, mounted on a vibration table in its normal operating position and by its normal fastenings, shall be subjected to horizontal vibrations of peak displacement amplitudes corresponding to a constant peak acceleration of 0.98 $m/s^2$ over the frequency range 5 Hz – 60 Hz. One sweep of the frequency range shall be made at a rate of approximately 1 octave per min for each condition of the equipment in the functional tests described in 220.5.

#### 220.9 Performance requirements

The equipment shall be considered satisfactory if:

(a) No mal-operation occurs during the environmental test;

(b) The functional tests specified cause the equipment to respond correctly and no failures occur; and

(c) No damage which is a result of faulty design or workmanship is revealed.

## 221 Operational test

#### 221.1 Test procedure

Starting with the control and indicating equipment in its quiescent condition, each zone shall be operated in succession. Zone circuits shall not be reset between each operation but audible alarms shall be silenced between each operation.

#### 221.2 Performance requirement

The performance of the equipment shall be considered satisfactory if the requirements specified in 204 are met.

## 222 Radiated radio frequency interference

#### 222.1 Test procedure

The noise voltages produced by the control and indicating equipment during the functional tests (see 220.5) shall be measured. The equipment shall be considered satisfactory provided that the results of the tests comply with the relevant statutory requirements.

#### 222.2 Radio frequency immunity

The control and indicating equipment shall be demonstrated to be immune to radio frequency interference according to the requirements of BS EN 50130-4 or AS/NZS 61000.4.3 (80 MHz – 1000 MHz to test level 2).

## 223 Marking

#### 223.1

Control and indicating equipment shall be clearly and permanently marked with the name of the manufacturer, the manufacturer's type identification, and the year of manufacture in addition to any markings specified by the relevant statutory regulations.

#### 223.2

Components, sub-assemblies, and terminals shall be clearly and adequately identified.

#### 223.3

All manual controls shall be clearly labelled to indicate their functions.

## 224 Software-controlled equipment

### 224.1 Program monitoring

#### 224.1.1

The correct execution of the software by any processor of a control unit shall be supervised by a monitoring (watchdog) circuit. This watchdog shall monitor execution of the main functions of the program, and shall not be prevented from operation by the failure of a processor or its associated clock circuits.

#### 224.1.2

If correct execution is not successfully established, a defect warning shall be given within 60 s of the occurrence of the failure.

### 224.2 Storage of software

#### 224.2.1

All software necessary for the functions required by this Standard shall be held in solid-state memory.

#### 224.2.2

The main operating software (firmware) of control and indicating equipment shall be held in non-volatile, read-only memory, marked with a designation positively identifying its contents (such as program version).

Configuration data shall be safeguarded either as for firmware above or shall be:

(a) Modifiable only after access by lock or code at a level additional to that specified in 215.1(d);

(b) Changeable only then after a particular manual enabling action;

(c) Protected from corruption due to abnormal operation or program execution;

(d) Able to be clearly and unambiguously checked against hard-copy documentation to reveal any undocumented or unauthorised alteration;

(e) Preserved (by design) in the event of system power failure for a period of at least 10 years.

Run-time data may be stored in volatile memory. The equipment shall restart in a safe, operational and predictable manner after a failure of the power supply.

All control and indicating equipment firmware and configuration data shall be checked automatically (for example by ‘check-sum’ procedure) at intervals not exceeding 72 h. A defect warning shall be given in the event of failure of these data checks.

# PART 3 SINGLE-ZONE FIRE ALARM SYSTEMS

NOTE – The equipment design requirements for multi-zone fire alarm systems are set out in Part 2.

## 301 Functions, limitations, and components

**301.1**

The intended function of any particular single-zone fire alarm system shall be that declared by the owner in accordance with 105.

**301.2**

A single-zone fire alarm system shall not be used to protect more than a single zone.

**301.3**

Single-zone fire alarm systems shall comply with all relevant requirements of Parts 1, 2, 4, 5, and 6 of this Standard except for the following:

(a) Zone division and indication as per 202 and 204.1(b) is not required;

(b) Unless a declared functional requirement, initiation of a fire alarm signal to a remote receiving centre as per 204.1(c) and 204.12 is not required – in which case:

  (i) Isolation facilities as per 209 are not required

  (ii) Functional tests of 220.5(d) and (f) are not applicable;

(c) The internal silencing switch required by 205.2 and 205.3 need not be provided;

(d) A zone index and indicating unit as defined by 402.8 and 403.1 are not required;

(e) The fire service access requirements of 403.2(a) are not applicable;

(f) The verbal message required by 218.6, 218.8(a) and 406.1 need not be provided.

# PART 4 INSTALLATION

## 401 Zones and sectors

### 401.1

A sector shall be confined to a single building and shall cover no more than 11 000 m² in floor area (not including ceiling space). This may be extended to 22 000 m² in floor area where areas no greater than 5500 m² can be separately isolated (for example using the zone or point isolation facilities of the control equipment).

Where two or more buildings are contained on one site, and are intended to be managed as one building with a common use and set of ownership arrangements, common access, and a single fire service attendance point, they may be covered by one control unit if the combined floor area is not greater than a total of 5500 m². Each building shall not be greater than two storeys, and the travel distance to the furthest entrance shall not be greater than 100 m from the common fire service attendance point.

NOTE –

(1) The fire service should be consulted at an early stage in the design to facilitate the approval of the proposed arrangement.

(2) The fire service may require flashing lights outside the building that is in alarm if the buildings are hard to define or locate on the complex.

### 401.2

#### 401.2.1

Every part of each floor of the building shall be designated as part of a discrete zone except:

(a) An area of the top floor and the next floor down may form part of one zone provided that the only access to the highest area is from the floor immediately below. Ceiling spaces in such areas may be included in the zone; or

(b) Firecells containing more than one level may be regarded as a single zone, provided escape routes are not shared with other firecells. Ceiling spaces in such firecells may be included in the zone. Ceilings predominantly comprising removable tiles do not add to the zone area.

#### 401.2.2

Every ceiling or roof space in the building required to have more than two detectors shall designate as one or more unique zones except where the ceiling forming the space predominantly comprises removable tiles. In this case, the space may form part of the corresponding zone of the floor below and in calculating the area of that zone, the ceiling space shall be ignored.

**401.2.3**

The maximum area per zone shall be 750 $m^2$ except where:

(a) There are only manual call points in the area, the zone area may be extended to 900 $m^2$;

(b) Unique detector and call point identification is readily accessible by the fire service from the fire service attendance point, the zone area may be extended to 2000 $m^2$. This identification may be located inside the building (for example liquid crystal display (LCD));

(c) Sprinklers are used as thermal detectors, the zone area may be extended to 2000 $m^2$;

(d) The area is open plan, the zone area may be extended to 2000 $m^2$.

**401.2.4**

Every household unit shall be a separate zone or zones, except where 401.2.3(b) applies.

Separate buildings shall have separate zones, whether or not they are linked by covered walkways.

**401.3**

Where sprinklers are used as thermal fire detectors, they shall be provided with flow switches or other devices as necessary to provide zone indication in accordance with this Standard. To do so, they may be monitored by the fire alarm system as in 203.4.

NOTE – In areas covered by both smoke detectors and fire sprinklers, for example hotel/motel rooms and apartments (Type 5 or Type 7e systems – see Appendix B), the fire sprinklers are not considered as being used as thermal fire detectors and are therefore not required to provide zone indication. In such situations the zone indication will be provided by the smoke detection facility.

**401.4**

In buildings of more than one floor level, the delineation of the zones on all floors shall be similar as far as possible with the usage and construction of the building.

**401.5**

The area defined by a zone is the nominated search area which is normally accessible from within the zone. Attached areas with external access only may also be included in the zone provided that they are not additional to the search area limit.

**401.6**

Each zone shall be designated so that the origin of the fire alarm activation can be readily and accurately located.

NOTE – Detectors and manual call points in multi-level areas (such as stairwells) should designate in the zone of the level on which they are located.

**401.7**

Where several control units are installed within the same firecell all alerting devices shall be operated simultaneously.

**401.8**

In addition to the building being protected throughout by a fire alarm system that fully complies with this Standard, a supplementary fire alarm system may be installed to cover a specific risk, and be connected to a separate zone on the control unit. In such instances, the zone area and boundary requirements of 401.2.3 may be relaxed for the supplementary system provided the location and extent of the supplementary fire alarm system is readily identifiable on the zone index. The supplementary fire alarm system shall comply with all other requirements of this Standard. (See also Appendix C.)

## 402 Installation practice

**402.1**

Cable used within a building for detector circuits, alerting device or loudspeaker circuits, or ancillary control circuits shall generally comply with either AS/NZS 5000.2 or AS/NZS 5000.3 and shall either be sheathed in polyvinyl chloride or installed in conduit. Conductors may be stranded or solid core and of any cross-sectional area, except that conductors less than 1 mm² shall be stranded. Two-core cables shall have a minimum cross sectional area of 0.75 mm² for each conductor. Cables having more than two cores shall have a minimum cross sectional area of 0.5 mm² for each conductor. Cable used external to a building (overhead, underground in conduit, direct buried) or in areas of sustained sub-zero temperature shall be of an appropriate alternative type.

Attention is drawn to the need for all wiring associated with the fire alarm system to comply with the requirements of the Electricity (Safety) Regulations for 230 volt systems (see also 108).

**402.2**

Cable installation shall be in accordance with the following requirements:

(a) All outgoing and return conducting paths of any one circuit connected into each detector and manual call point of that circuit;

(b) Protected against damage where installed on the surface and within 2 m of floor level, passing through walls, or in such other positions where it is likely to be damaged;

(c) Outgoing and return conducting paths of alerting devices, including loud speakers, (which are required by 208.1(f) to be monitored) shall terminate on, or within each alerting device;

(d) Installed in conduit where it is necessary to bury the cables in concrete or plaster;

(e) Through-jointed only in suitable enclosed terminal boxes accessible for inspection and maintenance purposes;

(f) A separate sub-circuit connected to the mains electrical supply at a main switchboard or distribution board shall be used solely for the fire alarm supply including any alarm transmission device. The circuit, circuit breaker, or fuse shall be clearly identified by a label, attached to the distribution board, marked in a permanent manner with the words ‘FIRE ALARM’;

NOTE –

(1) AS/NZS 3000 has specific requirements for electrical supplies to safety services.

(2) Termination at the main distribution board is preferable, especially where sub-main distribution boards serve separately tenanted areas.

(g) Conductor cross-sectional areas shall be such that the voltage available at equipment shall be within the equipment rating;

(h) Cables installed overhead between buildings shall be suitably protected from environmental conditions, adequately supported and relieved from stress;

(i) All zone circuit wiring external to the control unit shall be isolated from the building earth. Earth return circuits are not acceptable. Conduit or other metal sheathing of conductors shall not be used as any part of an electrical fire alarm circuit;

(j) The insulation resistance between individual conductors and between each conductor and earth shall be greater than 5 MΩ;

(k) All wiring external to the control unit shall be separate and distinct (normally red sheathed) and electrically separate from any other circuit;

(l) Notwithstanding the other requirements of this Standard, optical fibres are permitted provided that the integrity of the installation is equivalent to the requirements of this Standard and such circuits are dedicated to the fire protection functions of a building;

(m) Unless duplicated as per 402.2(p), the cabling of transmission circuits from a control unit to the telecommunications demarcation point for a fire alarm system connected to a remote receiving centre shall be run in a fire-rated cable. The cable shall have a minimum 15 min integrity rating and shall comply with AS/ NZS 3013 Classification WS11. Alternatively, the cable may be run in a fire-rated conduit or a fire-rated duct used solely for cabling and non-combustible services. The conduit, duct, or wall cavity shall have minimum fire resistance rating of 15 min (FRR-/15/-). If the demarcation point is external to the building, that part of the cable run external to the building is not required to have a fire resistance rating;

(n) A wiring fault (such as an open or short circuit) shall not initiate a fire signal;

(o) A single wiring fault (such as an open or short circuit) shall not result in a loss of coverage of more than one zone as defined by this Standard;

(p) Where duplicated path or loop wiring is used to achieve the performance requirements of this Standard, this wiring shall be run diverse and not in the same route or conduit, or trunking, unless fire-rated to the level required for transmission circuits in 402.2(m);

(q) Notwithstanding the other requirements of this Standard, cables of other specifications (for example CAT 5) and less than 0.5 $mm^2$ in cross-sectional area are permitted for dedicated supervised data communications links such as remote signalling, networking between zone control units, or between zone control units and indicating equipment;

(r) In staged evacuation systems (see 406.12), where the path of loudspeaker or alerting device cabling traverses another firecell or evacuation zone, such cabling, including joints and terminations, shall have a minimum fire resistance rating of AS/NZS 3013 classification WS51W. Cabling within the firecell or evacuation zone it serves is not required to be fire-rated.

**402.3**

Earthing and bonding of the installation shall be in accordance with the relevant statutory requirements.

**402.4**

Ancillary services as described in 203.1 shall be connected through isolating devices. The connection of this additional apparatus shall not adversely affect or prejudice the performance of the fire alarm system. Voltages in excess of 32 V a.c. and 50 V d.c. associated with remote control functions shall not enter the control unit.

**402.5**

The mounting shall be such that the control and indicating units are securely fixed in place and are not subjected to undue vibration or shock.

**402.6**

Fire alarm and defect warning indicators shall be labelled in accordance with 210.5 and 210.6.

**402.7**

Where an audible defect warning device is required (see 208.2), this shall be located so as to be audible in a normally occupied part of the building. The audible warning device shall be labelled 'FIRE ALARM FAULT – CONTACT SERVICE COMPANY'.

**402.8 Zone index**

**402.8.1**

The location of the zones relative to the usual viewing position of the indicating unit shall be clearly defined by means of a robust and indelibly marked index on the outside face of the unit.

**402.8.2**

The index shall include a diagram, complying with Appendix G, which is correctly oriented relative to the viewing position, on which shall be shown:

(a) The outline of the building or buildings by means of a solid line. The location of any stairways shall also be shown;

(b) The main fire service access into the premises and other entry points, by means of triangles oriented to indicate direction of entry (see Appendix G). External stairs providing access to the building shall be shown;

(c) The location and approximate divisions between zones by means of a solid line where there is no access and a broken line where there is access;

(d) The location of any other systems connected to the alarm system (see 218.9 and 401.8);

(e) The location of the indicating unit, using the symbol of Appendix G, and the words 'YOU ARE HERE';

(f) The location of any other indicating units;

(g) The type of detector installed in the building prominently displayed, for example smoke, heat, manual, etc. Zones protected by line-type heat detectors shall also be identified;

(h) For a fire service connected system, the system's identifying number permanently and durably affixed to a bottom corner of the front and back of the indicating unit;

(i) Zone descriptors that are either the name of the area or a logical sequence of numerical and/or alphabetical characters, preferably arranged in a vertical configuration;

(j) Unprotected significant areas;

(k) Mezzanine levels and associated stair access;

(l) The location of internal stairs, lift shafts, ramps within the building;

(m) If the smoke detection component of a Type 5 is used, or smoke detectors do not call the fire service, and optional indication on the zone index is provided (see 204.1(d), it shall be separate and shall be labelled 'NOT CONNECTED TO FIRE SERVICE';

(n) A side elevation if a building has 5 or more levels or has unusual access. Levels of similar layout may have a single common diagram if accompanied with an appropriate legend.

Index lettering shall be 3 mm minimum height, upper case Arial font and arranged horizontally.

The diagram shall be approved by the fire service.

**402.8.3**

A diagram may not be required in the following circumstances:

(a) In a single building containing only one zone and in multi-storeyed buildings where the floor plan contains only one zone per floor, and the floor plan throughout the building is similar; and

(b) Where the ingress to the building, all floors and any special requirements are clearly apparent.

**402.8.4**

Where manual call points, heat or smoke detectors are in a common zone, separate indicators can be used but should be positioned together on the zone index.

**402.9**

Detectors and manual call points shall be connected in such a way that a defect warning is given in the event of the removal of any such devices from a circuit.

**402.10**

Terminals of electrical detectors shall be covered when installed.

**402.11**

Zone circuits shall be allocated an identifying symbol. Every detector, sampling point, manual call point, alerting device, junction box, and end of line device shall be uniquely marked in a permanent and durable manner in characters not less than 5 mm high with its zone symbol and a designation indicating either its logical system address (such as corresponds with a system's alphanumeric display) or the numerical order in circuit beginning at the control unit. This marking shall be visible when the components are installed.

**402.12**

Where detectors or sampling points are mounted on movable tiles, adequate cable or tubing shall be left to allow for movement of tiles.

**402.13**

The manufacturer's finish on the surface of the sensing element of a detector shall not be painted or coated over.

**402.14**

In occupancies or situations likely to be subject to vandalism, interference or damage:

(a) Alerting devices and detectors shall be protected by a suitable guard; and

(b) Any exposed alerting device cabling shall be suitably protected.

**402.15**

Detectors, located in high roofs and other places that are difficult to access, shall be installed so as to be accessible for replacement.

**402.16**

Where exposed to the weather, or in locations subject to regular washing down, the detection system shall be resistant to false actuation due to the entry of water.

## 403 Equipment location

### 403.1 Indicating units

**403.1.1**

Indicating units shall be located to suit the fire service access requirements. On occasion this may override some aspects of 403.1.2.

NOTE – Fire service approval is required.

**403.1.2**

Indicating units shall be located as follows:

(a) With the zone index and all indications and controls intended for fire service use contained within the limits of 750 mm and 1850 mm from floor or ground level (as applicable) and centred as close as practicable to 1700 mm from floor or ground level;

(b) With only clear annealed glass acceptable in front of the indicating unit. No internal fittings, (such as blinds, curtains etc.) or external objects (such as signs, vegetation, etc.) that may hinder visibility are permitted in front of the indicating unit;

(c) Clearly visible from the normal viewing position;

NOTE – To assist firefighting personnel, the normal viewing position is usually external to the building (see also 406.10).

(d) To minimise the effects of direct sunlight (see 210.6);

(e) With a minimum clearance of 1000 mm at the access doors for maintenance purposes;

(f) Such that the equipment can be serviced in a weather protected environment;

(g) To provide easy access to all control facilities; and

(h) To preclude malicious damage wherever practicable.

At least one evacuation switch (see 207), one external silencing switch (see 205), plus any other firefighters' emergency services controls shall be provided at the main indicating unit (as agreed or approved by the fire service). These controls may also be provided at other indicating or control units or both.

