New Zealand Standard

Interconnected smoke alarms for houses

Superseding NZS 4514:2002

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This Standard was prepared under the supervision of the P 4514 Committee the Standards Council established under the Standards Act 1988.

The committee consisted of representatives of the following:

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Department of Building and Housing	Nick Saunders
Electrical Contractors' Association of New Zealand	John Howard
Fire Protection Association of New Zealand	David Percy
Institution of Fire Engineers New Zealand	Peter Menzies
Insurance Brokers' Association of New Zealand	Peter Hughes
IPENZ/Society of Fire Protection Engineers	John Davidson
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New Zealand Institute of Architects	Ken Collins
NZ Fire Equipment Manufacturers' Association	David Prosser

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AMENDMENTS

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

NZS 4514:2009

New Zealand Standard

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REFERENCED DOCUMENTS

Reference is made in this document to the following:

NEW ZEALAND STANDARD

NZS 4512:2003	Fire detection and alarm systems in buildings

JOINT AUSTRALIAN/NEW ZEALAND STANDARD

AS/NZS 2201:- - - -	Intruder alarm systems
Part 1:2007	Client's premises – Design, installation, commissioning and maintenance

INTERNATIONAL STANDARD

ISO 12239:2003	Fire detection and fire alarm systems – Smoke alarms

AUSTRALIAN STANDARDS

AS 3786:1993	Smoke alarms
AS 1670:- - - -	Fire detection, warning, control and intercom systems – System design, installation and commissioning
Part 6:1997	Smoke alarms

BRITISH STANDARD

BS 5446: - - - -	Fire detection and fire alarm devices for dwellings
Part 1:2000	Specification for smoke alarms

OTHER STANDARDS

CAN/ULC S531:2002	Standard for smoke alarms
EN 14604:2005	Smoke alarm devices
UL 217:2006	Single and multiple station smoke alarms

NEW ZEALAND LEGISLATION

Electricity Regulations 1997

Radiocommunications Regulations 2001

LATEST REVISIONS

The users of this Standard should ensure that their copies of the above-mentioned New Zealand Standards are the 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 are welcomed. They should be sent to the Chief Executive, Standards New Zealand, Private Bag 2439, Wellington 6140.

OUTCOME STATEMENT

NZS 4514:2009 will continue to help prevent loss of life and provide ongoing protection of houses (single household units) by specifying requirements for the installation, commissioning, and maintenance of externally-powered interconnected smoke alarms.

FOREWORD

The purpose of installing smoke alarms in homes is to provide early warning of a potentially life-threatening situation in sufficient time for all occupants to escape, or be assisted to escape, safely.

Fires in houses, flats, and apartments account for the majority of fire fatalities in buildings in New Zealand, and most of these preventable deaths occur while occupants are asleep or otherwise unable to either detect or respond to a fire condition in time.

This Standard provides a specification for the selection, installation, commissioning, and maintenance of externally-powered interconnected smoke alarms in houses (single household units).

NZS 4514 was originally based on AS 1670.6 with modifications to make it suitable for New Zealand requirements.

This edition is a partial technical revision of, and supersedes NZS 4514:2002. Some advances in technology have been explicitly recognised. Maintenance requirements have been specified in more detail, and have become part of the Standard itself, rather than being for guidance. Power supply requirements have been clarified and strengthened. Additional guidance has been provided for the selection of smoke alarms, and their location to avoid nuisance activations.

A new informative Appendix A giving guidance for retrofit applications has also been included.

NOTES

New Zealand Standard

Interconnected smoke alarms for houses

1 GENERAL

1.1 Scope

This Standard sets out the requirements for the installation and commissioning of externally-powered interconnected smoke alarms. It also provides information on the selection, installation, and maintenance of smoke alarms.

1.2 Application

This Standard applies to externally-powered interconnected smoke alarms installed in houses.

NOTE – See Appendix A for guidance on retrofitting smoke alarms in existing buildings.

2 INTERPRETATION

For the purpose 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.

The term 'Informative' has been used in this Standard to define the application of the Appendix to which it applies. An 'Informative' Appendix gives additional information, and is only for guidance. It does not contain requirements.

3 DEFINITIONS

For the purpose of this Standard the following definitions apply:

Heat alarm	A device containing a heat detector and an alarm-sounding device
Multiple station smoke alarm	A smoke alarm with interconnection facilities for common alarm communication
Single station smoke alarm	A smoke alarm not intended to be interconnected with other units for common alarm purposes
Smoke alarm	A device containing a smoke detector and an alarm-sounding device

4 COMPLIANCE WITH OTHER REGULATIONS

The smoke alarm installation shall comply with the appropriate electrical safety and radio communication requirements.

NOTE – Refer to the Electricity Regulations and Radiocommunications Regulations.

5 INSTALLATION AND COMMISSIONING

5.1 Equipment

Smoke alarms shall comply with any of UL 217, CAN/ULC S531, BS 5446 Part 1, EN 14604, ISO 12239 or AS 3786.

5.2 Location of smoke alarms

5.2.1 General

Smoke alarms shall be located on or near the ceiling. Smoke alarms shall be located in bedrooms, living spaces, hallways and landings within the building. Protection in other spaces is optional. All smoke alarms shall be interconnected so that when one activates, all alarms will sound.

NOTE –

(1) For information on fire and detection characteristics, see Appendix B.

(2) For guidance on selection and location of alarms, see Appendix C.

5.2.2 Multi-level

Where the house is multi-level, at least one smoke alarm shall be located on each level so that the hallways and landings on each level are protected. Examples are set out in figure C3 and figure C4.

5.2.3 Sloping ceilings

Smoke alarms in rooms with ceiling slopes greater than 1 in 8 shall be located at the high side of the ceiling.

5.2.4 Mounting

Smoke alarms shall be mounted in accordance with the manufacturer's instructions, with the aperture for smoke entry not less than 25 mm below the ceiling surface when mounted on the ceiling.

5.2.5 Dead air spaces

Smoke alarms shall not be located in dead air spaces (as shown in figure 5.1) or close to ceiling obstructions where dead air spaces may be created.

5.2.6 Joists, purlins, or beams

On ceilings with exposed joists, purlins, or beams with a depth not exceeding 300 mm, smoke alarms may be located on the underside of a joist, purlin or beam.

5.2.7 Stairwells

Smoke alarms installed in stairwells shall be located to ensure that smoke rising in the stairwell is not prevented from reaching the smoke alarm by a door or other obstruction.

