COMMITTEE FP-002

DR 08173

(Project ID: 7884)

Draft for Public Comment Australian Standard

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BEGINNING DATE FOR COMMENT:	**13 August 2008**
CLOSING DATE FOR COMMENT:	**5 November 2008**

Smoke alarms

(Revision of AS 3786—1993)

STANDARDS Australia

Draft for Public Comment
Australian Standard

The committee responsible for issuing this draft comprised representatives of organizations interested in the subject matter of the proposed Standard. These organizations are listed on the inside back cover.

Comments are invited on the technical content, wording and general arrangement of the draft.

The preferred method for submission of comment is to download the MS Word comment form found at http://www.standards.com.au/Catalogue/misc/Public Comment Form.doc. This form also includes instructions and examples of comment submission.

When completing the comment form, please ensure that the number of this draft, your name and the name of your organization (if applicable) are recorded. Please place relevant clause numbers beside each comment.

Editorial matters (i.e. spelling, punctuation, grammar etc.) will be corrected before final publication.

The coordination of the requirements of this draft with those of any related Standards is of particular importance and you are invited to point out any areas where this may be necessary.

Please provide supporting reasons and suggested wording for each comment. Where you consider that specific content is too simplistic, too complex or too detailed please, provide an alternative.

If the draft is acceptable without change, an acknowledgment to this effect would be appreciated.

When completed, this form should be returned to the Projects Manager, Helen Noonan, via email: helen.noonan@standards.org.au.

Normally no acknowledgment of comments is sent. All comments received electronically by the due date will be put before the relevant drafting committee. Because Standards committees operate electronically we cannot guarantee that comments submitted as hard copy will be considered along with those submitted electronically. Where appropriate, changes will be incorporated before the Standard is formally approved.

If you know of other persons or organizations that may wish to comment on this draft Standard, would you please advise them of its availability. Further copies of the draft are available from the Customer Service Centre listed below and from our website: http://www.standards.com.au/.

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Draft for Public Comment

STANDARDS AUSTRALIA

Committee FP-002—Fire Detection, Warning, Control and Intercom Systems

Subcommittee FP-002-02 — Equipment and Test Methods

DRAFT

Australian Standard

Smoke alarms

(Revision of AS 3786—1993)

(To be AS 3786—200X)

This Draft Standard was prepared by the Standards Australia committee F002, Fire Detection, Warning, Control and Intercom Systems, to supersede AS 3786—1993 *Smoke alarms*.

When the latest edition of AS 1670.1 *Fire detection, warning, control and intercom systems—System design, installation and commissioning* Part 1: *Fire*, was revised and then published in 2004, it was recognized that in residential buildings, (providing sleeping accommodation), the type of fire most likely to occur while occupants are asleep is initially a smouldering fire. The smoke obscuration levels from smouldering fires will affect the ability to see and the tenability of the sleeping areas and exit paths. Therefore early detection based upon obscuration will maximize the available time for occupants to safely evacuate.

This Draft Standard proposes to revise AS 3786 to establish that a defined level of obscuration is to be the acceptance criteria for smoke alarms. This also brings AS 3786 into line with international product standard acceptance criteria.

Comment on the draft is invited from people and organizations concerned with this subject. It would be appreciated if those submitting comment would follow the guidelines given on the inside front cover.

This document is a Draft Australian Standard only and is liable to alteration in the light of comment received. It is not to be regarded as an Australian Standard until finally issued as such by Standards Australia.

Please note, AS 12239 *Smoke alarms* has been withdrawn and will be re-published when the current revision of its international version, ISO 12239 is complete. This Standard may be changed significantly when re-published. It is intended that AS 12239 will then replace this +Standard, but until such a time, AS 3786 is to remain as the current Australian Standard for smoke alarms.

This Standard incorporates a Commentary on some clauses. The Commentary directly follows the relevant clause, is designated by 'C' preceding the clause number and is printed in italics in a panel. The commentary is for information only and does not need to be followed for compliance with this Standard.

PREFACE

This Standard was prepared by the Standards Australia Committee FP-002, Fire Detection, Warning, Control and Intercom Systems, to supersede AS 3786—1993, *Smoke alarms*.