NOTE – In special circumstances these controls may be required at other locations such as building management positions or the building's fire control room(s). Consultation with the fire service should be sought.

**403.2**

Control units not incorporating an indicating unit shall be located as follows:

(a) To suit the fire service access requirements, if including switches or other controls intended for firefighter use;

NOTE – Fire service approval is required.

(b) Contained within the limits of 700 mm and 2300 mm from floor level, and with all indications and controls intended for fire service use contained within the limits of 750 mm and 1850 mm from floor or ground level (as applicable);

(c) With a minimum clearance of 1000 mm at the access doors for maintenance purposes;

(d) Such that the equipment can be serviced in a weather-protected environment;

(e) To provide easy access to all control facilities;

(f) To preclude malicious damage wherever practicable; and

(g) Within a firecell protected by a fire alarm or sprinkler unless situated on the exterior of the building.

NOTE – Control units should not penetrate a fire separation.

**403.3**

Battery chargers, batteries, and the mains power supply switch shall be housed in a cabinet or cabinets constructed in accordance with 215.1(a), (b), (c) and (d). Adequate ventilation and protection from the corrosive effects of electrolytes shall be provided.

**403.4**

Alphanumeric displays used to provide supplementary information for the fire service may be located in a readily accessible position within the building.

**403.5**

End of line devices, and the like, which require physical access to perform annual tests shall be installed in a readily accessible location.

## 404 Manual call point locations

**404.1**

Manual call points shall be located on each escape route and as close as practicable to the main exit doors. Where there are multiple exit doors, one common manual call point may be used provided not more than a 5 m travel path deviation is required to reach the manual call point from each door. Additional manual call points shall be located elsewhere to ensure there is not more than 30 m travel to the nearest manual call point. In multi-level buildings there shall be a manual call point located on the escape route at each full floor landing.

NOTE – Manual call points are not required at every exit. Knowledge of the building's primary escape routes may be required to determine which exits require them.

**404.2**

Each manual call point shall be at all times clearly visible, readily accessible, and positively identifiable. It shall be securely mounted with its centre at a height of 1200 mm to 1500 mm above floor level and a clear space of at least 600 mm shall be preserved in all directions.

**404.3**

Where the occupancy of the premises can result in repetitive malicious fire alarms, the manual call points may be located where they are under the direct control of supervisory staff or apartment occupants.

**404.4**

Manual call points may be located in yard areas between buildings or on isolated structures provided that the cabling is run in such a manner as to be protected against damage. Where the system is connected to the fire service and the site is at times unattended such manual call points shall only be permitted if the site is secured against unauthorised access or the fire service agrees to each location.

# 405 Detector selection, location, position, spacing, and coverage

## 405.1 Selection of detectors

### 405.1.1

The firecell shall be covered by listed detectors and, in particular, respond to the normal phenomena arising at an early stage in a fire. However the selected detector shall not respond to ambient and environmental conditions typical of the location. Specialised detectors responding to phenomena other than heat or smoke should be used with caution and shall only be used in addition to a comprehensive heat or smoke detector coverage. Detector selection shall be consistent with the detector manufacturer's instructions (see also Appendix H).

### 405.1.2

The temperature rating of heat detectors shall be at least 15 °C above the highest normally expected temperature.

NOTE –

(1) In areas where the ambient temperatures are higher than normal, heat detectors should be selected to respond at 40 °C to 50 °C above the expected average ambient temperature.

(2) Heat detectors that conform to Appendix D are colour coded according to D8.2.

### 405.1.3

To reduce unwanted alarm activations, smoke detectors may be replaced by heat detectors (or sprinklers – see 405.2.2(h)) in the following areas (up to a maximum of 30 % of the area of the firecell):

(a) At the top of stairways, hoists and lift wells, service ducts, chutes, above rope or belt openings, and in skylights;

(b) Under loading-dock canopies, over occupiable covered balconies and under external building appendages;

(c) In built-in storage enclosures (such as cupboards and wardrobes), including cleaners' cupboards and understair cupboards;

(d) Within 5 m horizontally of any fixed cooking apparatus;

(e) Within bathrooms or other wet areas where steam is likely to be generated in sufficient quantity to be the cause of spurious alarms;

(f) In toilet spaces;

(g) In roof or ceiling spaces with difficult access to clean detectors;

(h) In any other area where the activity occurring in that area may be the cause of spurious smoke detector alarms, except that under no circumstances may substitution of smoke detectors be permitted in the following areas:

(i) Spaces used for sleeping

(ii) Corridors used for escape from sleeping spaces

(iii) Corridors used for escape from places of crowd activity

(iv) Any exitways internal to the building.

NOTE –

(1) If substituting heat detectors (or sprinklers) for smoke detectors, there are differing requirements for spacing (see 405.3.1).

(2) A wardrobe or similar built-in storage enclosure or room adjacent to or opening into a sleeping space is not considered to be a sleeping space. It may, however, be part of a corridor used for escape from a sleeping space therefore requiring smoke detectors.

See Appendix H for further information.

### 405.2 Detector location and position

#### 405.2.1

Detectors shall be installed in locations as follows:

(a) All areas of the building, including rooms, halls, corridors, storage areas, basements, other subdivisions, and accessible spaces;

(b) Each subdivision where a space is subdivided by walls, partitions, or storage racks reaching within 300 mm of the ceiling, except water closets which comply with the requirements of 405.2.2(e);

(c) At the top of stairways, hoists and lift wells, service ducts, chutes, above rope or belt openings, and skylights if used for ventilation or if having a volume greater than 3 $m^3$;

(d) On the floor landings of all stairways;

(e) Within 1500 mm of a fire door where detection is not provided on both sides of the door;

(f) In other cases of unusual roof or ceiling geometry, detectors shall be installed in positions that approximate to that shown in the relevant diagrams of figure 1;

(g) Under fixed decks, ventilation ducts, mezzanine floors, landings, and the like, which are more than 1500 mm in both plan dimensions;

(h) Under loading-dock canopies and over occupiable covered balconies, provided in each case there is no dimension less than 1500 mm. Under other external appendages (such as verandahs) where combustible material is likely to be stored or a vehicle can be parked and where there is no dimension less than 1500 mm;

(i) Under ducted hoods over cooking apparatus, with any dimension greater than 1500 mm, located adjacent to the extract point(s);

(j) Within 500 mm horizontally from the apex of a roof or ceiling;

NOTE – A roof or ceiling with a slope of less than 6° (1 in 10) may be deemed to be flat (see 405.3.6).

(k) Not less than 1 m from air delivery points of air conditioning plant or ducting;

(l) Not less than 200 mm from a wall;

(m) Where solid open joists, beams, purlins, girders, trusses or the like are surmounted by roofs, floors or ceilings, in sufficient quantities to meet the following minimum requirements (see also figure 2):

(i) Supports for beams or joists that run at angles to other beams or joists may be ignored if the tops of the supports are spaced 100 mm or more from the ceiling

(ii) Where the beam or joist depth is less than 100 mm, detectors may be mounted either on the ceiling or on the bottom of the beams or joists, and the spacing requirements of 405.3 shall apply

(iii) Where beams or joists of depth 100 mm or more are spaced at centre-to-centre or centre-to-wall intervals of 900 mm or less, detectors shall be mounted on the bottom of the beams or joists and the spacing of detectors in the direction perpendicular to the beams or joists shall be two-thirds of the requirements of 405.3

(iv) Where the beam or joist depth is greater than 460 mm and the beams or joists are spaced at intervals exceeding 2400 mm centre-to-centre or centre-to-wall, each beam or joist shall be treated as a wall and the spacing requirements of 405.3 shall apply

(v) Where the beam or joist depth is less than 300 mm, and the beams or joists are spaced at centre-to-centre or centre-to-wall intervals of 2400 mm or less, but more than 900 mm, spacing of detectors in the direction perpendicular to the beams or joists shall be two-thirds of the requirements of 405.3. Detectors may either be mounted on the bottom of the beams or joists or on the ceiling (unless 405.3.1(a) applies)

(vi) In all other cases, detectors shall be mounted on the ceiling and the spacing of the detectors in the direction perpendicular to the beams or joists shall be two-thirds of the requirements of 405.3 to the first row of detectors in each inter-beam space

(vii) Where the beams or joists are at angles to each other (i.e. cross-hatched), the two-thirds spacing requirements of 405.2.1(m)(iii), (m)(v) and (m)(vi) shall be applied in both perpendicular directions

(viii) In concealed spaces, the requirements of 405.2.1(m)(i) to (m)(vii) shall apply except for concealed spaces less than 2000 mm high where the two-thirds spacing requirements of 405.2.1(m)(iii), (m)(v) and (m)(vii) may be ignored

(ix) In all cases where detectors are mounted on the ceiling, they shall be stagger-spaced to evenly cover all inter-beam and inter-joist spaces as much as possible without resorting to additional detectors;

NOTE – The general principle of 405.2.1(m) is that each beam-to-beam or beam-to-wall space is first assessed separately, and then the requirements are applied on a best-fit basis to aggregations of similarly treated adjacent areas. Where beams or other protrusions are treated as walls, 405.3.1(d) is applied twice – once to each beam-to-beam or beam-to-wall space, and secondly to the room as a whole.

(n) The distance the sensing element is below the roof or ceiling underface is:

(i) In areas with up to 10 m ceiling height

(A) For heat detectors, not less than 25 mm and not greater than 100 mm

(B) For point-type smoke detectors, not less than 25 mm and not greater than 250 mm

(C) For beam-type smoke detectors, not less than 300 mm and not greater than 600 mm

(ii) In areas with ceiling 10 m to 20 m height, according to the manufacturer's data sheets

(iii) In areas with ceilings exceeding 20 m in height (see 405.5);

(o) Such that the correct operation is not prejudiced or delayed by ambient conditions such as corrosion, dampness, high ambient temperature, vibration, stratification, cool air currents, ventilation systems, high airflow or the like;

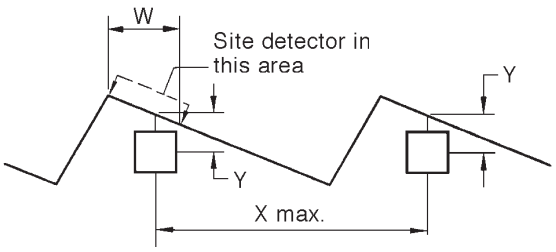
(p) All built-in cleaners' cupboards and built-in understair storage enclosures (see also figure 3);

(q) All built-in storage enclosures opening into a sleeping space that have a capacity exceeding 6 m³, and those with a capacity between 1.5 m³ and 6 m³ unless vented at the top into the room by an orifice greater than 0.02 m² (200 cm²) (see also figure 3);

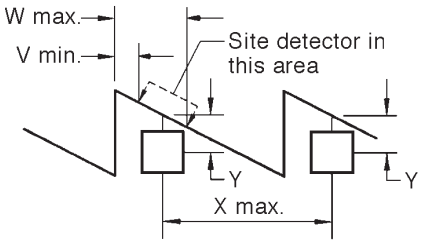
(r) All built-in enclosures that have a capacity exceeding 1.5 m³ and contain electrical switchboards, distribution boards, or in which electrical or gas-fired appliances are used in situ (see also figure 3);

(s) All other built-in storage enclosures that have a capacity exceeding 6 m³ and those with a capacity between 3 m³ and 6 m³ unless vented at the top into the room by an orifice greater than 0.02 m² (200 cm²) (see also figure 3).

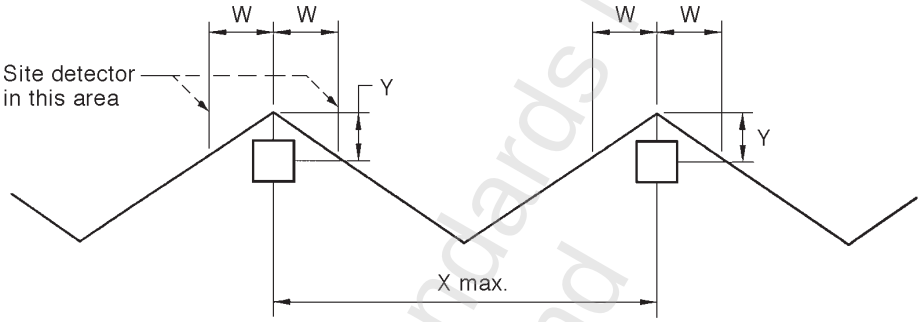
NOTE – The location requirement given for detectors in 405.2.1(p), (q), (r) and (s) may occasionally be greater than recommended by the Compliance Documents for the New Zealand Building Code for such spaces. The cost consequence of full compliance with this Standard is minimal on the few occasions when these spaces are larger than already exempted by this Standard.



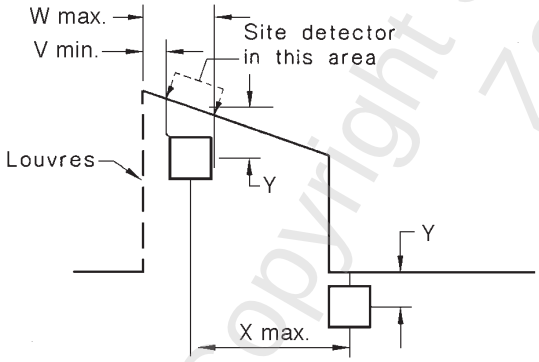

(a) Unequal sloping surface



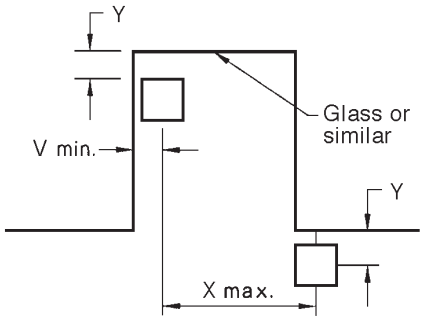

(b) Sawtooth ceiling, roof or surface




(c) Equal sloping surface




(d) Louvred ceiling or roof with louvred riser




(e) Ceiling, roof or surface with skylight

V = Minimum distance from wall as per 405.2.1(l)

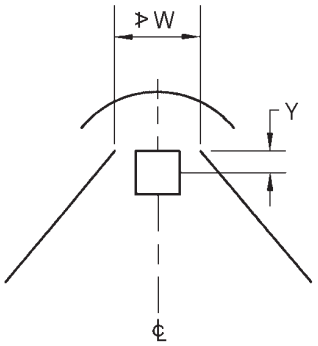
W = Maximum distance from apex as per 405.2.1(j)

X = Detector spacing as per 405.3

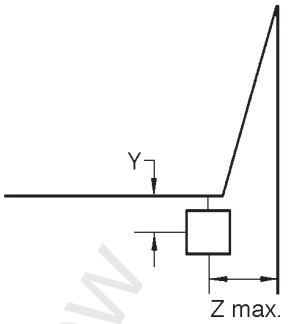
Y = Distance from ceiling or roof as per 405.2.1(n)

Z = Spacing from wall or partition as per 405.3

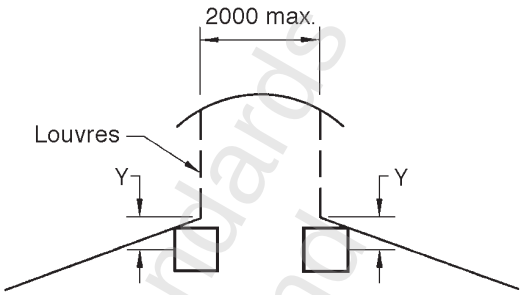
**Figure 1 – Typical detector locations at apex of ceiling, roof, or surface**



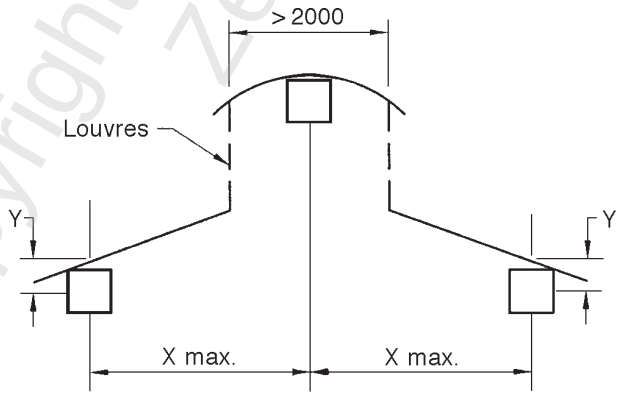

(f) Ventilated ridge




(g) Narrow apex




(h) Ventilated ridge (greater than W)




(i) Ventilated ridge (greater than 2000 mm)

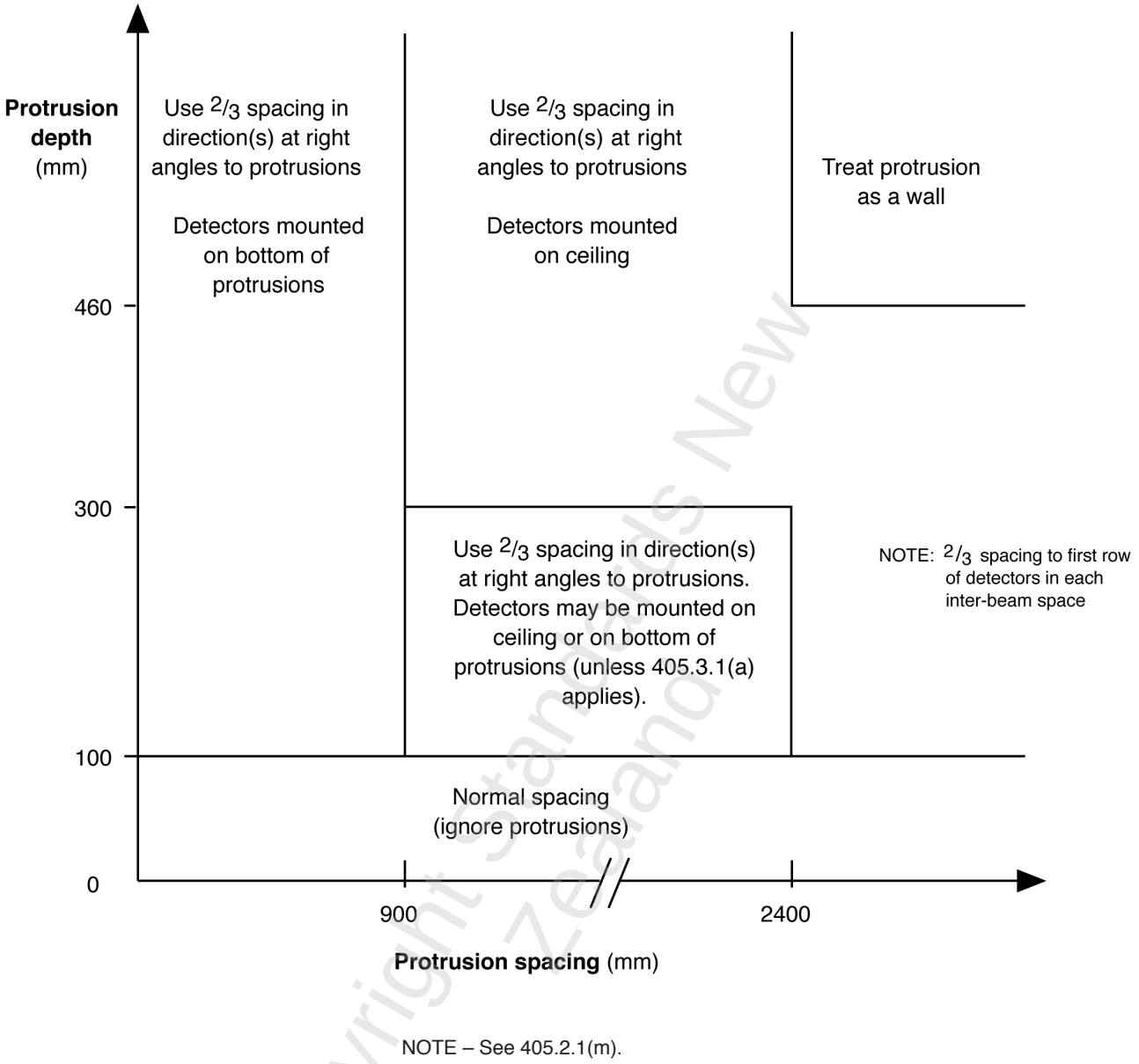
NOTE –

(1) Detector is always on the side with least slope.

