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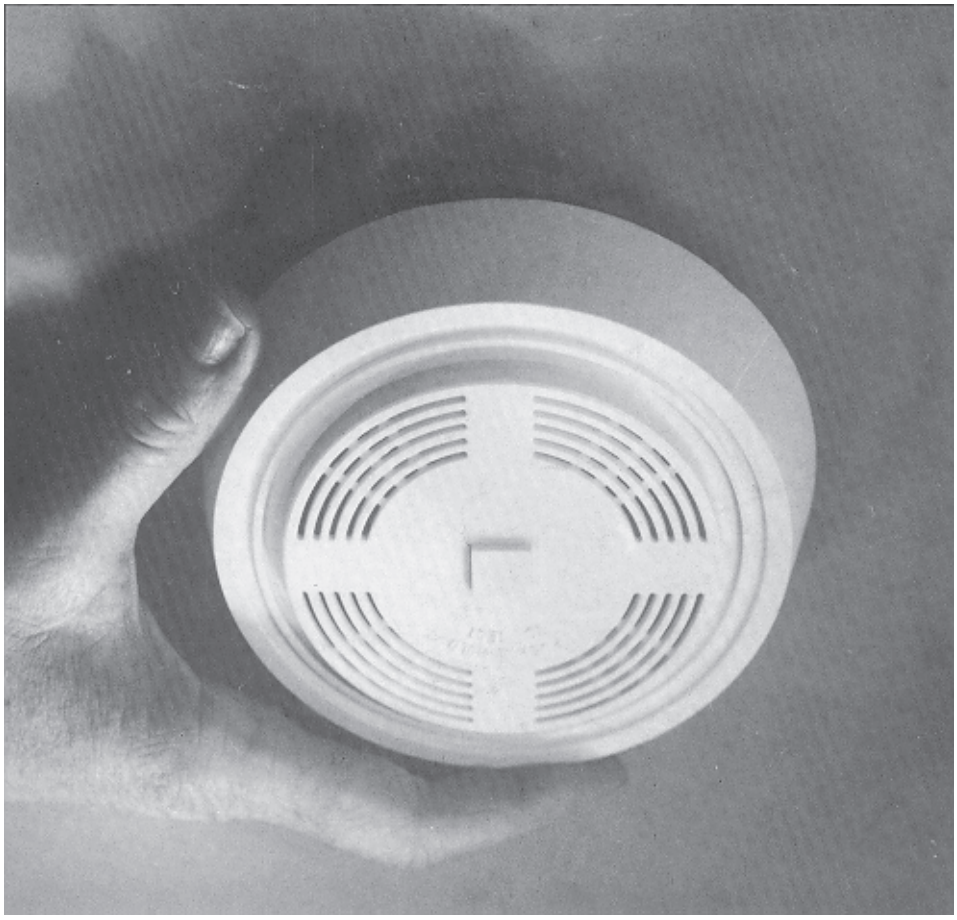

NEW ZEALAND STANDARD

THE INSTALLATION OF SMOKE-ALARMS

UDC 614.842.4 : 654.924.5

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Standards Association of New Zealand

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	AMENDMENTS
Date of issue	*Description*

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RELATED DOCUMENTS

This Standard makes reference to:

AMERICAN NATIONAL STANDARDS INSTITUTE/UNDERWRITERS' LABORATORIES
ANSI/UL 217:1985 Single and multiple station smoke detectors

BRITISH STANDARDS

BS 5446:----Components for automatic fire alarm systems for residential purposes
Part 1:1977 Point type smoke detectors

UNDERWRITERS' LABORATORIES OF CANADA
ULC-S531-1978 Smoke–alarms

FOREWORD

This Standard is based upon the Canadian Standard CAN/ULC-S553-M86 *Standard for the installation of smoke-alarms* which has been modified to permit the use of the smoke-alarms manufactured to British and American Standards as well as to the Canadian Standard.

In its present form the Standard is limited to battery operated smoke alarms; however should mains operated smoke alarms suitable for use in accordance with the New Zealand Electric Wiring Regulations become available then the Standard can be amended to permit their use.

The Standard does not apply to fire alarm systems suitable for connection to the Fire Service or other remote receiving centres; such systems are covered by NZS 4512:1981 *Automatic fire alarm systems in buildings.*

REVIEW OF STANDARDS

Suggestions for improvement of this Standard will be welcomed. They should be sent to the Director, Standards Association of New Zealand, Private Bag, Wellington.