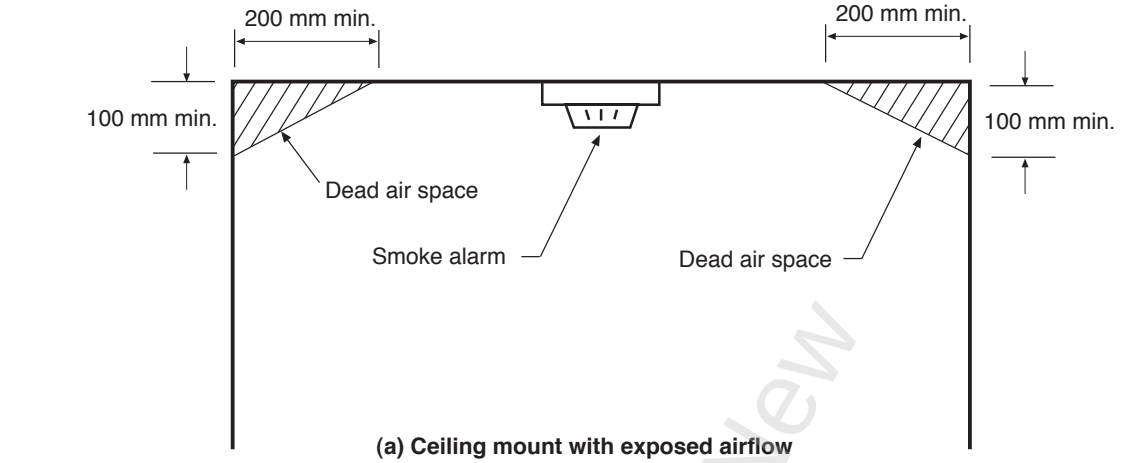
5.2.8 Forced air circulation

In areas provided with air conditioning or forced-air ventilation, smoke alarms shall not be installed closer than 400 mm to any supply air opening. Where ceiling fans are installed, smoke alarms shall not be located within 400 mm of the blades of the fan.

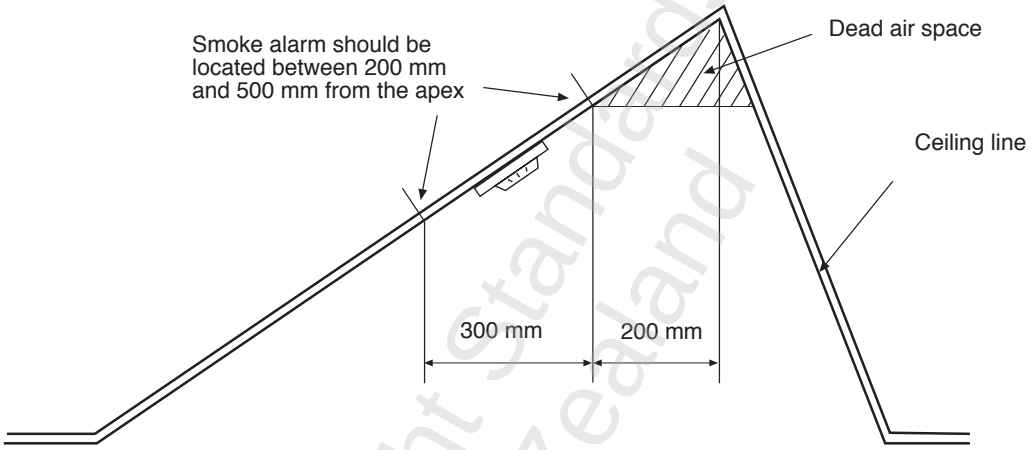
5.2.9 Environmental conditions

Smoke alarms shall not be located in areas where the environmental conditions exceed the manufacturer's specified operating parameters (such as temperature or humidity).

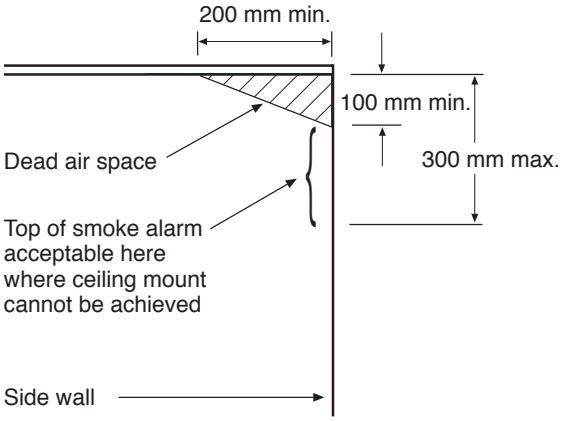
NOTE – Appendix D2 provides guidance on locations to avoid for smoke alarms.