(2) See 405.2.1(f).

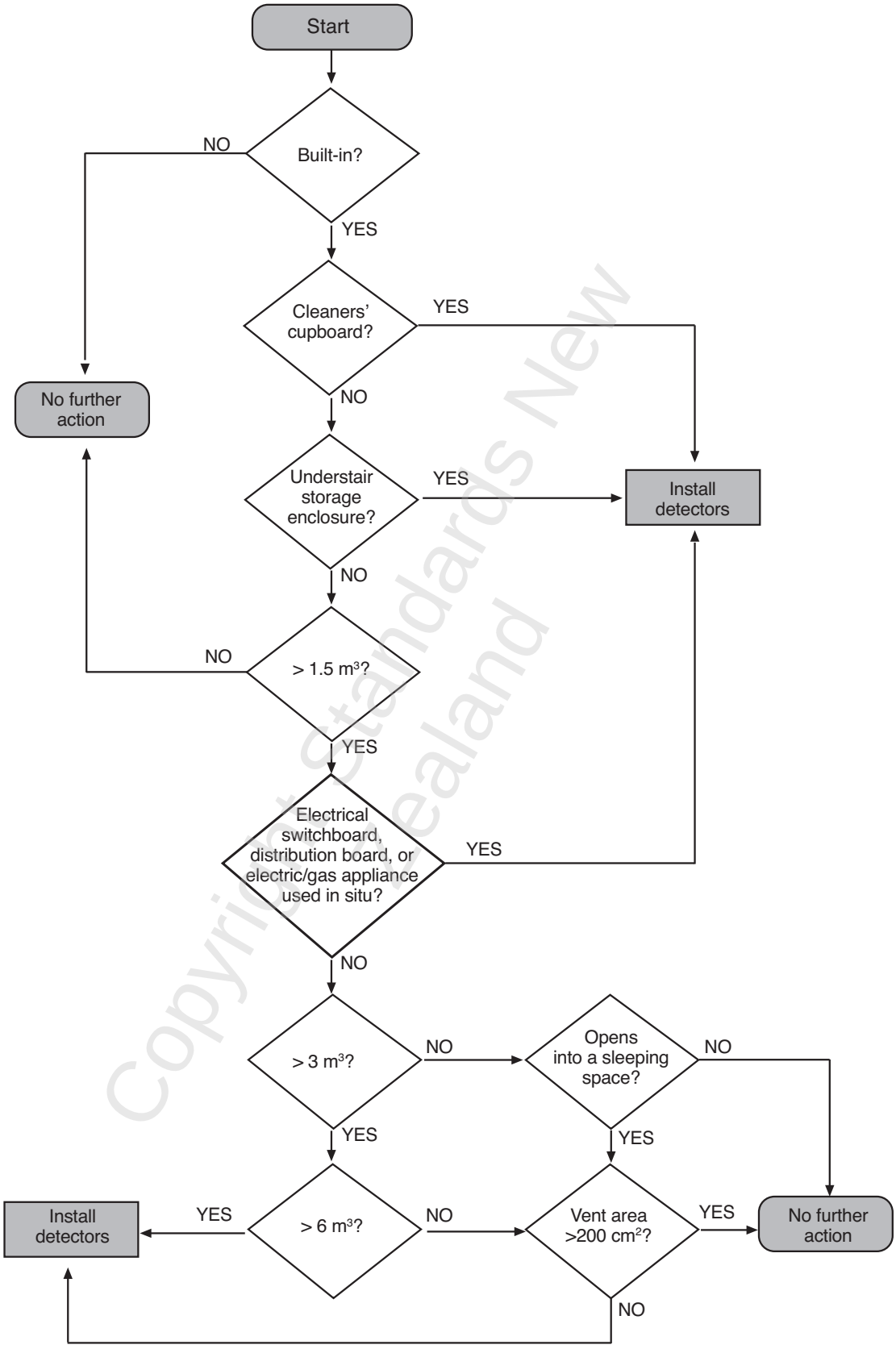
(3) All dimensions are in millimetres.

**Figure 1 – Typical detector locations at apex of ceiling, roof, or surface** (continued)




NOTE – See 405.2.1(m).

**Figure 2 – Effect of protrusions (beam, joist, purlin etc.) on detector location and spacing**




NOTE – See 405.2.1(p), (q), (r), and (s).

**Figure 3 – Protection of built-in storage enclosures (for example cupboards and wardrobes) flowchart**

**405.2.2**

Partial coverage of a building (or firecell) is not permitted with the exception that detectors may be omitted from the following spaces:

(a) Concealed spaces which are fire isolated with a minimum fire resistance rating (FRR) of 15/15/15 and which do not include combustible construction, materials, services or equipment;

(b) Concealed spaces, irrespective of depth between the lowest floor and ground, which do not contain equipment or stores, and to which there is no access;

NOTE – Access to concealed spaces applies to general building users, not specialist tradespeople. A small secure manhole or trapdoor (internal or external) is acceptable for a concealed space without constituting 'access', unless there is evidence the space is regularly occupied or used for storage.

(c) Concealed spaces less than 800 mm deep between false ceilings and fire-resisting slabs above, and which do not contain any combustible material;

NOTE – Flush-mounted light fittings, small air conditioning dampers, fans and associated wiring, and timber framing construction in such concealed spaces are not regarded as 'combustible' for the purposes of this Standard.

(d) That part of concealed spaces under roofs which are neither formed of, nor contain combustible materials, and which are less than 800 mm deep (see also 405.2.3);

(e) Individual water closets which open off a protected room, and where the doors or walls or both are not full height;

(f) Adjacent firecells (unless required by the New Zealand Building Code or the declared functional requirement);

(g) Where there is a false ceiling of a perforated type and the open area, consisting of individual holes each at least 625 mm² (6.25 cm²) in area, exceeds 50 % of the total area, it is sufficient to locate detectors on the main ceiling above the false ceiling;

(h) Where sprinkler heads are installed as part of a sprinkler system to NZS 4515 or NZS 4541, heat detectors may be omitted. The sprinkler system shall fully comply with these Standards, or any amendment to them, as specified in the Compliance Documents for the New Zealand Building Code.

**405.2.3**

If the roof pitch means that the width of the space which is less than 800 mm deep is greater than 3 m, then the first line of detectors shall coincide with the line at which the depth of the roof space is 800 mm and the maximum area of coverage per detector shall still apply.

## 405.3 Spacing

**405.3.1**

Point-type heat detectors shall be spaced and located in the optimum position for exposure to the flow of hot fire gases during a fire and as follows:

(a) Located at the highest point of the low side pocket formed by beams or other members which project more than 100 mm from ceilings when the ceiling slope is more than 6° (1 in 10). The heat collector shall not project below the bottom of the beam;

(b) Not exceeding 6 m centres in general areas and 9 m in corridors;

(c) Not exceeding 3 m from any wall or partition in general areas, and 4.5 m in corridors; and

(d) Not less than one detector for each 30 m² of floor area.

**405.3.2**

Line-type heat detectors shall be spaced as follows:

(a) In accordance with the conditions of 405.2 as far as they are applicable and appropriate;

(b) Lines shall be so disposed throughout the building that adjacent lines are not more than 8 m apart and all points in the area covered are within 4 m of a line;

(c) Mounted within 500 mm horizontally from the apex of each apex type roof.

**405.3.3**

Point-type smoke detectors shall be spaced as follows:

(a) Not exceeding 10 m between detectors;

(b) Not exceeding 5 m, and not less than 200 mm from any wall or partition;

(c) Such that no point in the room is more than 7 m from the nearest detector;

(d) Not exceeding 500 mm horizontally from the apex of a ceiling sloping more than 6° (1 in 10).

**405.3.4**

Beam-type smoke detectors shall be spaced and positioned as follows:

(a) With their projected beams normally parallel to the ceiling and in accordance with the manufacturer's instructions;

(b) In accordance with the conditions of 405.2 as applicable;

(c) Located throughout the building so that adjacent beams are not more than 14 m apart and all points in the area covered are within 7 m of the centre line of a beam;

(d) Mounted within 600 mm horizontally from the apex of each apex type roof.

**405.3.5**

Aspirating smoke detection sampling points for room protection shall be spaced so as to comply with 407.2 but shall not be at greater spacing than the requirements for point-type smoke detectors in 405.3.3.

**405.3.6**

For sloping ceilings, the detector spacing distances shall be based on the horizontal projection of the ceiling. A roof or ceiling with a slope of less than 6° (1 in 10) may be deemed to be flat.

### 405.4 Indicators

Detectors shall be installed such that the indication of their operation is readily apparent to a person standing beneath the detector under normal conditions of illumination.

Unless a zone uniquely defines all the detectors located in a ceiling or concealed space, additional indication of their operation shall be given by means of an easily discernible, labelled indicator situated in an adjacent normally accessible space. Such indication may be common to multiple detectors in a concealed space.

A detector rated at 80 °C or higher installed in an area of high ambient temperature may have its visual indicator located in an adjacent (cooler) area, provided the indicator's labelling readily identifies the detector. Alternatively, the indicator for such a detector may be omitted if unique detector identification is readily accessible by the fire service from the fire service attendance point (for example a separate zone indicator or LCD as in 401.2.3(b)).

### 405.5 Ceilings exceeding 20 m in height

#### 405.5.1

In open areas with ceilings exceeding 20 m in height detector selection, location and spacing shall be in accordance with specific design that demonstrates adequate performance to meet the system's declared functional requirements (105) and system type (106 and 201.5). Designers shall consider:

(a) The entire contiguous volume in the area concerned;

(b) Elevated sub-areas of this volume, whether or not exceeding 20 m in height;

(c) Other areas of the building into which there is a free flow of air, smoke, and heat; and

(d) The effects of temperature, stratification, air currents and ventilation systems on all of these.

NOTE – Additional detectors at intermediate levels will generally be required in areas exceeding 20 m in height.

#### 405.5.2

Specific design in accordance with 405.5.1 is not required for enclosed limited-area vertical structures and penetrations such as stairways, hoists and lift wells, service ducts, chutes, above rope or belt openings, and skylights.

## 406 Alerting devices

**406.1**

Audible alerting devices used throughout a fire alarm system shall produce the evacuation signal of Appendix F (including verbal message) except as permitted in 406.5, 406.7 and 406.11, or as follows:

(a) Where audible alerting devices are added as part of an extension to an existing system the additional devices installed may produce the existing sound type (without verbal message) or alternatively, all alerting devices may be upgraded to produce the evacuation signal of Appendix F (including verbal message);

(b) Where an additional system is installed on a site with an existing uniform, site-wide evacuation sound, the audible alerting devices on the additional system may produce the existing sound type, but must also include a verbal message complying with Appendix F.

The audible alerting devices shall produce identical evacuation signals throughout the building.

**406.2**

Verbal messages forming part of the audible signal shall provide clear and readily understandable instructions. The verbal evacuation message shall be consistent with the building's evacuation scheme, and should include the word 'evacuate' as well as the word 'fire' or 'emergency' or both (see F4).

NOTE – This may require synchronisation in common or open areas.

**406.3**

At any location within the signal reception area, the maximum A-frequency-weighted F-time-weighted sound pressure level (SPL) of the audible alerting devices $L_{AFmax}$ measured over a complete signal cycle by a meter to BS EN 61672-1, shall exceed the residual sound level (see 104) by at least 10 dB where voice facilities are used for evacuation purposes, or by at least 5 dB where voice facilities are not used. The audible signals, however, shall not be less than 65 dB $L_{AFmax}$ and not more than 100 dB $L_{AFmax}$ measured at any normally accessible point in the room at a height of 1.8 m. In buildings providing accommodation, the audible signals shall be at least 75 dB $L_{AFmax}$ at the bedhead unless 406.5 or 406.7 apply. Sound pressure levels (SPL) shall be measured with all doors closed. For occupiable balconies the audible signals shall be at least 65 dB $L_{AFmax}$ measured with the balcony door open.

**406.4**

Where visual alerting devices are used, the intensity and the location of the visible signal shall be such as to ensure perception by the occupants.

Where required by the declared functional requirements, or the ambient sound level (see 104) exceeds 90 dB $L_{Aeq(10min)}$ or where ear protectors are routinely worn by all occupants of an area, visual alerting devices shall be provided.

**406.5**

Where audible alerting devices could cause occupants distress in areas of buildings, or where such devices would preclude proper conduct of critical or emergency functions, other suitable means of quickly alerting occupants shall be permissible in those areas as follows:

(a) In care or detention facilities in which there are on-duty staff available on a 24-hour basis, low level audible and/or visual devices shall be provided to alert all such staff wherever they may be located and whatever normal duties they may be undertaking;

(b) In other areas, low level audible or visual devices or both, to alert all occupants.

The character of the sound is not required to comply with 406.1.

In both cases, provision may be made for a responsible person to silence (after they have operated) the sounders of audible or visual warning devices or both, in that person's area of responsibility. All visual devices shall continue to operate.

**406.6**

A minimum of two alerting devices per system shall be installed.

**406.7**

The type of alerting devices in hospital wards or other areas where care is provided may be a combined pulsing light and low sound level sounder that is common to all such areas where 406.1 is not complied with. Such devices shall have:

(a) A visual alerting device (see 218);

(b) An audibility level of no less than 5 dB above ambient sound level (see 104). If the sounder is pulsed, then it shall pulse at the same rate as the pulsing light;

(c) The sound character of such devices is not required to comply with 406.1.

**406.8**

An EWIS installed to comply with AS 1670.4 may be used as the alerting device, however audible alerting signals, verbal messages, and intelligibility measurement shall be as per 501.2 and Appendix F.

**406.9**

The label required by 218.3 shall be located on or adjacent to the alerting device and sized to be readable when installed from a point 1800 mm above the floor.

**406.10**

Where the position of the indicating unit is not readily visible from the point of fire service attendance, an alerting device (visual or audible) shall be located on the exterior of the building in such a position so as to draw attention to the location of the indicating unit.

**406.11**

Where a firecell is protected by a Type 5 fire alarm system, the smoke detectors within that dwelling unit shall generate a non-latching alarm signal within the firecell only. Where a management response is available, a local signal shall be communicated to the management (see 105(f)).

The character of the sound is not required to comply with 406.1.

A readily accessible means shall be provided within the firecell for occupants to silence (mute) the local alarm signal in that firecell for periods not exceeding 2 minutes.

**406.12**

Where staged evacuation is approved by the appropriate authority, the system should signal the evacuation alarm of 406.1 in the zone(s) or firecell(s) from which the alarm has originated, and sound the audible alert signal of 218.6(c) in all other zones or firecells unless otherwise specified in the approved evacuation scheme.

## 407 Multi-point aspirating smoke detectors

**407.1**

Multi-point aspirating smoke detectors may be used to provide conventional room protection in compliance with 405.2.1(a), where installed in accordance with 407.2 to 407.14.

Where the declared functional requirement is for detection of very low levels of smoke or of pre-combustion aerosols in specified items of equipment or in certain areas, multi-point aspirating smoke detectors may be used if installed in accordance with 407.4, 407.5, 407.7, 407.9, 407.10 and 407.11. This shall be either as an adjunct to general coverage by other forms of detector or on a stand-alone basis according to the tenor of the declared functional requirements.

**407.2**

The requirements of AS 1603.8, in respect to installation of multi-point aspirating smoke detectors, shall be complied with where these do not conflict with the requirements of this Standard.

NOTE – AS 1603.8 contains installation-dependent requirements for system design, components and performance.

**407.3**

The total system design shall ensure that the system has a sensitivity equal to or greater than equivalent point-type smoke detectors covering the same area.

**407.4**

The air-sampling network design shall be such that the amount of airflow drawn from the penultimate sampling point is at least 50 % of that drawn from the sampling point nearest the detector.

NOTE – Manufacturer's design-tool calculations showing the network design according to the above criteria should be provided as a means of demonstrating compliance.

**407.5**

The installation and alignment of any part of the system shall be such that it can be easily maintained. The sampling point orientation shall not jeopardise the long term reliability and performance of the system.

**407.6**

Each sampling point shall have an orifice sized to facilitate the correct operation of the system in accordance with the system design data. Each single compartment or room in excess of 15 m² shall have a minimum of two sampling points.

**407.7**

Sampling points shall not be painted or coated with any substance that will reduce the size of the opening. Sampling points shall be de-burred internally.

**407.8**

The location of the sampling point shall be marked in a contrasting colour.

**407.9**

Aspirating network pipes shall be installed in accordance with AS/NZS 3000 requirements for flexible conduit or rigid non-metallic conduits (as appropriate). All joints shall be airtight.