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NEW ZEALAND STANDARD
THE INSTALLATION OF SMOKE-ALARMS

1
SCOPE

1.1
This Standard covers the requirements for the installation of smoke-alarms for use within dwellings or sleeping rooms not within dwellings.

1.2
This Standard specifies how such smoke-alarms shall be installed to perform their intended function.

2
DEFINITIONS

2.1
For the purposes of this Standard the following definitions shall apply:

DWELLING. A residential building designed for, or occupied exclusively as, the residence of one household.

SMOKE-ALARM. A combined smoke detector and audible alarm device designed to sound an alarm within the room or suite in which it is located upon detection of smoke within that room or suite.

2.2
For the purposes of this Standard the word "shall" refers to practices which are mandatory for compliance with the Standard. The word "should" refers to practices which are advised or recommended.

3
INSTALLATION

3.1
General

3.1.1
All smoke-alarms to be installed in conformance with this Standard shall comply with the requirements of one of the following specifications:

ANSI/UL 217
BS 5446 Part 1
ULC S531

3.1.2
Upon completion of the installation, all installed smoke-alarms shall be tested for proper operation.

3.1.3
Smoke-alarms shall be installed in such a manner as to ensure that the alarm signals are clearly audible in all bedrooms of a dwelling, or in sleeping rooms not within a dwelling, over any high background noise level which may be normally encountered with all intervening doors closed.

NOTE - Examples of equipment which will produce high background noise levels are room humidifiers. (See Appendix A, Clause A2).

3.2
Location of smoke-alarms

3.2.1
Smoke-alarms in rooms with ceiling slopes greater than 1 in 8 shall be located at the high side of the room.

3.2.2
Smoke-alarms shall not be located in the vicinity of "dead" air spaces but shall be located where they will be exposed to air flow during a fire condition.

NOTE - See fig. 1 and Appendix A, clause A3.

3.2.3
On ceilings with exposed joists or beams, smoke-alarms shall be mounted on the bottom of such joists or beams.

NOTE - See Appendix A, clause A3.

3.2.4
Smoke-alarms installed in a stairwell shall be so located as to ensure that smoke rising in the stairwell cannot be prevented from reaching the device by a door or obstruction.

3.2.5
Smoke-alarms installed in the vicinity of a sleeping area shall be located as close as possible to the area while avoiding possible nuisance alarms due to excess water vapour from a bathroom or cooking fumes from a kitchen or smoke from a fireplace.

3.2.6
Smoke-alarms shall be located on the ceiling not less than 100 mm from any wall measured to the nearest edge of the unit, or on the wall with the top edge 100 to 300 mm from the ceiling.

NOTE - See Appendix A, clause A2.

3.2.7
In areas provided with air-conditioning or forced air ventilation, or where open windows may be present, smoke-alarms shall not be mounted near fresh air inlets. Smoke-alarm locations shall favour air flow toward air outlet openings.