(a) Ceiling mount with exposed airflow



(b) Ceiling mount – sloping ceiling



(c) Ceiling mount not available

Figure 5.1 – Dead air spaces

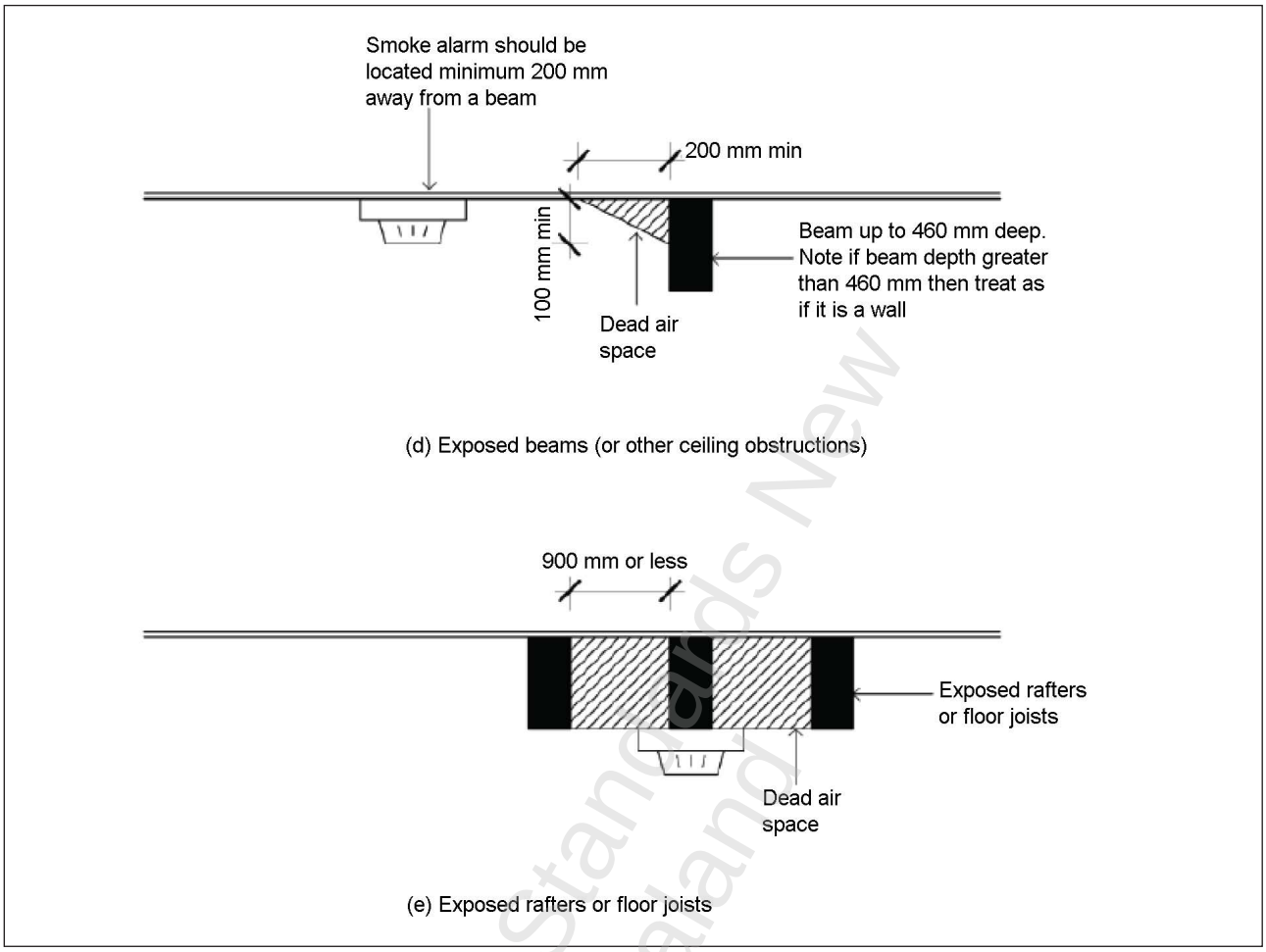


Figure 5.1 – Dead air spaces (continued)

5.3 Alarm signals

5.3.1 Audible alarm signals

Smoke alarms shall be installed to ensure that the audible signal is clearly perceptible in all bedrooms of the house over the background noise normally encountered, with all intervening doors closed. For audible signals intended to arouse sleeping occupants, the sound pressure level of the signals shall be not less than 75 dBA when measured at the sleeping position. The sound pressure level of the audible signals shall be not more than 100 dBA measured at any normally accessible point at a height of 1.8 m.

NOTE –

(1) A sound pressure level of not less than 75 dBA and 10 dBA above expected ambient noise levels (air conditioners and the like) at the bed head should be sufficient to awaken an average sleeping person.

(2) Appendix C provides a guide to the selection of smoke alarms, and to the locations in which they will achieve adequate performance.

5.3.2 Additional sensory alarm signals

Where audible alarm signals are not adequate, additional types of sensory stimulating alarm devices may be used, such as visual or vibrating pillow devices.

5.4 Power supplies

Smoke alarms shall be powered from one of the following sources:

(a) Permanently energised 230 V a.c. mains power supplied from the unswitched side of a commonly used circuit (for example, lighting). A user-replaceable long-life battery backup (such as a lithium battery) or a long-life (10-year minimum) built-in rechargeable energy storage device (such as 'Supercap') shall be included to power the device during periods of mains power failure;

(b) An external d.c. power supply continuously maintained from a 230 V a.c. mains supply, with battery backup. This power supply and battery backup shall comply with either NZS 4512 or AS/NZS 2201.1.

Where 5.4(b) applies, all wiring between the power supply and the smoke alarms shall be supervised such that an open or short circuit generates a fault condition or an alarm condition.

Any fault condition shall generate an audible warning within the house.

NOTE –

(1) Where a system is remotely monitored, faults should also be signalled to the remote monitoring centre.

(2) NZS 4512 uses the term 'defect' instead of 'fault'.

5.5 Interconnection

Smoke alarms shall be interconnected in accordance with the manufacturer's instructions. All other devices intended to be connected to a smoke alarm circuit shall be compatible with the smoke alarms.

Typical field wiring with interconnections is shown in figure 5.2.

Single station smoke alarms shall not be used except where a single smoke alarm provides complete coverage of the whole house.