**407.10**

Capillary tubes used to branch from the main sampling pipe shall be fixed at both ends so that the joints have a withdrawal force of not less than 10 N.

**407.11**

Capillary tubes shall not restrict the airflow by changes of direction or reduction in cross-sectional areas. Non-metallic capillary tube materials shall comply with the relevant requirements of AS/NZS 4130.

**407.12**

Where the system piping is concealed, the air-sampling points attached to the capillary tubes shall be clearly identifiable by a label reading 'FIRE DETECTION SYSTEM – DO NOT PAINT'.

**407.13**

Sampling points for room protection shall be not more than 300 mm or less than 25 mm from the ceiling.

NOTE – The lower limit of the mounting position of the sampling point may be changed to suit individual applications as determined by smoke tests.

**407.14**

Where the aspirating smoke detection system is capable of providing a range of alarm levels, those used to generate fire alarms shall be sufficiently high to prevent false alarms.

## 408 Delay timers

**408.1**

Delay timers may be used to enable investigation of fire alarm activation where processes or the environment may cause false alarms, and where a proper management process can be instituted to establish the cause of the fire alarm. However, delay timers should not generally be used to delay remote signalling or a general activation of the alerting devices.

**408.2**

Delay timers shall not be used as a substitute for proper system engineering to prevent false alarms due to environmental conditions (see 405.1.1).

**408.3**

Delay timers shall only be used in consultation with the building's fire engineer, regulatory authority, and/or the fire service for the building's fire evacuation procedure.

**408.4**

Delay timers shall not be used to delay alarms from manual call points or heat detectors.

**408.5**

Where a building consent requires a Type 2, 3, 4, 5 or 7 fire system (except smoke detectors in the case of Type 5 or 7), timers shall not be used to delay the fire service response and general operation of the alerting devices.

**408.6**

Any time delay period before remote signalling or general building evacuation should be kept to an absolute minimum.

## 409 Owner isolation facilities

**409.1**

Owner isolation facilities may be provided to prevent a remote alarm being signalled from smoke detectors on Type 7 systems (or where a remote connection is not required) due to predictable false alarms from specific occupant activities (for example manufacturing processes or theatrical smoke).

**409.2**

Owner isolation facilities shall only be used on Type 7 systems or where a remote connection is not required.

**409.3**

Owner isolation facilities shall only be used in consultation with the building's fire engineer, regulatory authority, and/or the fire service for the building's fire evacuation procedure.

**409.4**

Owner isolation facilities shall not be used to inhibit alarms from manual call points or heat detectors.

**409.5**

Owner isolation facilities should not generally be used to inhibit a general activation of the alerting devices.

**409.6**

Where provided, owner isolation facilities shall be accessible from the outside of the control unit and secured against unauthorised use. Positive indication shall be given whenever devices are isolated.

## 410 Hazardous area installations

**410.1**

Detector and/or manual call point indicators of operation may be omitted in hazardous areas provided each hazardous area (and any non-hazardous area immediately above it) is designated a separate zone.

**410.2**

Open- or short-circuit initiating of a fire alarm is permitted in detectors and circuits serving only a hazardous area (and any non-hazardous area immediately above it).

NOTE – There are overriding legal requirements (see 108) applicable to the safeguarding of hazardous areas, which include requirements for safety barrier devices, simple or certified apparatus, and the physical protection of cabling.

# PART 5 COMMISSIONING

## 501 General

**501.1**

Each completed system shall be inspected to ensure compliance with the requirements of this Standard. The relevant inspection and testing requirements of this Part shall be carried out for all multi-zone fire alarm systems and, where applicable, for single-zone fire alarm systems.

**501.2**

EWISs shall be commissioned in accordance with AS 1670.4 (as qualified by 406.8). Speech intelligibility testing by instruments per AS 1670.4 is not required; assessment 'by ear' is acceptable.

**501.3**

Where the maintenance of any part of a fire alarm system is inadequately covered by Part 6, the designer shall compile a draft compliance schedule to provide maintainers with guidance on those parts of the system. The installer shall attach any draft compliance schedule clauses to the certificate of completion and submit a copy to the building consent authority for their consideration as a part of the building's compliance schedule.

## 502 Visual examination

**502.1**

A visual examination of the system as a whole shall be made, checking in particular the following:

(a) Wiring of the control and indicating units;

(b) Where connected, the type of signalling equipment is compatible with the remote receiving centre equipment;

(c) Electrical supply, including batteries, battery accommodation and wiring;

(d) Cable;

(e) Location and area of coverage of detectors;

(f) Manual call point location;

(g) Alerting device locations;

(h) The logbook and documentation specified in 505 has been supplied;

(i) The marking is in accordance with 223 and 402.11;

(j) The zone control and indicating units have been located correctly in relation to the fire service attendance points;

(k) That zones have been correctly designated;

(l) That indicators and legends, when operated, clearly indicate their function at a viewing distance of 2 m.

## 503 Tests on electrical equipment

Carry out tests on all the electrical equipment as follows:

(a) Test that all circuit wiring external to the control unit is isolated from the building earth using the test method specified by the system manufacturer;

(b) Verify that the electrical wiring is in accordance with the requirements of the relevant statutory regulations for 230 volt installations;

(c) Verify that the time delay from operation of a detector or manual call point to the fire alarm signal operation does not exceed 15 s and that a 1 s operation of a manual call point latches the system (see 204.5);

(d) Where ancillary services are connected to the system, verify that the voltages do not exceed the limits specified in 203.3;

(e) Verify that each battery complies with 213 or 214, as appropriate.

To comply with 213, the rated capacity of a battery shall be greater than the minimum, calculated as follows:

For a remotely-connected system: $Ah = (I_Q \times 24) + I_A$

For a non-remotely-connected system: $Ah = (I_Q \times 72) + I_A$

where:

Ah = the minimum rated battery capacity, in ampere hours at the 10 h rate

$I_Q$ = the non-alarm current from that battery (charger off) in amps

$I_A$ = the alarm current drawn from that battery (charger off) in amps;

NOTE – A times 2 derating factor has been applied to the alarm capacity to compensate for battery conversion inefficiencies.

(f) Verify that the output of any battery charger complies with the requirements of 212.

The minimum allowable output rating for a battery charger shall be calculated as follows:

$A = I_Q + (Ah/24)$

where:

A = the minimum allowable battery charger output rating in amps

$I_Q$ = the non-alarm current drawn from that charger (battery disconnected) in amps

Ah = the minimum rated battery capacity calculated in 503(e), in ampere hours at the 10 h rate.

## 504 Tests to verify correct operation and function

**504.1**

Carry out tests to verify the correct operation and function of the system as follows:

(a) All detectors are in circuit;

(b) Manual call point operation, except those designed for once only operation;

(c) Alerting devices, as per 406.3;

(d) Control and switching facilities;

(e) Visual indicators, and also that the correct zone is indicated;

(f) The removal of a detector from a circuit results in a signal being indicated;

(g) The removal of a manual call point from a circuit results in a signal being indicated;

(h) Defect warning facilities by simulating the appropriate defect condition in accordance with 208.1;

(i) Where connected to a remote receiving centre, and with the complete system in the normal operational condition, the operation of a zone circuit results in a fire alarm signal being received;

(j) With the complete system in the normal operational condition, the operation of a zone circuit results in the appropriate alerting devices operating;

(k) Where facilities are provided for evacuating by zones, a test shall be carried out to check that all alerting devices operate when the controls are in the total evacuation mode;

(l) Perform appropriate testing of multi-point aspirating smoke detection systems to ensure that the design objectives for sensitivity, proportion of air and transport time have been achieved.

**504.2**

Perform sample testing of detectors as per 603.3. Particular care should be taken to select a representative sample.

NOTE – Smoke detector sensitivity testing is vital for detecting initial contamination due to construction work.

## 505 Documents

In addition to a logbook for test and survey records required per 602.9 and 603.13, adequate documentation shall be provided and maintained detailing:

(a) All equipment installed, its location, interconnection and intended function, and including battery and battery charger capacity calculations to demonstrate compliance with 212, 213, and 214 of this Standard;

(b) Any special requirements for maintenance or replacement of system components;

(c) Software versions and site-specific configuration data;

(d) All subsequent additions, alterations and amendments to the system, its components and configuration.

NOTE – SAA HB 20 is recommended for use as a source of symbols used in layout and interconnection drawings.

## 506 Certificate of completion

A certificate of completion shall be provided by an accredited inspection body (see 104) to confirm that the installed system agrees with the intent of this Standard. The required certificate of completion is included in Appendix J. The certification of completion shall be held with other documents (see 505). This requirement shall also apply to extensions to systems where additional zones are added and/or the zone control unit is upgraded or replaced.

## 507 System passwords

If a fire alarm system has a password facility, the passwords shall be changed from the system manufacturer's default settings once commissioning is completed, to prevent unauthorised programming changes.

# PART 6 MAINTAINING SYSTEMS IN COMPLIANCE AND GOOD WORKING ORDER

## 601 General

**601.1**

Fire alarm systems shall be maintained in compliance with this Standard and in good working order at all times.

**601.2**

Tests, inspections, other routine maintenance and reporting specified in this Part shall be carried out at the intervals specified. Deficiencies identified by such work shall be remedied in a timely manner (see 601.3).

NOTE – For some systems the compliance schedule may specify intervals different to those specified in this Standard.

**601.3**

Any defect or previously unnotified isolate warnings generated by the fire alarm system shall be immediately investigated and remedial action implemented as appropriate.

To allow a Certificate of Compliance to be issued for the system, the contractor must be satisfied that the system is performing, and will continue to perform, in accordance with the Standard or specification to which it was installed. All deficiencies must be rectified in a timely manner taking account of the probability and degree to which the deficiency will adversely affect system performance.

NOTE –

(1) A Certificate of Compliance is commonly referred to as a 'Form 12A' as defined in the Building (Forms) Regulations 2004. This is not the same as an Appendix J Certificate of Completion, issued at system commissioning.

(2) Significant deficiencies which would lead to a probability of system failure should be urgently attended to, to ensure that the system will operate reliably. Examples of such deficiencies include missing detectors or manual call points, or deficiencies that would significantly delay the operation of the system in the event of a fire. A Certificate of Compliance should not be issued if such deficiencies exist.

(3) Minor deficiencies which are in the process of being rectified should not preclude the ability to issue a Certificate of Compliance. Such deficiencies could include areas with individual detectors out of rule, a zone index that requires updating, and the like. If such deficiencies appear on subsequent inspection reports, a Certificate of Compliance should not be issued until such deficiencies are rectified.

**601.4**

Fire alarm systems which are in 'Fire' alarm condition shall be restored to normal as soon as possible following completion of appropriate checks and servicing functions to ensure the system remains in good working order.

**601.5**

To ensure that the foregoing will occur, there shall be at all times a suitable contract in force that will ensure the regular, and in emergency prompt, attendance of personnel who are competent and qualified. (See 109).

Where the actions described in 601.1 to 601.4 are performed by appropriately qualified persons, then the requirements of this Part of the Standard are deemed to have been met.

## 602 Monthly checks and tests

**602.1**

Monthly checks and tests shall be carried out as specified in this Part by an appropriately qualified person as defined in 601.5.

**602.2**

The float voltage across any rechargeable battery shall be checked to ensure that the voltage per cell is maintained within the limits listed in 212.5.

**602.3**

Where appropriate, the specific gravity and electrolyte level of each cell of any rechargeable battery shall be checked to ensure that it is correct. Check that the voltage of any non-rechargeable cell is above the defect warning level specified in 208.1(a).

**602.4**

The battery cabinet and battery terminals shall be checked to ensure they are maintained in a clean serviceable condition.

**602.5**

Correct operation of the system, including all indicators, shall be tested by using the test facilities in zone circuits with the system in the test or isolate mode. The system shall be reset to normal after completion of the tests. Test the alerting devices to ascertain they operate satisfactorily, as witnessed from the control unit.

NOTE – An acceptable method of testing the alerting devices is where the evacuation switch is operated at a set time and wardens in each zone report alerting devices which do not operate. During this test the system may give a defect warning signal.

**602.6**

Where connected to a remote receiving centre, and with the system in the appropriate test mode, a test of the device for signalling shall be made to ensure that the correct signals are generated and received.

**602.7**

The battery shall be tested for 10 s at not less than the 5 h discharge rate. During this test the battery voltage shall not fall below 80 % of its nominal voltage. The battery under test shall not receive any assistance from any other power source.

**602.8**

Each battery shall be marked with its installation date and any battery which exceeds the service life specified by its manufacturer shall be replaced.

**602.9**

A test report shall be completed and the results entered in the system logbook. The report shall be copied, on request, to the owner and to any authority or agency required to receive one.

NOTE – It is acceptable for detailed test records to be stored off site provided their location is readily identifiable on site and there is evidence (for example in a system logbook) on site that the test has taken place and whether it passed or failed.

## 603 Annual checks and tests

**603.1**

Annual checks and tests shall be as in 602, and additionally as specified in this section.

**603.2**

The warning facilities shall be checked to ensure they are operating correctly for the following conditions:

(a) Failure or disconnection of the battery;

(b) Failure or disconnection of the leads to a detector or manual call point;

(c) Absence of any plug-in zone circuit board.

**603.3**

The operation of all manual call points shall be tested in situ.

Automatic fire detectors shall be tested according to the following:

(a) Heat detectors shall be sample tested in situ by applying a safe heat source to a minimum of 2 % of the detectors. If any detector fails to operate, a further sample of 10 % of all detectors shall be heat tested. If a further failure occurs, 100 % of the detectors shall be inspected to determine the cause of the failure or identify other potentially defective detectors or both. Appropriate remedial action shall be carried out to all affected detectors. Any detectors destroyed during these tests (for example eutectic alloy type) shall be replaced using types of current manufacture and compatible with the system;

(b) Smoke detectors shall be sample tested by checking the sensitivity of a minimum of 20 % of the detectors. These detectors shall then be cleaned in accordance with the manufacturer's instructions for routine maintenance, and given an in situ test by applying test smoke, or other phenomena which directly simulate the fire products being detected. If any detector fails to operate, or if the calibration of any detector falls outside the manufacturer's recommended limits, a further sample of at least 40 % of all detectors shall be tested. If a further failure occurs, 100 % of the detectors shall be inspected to determine the cause of failure or identify other potentially defective detectors or both. Appropriate remedial action shall be carried out on all affected detectors. Where a smoke detector is able to signal a maintenance request when its calibration falls outside the manufacturer's recommended limits, the requirements for cleaning above may be omitted providing the smoke entry of the detector is externally clean. The sensitivity of all aspirating smoke detectors shall be tested. At least 20 % of sampling points shall be given an in situ test as above;

(c) Other detector types shall be tested by means appropriate to that detector type;

(d) All detectors and sampling points in the system shall be tested in rotation. A log shall be kept detailing the tested detectors and sampling points to ensure that all detectors and sampling points are systematically tested;

(e) A minimum of one detector per zone shall be tested.

The in situ test shall be of a simple 'go/no go' nature and shall check that both the device and zone control unit operate correctly.

Detectors with finite life (eg carbon monoxide) that have reached the end of their manufacturer's specified service life shall be replaced or refurbished.

**603.4**

The operation of each zone circuit from either the end of line device, or the most remote detector or manual call point, to the output of the control unit signalling device shall be checked.

**603.5**

A thorough visual examination shall be made of the general condition of all components of the system.

**603.6**

All aspirating system pipe work shall be cleaned using alternating vacuum or positive pressure to remove internal dust build-up. All aspirating smoke detector filters shall be cleaned or replaced as per manufacturer's instructions.

NOTE – In dirty environments this may need to be performed more often.

**603.7**

The entire premises shall be checked to ensure that all areas are protected and that any building alterations, or changes in usage of any area, have not reduced the effectiveness of the system.

**603.8**

Indicators and legends shall be checked to ensure that they are still current and that they clearly indicate their function at a viewing distance of 2 m.

**603.9**

The correct operation and function of the defect warning facilities shall be checked by simulating the appropriate condition in accordance with 208.1.

NOTE – Tests for defect conditions 208.1(i), (j) and (k) may be omitted if the equipment does not allow practical field testing of these conditions.

**603.10**

The interface shall be checked between the fire alarm system and any ancillary service forming part of the building's fire safety system (such as smoke control system, lift override, etc.).

NOTE – This test may only check that the relay has operated. It is not a functional test of the ancillary equipment connected via the relay. Any ancillary equipment which operates as a result of the fire alarm operation needs to be checked by the service provider who maintains the ancillary devices, as these devices or equipment may be a separate compliance schedule item.

**603.11**

The circuit wiring external to the control unit shall be tested, using the test method specified by the system manufacturer, to ensure it is isolated from the building earth.

**603.12**

Initiation of a fire alarm within 90 s of the introduction of suitable test smoke or gas into the penultimate hole of each branch of an aspirating sampling network shall be checked.

**603.13**

A test report shall be completed which records the results of all tests and inspections together with a list of non-complying features and corrective measures necessary to return the system to compliance with this Standard. The report shall be copied to the owner, with a copy lodged as required by any compliance schedule issued in respect of the Building Act.

**603.14**

Testing and inspection shall be carried out to ensure correct operation of all alerting devices and that the building is adequately covered as defined in 406.3. All necessary measurements, adjustments and repairs shall be included to ensure the correct functioning of all alerting devices. All tests and results shall be recorded.

NOTE – The annual test and inspection described may be combined with any mandatory trial evacuation tests (for example, as required by the Fire Safety and Evacuation of Buildings Regulations).

## 604 Emergency warning and intercommunication systems (EWIS) – additional requirements

The checks and tests as specified in 601 to 603 inclusive shall be carried out for EWISs where applicable and, in addition, the checks and tests specified in AS 1851 sections 9 and 10, as applicable, shall be undertaken.

# PART 7 PRECAUTIONS TO BE TAKEN WHEN A FIRE ALARM IS RENDERED INOPERATIVE

## 701 General

Fire alarms may be rendered inoperative from time to time to effect maintenance, repairs or alterations. The contractor shall follow the procedures and the owner shall take the precautions specified in this Part of the Standard.

NOTE – Where the system being isolated is a necessary part of the fire safety requirements for the building under a building consent, the building should not be occupied in the affected areas during the period of isolation unless compensatory fire precautions are taken (see Appendix K).