The objective of this Standard is to standardize the performance of products designated as smoke alarms, so that when installed according to the requirements of the Building Code of Australia or the appropriate installation Standard, they will automatically detect and provide audible warning of a developing fire so that there is sufficient time for occupants of a building to evacuate safely, if necessary.

This edition of the Standard introduces the following changes:

(a) The performance of a smoke alarm is determined by its sensitivity to smoke using the measure of percent obscuration per metre (light obscuration), in accordance with AS 2362.17. The performance value determined by the measuring ionization chamber (MIC) is no longer included.

(b) The type of technology employed is to be clearly identified on both the outer enclosure of the smoke alarm and on point-of-sale material.

(c) Air velocity immunity is harmonized with ISO 12239.

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, whereas an ‘informative’ appendix is only for information and guidance.

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S E C T I O N 1 S C O P E A N D G E N E R A L

1.1 SCOPE

This Standard specifies the requirements for the design and performance of electrically operated smoke alarms containing both detection and alarm facilities.

This Standard allows, although it does not require, the inclusion within the smoke alarm of facilities for interconnection with other similar units or with accessories. Where such facilities are included, this Standard specifies the requirements for the connection interface.

NOTE: The installation of smoke alarms is covered in AS 1670.6.

1.2 APPLICATION

The test methods included in this Standard are intended to assess the suitability of smoke alarms solely for residential applications.

1.3 NORMATIVE REFERENCES

The following referenced documents are indispensable for the application of this Standard:

AS	
1319	Safety signs for the occupational environment
2362	Automatic fire detection alarm systems—Methods of test for actuating devices
2362.4	Method 4: Voltage stability test
2362.5	Method 5: Insulation resistance test
2362.6	Method 6: Static discharge test
2362.7	Method 7: Static discharge test
2362.8	Method 8: Impulse voltage withstand test
2362.9	Method 9: High frequency disturbance test
2362.10	Method 10: Low temperature test
2362.11	Method 11 Damp heat test
2362.12	Method 12: Dry heat test
2362.13	Method 13: Corrosion test
2362.15	Method 15: Vibration test
2362.18	Method 18: Air velocity stability test
2362.19	Method 19: Dust test
2362.20	Method 20: Overload test
2362.21	Method 21: Endurance test
2362.22	Method 22: Sound pressure level test
2706	Numerical values—Rounding and interpretation of limiting values
3000	Electrical installations (known as the Australian/New Zealand Wiring Rules)
3100	General requirements for electrical equipment
3786	Smoke alarms

ISO
2919 Sealed radioactive sources — Classification

7731 Ergonomics—Danger signals for public and work places; Auditory danger signals

8201 Acoustics; Audible emergency evacuation signal

1.4 CLASSIFICATION

Smoke alarms shall be classified as—

(a) internally energized;

(b) externally energized; or

(c) externally and internally energized.

Alarms in each of these classes may be either of the single station or multiple station type.

1.5 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

1.5.1 Alarm signal

An audible signal intended to indicate a fire.

1.5.2 Alarm state

The condition under which the smoke alarm signals a fire.

1.5.3 Fault signal

An audible, or audible and visual, signal intended to indicate a fault condition.

1.5.4 Multiple station smoke alarm

A smoke alarm designed to be connected to other smoke or heat alarms for common alarm purposes.

1.5.5 Primary power supply

The energy source to which a smoke alarm or accessory is connected to enable operation under normal conditions, such as mains electricity or battery, as distinct from a stand-by power supply.

1.5.6 Sensing assembly

Those parts of a smoke alarm that produce an electrical change in response to changes in smoke density.

NOTE: In the case of an ionization chamber, the sensing assembly may include a radioactive source, a chamber of electrodes, and electrical insulations to support the electrodes. In the case of photo-electric types, the sensing assembly may include the light source, the scatter chamber and the light sensor.

1.5.7 Sensitivity

The degree of response to the phenomenon being detected, i.e., the presence of smoke.

1.5.8 Single station smoke alarm

A smoke alarm not designed to be connected to other smoke or heat alarms for common alarm purposes.

1.5.9 Smoke alarm

A device containing a smoke detector and an alarm-sounding device.