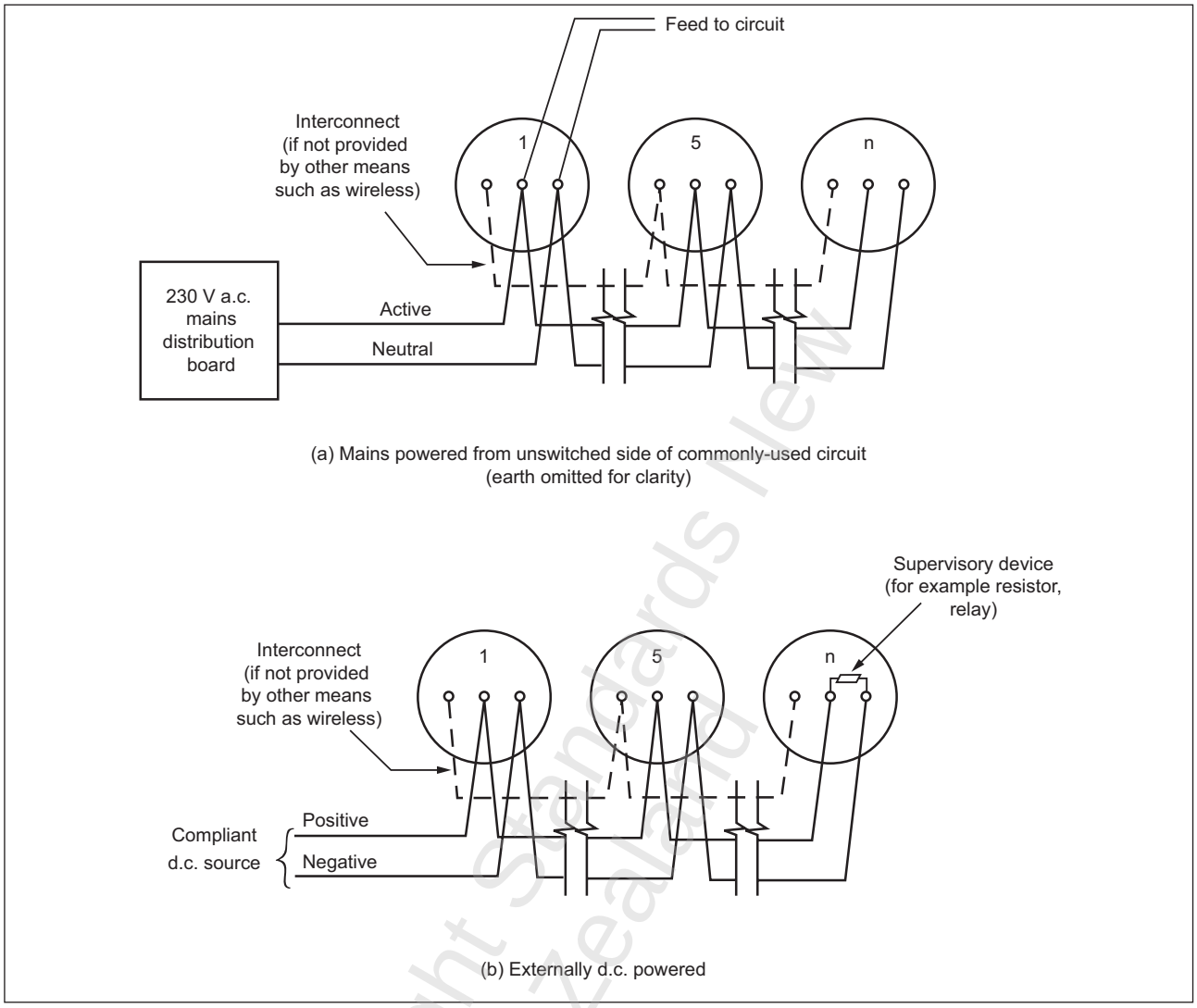


Figure 5.2 – Typical field wiring

5.6 Hush-button facilities

Smoke alarms shall be provided with a 'hush-button' to temporarily silence audible alarm signals in the event of nuisance activation, either on the smoke alarm itself or at another readily accessible location (for example, a hallway).

5.7 Wiring

Field wiring for smoke alarms shall be not less than 1.0 mm^2 cable.

All 230 Volt mains wiring shall comply with the Electricity Regulations.

5.8 Commissioning

Smoke alarms shall be commissioned in accordance with the manufacturer's instructions. The correct operation including the hush facilities and the alarm interconnection shall be certified by a registered electrician, and the adequacy of the sound intensity of each smoke alarm shall also be verified. Where the smoke alarm system performs additional functions they shall not adversely affect the operation of the system.

6 MAINTENANCE

Smoke alarms require regular maintenance to ensure their successful operation in the event of a fire.

Smoke alarms shall be maintained by the householder in accordance with manufacturer's instructions.

NOTE – See Appendix D for information on solving or preventing common problems.

6.1 Checks and tests

6.1.1 Monthly

Each smoke alarm shall be tested at least once per month by activating the 'test' function.

NOTE – This test is checking the power supply and the alarm sounding device but not necessarily the smoke detecting capability (see 6.1.3).

6.1.2 Six-monthly

Each smoke alarm shall be inspected and cleaned using the soft brush attachment of a household vacuum cleaner to remove any dust, cobwebs, insects, or the like.

NOTE –

(1) Liquid cleaners or solvents should not be used because they will damage the unit and present an electric shock hazard.

(2) The unit should not be disassembled as this will damage the unit and present an electric shock hazard.

6.1.3 Annually

Each smoke alarm detecting element shall be tested using a joss stick or commercial smoke alarm test 'smoke'. The smoke alarm shall be deemed to have passed if its sounder operates and the activation of one smoke alarm causes all the other smoke alarms to sound.

Smoke alarms shall not be tested using naked flames.

6.2 Batteries

Where batteries are used to backup 230 V smoke alarms and are designed to be replaced, replacement shall be in accordance with the smoke alarm manufacturer's recommendations. Batteries shall be of the same type they are replacing, and shall not be rechargeable types unless specifically advised by the smoke alarm manufacturer.

APPENDIX A –
RETROFIT APPLICATIONS

(Informative)

A1 General

This appendix gives guidance on retrofitting interconnected smoke alarms in existing buildings. The areas of relaxation relate primarily to power supplies. Various options are outlined below.

Requirements for selection, location, and alarm signals (section 5) should be adhered to as closely as practicable. Heat alarms should be included in areas where false alarms can be accidentally generated (see Appendix C).

Once installed, these alarms should be regularly tested and maintained in accordance with the manufacturer's recommendations and section 6.

A2 Hardwired smoke and heat detection

It is possible to retrofit smoke and heat alarms to one or more existing 230 V circuits in the building. It is preferable that these circuits be ones that are regularly used. Alarms should be powered from the unswitched (permanently-energised) side of the circuit. Power backup from a long-life energy source (such as a user-replaceable lithium battery, or built-in rechargeable 'Supercap') is strongly recommended. The method of interconnection needs to be carefully considered.

A3 Hardwired or wireless/radio interconnected smoke alarms

Wireless/radio interconnection is an acceptable alternative to hardwired interconnection.

A4 Stand alone wireless interconnected

Where connection to 230 V circuits is impractical, self-contained wireless (radio) interconnected smoke and heat alarms are a less-preferred retrofit alternative. It is recommended that the internal energy source is a long-life unit (such as a lithium battery).

A5 Security systems

Low-voltage hard wired smoke and heat alarms can be incorporated into a security system (see also 5.4 (b)). Various methods of interconnection (including provision of additional alarm sounders) are possible, which need to be carefully considered. It is important that both the alarms and the security system (including backup power source) upon which they depend, are maintained regularly. Connection to a remote monitoring agency is recommended.

APPENDIX B –
FIRE AND DETECTION CHARACTERISTICS

(Informative)

B1 General

Residential occupancies account for the majority of fire fatalities and most of these preventable deaths occur at night during sleeping hours. Statistics show that a family will experience one serious fire every generation.

Due to the variety of combustibles and conditions in the family home, the nature of fires will vary widely. Following ignition, a fire may break out in flames almost immediately, or smoulder for several hours before breaking out in flames. Some types of detector are more appropriate than others for specific types of fires, and consideration should be given to smoke alarm selection.

B2 Fire growth

During the smouldering stage, a fire will release a small amount of heat, toxic gases, and airborne matter in a variety of particle sizes. Particulate matter and toxic fume inhalation is the most common cause of death in house fires. Following the onset of flaming, the fire will grow in size and spread rapidly, fuelled by the surrounding combustible material and the heat produced by the fire. The rate of fire spread in any specific case will depend on the flammability of interior contents, including furnishings, the surface materials of ceilings, walls and floors, and the oxygen supply.

During the flaming stage, with adequate air supply, various gases and particulate matter released will be approximately proportional to the fire size. Where the air supply is restricted, as may be the case in a closed living unit, oxygen depletion will occur and carbon monoxide production will increase as the fire grows.

B3 Fire by-products

At a certain stage of the fire, the cumulative effects of overheated air, toxic gases, and oxygen deficiency will overcome any occupants. Since the time available for escape is dependent on the stage at which the fire is detected and on the rate of fire spread, maximum protection is achieved by detection of the fire at its earliest stage.