## 702 Notification

### 702.1

Before the alarm system is rendered inoperative, oral notification of the extent and effect of the impairment shall be given to the authorised representative of the owner or occupier, or person in charge of the building. If an emergency compels immediate action to render the system inoperative, such notification shall be given as soon as possible thereafter.

### 702.2

Oral notification shall be confirmed promptly in writing.

### 702.3

Notification to the owner shall be given on a notification form, a sample of which is provided in figure K1. This form also gives precautions which the owner should take during the period the alarm system is inoperative.

### 702.4

Where the alarm system is rendered inoperative, in whole or in part, the notice in figure K2 shall also be used to identify the presence and extent of the impairment. This notice shall be completed by the contractor at the time of isolation or impairment, and affixed to the main control or indicating unit. The notice shall remain in place until the whole system is restored.

## 703 Permanent disconnection

The contractor shall notify the fire service and territorial authority in writing when an alarm system is rendered permanently inoperative.

## 704 Authorisation

Except in emergency, the system shall not be rendered inoperative until the owner or the owner's representative has authorised the work by signing the notification form in figure K1.

# APPENDIX A – SIGNALLING TO A REMOTE RECEIVING CENTRE

(Normative)

## A1 Types of connection

The need for signal transmission ('connection') to a remote receiving centre should be determined by reference to the declared functional requirements of the system (see 105), and connection will be required as follows:

| Declared functional requirement | Acceptable type of remote receiving centre | |
|---|---|---|
| | NZ Fire Service | Other |
| (a) To transmit an alarm to summon NZ Fire Service assistance – as per 105(a) | Yes | No |
| (b) To transmit an alarm to summon some other specified emergency fire-related assistance – as per 105(f) | No | Yes |
| (c) To monitor and signal to a remote location the presence of faults – as per 105(b), | | |
| where: | | |
| 105(a) applies – as in (a) above | Yes | No |
| 105(f) applies – as in (b) above but NOT (a) | No | Yes |

## A2 Means of connection

Signalling to a remote receiving centre shall be achieved by:

(a) A dedicated signal path from each control unit;

(b) A signal path common to more than one control unit; or

(c) An alarm transport system.

NOTE – In all cases, the characteristics of the receiving equipment need to be established.

## A3 Functional requirements

**A3.1**

Each control unit shall be connected to a co-located or integral transmitting device which shall communicate continuously with the remote receiving equipment.

**A3.2**

Each control unit shall be separately identifiable by the fire service alarm transport system.

**A3.3**

The ability of the transmitting device to transmit a signal shall not be dependent on the energy supply from the control unit.

**A3.4**

Where the transmitting device cannot be powered from the remote receiving equipment, a separate supply shall be provided, integrated with the transmitting device and with the capacity to ensure that a defect signal can be transmitted on complete failure of the electrical supply to the control unit.

**A3.5**

The separate supply shall be supervised to give a defect warning as required by this Standard and shall have sufficient capacity to signal in event of the main system battery failure.

**A3.6**

Failure of the communications link between the transmitting device and the remote receiving centre shall not result in a fire signal at the receiving centre.

**A3.7**

Failure of the communications link between the transmitting device and the remote receiving centre unit shall result in an appropriate signal at the receiving centre.

## A4 Sector indicating unit

**A4.1**

Where multiple control units are located in one building or on one site, a sector indicating unit may be required by the fire service at the attendance point.

**A4.2**

The location of the individual control units relative to the usual viewing position of the sector indicating unit shall be clearly defined on the sector indicating unit (see figure A1).

**A4.3**

Where both sector and zone indicators are provided on one unit, clear differentiation shall be made between the two functions.

**A4.4**

The sector indicating unit needs to provide fire indication only.

**A4.5**

No sector indicating unit is required if all zone indicating units are co-located.

**A4.6**

The sector indicating unit shall be located near the main entrance point so that, in order to reach a control unit, the fire appliance is not required to return along roads already traversed.

**A4.7**

If there is more than one main entrance point, it may be necessary to have repeating sector indicating units located at the other main entrance points.

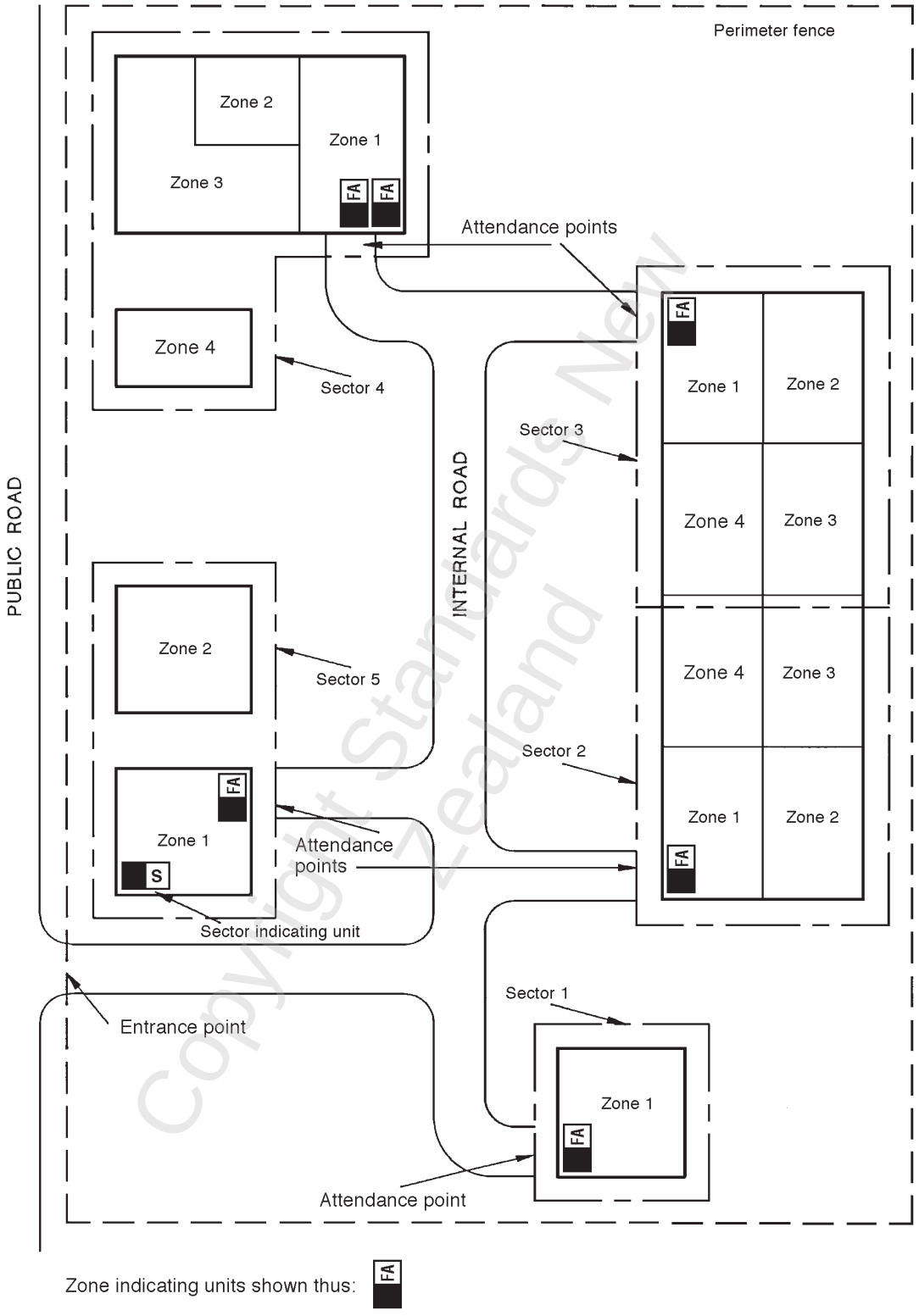



**Figure A1 – Example layout of zones and sectors**

## A5 Power supplies

**A5.1**

The power supply for sector indicating units shall meet the requirements of 211, 212, 213, and 403.3.

**A5.2**

The sector indicating unit may share a power supply with repeating sector indicating units but shall not share a power supply with any other control units.

## A6 Installation

**A6.1**

The installation of sector indicating units shall meet the requirements of Part 4 as applicable.

**A6.2**

All zones shall be included in the designation of sectors.

## A7 Commissioning

**A7.1**

The commissioning of sector indicating units shall meet the requirements of Part 5 as applicable.

**A7.2**

Checks shall also be made that sector indicating units have been located correctly in relation to the fire service attendance points and that sectors have been correctly designated.

## A8 Regular inspection and testing

**A8.1**

The inspection and testing of sector indicating units shall meet the requirements of Part 6 as applicable.

**A8.2**

The sector indicating units shall be tested to ensure correct operation.

# APPENDIX B – TYPES OF FIRE ALARMS

(Informative)

## B1 Introduction

For the purposes of this Standard, the equipment needed for the various types of fire alarms defined in the Compliance Documents for NZBC Fire Safety Clauses is usually as follows.

NOTE –

(1) This appendix is based on the July 2010 requirements of the NZBC Compliance Documents. Users should check for any subsequent amendments.

(2) This appendix is for general information only. Refer to the Compliance Documents for NZBC Fire Safety Clauses for the full description of the various types.

(3) Type 1 systems (domestic smoke alarms) are not covered by this Standard.

## B2 Type 2

A single or multi-zone manual fire alarm system with automatic signalling to a remote receiving centre.

## B3 Type 3

An automatic fire alarm system activated by heat detectors and manual call points with automatic signalling to a remote receiving centre.

NOTE – Sprinkler coverage to NZS 4541 or NZS 4515 may be allowed to be substituted for all or part of the heat detection in a Type 3 system.

## B4 Type 3b

The suffix 'b' indicates that in firecells where only a single escape route is available, a Type 4 or Type 6 alarm is required.

## B5 Type 4

An automatic fire alarm system activated by smoke detectors and manual call points with automatic signalling to a remote receiving centre.

NOTE – In limited circumstances, heat detectors may be allowed to be substituted for smoke detectors where the ambient conditions of a space are not suitable for smoke detectors.

## B6 Type 4e

Type 4e is no longer used.

## B7 Type 5

A Type 5 alarm system is a variation of a Type 4 alarm system that requires the Type 4 smoke detection in specified sleeping accommodation firecells only to sound a 'hush'-able local alarm and alert local building management (if any), provided that in addition those specified firecells are provided with heat detection (or sprinkler protection) that results in the alerting of all building occupants.

### B8 Type 6

An automatic fire sprinkler system with automatic signalling to a remote receiving centre plus a Type 2 manual fire alarm system. Sprinkler activation is also required to interface with the Type 2 system's alerting devices.

### B9 Type 7

An automatic fire sprinkler system with automatic signalling to a remote receiving centre plus a Type 4 smoke detection and manual call point system.

NOTE – It is optional for smoke detectors to automatically signal the remote receiving centre.

### B10 Type 7e

A variation of a Type 7 system which requires the Type 4 component to be a Type 5 system within firecells containing sleeping accommodation.

### B11 Sub Type f

The suffix 'f' indicates a direct connection to the fire service is not required provided a telephone is installed and freely available at all times to enable '111' calls to be made.

### B12 Type 8

Emergency warning and intercommunication voice communication system (EWIS) and emergency telephone system complying with AS 2220.1.

# APPENDIX C – SUPPLEMENTARY DETECTORS AND SYSTEMS

(Informative)

| | Category of detector or system supplementary to the main fire alarm system: | | |
|---|---|---|---|
| | **Supplementary (additional) detectors (see 204.1(d)) eg in-duct smoke detectors, heat detectors in lift shaft, escape route smoke detectors** | **Supplementary fire alarm systems (see 401.8) eg supplementary high sensitivity smoke detection, linear heat sensing cable, in-cabinet smoke detection** | **Other fire protection systems (see 218.9) eg sprinkler system, gas flood system, deluge system, restaurant suppression system** |
| **Is full building coverage required before considering?** | Yes | Yes | Yes |
| **May the supplementary detector or system operate the main fire alarm system's alerting devices?** | Optional. (Via a zone circuit of the main fire alarm system). May reset automatically (see 204.2). | Yes. Either via a zone circuit of the main fire alarm system, or directly (as right). | Optional. Must connect directly. Must have its own silence alarms switch (see 205.5). Interconnection must be supervised by the main fire alarm (see 218.9). |
| **May it operate a main fire alarm system zone indicator?** (must be red, see 210.5) | Optional. (Recommended if the detectors operate alerting devices or signal remotely). | Yes | Recommended if the other system is remote connected (see 402.8.2(d), 210.5). |
| **May the supplementary detector or system signal fire or defect remotely?** | Optional. (Via a zone circuit of the main fire alarm system). | Optional. (Via a zone circuit of the main fire alarm system). | Optional. Fire must not signal via the main fire alarm system (see 203.4), but some defects may do so (see 203.4 and 205.5). |
| **Is a zonal relaxation permitted for the supplementary detector or system?** | Not applicable. | Yes | Not applicable. |
| **What Standard is the supplementary detector or system required to comply with?** | NZS 4512 | NZS 4512 | Whatever technical Standard is applicable to the other system. |

NOTE – This table is intended as a ready reference for some aspects of the relevant clauses. It is not a substitute for a full understanding of them.

# APPENDIX D – SPECIFICATION FOR HEAT ACTUATED FIRE DETECTORS

(Normative)

## D1 General

**D1.1**

This Appendix specifies performance testing for electrical and electronic detectors. Alternative technologies that do not comply with the specific requirements, but give equivalent performance, are not necessarily prohibited. In such cases, appraisal testing will need to demonstrate this to the satisfaction of the relevant authority.

**D1.2**

Attention is drawn to the general requirements for detectors contained elsewhere in this Standard. In particular, the requirement for mechanical alarm contacts to be normally closed (216.6), the requirement for detectors to have visual operation indication (216.5), and the prohibition on use of eutectic alloys for heat detection (216.7).

## D2 Materials, design and construction

**D2.1**

The selection and application of materials, and the design and construction of the detector shall ensure that, under normal conditions of installation and use, and taking into account any depreciating factors which may be reasonably anticipated, there is no risk of mechanical or electrical failure and reliability of operation is maintained.

**D2.2**

Detectors shall be made of corrosion resistant material, or plated or otherwise suitably treated to resist the particular atmosphere likely to be met in service.

**D2.3**

The base on which live parts are mounted and the insulating material, if any, between current and non-current carrying parts shall consist of strong, moisture-resistant, insulating material of low flammability.

**D2.4**

Any plastic material used in the detector shall meet the requirements of the test specified in D7.2.

**D2.5**

Any sealing compound used in a detector shall not fail to perform its intended function at any temperature less than 20 °C above the detector's rated temperature.

## D3 Mounting facilities

**D3.1**

Detectors shall be provided with a suitable means for their secure mounting. This mounting shall be designed so that it has sufficient strength to resist any distortion which may affect the operation of the detector where fixed to an uneven surface.

**D3.2**

The means of mounting detectors shall be such that they are supported independently of their connecting leads, and provision shall be made for accommodating this wiring by means of a mounting recess or connection box.

## D4 Connecting facilities

**D4.1**

Terminals shall be so designed that the conductors connected to them are rigidly and effectively clamped between metal surfaces and that a connection shall not slacken or overheat under normal conditions of use. The metal clamping surfaces or screws that come into direct contact with conductors shall be made of non-ferrous materials.

**D4.2**

The terminals shall be capable of taking at least two conductors each of 1.5 $mm^2$ of cross-sectional area. Soldered joints shall be made without use of fluxes containing corrosive substances.

**D4.3**

Each terminal shall be marked, either by colouring, lettering, or otherwise as may be necessary, to indicate the correct manner of connecting it to the circuit conductors. The marking shall remain legible during the service life of the detector. No identification marking shall be placed on screws, washers or other parts which may be removed when conductors are being connected.

**D4.4**

Where pillar-type terminals are used, the screw shall be of sufficient length to extend to the far side of the terminal hole and shall have a diameter approximately equal to that of the hole. The ends of the screws shall be rounded or chamfered to prevent damage of the conductors, and the side of the hole against which the screw bears shall be smooth and unbroken.

**D4.5**

Binding-screw type terminals shall be designed to retain the strands of the conductor, and if the connection is made under the head of a screw or bolt, a cup shaped washer or equivalent device suitable for repeated use shall be provided.

**D4.6**

Screw threads shall comply with an appropriate specification. The terminal screws shall engage at least two full threads in metal and shall be capable of passing the torque test requirements given in AS/NZS 3100. During, and as a result of this test, the threads of the screwed component and its fixing shall not strip, insulating material shall not crack and there shall be no other failure that would render the screwed component non-reusable.

**D4.7**

Detectors intended for use in areas prone to higher corrosion than normal shall have their electrical connections encapsulated or otherwise protected to prevent the ingress of moisture.

## D5 Internal conductors

All internal conductors of an electrical detector shall be provided with a minimum of 250 V grade insulation or equivalent insulating sleeving, apart from short lengths adequately and permanently spaced from non-current-carrying metal parts.

## D6 Contacts

**D6.1**

Contacts shall have surfaces of suitable material such as silver or other metal or alloy of equivalent characteristics. For any application where hydrogen sulphide or other corrosive gas may be present, contacts shall be made of palladium or similar corrosion resistant metal.

**D6.2**

Electrical contacts and other moving parts of a detector shall be enclosed in a manner that shall afford protection against moisture, dust, insects and other foreign matter which may adversely affect their normal operation.

**D6.3**

Any adjustment affecting the operation of the detector shall be a factory adjustment, and shall be effectively and permanently sealed to prevent tampering or movement under normal conditions of installation and use.

## D7 Tests

### D7.1 General

**D7.1.1**

Sufficient samples shall be supplied for appraisal testing to enable a minimum of five detectors to be subjected to each test.

**D7.1.2**

Unless otherwise stated, all tests shall be initiated and conducted with the test apparatus, sample detector, and air stream or test liquid stabilised at a temperature of 23 ± 2 °C.

**D7.1.3**

Unless otherwise stated, all tests shall be initiated and conducted with the sample detector connected in the normal way to a compatible zone control unit (or equivalent), in normal operational orientation. The control and indicating equipment shall be reset as necessary after each detector operation.

**D7.1.4**

A suitable airflow oven for carrying out the tests of D7.5.1(c) and D7.5.2 shall satisfy the rate of rise of temperature requirements, and have a minimum air velocity of 0.15 m/s at the point where the test sample is situated.