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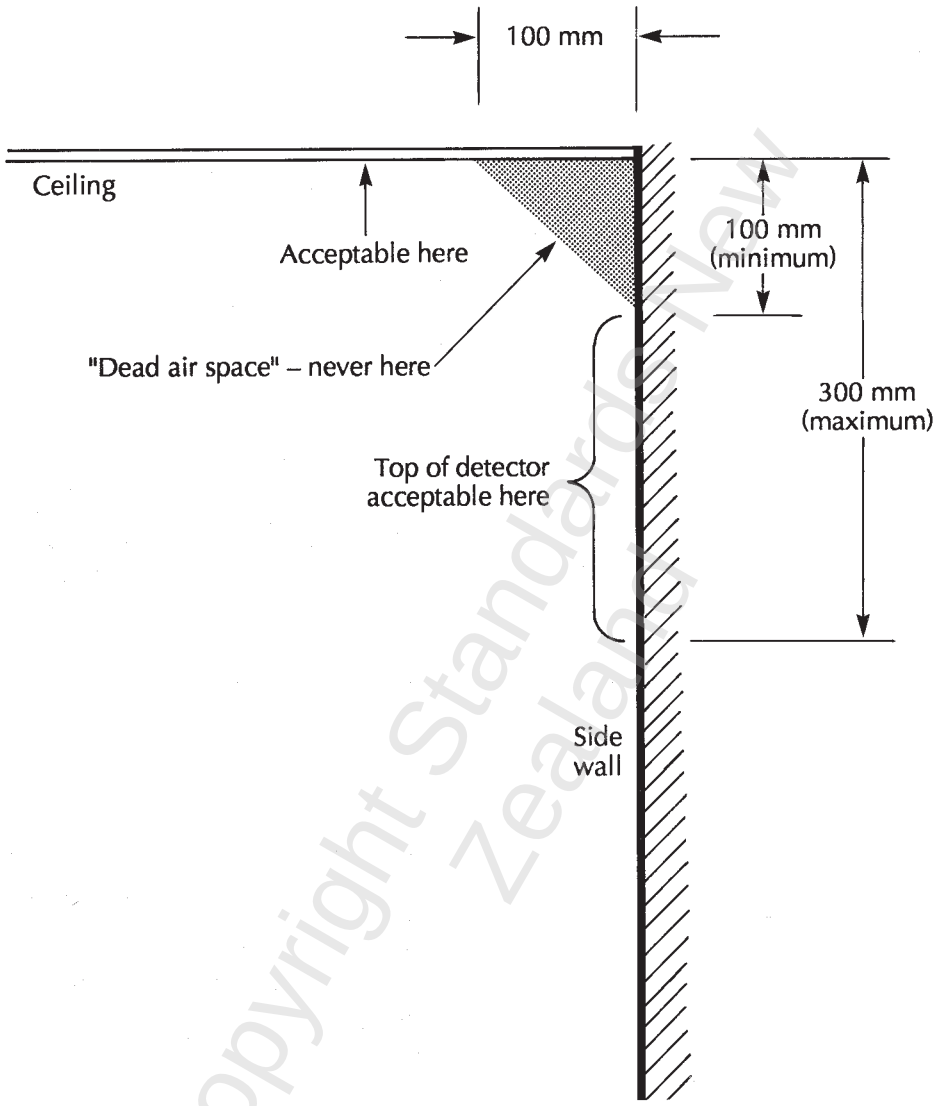

Fig. 1
RECOMMENDED MOUNTING OF SMOKE-ALARMS

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APPENDIX A
Explanatory material

A1
Due to the variety of combustibles and conditions in a family dwelling the nature of fires occurring therein will also vary widely. Following inception, a fire may break out in flames almost immediately or smoulder for up to several hours before breaking out in flames. During the smouldering stage, a fire will release a small amount of heat, a variety of toxic gases and airborne particulate matter in a variety of particle sizes. Following onset of flaming, the fire will grow in size and spread rapidly from propagation by the flames and from the increasing burning rate resulting from the heat produced by the fire. The rate of fire spread in any specific case will depend on the flammability of interior contents and furnishings, and on the flammability of the surface materials of ceilings, walls and floors. During the flaming stage, the amount of heat, various gases and particulate matter released will be approximately proportional to the fire size, provided an adequate fresh air supply is available. Where the fresh air supply is restricted, as may occur in a closed up living unit, oxygen depletion will occur and carbon monoxide production will increase as the fire grows in size. 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 the rate of fire spread thereafter, maximum protection is achieved by detection of the fire at its earliest stage.

Smoke-alarms respond to the smouldering state of a fire by detecting the airborne particulate matter from the fire before significant heat build-up occurs. Results of full-scale fire tests in actual dwellings indicate that smoke-alarms provided sufficient time for evacuation from the dwelling. For these reasons, the installation of smoke-alarms in the vicinity of sleeping areas is recommended as the primary means of providing an alarm signal. (See fig. A1).

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

Where the ceiling temperature is significantly different from the temperature of the air space below, such as where the space above the ceiling is open to the outside with little or no insulation over the ceiling or where a ceiling mount is not feasible, the smoke-alarm should be located on the wall. Where exterior walls are uninsulated, the smoke-alarm should be located on an interior wall. (See fig. 1).