The most threatening by-product of a fire and one of special consideration where fire deaths are concerned is carbon monoxide. Most materials, when burned, release carbon monoxide – some synthetic materials at much higher rates. Test fires of simulated living rooms show that furniture upholstered with polyurethane foam is capable of producing lethal concentrations of carbon monoxide within one or two minutes of ignition. Carbon monoxide interferes with the ability of blood to carry oxygen to the brain, causing confusion, disorientation, and unconsciousness. A person exposed to high levels of carbon monoxide would be unconscious after a few breaths and death would follow in one to three minutes.

B4 Smoke alarm selection

Appendix C5 also provides information on smoke alarm selection.

B4.1 General

The object of any smoke alarm is to provide early warning of a fire in order to maximise escape time. While attempting to reach the same objective, different detection principles (such as ionisation or photoelectric) behave differently. In deciding which type to install, consideration needs to be given to the likely type of fire (smouldering or flaming) and therefore the type of particulate matter and gases to be detected. The ambient conditions and the likelihood of the installation creating an unacceptable level of nuisance alarms should also be considered. A mixture of alarm types may be required to optimise detection results.

B4.2 Principle of operation

Smoke alarms respond to fire by detecting the airborne particulate matter from the fire before significant heat build-up occurs. Results of full-scale fire tests in actual houses indicate that smoke alarms provide sufficient time for evacuation from the house. For these reasons, the installation of smoke alarms within and adjacent to the sleeping areas is the primary means of providing an alarm signal.

B4.3 Types

B4.3.1 Ionisation smoke alarms

Ionisation smoke alarms respond to a sufficiently wide range of fires to be of general use, and are particularly responsive to flaming fires where little visible smoke may occur. They are generally less troubled by dust or insect contamination, and are generally more prone to nuisance alarms due to fumes from cooking and portable gas or oil heaters, which may lead to the alarm being disconnected by the user. Ionisation smoke alarms are also slower to respond to smoke produced by slow smouldering fires than photoelectric types.

B4.3.2 Photoelectric smoke alarms

Photoelectric smoke alarms sense visible smoke particles. They respond to a sufficiently wide range of fires to be of general use and are particularly responsive to smouldering fires and the dense smoke given off by foam-filled furnishings or overheated PVC wiring. Photoelectric smoke alarms are generally less prone to nuisance alarms from cooking but may be more prone to nuisance alarms caused by airborne condensate (steam), dust or insect contamination. Mesh screens may reduce insect ingress, but it is impossible to make the alarms dust proof, as they would then be unable to sample the air. For this reason it is important to keep photoelectric smoke alarms clean.

B4.3.3 Multi-sensor smoke alarms

Multi-sensor smoke alarms incorporate two (or more) detection technologies, usually ionisation and photoelectric (B4.3.1 and B4.3.2). They offer a broader response to both flaming and smouldering fires than one technology alone, however may also be prone to a wider range of nuisance alarm causes.

B4.3.4 Heat alarms and heat detectors

As an addition to the installation of smoke alarms, heat alarms or detectors provide a method of fire detection in locations where detection is considered advisable, yet the installation of a smoke alarm is inappropriate or would cause an unacceptable level of nuisance alarms. Examples may include enclosed laundries or kitchens.

Heat alarms or detectors are not a substitute for smoke alarms; they are not sensitive to smoke, but in a closed room with a vigorous fire they may respond faster than a remotely located smoke alarm. A heat alarm or detector should be interconnected to any smoke alarms so that the alarm can be heard throughout the building. Heat alarms or detectors require the least maintenance of any alarm and are less affected by contamination.

APPENDIX C –
INSTALLATION GUIDE

(Informative)

C1 General

The purpose of installing smoke alarms is to provide early warning of a potentially life-threatening condition, and provide the maximum possible escape time.

Personal preference or ambient conditions may require the provision of additional alarms.

C2 Dead air spaces

Smoke and heat generated by a fire generally rise, spread out and begin to bank down from the ceiling. However, smoke may have difficulty penetrating the air space in the corner where the ceiling and wall meet. In most fires, this dead space measures approximately 0.2 m across the ceiling and 0.1 m down the wall from the corner. A dead air space will also be found at the apex of a sloping ceiling. See figure 5.1.

Dead air spaces may also be found between joists, purlins, and beams. Do not place smoke alarms in these dead air spaces. While the preferred location of smoke alarms is on the ceiling, in some instances it may be necessary to mount them on a wall to avoid dead air spaces.

C3 Airflow

A smoke alarm will detect a fire when the concentration of airborne particulate matter at the device reaches the alarm threshold level. Under adverse ambient airflow conditions, these products may not reach a smoke alarm until the fire has developed sufficient heat to overcome the ambient air movement pattern. Dilution and adverse air movement patterns may be caused by forced air ventilation systems, hot air circulating heating systems, air conditioning systems, and movement of outside air through open doors and windows. In a rapidly spreading fire, this may result in insufficient time for escape.

C4 Location and number of smoke alarms

C4.1 General

In the absence of ambient air movement, detection of a fire by an alarm located outside the room of fire origin will be delayed by the restrictions on the movement of fire products to other areas of the house. The optimum is the installation of a smoke alarm in each room of a house.

C4.2 Bedrooms

Fatal fires do originate in bedrooms. Install smoke alarms in bedrooms to provide the earliest warning of an outbreak of fire.

C4.3 Doors

The practice of closing doors within the house is recommended, as this can act as a heat and smoke barrier, effectively dividing the house into 'fire zones'. There are documented case histories where a closed door has saved lives in a fire. If this practice is adopted, the closed door may delay or prevent products of combustion reaching a smoke alarm. At least one smoke alarm should be located in each 'fire zone'. Interconnect all smoke alarms.

C4.4 Interconnection

Smoke alarms located remotely from the bedroom areas may not be loud enough to waken the average person. It is essential that remote smoke alarms be interconnected with those in and adjacent to bedrooms. The interconnection of smoke alarms provides a simultaneous alarm throughout the house thereby providing earlier warning. For example, if the smoke alarm in a child's room activates, then the interconnected unit in the master bedroom will simultaneously sound to awaken sleeping adults so they can assist the child to evacuate the building.

C4.5 Occupants with special needs

Consideration should be given to installing an additional smoke alarm in any other room where the occupant, such as an elderly or sick person, or a very young child, is unable to respond quickly to a fire. This gives the occupant maximum time to evacuate (or be assisted to evacuate) the building.

C5 Types of smoke alarms

Table C1 provides installers with guidance on the correct selection of smoke alarms.