**D7.1.5**

The actual (measured) fixed operating temperature of individual detectors may be used for performance testing instead of the rated temperature. In these cases, the detector's actual operating temperature shall be established as per D7.7.

**D7.1.6**

During the airflow oven tests of D7.5.1(c) and D7.5.2, the rear of the sample shall be covered or sealed to prevent any airflow through the sample that is not characteristic of a normal installation.

## D7.2 Heat-resisting test

The enclosure, base and the insulating material between current- and non-current-carrying parts shall be subjected to a ball pressure test by means of the apparatus shown in figure D1. The surface of the part for test shall be placed in a horizontal position and a steel ball of 5 mm diameter shall be pressed against this surface with a force of 20 N. The test shall be made in a heating cabinet at the detector's rated temperature plus 20 ± 5 °C. After 1 hour, the ball shall be removed and the diameter of the impression measured. This diameter shall not exceed 2 mm.

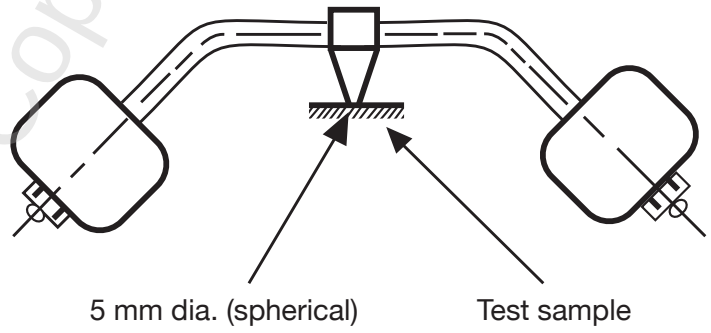



**Figure D1 – Ball pressure apparatus**

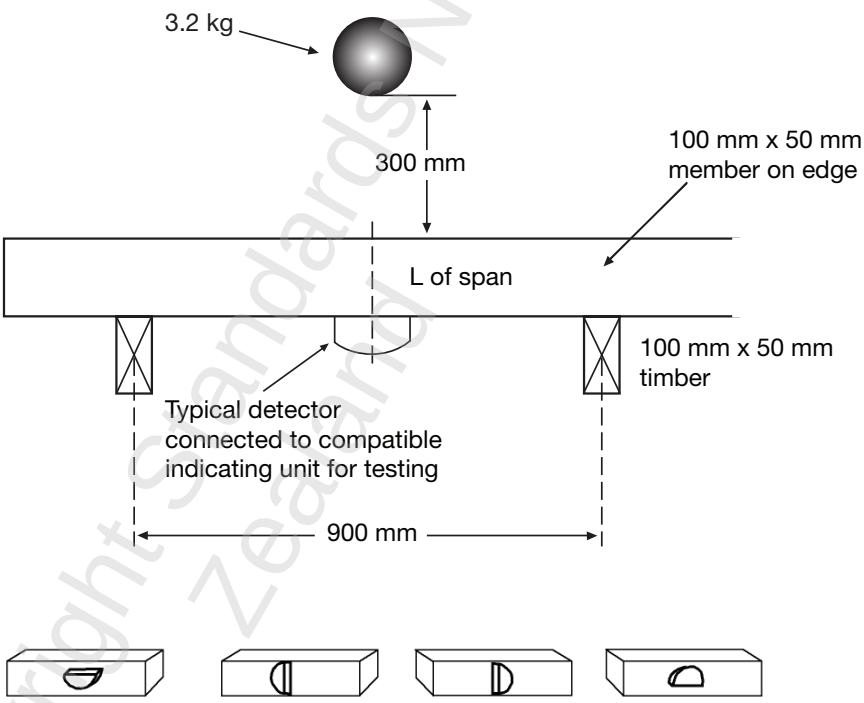
## D7.3 Resistance to shock test

### D7.3.1

A detector shall be capable of withstanding a test for resistance to shock by means of the test arrangement shown in figure D2. The detector shall be mounted on a piece of 100 mm by 50 mm hardwood timber fixed on edge on supports of the same material spaced 900 mm apart (centre to centre). The test shall be made with the detector in the following positions:

(a) At the mid-point on the horizontal underside;

(b) At the mid-point on the vertical side (tested at the four different orientations shown).




Additional positions for testing detectors

**Figure D2 – Resistance to shock test**

### D7.3.2

A metal sphere weighing 3.2 kg shall be dropped on to the mid-point of the timber from a height of 300 mm above the horizontal face of the timber.

### D7.3.3

The detector shall be considered satisfactory if:

(a) No operation of the detector is indicated as a result of the shock;

(b) No failure of any component occurs during the test; and

(c) The response time of the detector lies within the limits specified in D7.5.1(c) or D7.5.2(d) (as applicable) after the shock test.

## D7.4 Vibration test

### D7.4.1

A detector shall be attached in its normal operating orientation to a vibrating table. It shall then be subjected to a vertical sinusoidal vibration of amplitude 0.127 mm peak to peak for a period of 5 min at each of the following frequencies:

10, 15, 20, 25, 30, 35, 40, 45, 50, 55 and 60 Hz.

### D7.4.2

Operation of the detector or resonance of any component shall be noted. If resonance occurs the detector shall be vibrated at the resonant frequency for a period of 60 min. If no resonance occurs, the detector shall be vibrated at 50 Hz for 60 min.

### D7.4.3

The detector shall be considered satisfactory if:

(a) No operation of the detector is indicated during vibration;

(b) No failure of any component occurs during the test; and

(c) The response time of the detector lies within the limits specified in D7.5.1(c) or D7.5.2(d) (as applicable) after vibration.

## D7.5 Performance tests

### D7.5.1

Fixed-temperature detectors shall sequentially pass the following tests:

(a) The heat collector or sensitive element of the detector shall be immersed in oil. The temperature of this liquid shall then be raised to 5.5 ±1 °C below the detector's rated temperature. This temperature shall be maintained for 24 h during which the detector shall not operate;

(b) The heat collector or sensitive element of the detector shall be immersed in oil which has been pre-heated and maintained at 5.5 ±1 °C above the detector's rated temperature. The detector shall operate within 60 s of immersion; and

(c) The heat collector or sensitive element of the detector shall be placed in a suitable heated airflow testing oven. When the air temperature is raised at a rate of 5.5 °C per min the detector shall operate not later than 3 min after the air temperature reaches the detector's rated temperature.

### D7.5.2

Rate of rise detectors shall pass all of the following tests:

(a) The heat collector or sensitive element of the detector shall be placed in a suitable heated airflow testing oven. The temperature of the heated air shall be raised at several different rates of rise and as evenly as possible. During this test the detector shall operate within the minimum or maximum response curves shown on the graph in figure D3;

(b) Rate of rise fire detectors shall include in their construction a limiting mechanism or fixed temperature detector. After the performance tests in heated air described in D7.5.2(a) above, the following additional tests shall be made to ensure the stability of the detector and the fixed temperature limit;

(c) The heat collector or sensitive element of the detector shall be immersed in oil or other suitable liquid (or placed in a suitable heated airflow testing oven) and raised to a temperature of 5.5 ±1 °C below the detector's rated temperature. This temperature shall be maintained for 24 h during which the fixed temperature device shall not operate, nor shall the rate of rise response device operate once it has stabilised in the elevated temperature;

(d) The heat collector or sensitive element of the detector shall be placed in a suitable heated airflow testing oven. When the air temperature is raised at a rate of 2 °C per minute the fixed temperature device shall operate not later than 7.5 min after the air temperature reaches the detector's rated temperature, whether or not the rate of rise device has operated.

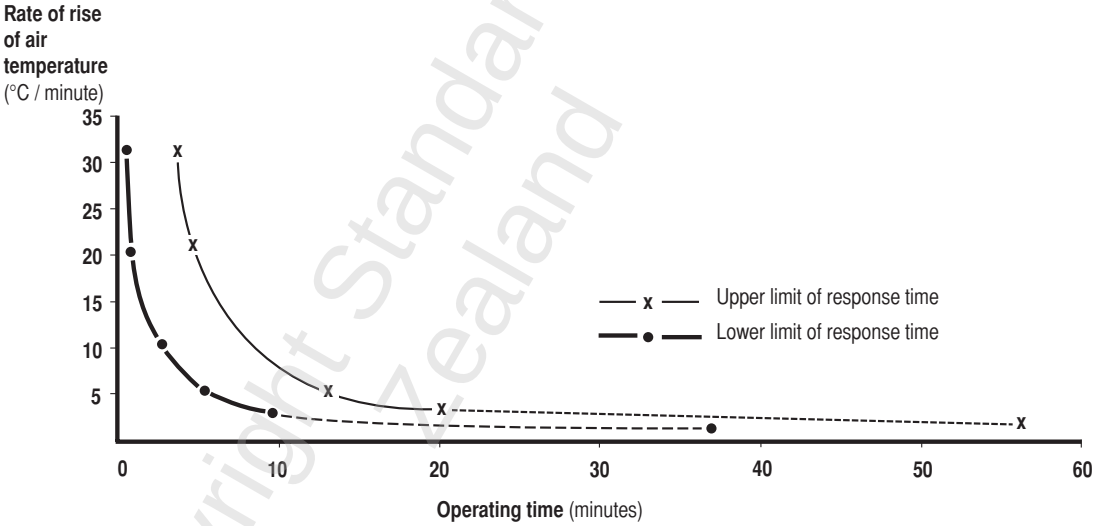



**Figure D3 – Rate of rise heat-actuated fire detectors**

## D7.6 Corrosion test

### D7.6.1

Upon satisfactory completion of the performance tests of D7.5.1(c) or D7.5.2(d) (as applicable), detectors shall be subjected to a 16 day exposure to an atmosphere of neutral salt spray (fog).

### D7.6.2

The procedure and equipment used for salt spray shall follow those described in ASTM B117.

**D7.6.3**

A detector shall be considered satisfactory if:

(a) Normal use of the detector is possible after salt spray exposure;

(b) No significant structural failure of any component occurs during the salt spray exposure; and

(c) On subsequent re-test to D7.5.1(c) or D7.5.2(d) (as applicable), the detector's response time is no greater than 1.25 times the applicable limit.

### D7.7 Determination of fixed operating temperature (option with requirements)

**D7.7.1**

As permitted in D7.1.5, the actual (measured) fixed operating temperature of individual detectors may optionally be used in performance testing instead of the rated temperature.

**D7.7.2**

The heat collector or sensitive element of the detector shall be immersed in oil or other suitable liquid. The temperature of this liquid shall then be raised at a rate less than 0.5 °C per minute until the fixed temperature element of the detector operates. This temperature shall be recorded as the (measured) fixed operating temperature of the detector.

**D7.7.3**

The (measured) fixed operating temperature of the detector shall be within ±3 °C of the detector's rated temperature.

## D8 Temperature classification

**D8.1**

All detectors shall be classified according to their rated temperature (at which the fixed temperature element is set).

**D8.2**

The colour code for each temperature classification shall be as follows:

Range within:

| | | | |
|---|---|---|---|
| 54 °C | – | 61 °C | Blue |
| 62 °C | – | 71 °C | Red |
| 72 °C | – | 80 °C | Yellow |
| 81 °C | – | 105 °C | Green |
| 106 °C | – | 121 °C | White |
| | > | 121 °C | Black |

## D9 Marking

**D9.1**

The following information shall be clearly and permanently marked on all detectors:

(a) The manufacturer's name or registered trade mark;

(b) Colour code to indicate the fixed element temperature classification. This shall be visible when the detector is fixed in place;

(c) The detector's rated temperature (see 104);

(d) Identification of detectors for use in corrosive atmospheres.

NOTE – The information in D9.1(a), (c) and (d) is not required to be visible when the detector is fixed in place.

**D9.2**

Where a detector's rated temperature is determined remotely (for example an analogue addressable device), the colour code and rated temperature markings of D9.1(b) and (c) may be replaced by a type or model identification, provided the actual rated temperature selected is readily verifiable by other means.

# APPENDIX E – SPECIFICATION FOR MANUAL CALL POINTS

(Normative)

## E1

Manual call points shall be of a strong, rigid construction. The method of operation shall be two-stage, either:

(a) The breaking or displacing of a frangible or resettable element followed by the manual operation of a switch; or

(b) The opening of a transparent cover or flap followed by the breaking or displacing of a frangible or resettable element.

## E2

The method of operation shall be clearly indicated by a concise inscription similar to that shown in figure E1 This notice shall be displayed on or adjacent to each manual call point. The minimum dimensions of this notice and of the manual call point shall be 85 mm by 85 mm, and the colour of the shaded area shall be red (approximating shade no. 537 of NZS 7702).

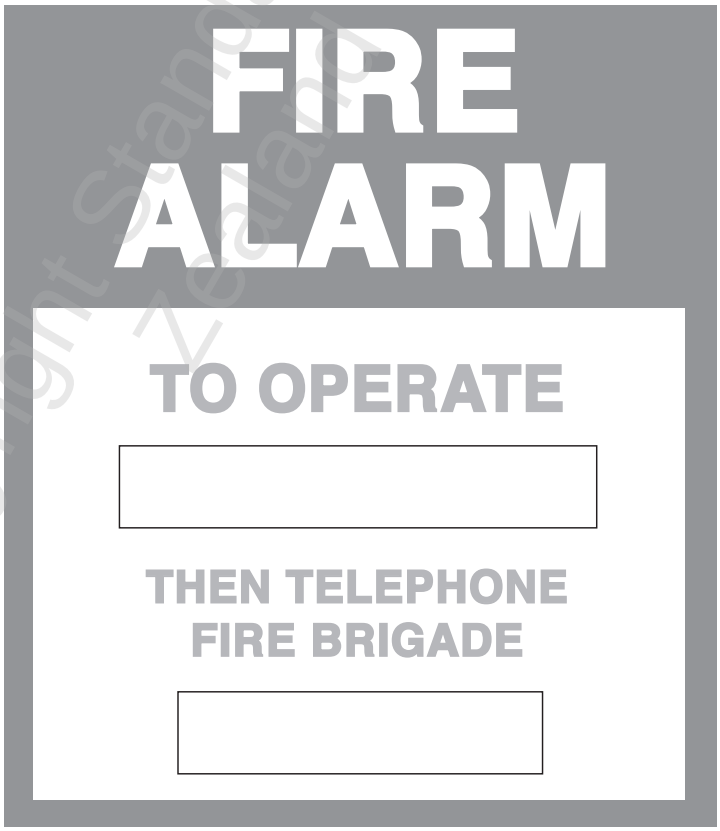



**Figure E1 – Typical notice to be displayed on, or adjacent to, each manual call point**

NOTE – Insert the method of operation and telephone number of fire service or other site emergency number in the appropriate boxes.

**E3**

The construction shall provide safeguards against accidental operation.

**E4**

All manual call points shall provide a visual indication of operation. This indication shall latch in the alarm condition until manually reset from the control unit.

**E5**

Connection arrangements shall be such that it is not possible to remove a manual call point from the circuit without initiating a defect warning.

**E6**

The frangible material or resettable element shall comply with the test requirements of BS EN 54-11 or ISO 7240-11.

**E7**

Manual call points exposed to the weather or other damp locations (such as wash down areas or manufacturing processes) shall have a degree of protection to at least IP54 of AS 60529. This may be achieved by means of the cover of E1(b), or by an additional cover labelled 'COVER ONLY'.

**E8**

The colour finish of the outside shall be red (approximating shade no. 537 of NZS 7702) on at least 50 % of the exposed surface.

**E9**

Where a manual call point uses a mechanical contact to initiate a fire alarm, that contact shall be closed in its normal condition, opening to initiate the fire alarm.

**E10**

Where the occupancy of the premises can result in repetitive malicious false alarms of fire, the cover of E1(b), or an additional cover labelled 'COVER ONLY', may incorporate a non-latching audible device to identify that the cover has been opened.

**E11**

Any cover or flap must not impede the easy activation of the manual call point.

**E12**

A red single-action (type A) manual call point complying with BS EN 54-11 or ISO 7240-11 and fitted with a transparent cover or flap is deemed to comply with E1(b), E3, E6, E8, and the dimensional requirements of E2.

# APPENDIX F – AUDIBLE ALERTING SIGNALS

(Normative)

## F1 General

Unless otherwise specified in this Standard, audible alerting signals shall comply with the following requirements, as applicable.

## F2 Evacuation signal

**F2.1**

The evacuation signal shall be emitted in cycles of 24 s nominal duration. Each cycle shall consist of four identical bursts of a frequency-modulated square wave tone uniformly (by period or frequency) increasing from 500 Hz to 1200 Hz, followed by one or two identical verbal messages, in accordance with figure F1.

**F2.2**

Where required by the particular application, the total length of the verbal evacuation message may be extended to a maximum of 20 s per cycle, and the message repetition may be omitted, however the four tone bursts per cycle shall remain.

## F3 Alert signal

**F3.1**

The alert signal shall be a repetitive interrupted square wave tone of 420 Hz having equal on-off duration of 0.625 s each.

**F3.2**

Upon assignment of an alert signal to an evacuation zone, the first tone burst may be 50 dB below the maximum output, in which case each successive tone burst shall have an amplitude of 10 dB above that of the previous one until the maximum is reached at the sixth tone burst. All subsequent tone bursts after the sixth shall have the maximum output.

**F3.3**

A graphical representation of the initial character of the alert signal (with the optional amplitude escalation) is given in figure F2.

**F3.4**

A verbal message shall be interspersed with the alert signal, provided that between 15 s and 24 s of alert tone cadence is produced between messages. The verbal alert message should have a maximum total length of 20 s.

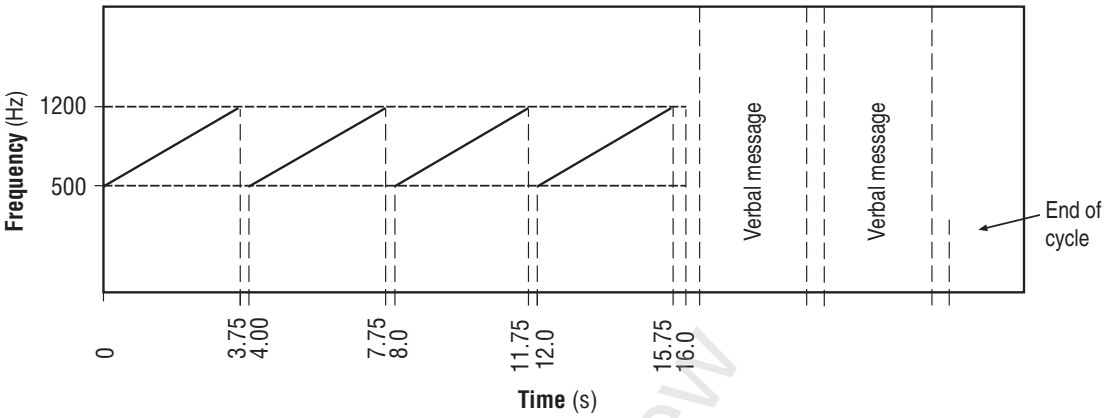



**Figure F1 – Typical evacuation signal**

## F4 Verbal messages

**F4.1**

Verbal messages shall be either digitally stored or use voice synthesised techniques. All messages shall be clear and intelligible, without heavy accent. The signal shall have a minimum operational band width of 300 Hz to 4 kHz.