A2
At times, depending upon conditions, the audibility of alarms may be seriously impaired to the occupants within the bedroom area. For example, there may be a noisy room humidifier, which may generate an ambient noise level of 55 dBA or higher. The alarms must be able to penetrate through closed doors and must be heard over the bedroom's noise levels with sufficient intensity to awaken sleeping occupants therein. Test data indicate that devices having sound pressure ratings of 85 dBA at 3000 mm and installed outside the bedrooms can produce about 15 dBA over ambient noise levels of 55 dBA in the bedrooms. This should be sufficient to awaken the average sleeping person. Smoke-alarms located remote from the bedroom areas may not be loud enough to awaken the average person. In such cases, it is recommended that multiple station type smoke-alarms, which may be interconnected with other similar devices so that actuation of one device results in the sounding of the alarm signal by all interconnection devices, be installed.

A3
The smoke and heat generated by a fire generally rises to the ceiling, spreads out across the ceiling and begins to bank down from the ceiling. The corner where the ceiling and wall meet is an air space into which the smoke may have difficulty penetrating. In most fires this "dead" space measures about 100 mm along the ceiling from the corner and about 100 mm down the wall. Such "dead" air spaces may also be found between joists and beams. Smoke-alarms should not be placed in these "dead" air spaces. (See clause 3.2.2 and fig. 1). While the preferred location of smoke-alarms is on the ceiling, and while their acceptability has been evaluated on that basis, in some instances it may be necessary to mount them on a wall. However, they should not be placed in the "dead" air space.

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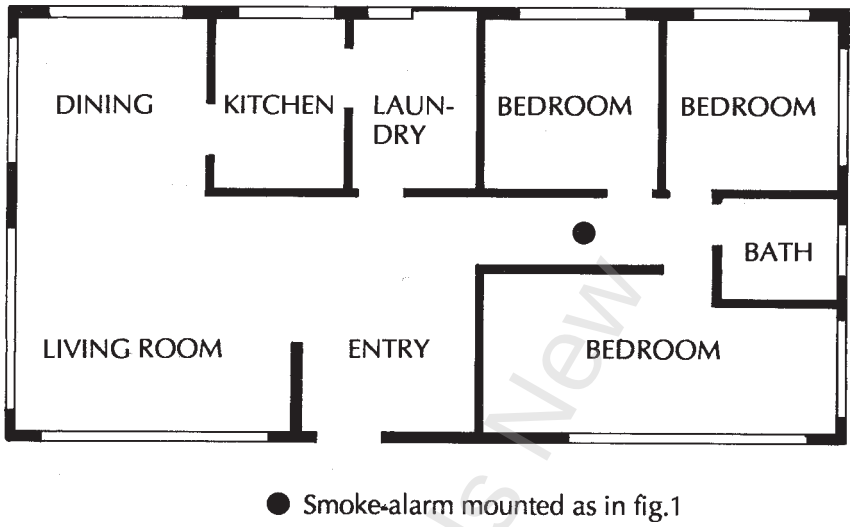

Fig. A1
RECOMMENDED MINIMUM INSTALLATION FOR A TYPICAL DWELLING

NOTE - A smoke-alarm should be installed between the sleeping area and the living area. Where there are two sleeping areas separated by the living area, and in extended plan dwellings, two smoke alarms should be used.