Table C1 – Recommended alarm types for different locations

Mandatory locations for smoke alarms	Ionisation smoke alarm	Photoelectric smoke alarm or photo/heat alarm	Ion/photo smoke alarm	Heat alarm
Bedrooms/sleeping areas	OK[1]	OK	Best	No
Common area separating bedroom(s) and rest of house	OK	Better	Best	No
Landings in multi-level house	OK	Better	Best	No
Living room	Better	Better	Best	No
Family room	Better	Better	Best	No
In any of above if near kitchen	No	OK [2]	No	No
Optional (additional) locations for alarms				
Bathrooms, laundries	No	No	No	Best
Kitchens	No	OK [2]	No	Best
Attached garage	No	No	No	Best

NOTE –
(1) The term 'OK' signifies the minimum level of suitability. 'Better' and 'Best' are improvements on this. 'No' signifies an unsuitable choice for a particular location.
(2) These applications have a higher risk of false/unwanted alarms – locate smoke alarm as far away from cooking as possible.

C6 Skylights

In rooms with a skylight greater than 3 m^3 it is recommended that an additional smoke alarm is installed in the skylight.

C7 Installation examples

C7.1 Three-bedroom house

Figure C1 shows a design for a typical house. Smoke alarms are installed in each bedroom, the family room, and in the living/dining room and hallway associated with bedrooms 2 and 3. Warning is provided if smoke accumulates in the escape paths associated with both bedroom areas or within each bedroom. An important consideration for this house is the choice of a photoelectric smoke alarm in the family room. When the doors leading from the family/kitchen area are closed, the house is divided into six fire zones (with the bedroom doors closed), each now with smoke alarm coverage. The choice of a photoelectric alarm in the family room has been made because it is less sensitive to cooking fumes. (See B4.3 for further clarification of smoke alarm types.) With no smoke alarm in this location, a fire could develop to a significant stage before the next closest smoke alarm activates, particularly if the doors were closed. The requirement for the family room smoke alarm greatly enhances life safety protection, as it provides earlier warning and thereby a greater chance of escape. The six alarms are interconnected to enable a general alarm to be given throughout the house.

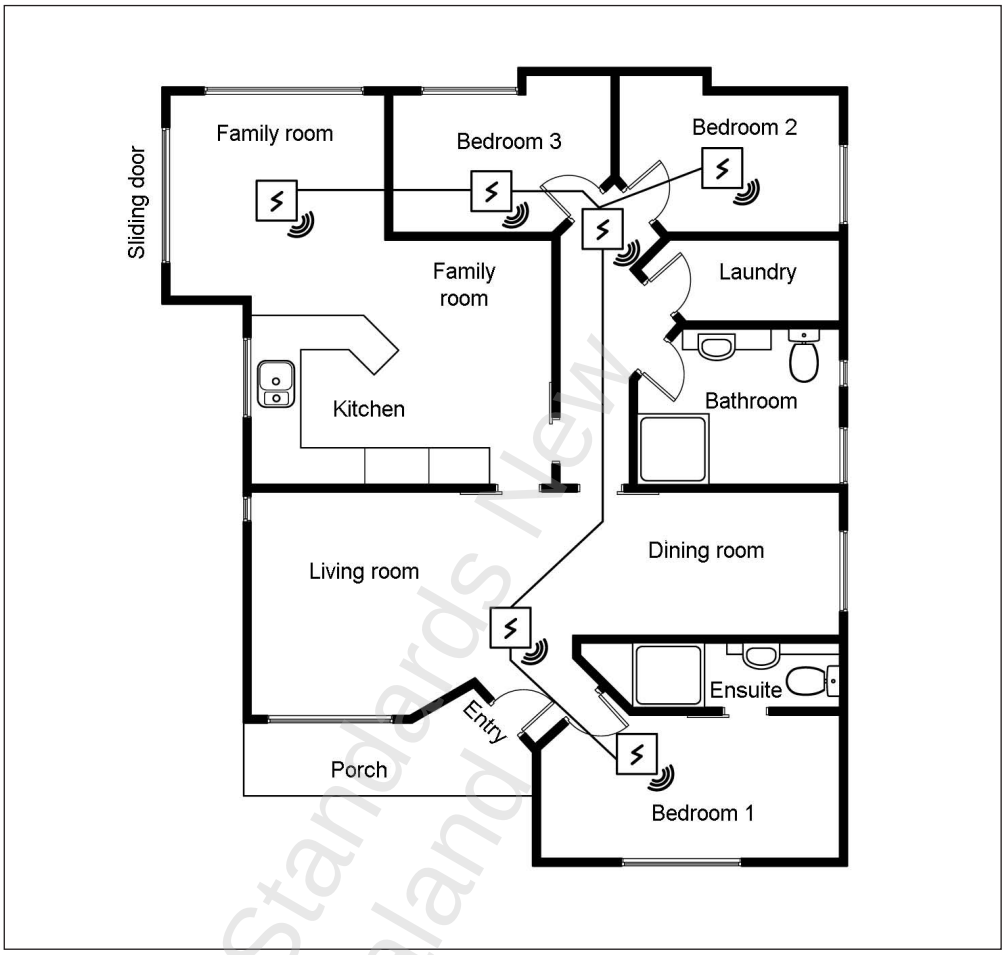


Figure C1 – Typical three-bedroom house

C7.2 Long house

In a house with a long layout (see figure C2) one smoke alarm is located in each bedroom, with one smoke alarm in the hallway adjacent to the bedroom area protecting the escape path either through the family room or the laundry. Additional smoke alarms are located in the family and lounge/dining areas.

The hallway door potentially divides the house into two areas, ‘sleeping area’ and ‘living area’. Should this door be closed, products of combustion originating from the living area will be delayed in reaching the smoke alarm in the hallway, thereby preventing early warning. Closing the door at night will help restrict smoke/fire spread; however, this makes it necessary to place a smoke alarm (photoelectric because it is less sensitive to cooking fumes) in the family area. Similarly the lounge/dining area, where without a smoke alarm a significant fire could develop undetected and prevent escape through the main entry.

Smoke alarms are interconnected so that any alarm will be simultaneously raised in both the sleeping and living areas.