**F4.2**

Each verbal message shall be in a form consistent with the particular building's evacuation scheme, and shall provide clear and readily understandable instructions.

**F4.3**

The verbal evacuation message should include the word 'evacuate' as well as the word 'fire' and/or 'emergency'.

## F5 Tolerances

The frequencies and durations for audible signals specified may vary within ± 5 %, over the full operating temperature range, including anticipated long-term ageing effects. Amplitudes specified in F3 may vary within ± 5 dB. Digitally generated, frequency stepped increments shall not exceed 4 %.

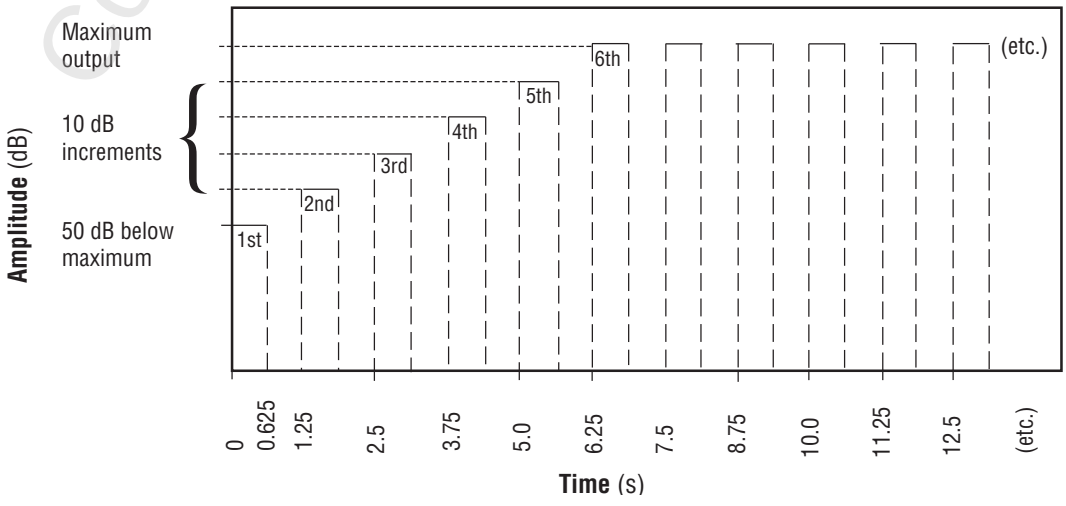



**Figure F2 – Alert signal**

# APPENDIX G – STANDARD ZONE INDEX SYMBOLS

(Normative)

**Table G1 – Symbols**

| Symbol | Usage | Colour |
|---|---|---|
|  | Building outline (bold) | Black |
|  | Internal walls with no through access.<br>May also be zone demarcation | Black |
|  | Zone demarcation with access available between zones | Black |
|  | Projection line to a plan view of a hidden area<br>eg mezzanine, basement | Black |
|  | Area of special fire protection or ancillary system coverage | Amber |
|  | Accessway between levels<br>– stairs, escalators, travelators, ramps | Black |
|  | Lift | Black |
| 'YOU ARE HERE' | Reader orientation title (upper case) | Red |
|  | Directional arrow indicating a location | Black |
|  | Building access point<br>Placed outside building outline and oriented appropriately | Black |
|  | Main indicating unit (fire alarm panel) | Black |
|  | Sector indicating unit | Black |
|  | Repeater zone index (mimic panel) | Black |
| **FSI** | Fire sprinkler inlet | Red |
| **CV** | Sprinkler control valves (if not co-located with FSI)<br>(CV location can also be written adjacent to 'sprinkler operated' light-emitting diode (LED)) | Red |

The font shall be upper case Arial, and a minimum size of 3 mm.

All lettering shall be positioned to read horizontally. Vertical alignment is not permitted.

Use of a legend is only required when additional non-standard symbols are required and their meaning is not clearly discernible.

# APPENDIX H – SELECTION AND LOCATION OF FIRE DETECTORS

(Informative)

## H1 General

### H1.1

Fire detectors are designed to respond at an early stage to one or more of the four major characteristics of combustion, that is, heat, smoke, flame or gas.

### H1.2

No single type of fire detector is suitable for all types of premises, situations or types of fires, but some detector types are better suited to detect certain types of fire than others, and each detector type is prone to different sources of spurious activation. See table H1 for general recommendations of suitable and unsuitable fire detectors for various applications.

### H1.3

Detectors should be chosen for the best response to the effects of fire without spurious activation caused by ambient conditions. The best results may be obtained by installing a mixture of detector types.

### H1.4

Detectors should be located where detection is most likely in the early stages of a fire. The smoke produced by a smouldering fire is likely to be moved about in a room by the general air movement. As soon as flaming combustion starts, convection will lift the smoke and heat to the ceiling, and spread it horizontally. Therefore standard practice is to locate detectors at regular intervals on the ceiling.

### H1.5

Heating, ventilation and air conditioning systems (HVAC), high or glass roof ceilings, or other building characteristics may significantly impair the effectiveness of detectors, as the smoke or heat may not reach the detector. In such cases, alternative locations and/or additional detectors may be necessary.

### H1.6

There is no substitute for good engineering practice, and the selection of the detector most suitable for the environment and for the characteristics of the fires that may occur.

NOTE – The Compliance Documents for NZBC Fire Safety Clauses only recognise heat and smoke detectors (and sprinklers), and have specific requirements for their selection and installation. The use of any other detector type for basic coverage is an Alternative Solution, and will need to be supported by specific fire engineering design.

## H2 Heat detectors

**H2.1**

Heat detectors respond to the temperature rise associated with a fire.

**H2.2**

A fixed temperature heat detector is designed to operate when the temperature at the detector exceeds a predetermined value. A rate of rise detector is designed to operate when the rate of temperature rise at the detector exceeds a predetermined value.

**H2.3**

Smoke detectors should be preferred to heat detectors where detection of visible smoke or smouldering fires is required. Rate of rise detectors should be avoided where rapid temperature fluctuations are expected.

## H3 Ionisation smoke detectors

**H3.1**

Ionisation smoke detectors respond to very small smoke particles.

**H3.2**

Ionisation detectors have a wide range of response. They are most sensitive to fire situations where flaming has occurred and less sensitive to slow smouldering fire situations where flaming has not yet occurred. They contain a small amount of radioactive material which may present disposal problems.

**H3.3**

Ionisation smoke detectors should be avoided in cooking areas, in areas subject to high air velocity or wind gusts, near sources of steam, or anywhere combustion exhaust may be present.

## H4 Photoelectric smoke detectors

**H4.1**

Photoelectric detectors measure the scattered light from smoke particles. They are most sensitive to larger, cooler, smoke particles typical of smouldering fires and fires involving overheated electrical cabling. They are sometimes called ‘optical’ or ‘photo-optical’ detectors.

**H4.2**

Photoelectric detectors should be avoided where steam or dust may occur. They can be used in locations where motor vehicles operate.

**H4.3**

As the combustion products from alcohol and some chemical fires are generally invisible, they may not be detected by this type of detector.

## H5 Linear beam smoke detectors

**H5.1**

Linear beam smoke detectors measure the reduction of intensity of a beam of light due to the presence of smoke particles. They have a broad response to a wide range of smoke types, and are particularly useful for detection applications in large spaces.

**H5.2**

They are very sensitive to misalignment of, or interference with the light beam, and therefore require careful installation. Specific adverse influences include: building occupant activity, thermal expansion, wind and seismic deformation and strong light sources.

**H5.3**

Specific fire engineering is strongly recommended for glazed, sloping or high ceiling applications to ensure correct placement.

## H6 Aspirating smoke detectors

**H6.1**

Aspirating smoke detectors use high sensitivity detection elements connected via an aspirating system (suction fan) to a pipe network, with air sampling points located similarly to point style smoke detectors.

**H6.2**

Careful engineering design of the aspirating pipe network is necessary to ensure their effective use.

## H7 Flame detectors

**H7.1**

Flame detectors respond to the heat radiation emitted by a fire. They must be aimed at the fire, so it is normally necessary to use several detectors to cover one area. Careful engineering design is needed to ensure their effective use.

**H7.2**

Flame detectors are most suitable for detecting very fast growing fires such as flammable liquid fires, and are also useful for detecting flaming fires in large open spaces.

## H8 Carbon monoxide (CO) fire detectors

**H8.1**

CO fire detectors respond to the presence of carbon monoxide (CO) gas which is characteristic of fires involving carbon-based materials.

**H8.2**

Carbon monoxide is produced when incomplete combustion occurs during slow or smouldering fires. CO is generally present in indoor fires where mixed materials burn.

**H8.3**

CO detectors are unsuitable for detecting clean burning fires where complete combustion is accomplished and should also be avoided anywhere combustion exhaust gases may be present. Due to CO fire detectors being a relatively new technology, they are currently only recommended for use as part of a specific fire engineering design.

## H9 Combination detectors

**H9.1**

Combination (sometimes known as 'multiple criterion' or 'multi-sensor') detectors combine two or more of the above detection techniques in a single device.

**H9.2**

The most common combination detectors are the photoelectric and heat devices. Combining the heat sensor and the photoelectric detector increases the device's response to faster flaming fires that produce less visible smoke. Such detectors can achieve a similar response to ionisation detectors across a broader range of fires but without the same spurious activation characteristics.

**H9.3**

Manufacturers have also introduced other combinations of sensors in their detectors with the objective of achieving a broader response to genuine fires and increased immunity to spurious alarms.

## H10 Cleaning of smoke detectors

**H10.1**

Smoke detectors should only be cleaned in accordance with the detector manufacturer's instructions. Careful checking should always be carried out during site inspections or surveys to ensure that no smoke detectors are clogged in their grilles with dust or dead insects.

**Table H1 – Recommended fire detectors for different applications**

| Location | Ionisation smoke | Photoelectric smoke | Linear beam smoke | Aspirating smoke | Carbon monoxide (CO) | Fixed temperature Thermal | Rate of rise thermal | Flame | Specific fire engineering |
|---|---|---|---|---|---|---|---|---|---|
| Bedrooms/sleeping areas | ✓ | ✓ | OK | OK | ✓ | OK | OK | OK | OK |
| Offices, shops | ✓ | ✓ | OK | OK | ✓ | ✓ | OK | OK | OK |
| Auditoriums/clubs (theatrical smoke) | x | x | x | x | ✓ | ✓ | OK | OK | ✓ |
| Autoclave/sterilizer areas | x | x | x | x | ✓ | ✓ | x | OK | OK |
| Bathrooms/laundries | x | x | x | x | OK | ✓ | x | OK | OK |
| Boiler/furnace rooms | x | x | x | x | x | ✓ | x | x | OK |
| Car parking [1] | x | x | OK | x | xx | ✓ | ✓ | OK | OK |
| Ceiling or roof voids with access | OK | OK | OK | OK | OK | ✓ | OK | OK | OK |
| Ceiling or roof voids difficult access | x | x | OK | OK | x | ✓ | OK | OK | ✓ |
| Cleaners'/understair cupboards | x | x | x | x | x | ✓ | ✓ | OK | OK |
| Cool rooms/freezers [2] | x | x | x | OK | x | OK | ✓ | OK | ✓ |
| Electrical risers | ✓ | ✓✓ | x | OK | x | ✓ | OK | OK | OK |
| Electrical switchrooms/cupboards | ✓ | ✓✓ | OK | ✓ | x | ✓ | OK | OK | OK |
| Flammable liquid hazard areas [3] | ✓✓ | ✓ | OK | OK | x | ✓ | OK | ✓ | OK |
| Forced air flow/draughts | x | ✓ | OK | OK | OK | ✓ | OK | OK | ✓ |
| Fume cupboards [3] | x | x | x | x | x | ✓ | ✓ | OK | ✓ |
| High/difficult access ceilings | OK | OK | ✓✓ | ✓ | ✓ | OK | OK | OK | ✓ |
| HVAC duct sampling | OK | ✓ | OK | OK | x | x | x | x | ✓ |
| Ice rinks [1] | OK | x | OK | OK | OK | ✓ | ✓ | OK | OK |
| Kitchens | x | x | x | x | OK | ✓ | x | x | OK |
| Kitchen extract ducts [1] | xx | xx | xx | xx | x | ✓ | x | x | OK |
| Paint spray booth(s) [3] | x | x | x | x | x | ✓ | OK | OK | OK |
| Service shafts | ✓ | ✓ | x | OK | ✓ | OK | OK | OK | OK |
| Stables [1] | x | x | OK | x | ✓ | ✓ | OK | OK | OK |
| Warehouse with vehicles and/or non-electric forklift | xx | ✓ | OK | OK | xx | ✓ | OK | OK | OK |
| <1.8 m from rooms containing bath, shower, or steam source | x | x | x | OK | ✓ | ✓ | x | OK | ✓ |

KEY – ✓✓ strongly recommended ✓ recommended OK may be used
x not advised xx do not use

NOTE –

(1) Environmental protection may also be required.

(2) Cold rooms and freezers can be difficult to reliably protect and will usually need special engineering including heaters to prevent ice build-up on detectors, manual call points, and alerting devices.

(3) Hazardous area.

# APPENDIX J – CERTIFICATE OF COMPLETION FOR FIRE ALARM SYSTEM

(Normative)

Front side

FIRE ALARM SYSTEM DECLARATION OF COMPLIANCE

Building consent no. ..... Certificate no. .....

1. Building (and area of building, if relevant) .....
2. Location .....
3. Nearest fire station .....
4. Name and address of owner.....
5. Name and address of installation agent .....

5a. Name and qualifications of system designer (if not installer) .....

6. Details of system: automatic/manual/single-zone/multi-zone/other (specify)
   - (a) The declared functional requirements.....
   - (b) Equipment manufacturer .....
   - (c) Equipment appraisal certificate or listing no(s). .....
   - (d) General description – occupancy .....
   - (e) Detail of any remote connection .....
7. Details of ancillary services connected to the system .....

   .....
8. Date of consent ……Date of completion .....
9. Commissioning details on reverse this sheet completed YES / NO
10. Battery load calculations attached YES / NO
11. Index plan attached YES / NO
12. System documentation provided YES / NO

| | |
|---|---|
| I hereby certify that all work that we have carried out on the above system has been performed in accordance with NZS 4512 and in the manner defined by clause 109.<br><br>***Installer:***<br>Signed .....<br>Name of signatory .....<br>Capacity of signatory .....<br>Qualifications of signatory .....<br>Date .....<br>Company .....<br>Address ..... | I hereby certify that the above system and its installation process has been inspected, assessed, and tested by an accredited inspection body in accordance with NZS 4512, and on the basis of the results, this system complies with the Standard.<br><br>***Accredited inspection body:***<br>Signed .....<br>Name of signatory .....<br>Capacity of signatory .....<br>Date .....<br>Company .....<br>Address ..... |

Copyright waived

(Reverse side)

RECORD OF COMMISSIONING TESTS REQUIRED FOR FIRE ALARM SYSTEM

| | |
|---|---|
| Building | |
| Address | |
| City | |
| System make | Type 2, 3, 4, 5, 7, other |

| Detector zone | Electrical Tests | | Operational Tests | | | | Number of other devices | Total points on zone | Location of EOLD[1] |
|---|---|---|---|---|---|---|---|---|---|
| | Loop resistance ohms[1][2] | Complies with manufacturer's earth isolation test requirements | Number of detectors | | | Number of call points | | | |
| | R – B | Yes/No | Smoke | Heat | Other | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| Alerting zone | Location of EOLD[1] | EVAC monitor tested | Number of alerting devices | Sound level measured (tone) | |
|---|---|---|---|---|---|
| | | | | Max. | Min. |
| | | | | | |
| | | | | | |
| | | | | | |

**Technician** | **Date:**

NOTE –

(1) On conventional systems this is measured with the end of line device (EOLD) shorted out.

(2) On analogue addressable systems it may not be practicable to measure the loop resistance due to the presence of loop isolator devices. In this case follow the loop resistance test procedure specified by the system manufacturer.

# APPENDIX K – NOTIFICATION FORMS – FIRE ALARM ISOLATION

(Normative)

NOTE – Where the system being isolated is a necessary part of the fire safety requirements for the building under a building consent, the building should not be occupied in the affected areas during the period of isolation unless compensatory fire precautions are taken.

## Fax Back Form From:

Date: _____

Building name: _____

Contractor: _____

Contractor telephone contact details: _____

**To:** Customer: _____

Attention: _____ No. of pages: _____

Ph. Number: _____ Fax Number: _____

## FIRE PROTECTION SYSTEM SHUTDOWN

**INSTRUCTIONS:**

- 24 hours notification of all programmed isolations shall be given in writing to the Fire Service and the Building Owner prior to a sprinkler system being rendered inoperative.
- If an emergency compels immediate action to render a system inoperative, such notification shall be given as soon as possible afterwards.
- NZS 4541 & 4515 (sprinkler systems), 4512 (fire alarm systems), 4510 (fire hydrants), 4503 (hose reels), require Sections A and B to be completed and sent to the New Zealand Fire Service or their agents prior to a fire sprinkler shutdown. Section B requires OWNERS APPROVAL and for the Owners to notify their insurers if the systems are isolated for more than 12 hours.

NOTE –

1. Partially isolated systems - If a section or zone of a fire sprinkler system is isolated , blanked off or left impaired whilst the main system is restored a tag label shall be attached to the main sprinkler stop valve indicating which sections are affected. Building owners must inform NZFS and their insurers that the system has been partially restored and must inform the Fire Service and their insurers when the isolated sections have been restored.
2. Send completed forms and notifications to the New Zealand Fire Service by email: fireinfo@fire.org.nz or by fax 09 309 8223. For more information phone 0800 FIREINFO (0800 347 346)

**OWNERS** – please **sign** your approval of this shutdown in **Section B** of this form and fax to your insurer / broker/ agent.