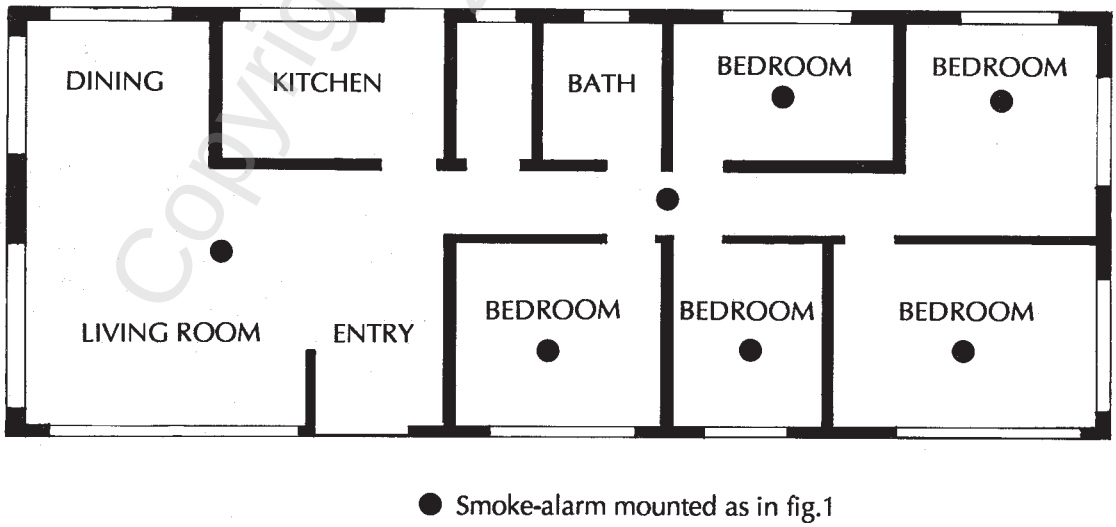

Fig. A2
RECOMMENDED INSTALLATION TO PROVIDE MAXIMUM COVERAGE

NOTE - Smoke-alarms installed in each bedroom and in the dining and living room area provide maximum coverage.

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APPENDIX B
Enhancement of fire safety in the home

B1
Fire danger in the home

B1.1
Fire is the third leading cause of accidental death. Residential occupancies account for most fire fatalities and most of these deaths occur at night during the sleeping hours. The chances are that the average family will experience one serious fire every generation.

B2
Fire safety in the home

B2.1
Installation of smoke-alarms in compliance with this Standard is intended to contribute to fire safety for persons in the home. Fire safety can be enhanced by following a four-point programme of:

A Minimizing fire hazards;

B Providing additional smoke-alarms;

C Maintaining the smoke-alarms; and

D Having and practicing an escape plan.

B3
Minimizing fire hazards

B3.1
Compliance with this Standard alone does not provide protection for persons at all times. Efforts must be made to eliminate the three traditional causes of death from fires:

A Smoking in bed;

B Leaving children home alone; and

C Cleaning with flammable liquids, such as gasoline.

B4
Providing additional smoke-alarms

B4.1
In the absence of ambient air movement, detection of a fire by a device located outside the room of fire origin will be delayed by the restrictions on the movement of the fire products to other areas of the dwelling unit. The installation of a smoke-alarm in each room of a dwelling will reduce this delay to a minimum.

B5
Maintenance and tests of smoke-alarms

B5.1
Tests or inspections, as recommended by the manufacturer of the smoke-alarm, should be carried out on a monthly basis.

B5.2
Batteries used as a source of energy, should be replaced in accordance with the recommendations of the smoke-alarm manufacturer.

B6
Family escape plan

B6.1
There often may be very little time between detection of a fire and the time it becomes deadly. This interval may be as little as one or two minutes. Thus this Standard requires detection to give a family some advance warning of the development of conditions that will become dangerous to life within a short period of time. Such warning, however, may be wasted unless the family has planned in advance for rapid exit from their dwelling.

B6.2
Planning and practicing for fire conditions with accent on rapid exit from the dwelling are important. Drills should be held so that all family members know what to do. Each person should plan for the possibility that exit out of the bedroom window may be necessary, if such an alternative exists. An exit out of the dwelling without requiring the opening of a bedroom door improves the chances of safe egress.

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OTHER NEW ZEALAND STANDARDS FOR FIRE PROTECTION

NZS 2139:1967 Heat actuated fire detectors

NZS 4501:1972 Code of practice for location marking of fire hydrants

NZS 4502:---- Glossary of terms associated with fire
Part 1:1972 The phenomenon of fire. (± BS 4422:Pt 1:1969)
Part 2:1972 Building materials and structures. (± BS 4422:Pt 2:1971)

NZS 4503:1974 Code of practice for the distribution, installation and maintenance of hand operated fire fighting equipment for use in buildings

NZS 4504:1981 Fire hose reels

NZS 4505:1977 Fire-fighting waterway equipment

NZS 4506:1978 Portable fire extinguishers of the water, foam, and dry powder type

NZS 4507:1978 Fire testing and rating of portable fire extinguishers

NZS 4508:1979 Portable carbon dioxide fire extinguishers

NZS 4510:1978 Code of practice for riser mains for fire service use

NZS 4511:1979 Bucket pump fire extinguishers

NZS 4512:1981 Automatic fire alarm systems in buildings

NZS 4521:1974 Boxes for fire brigade connections

NZS 4541:1987 Automatic fire sprinkler systems

NZS 4551:1974 Portable fire extinguishers of the halogenated hydrocarbon type

NZS 4561:1973 Manual fire alarm systems for use in buildings

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