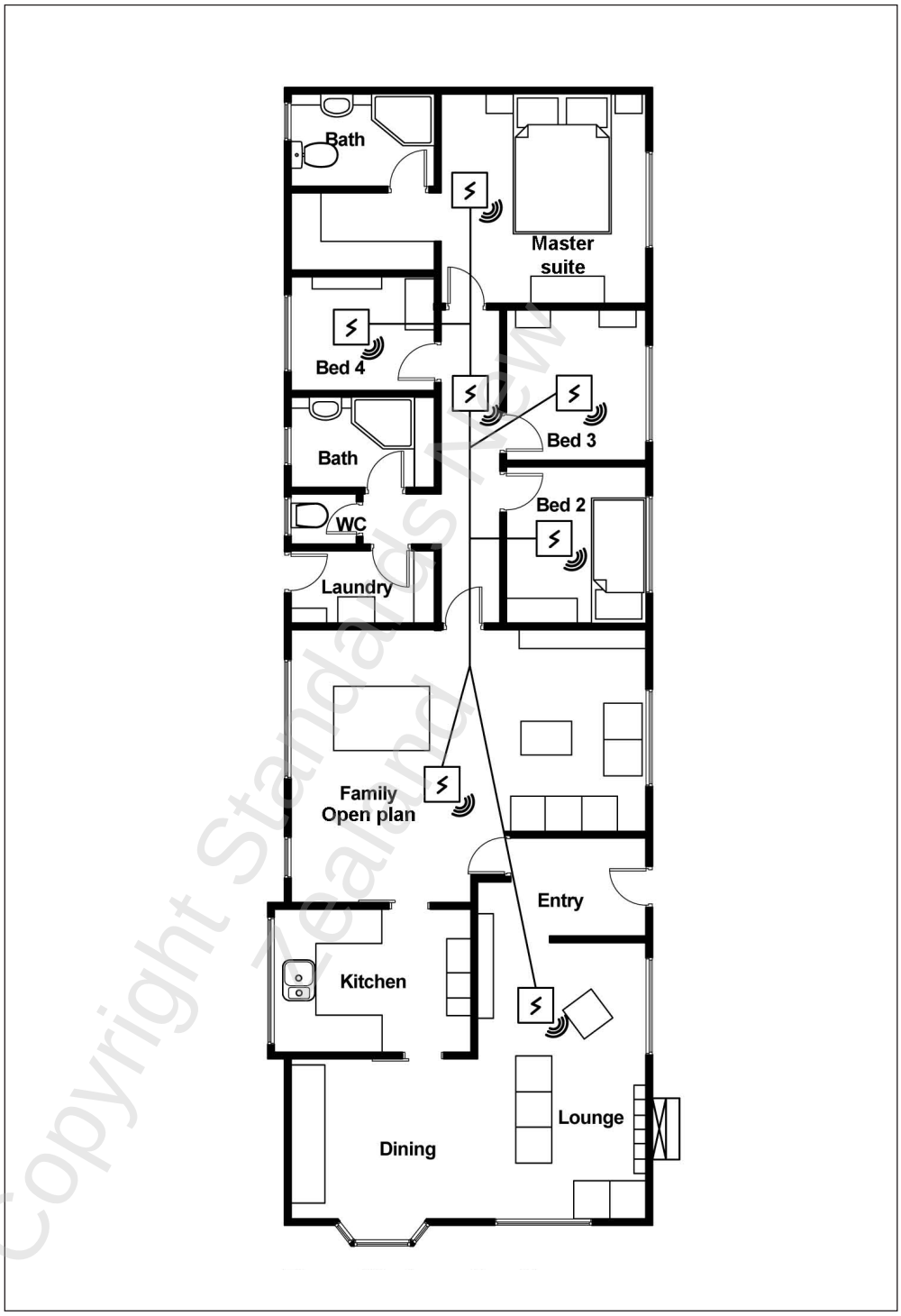


Figure C2 – Long house

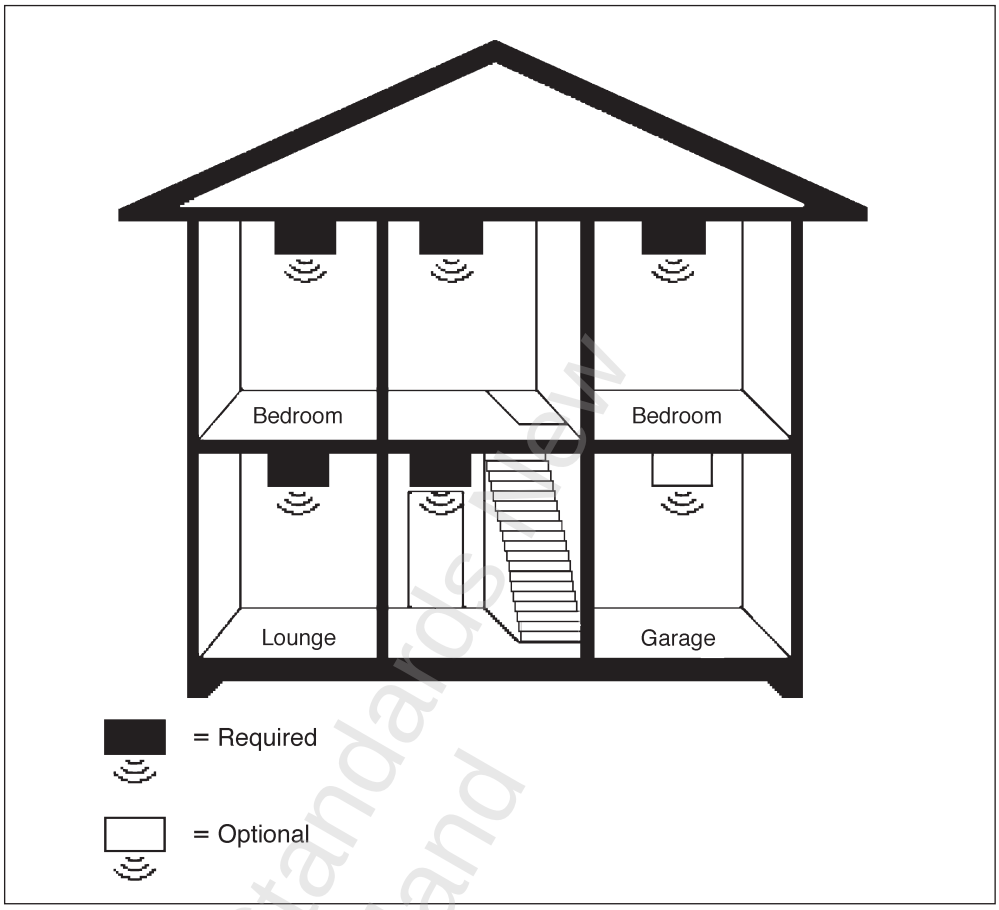


Figure C3 – Multi-level house

C7.3 Multi-level house

In a multi-level house (see figure C3), a smoke alarm is required to be fitted on each level. Most houses of this type have only one escape path from the upper level, through the lower level.

Sleeping occupants on the upper level need to be quickly alerted to an alarm originating from elsewhere in the house as the escape path may rapidly become untenable. To effectively alert occupants, all smoke alarms are required to be interconnected.