NZFS Fax: _____ Date: ____/____/_____ Building owner's insurance Fax: _____ Date: ____/____/_____

### Section A Fire System / Site Detail

**SYSTEM** PFA No: _____

Building Name: _____

Address: _____

Fire System: Sprinkler 4541 ☐ Sprinkler Pumps ☐ Sprinkler 4515 ☐ Fire Alarm 4512 ☐ Hydrants 4510 ☐ Hose reels 4503 ☐

Areas affected: _____

**SHUTDOWN**

Shutdown date: _____ Shutdown time: _____ Reinstated daily: _____

Reinstatement date: _____ Reinstatement time: _____ Continuous shutdown: _____

**SECTION OF SYSTEM LEFT ISOLATED WHILST MAIN SYSTEM RESTORED** Date due for completion: _____ Date completed: _____

Work to be completed during system shutdown: Alterations: ☐ Damage to system: ☐ Maintenance work: ☐

Other: _____

**OWNERS** – please use this form to notify your '**building insurers**' of all shutdowns, reinstatements and of any sections of a system left isolated.

NOTE – If a section or zone of a fire sprinkler system is isolated, blanked off or left impaired whilst the main system is restored, a tag label must be attached to the main sprinkler stop valve indicating which sections are affected.

### Section B Owners Approval

Date: _____ Name: _____ Insurers Notified: Yes ☐ No ☐

Time: _____ Signature: _____ Date: _____

NOTE – Failure by the owner to notify insurers of an impairment or partial isolation of an alarm system or sprinkler installation may void insurance cover.

**☑ OWNER SAFETY PRECAUTIONS FOR FIRE SYSTEM SHUTDOWN**

- ☐ Forbid smoking in the area affected by the fire system shutdown
- ☐ Stop hazardous processes
- ☐ Where sprinklers are installed ensure they are operative
- ☐ Ensure all smoke stop doors are closed
- ☐ Ensure Alarm Company can re-establish evacuation sounders if required
- ☐ Where other systems (lifts, air conditioning etc.) are affected by shutdown, manual controls need to be checked
- ☐ Arrange to notify others who may use the building during the period of isolation
- ☐ Ensure building occupiers know that they must dial '111' for FIRE
- ☐ Detail 'FIRE WARDENS' to patrol affected area. (One person per 1000 $m^2$)
- ☐ No 'HOT WORK' by any parties whilst the fire system is shutdown.

NOTE – If your building has smoke detectors be aware that dust, heat and fumes from building work may activate your fire alarm.

Service company name: _____ Phone: _____ Fax: _____

Any queries, please contact: Name: _____ Phone: _____ Cell phone: _____

**Figure K1 – Typical form for notifying that an installation is to be rendered inoperative**


The notice should be affixed to the outside of the main control or indication panel whenever any isolation or impairment of the system is undertaken. This notice should be filled in by the technician undertaking the work, at the time of the disablement.

Name of building.

Address of premises.

NZFS assigned PFA number (if applicable).

Date and time of the issue of the notice.

Aspect of or type of system which has been disabled. Internal monitoring refers to a system function such as bell or earth fault monitoring. External monitoring would affect a signal to a remote receiving centre, such as overriding a defect signal.

Provide brief details of the circumstances, and what systems are not operational, in text a lay person can understand.

Provide details of what is required before the work can be completed, and the system reinstated – include anything that needs to be done by any other party.

Technician should provide an estimate of when the system is going to be fully reinstated, allowing for any other work which might be required.

Allocated area for service contractor to tear off and follow up with service report or job sheet.

NOTE – Colour of notice should be red background with white lettering

**Figure K2 – Typical notice of system impairment**

# APPENDIX L – GUIDELINES FOR ASSESSMENT OF COMPETENCE AND QUALIFICATION

(Informative)

## L1 General

This Appendix provides guidance to installers on assessing their competence and qualification to certify the design, installation, and commissioning of fire alarm systems in accordance with NZS 4512.

Section 109 specifies that personnel undertaking design, installation, maintenance, and testing of fire detection and alarm systems need to meet New Zealand Qualifications Authority (NZQA) recognised qualification levels or an equivalent as described below.

The 'Certificate of Completion' of Appendix J requires that system installers formally certify both the work they have undertaken and the qualification of the personnel who have performed it. This certification has legal standing and is relied upon by various authorities. In case of dispute or loss, it may become subject to legal challenge.

In situations where the signatory to the Appendix J certificate does not hold the specific qualification recognised by NZQA, or has not personally performed or supervised all of the installation work being certified, it is strongly recommended that such a signatory establish robust documentary evidence through an assessment process demonstrating how the requirements of section 109 have been met for:

(a) The 'equivalence' of their qualifications to those specified in section 109, and

(b) Their supervisory relationships with those who actually performed the work.

Underpinning the assessment procedures is the principle that quality cannot be inspected into a system but instead must be built into the process that produced it.

The design and manufacture of fire alarm equipment and components is covered by the requirements of this Standard for these to be listed, and for the listing number(s) to appear on the Certificate of Completion (Appendix J). No additional assessment is required.

The routine testing and maintenance of fire alarm systems is covered by the legally-mandated Independent Qualified Person (IQP) approval scheme. No additional assessment is required.

NOTE – Design refers to the technical design of fire alarm systems to this Standard. It is not intended to represent the 'fire report' design which is typically completed by a fire engineer and separately noted on the Appendix J certificate and possibly also on the building consent. Until a specific NZQA qualification for fire alarm system design is developed, technical designers should evaluate their qualification and competency to undertake such work in a form that can be readily peer reviewed within the context of an overall system inspection to this Standard.

## L2 Qualified individual signatory

Any individual who holds an NZQA National Certificate in Fire Detection and Alarms (Level 4) and is responsible for the overall design, installation, and commissioning of a fire alarm system (either personally, or by staff under their direct personal (on-job) supervision, or by colleagues who hold the same qualification) is deemed by section 109 to meet the requirements to sign a Certificate of Completion (Appendix J). No additional assessment is necessary other than routine confirmation of each person's ongoing competence.

## L3 Larger organisation systems

Typically, in a larger organisation, a number of employees or members of staff (qualified, partially-qualified, and unqualified) are collectively responsible for the design, installation, and commissioning of a fire alarm system. One employee qualified to the NZQA National Certificate in Fire Detection and Alarms (Level 4) (or 'equivalent' qualified) will sign the Certificate of Completion (Appendix J) on behalf of the company.

The company's internal systems then assume a vital role in ensuring a formal supervisory connection between the person who signs the Certificate of Completion and those who actually performed the work.

It is thus strongly recommended that these relationships, and the qualifications of the various personnel, be formally assessed and documented.

Consideration should be given to assessing how they manage apprentices or unqualified personnel working under the supervision of an NZQA qualified 'or equivalent' qualified person. It would be reasonable to expect the degree of this supervision to depend on the experience and knowledge of the apprentice, and to progressively decrease as they gained experience and/or progressed toward formal qualification.

Consideration should also be given to assessing how they would demonstrate that any subcontractors who carried out installation work held suitable qualifications, or equivalent competency, or were working under the supervision of an NZQA qualified 'or equivalent' qualified person. Again, it would be reasonable to expect the degree of this supervision to depend on the experience and knowledge of the subcontractor.

It would be reasonable to expect that if an organisation has a quality management system certified by an accredited quality management system certification body as compliant with ISO 9001, and with a scope that includes the design, installation, and commissioning of fire alarm systems, much of this documentation would already exist, or, if it did not exist, could be formally developed and controlled within such a system.

## L4 'Or equivalent' signatory

When in either of the situations in L2 or L3 the person signing the Certificate of Completion (Appendix J) does not hold an NZQA National Certificate in Fire Detection and Alarms (Level 4), then an assessment is necessary to determine equivalence.

People holding a relevant overseas qualification are encouraged to apply to NZQA for an international qualifications assessment to formally evaluate their qualification against the New Zealand requirements.

Knowledge and experience gained in New Zealand can also be formally recognised through an industry training organisation competency based assessment process whereby individuals experienced in their trade are examined for knowledge and experience in relation to the requirements of the relevant NZQA national certificate. This process includes an oral, written, and practical examination supported by site visits and evidence provided. If the assessor is satisfied that the candidate meets the requirements of the National Certificate the unit standards are registered with the NZQA and a formal qualification can be awarded.

In situations where either of the above is not practical, an organisation or individual needs to either self-assess or have a suitable third party assess the adequacy of both practical ('how to do it') and theoretical ('what to do') components of the qualifications and experience that the personnel designing, installing, and commissioning the system do have, in order to reasonably establish objective and practical equivalence to the level of the minimum NZQA qualifications specified in section 109.

This assessment of equivalence should be performed taking into account a combination of typical factors such as:

(a) Relevant overseas fire alarm qualification(s);

(b) Relevant level 5 (or higher) New Zealand qualifications;

(c) Completed work towards a relevant NZQA qualification;

(d) Technical membership of a relevant New Zealand or international professional body;

(e) Recent industry experience;

(f) Examples of recent successfully-completed system design work, fully compliant, and accepted by an accredited inspection body;

(g) Examples of recent successfully-completed installation work, fully compliant, and accepted by an accredited inspection body;

(h) Equipment supplier training certificates;

(i) Evidence that the individual has access to and knowledge of this Standard (NZS 4512) and its referenced documents;

(j) Their relative skills and experience in relation to the system being installed;

(k) The nature of any deficiencies found in systems previously offered for inspection (in effect an individual experience rating with accredited inspection bodies).

It is recommended that any self-assessment be independently peer reviewed.

By way of specific examples:

Registered/qualified electricians could reasonably be expected to have much of the 'how to do it' ability, but would need to carefully assess their adequate knowledge of, and familiarity with, design and installation to NZS 4512 plus fire alarm systems technology in particular.

Registered electrical appliance service persons (formerly ESTA registered electrical service technicians) or security technicians who hold an NZQA National Certificate in Electronic Security (Level 4) could reasonably be expected to have much of the general 'what to do' knowledge, but would need to carefully assess their competence in and knowledge of the areas of general installation practice; knowledge of, and familiarity with, design and installation to NZS 4512; plus familiarity with fire alarm systems technology in particular.

# APPENDIX M – SUMMARY OF KEY CHANGES IN NZS 4512:2010

(Informative)

This summary does not list unamended clauses, tables, figures, or very minor editorial changes. The term 'rewritten' is a more extensive change than 'modified' which includes only small additions or small deletions.

| Number | Clause / figure / table heading or subject | Description of change |
|---|---|---|
| – | Referenced documents | Modified |
| – | Foreword | Rewritten |
| – | Outcome statement | New |
| 103.3 | Italicisation | Clause deleted. Italicisation for defined terms discontinued |
| 103.4 | Formal interpretations | New clause |
| 104 | Definitions | Changes to:<br>Accredited inspection body (was in 107.1(e))<br>Ambient sound level<br>Building consent<br>Building consent authority<br>Combustible<br>Household unit<br>Residual sound level<br>Sound pressure level<br>Territorial authority<br>Zone |
| 107.1(e) and note | Accredited Inspection Body | Some text moved to Definitions.<br>Note modified |
| 109 | Workmanship, competency, and qualifications | Rewritten and expanded |
| 201.5 | Fire alarm systems required | 201.5(a) modified and note added |
| 205.3 | Internal silence alarms switch | Clause modified<br>Note added |
| 205.4 | External silence alarms switch | Note added |
| 212.1 | Battery charger | Clause modified |
| 216 | Detection system | More cited standards added |
| 216.4A | Combination/multi-sensor detectors | New clause |
| 216.5 | Visual indicators | Exception added |
| 216.6 | Mechanical contact | Last sentence added |
| 216.7 | Eutectic alloy | Last sentence added |
| 216.11 | Detector environmental protection | Clause modified |
| 218.2 | Alerting device environmental protection | Clause modified |
| 218.3 | Alerting device colour finish | Last sentence added |
| 220.1 | Environmental tests – General | Clause modified |

| Number | Clause / figure / table heading or subject | Description of change |
|---|---|---|
| 220.8 | Environmental tests – Test environments | (b) modified |
| 222.2 | Radio frequency immunity | Cited standard change |
| 224.2.2 | Main operating software | Clause modified |
| 401.1 | Sectors and multiple buildings | Clause modified |
| 401.2.1 | Zoning of floors and ceiling spaces | Additions to both (a) and (b) |
| 401.2.2 | Zoning of ceiling spaces | Clause modified |
| 401.2.3 | Area per zone | (d) added |
| 401.2.4 | Zoning | First sentence modified |
| 401.3 | Sprinklers as thermal detectors | Note added |
| 401.5 | Attached areas to zone | Clause modified |
| 401.6 | Zone designation | Clause modified<br>Note added |
| 402.1 | Cable | Clause rewritten |
| 402.2 | Cable installation | (f) modified and note added<br>(g) and (m) modified<br>(q) and (r) added |
| 402.5 | Mounting | Clause modified |
| 402.8.1 | Zone index | Clause modified |
| 402.8.2 | Zone index | Modifications to (b), (g), (h) and (m) |
| 402.11 | Component marking | Clause modified |
| 403.1.1 | Indicating unit location | Second sentence added |
| 403.1.2 | Indicating unit location | (a) rewritten |
| 403.2 | Control unit location | (d) modified |
| 403.5 | End of line device location | New clause |
| 404.1 | Manual call point locations | First sentence of clause modified<br>Note added |
| 404.4 | External manual call points | Addition to end of clause. |
| 405.1.3 | Smoke detector substitution | Addition to first sentence<br>(c) rewritten<br>Note 2 added to (h) |
| 405.2.1 | Detector locations | (g) and (h) modified<br>(j) and note modified<br>Addition to (m) (vi)<br>Note added to (m)<br>(n)(iii) rewritten – some text moved to 405.5.1<br>(o) modified<br>(p) rewritten<br>(q) rewritten<br>(r) modified<br>(s) rewritten and note modified |

| Number | Clause / figure / table heading or subject | Description of change |
|---|---|---|
| 405.5 | Ceilings exceeding 20 m in height | New clauses (405.5.1 and 405.5.2) – some text was in 405.2.1(n)(iii) |
| Figure 1 | Typical detector locations at apex of ceiling, roof, or surface | Figure 1(e) has been modified and (f) – (i) have been renumbered |
| Figure 2 | Effect of protrusions (beam, joist, purlin etc.) on detector location and spacing | Figure has been modified |
| Figure 3 | Protection of built-in storage enclosures (for example cupboards and wardrobes) flowchart | Figure has been rewritten to reflect changes to 405.2.1(p), (q), (r), and (s) |
| 405.2.2 | Partial coverage | (b) modified and note added<br>(h) rewritten |
| 405.3.1 | Point-type heat detector spacing | (a) modified |
| 405.3.2 | Line-type heat detector spacing | (b) and (c) modified |
| 405.3.3 | Point-type smoke detector spacing | (c) modified |
| 405.3.4 | Beam-type smoke detector spacing | (c) and (d) modified |
| 405.3.6 | Sloping ceilings | Clause modified |
| 405.4 | Indicators | Second paragraph modified<br>Third paragraph added |
| 406.2 | Verbal messages | Note added |
| 406.3 | Sound pressure levels | Cited standard change<br>Last sentence added<br>Sound descriptor updated |
| 406.4 | Visual alerting | Second paragraph modified<br>Sound descriptor updated |
| 406.7 | Light and noise alerting | Sound descriptor updated |
| 406.8 | EWIS as alerting device | Clause modified |
| 406.11 | Type 5 system | Clause modified |
| 407 | Multi-point aspirating smoke detectors | Name change from ‘aspirated’ to ‘aspirating’ throughout the document |
| 407.9 | Aspirating network pipes | Reference to NZECP 28 deleted |
| 409.1 | Owner isolation facilities | Second example added |
| 410 | Hazardous area installations | New clauses (410.1 and 410.2) |
| 501.2 | EWIS commissioning | Clause rewritten |
| 503 | Tests on electrical equipment | (a) rewritten |
| 505 | Documents | First sentence modified |
| 507 | System passwords | New clause |
| 601.2 | Test intervals | Clause modified<br>Note added |
| 601.3 | Remedial action | Substantial additions to clause<br>Notes added |

| Number | Clause / figure / table heading or subject | Description of change |
|---|---|---|
| 602.9 | Test reporting | Clause modified<br>Note added |
| 603.3 | Testing of detectors | Last sentence added |
| 603.11 | Insulation testing | Clause rewritten |
| 604 | Emergency warning and intercommunication systems (EWIS) – additional requirements | Cited standard updated |
| 702.4 | Impairment notice | New clause |
| Appendix B | Types of fire alarms | Appendix rewritten to match latest Compliance Documents |
| D4.1 | Heat detector terminals | Clause modified |
| Appendix E | Specification for manual call points | Appendix rewritten to allow alternative operation method<br>E2 and figure E1 title and note modified<br>E5, E6, E7, and E10 modified<br>E11 and E12 added |
| F2.1 | Evacuation signal | Clause modified |
| Figure F1 | Typical evacuation signal | Timing of verbal messages deleted |
| H3.2 | Ionisation detector response | Clause modified |
| H4.1 | Photoelectric detector response | Clause modified |
| Table H1 | Recommended fire detectors for different applications | Aspirating smoke now a tick in electrical switchrooms/cupboards |
| Appendix J | Certificate of completion for fire alarm system | Certificate modified<br>Declarations rewritten<br>Form on reverse redesigned |
| Figure K1 | Typical form for notifying that an installation is to be rendered inoperative | Change in figure number<br>Form has been modified to mirror NZS 4515 |
| Figure K2 | Typical notice of system impairment | New figure |
| Appendix L | Guidelines for assessment of competence and qualification | Original appendix (Other Standards for fire protection) deleted and replaced with competence and qualifications appendix (new) |
| Appendix M | Summary of key changes in NZS 4512:2010 | New appendix |

# INDEX

# NOTES

# NOTES

Approved by the Standards Council on 27 August 2010, to be a New Zealand Standard pursuant to the provisions of section 10 of the Standards Act 1988.

First published: 20 September 2010

The following SNZ references relate to this Standard:

Project No. P 4512
Draft for comment No. DZ 4512
Typeset by: Standards New Zealand
Printed by: The Colour Guy

STANDARDS
NEW ZEALAND
PAEREWA AOTEAROA