In the more detailed example shown in figure C4, a smoke alarm has been positioned in each bedroom and in the primary escape path for each level (gallery and lounge/dining). A smoke alarm is also required in the family room where an undetected fire could grow significantly and compromise the only escape from the upper level through the lounge/dining area.

Protection can be enhanced (see figure C4) by:

(a) Choosing a photoelectric (because it is less sensitive to cooking fumes) smoke alarm in the family room. The closure of the access door into the lounge at night segregates the family/kitchen area as a separate fire zone;

(b) Placing an interconnected heat alarm in the garage because it is the storage area for flammable liquids and solvents. Even though the garage is integral to the house, any products of combustion generated within the garage will not be detected by the smoke alarms installed inside the house. Theoretically smoke alarms could be used, but the choice of detection technology depends upon the purposes for which the garage is used. Smoke alarms are likely to generate an unacceptable level of nuisance alarms from dust or vehicle exhaust fumes. A heat alarm is not sensitive to these conditions and has been selected for use. The heat alarm should be interconnected to the smoke alarms for early warning.

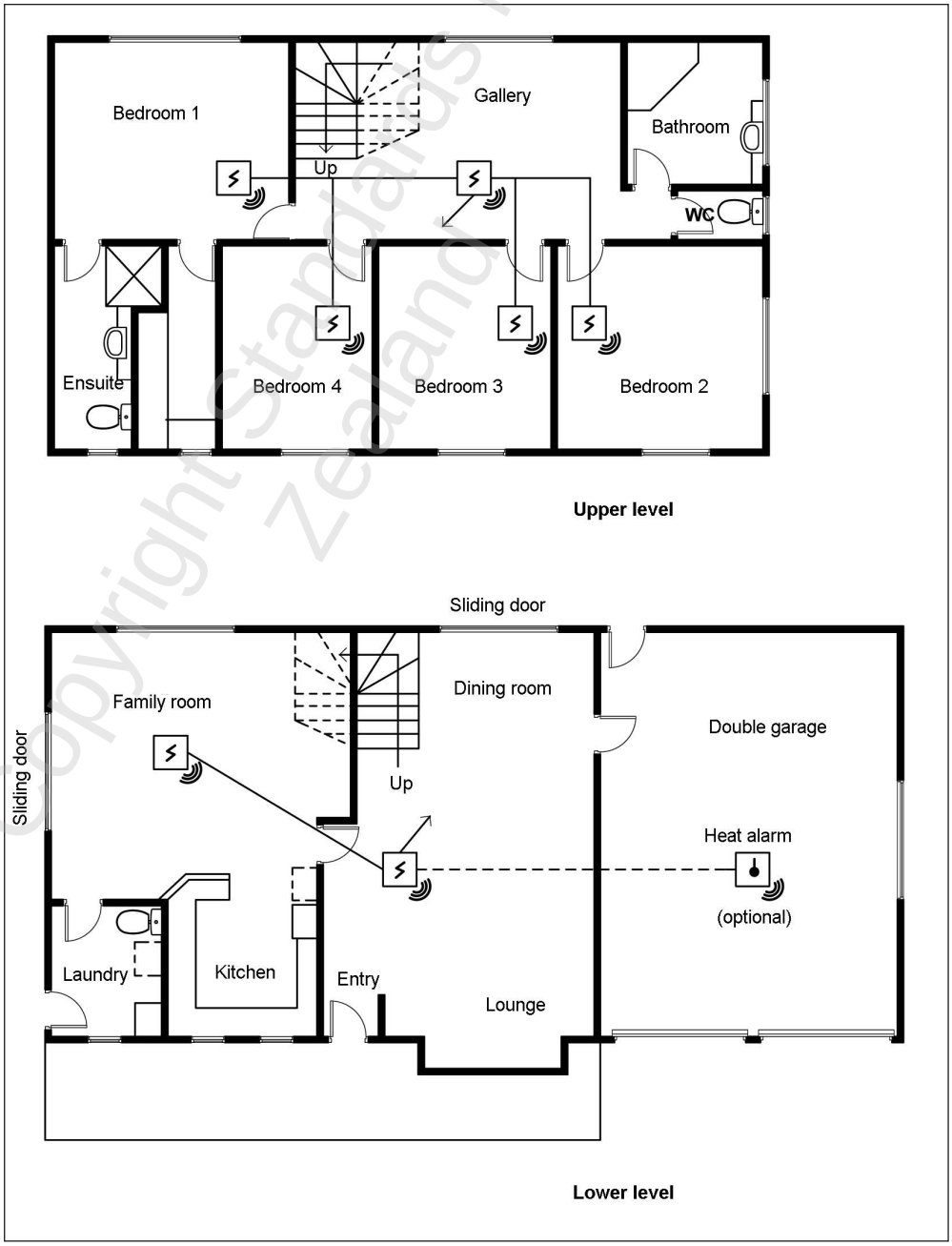


Figure C4 – Multi-level house floor plans

APPENDIX D –
PROBLEM SOLVING

(Informative)

D1 General

This appendix gives general advice on solving or preventing common problems.

D2 Locations to avoid

Location of smoke alarms in the following areas should be avoided:

(a) Near a stove, space heater, water heater, burner, furnace, or other fuel-burning or heat-producing source;

(b) In the air stream from a kitchen where cooking smoke can be carried into the smoke alarm;

(c) In very damp, humid or steamy areas, or near showers, saunas, dishwashers and so on;

(d) Where extremes of temperature can be expected – particularly unheated rooms, outdoor areas, and on uninsulated outside walls;

(e) In very dusty, dirty, or greasy areas;

(f) In draughty areas where smoke can be blown away from the smoke alarm preventing reliable operation (see also 5.2.8);

(g) Near an insect-infested area;

(h) Near fluorescent lights, which can interfere with correct operation.

D3 Frequent unwanted activations

If unwanted alarms are experienced, try one or more of the following:

(a) Choose a better alarm type (see table C1);

(b) Relocate the smoke alarm away from any source of steam, cooking fumes, and so on;

(c) Improve ventilation of the area to remove the unwanted cause;

(d) Close doors that allow the spread of unwanted airborne particles;

(e) Replace the smoke alarm if contaminated or dirty and unable to be cleaned as required by 6.1.2.

D4 Other general guidance

Do not point appliance remote controls (for example, TV, DVD, VCR) at the smoke alarm as this is used as a test mechanism in some models.

If the replacement or relocation of a smoke alarm is required this should be carried out by a qualified electrician. The interconnection facility will generally require replacement with a compatible model from the same manufacturer.

Do not spray deodorant or fly spray at a smoke alarm as this may contaminate and/or activate the alarm.

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