1.5.10 Stand-by power supply

An alternative energy source that enables operation of the system in the event that the primary supply fails.

1.6 INTERPRETATION OF SPECIFIED LIMITING VALUES

For the purpose of assessing compliance with this Standard, the specified limiting values herein shall be interpreted in accordance with the 'rounding method' described in AS 2706; that is, the observed or calculated value shall be rounded to the same number of figures as in the specified limiting value and then compared with the specified limiting value. For example, for specified limiting values of 2.5, 2.50 and 2.500, the observed or calculated value would be rounded respectively to the nearest 0.1, 0.01 and 0.001.

SECTION 2 GENERAL REQUIREMENTS

2.1 GENERAL

The following shall apply:

(a) The smoke alarm shall be designed to respond reliably to the presence of smoke.

(b) The material, form and arrangement of components shall be such that it will be practicable to install and to maintain the smoke alarm in a reliable condition.

(c) The smoke alarm shall be designed to minimize the effect of moisture, dust, insects or other foreign materials and the need for maintenance.

(d) The smoke alarm shall be capable of continuous service in temperatures between +5°C and +45°C.

(e) The smoke alarm shall have a recommended service life of at least 10 years under normal conditions of use.

2.2 POWER SUPPLY

2.2.1 Primary power supply

The primary power supply of the smoke alarm may be internal or external to the unit housing.

Where the power source is internal, the following shall apply:

(a) The recommended type of batteries shall be capable of powering the smoke alarm without a fault signal for at least one year, and allow for routine testing once per month. Compliance with this requirement shall be determined in accordance with the method agreed between the manufacturer and the testing authority.

(b) A distinctive battery fault signal shall be given before the battery power level drops to the point at which the alarm can no longer operate. The battery fault signal shall be produced at least once every minute over 7 consecutive days after the battery power level drops.

Compliance with this requirement shall be determined in accordance with the method agreed between the manufacturer and the testing authority.

(c) The smoke alarm shall be capable of producing an alarm signal for at least 4 min, at the end of the period specified in Clause 2.2.1(b).

2.2.1.2 *External power source above ELV*

Where the primary power supply is from an external source and is above extra low voltage (ELV), the following shall apply:

(a) The smoke alarm shall comply with AS 3100.

(b) Interconnecting wiring shall comply with AS 3000.

(c) The smoke alarm shall have a visual ‘power on’ indicator, such as a steady or pulsing LED, to indicate that the unit is energized from an external source. Pulsing power indicators shall operate at least once every 60 s.

2.2.2 Stand-by power supply

Where the primary power supply is from an external source, a stand-by supply shall be provided to energize the smoke alarm in the event that the primary supply fails. The following shall apply for stand-by power supply:

(a) If the stand-by battery is external, it shall be a rechargeable type. If the smoke alarm is designed for rechargeable batteries, they shall be installed and charged in accordance with the battery manufacturer's recommendations.

(b) If the stand-by battery is internal—

(i) and designed to be replaced by the user, the battery compartment shall be so designed that the user can safely and easily remove and replace the battery; or

(ii) if not intended to be replaced by the user, the battery compartment shall be so designed that the battery can only be removed and replaced with the use of tools.

NOTE: Smoke alarms not intended to be accessed by the user for battery replacement purposes should carry the words 'No user serviceable parts inside' in a position clearly visible to anyone attempting to access the battery compartment.

(c) Where internal batteries are used as the stand-by power source for externally powered smoke alarms, a protection device shall be incorporated in the battery circuit to limit the charge current for rechargeable batteries, or to prevent a charge current being applied to non-rechargeable batteries.

Where lithium batteries are used, a current-limiting device shall be incorporated in the battery circuit to ensure that, in the event the protection device fails, the current applied to the battery does not exceed the 'maximum abnormal charging current' specified for the type of battery used.

The means of achieving the above shall be readily demonstrable to the testing authority.

C2.2.2 *An acceptable method of preventing a charge current being inadvertently applied to non-rechargeable batteries shall be to make the battery non-accessible to the user.*

(d) The stand-by power supply shall satisfy the requirements of Clause 2.2.1, Items (a), (b) and (c), except that—

(i) the requirements of Clause 2.2.1, Item (a) may be reduced to 7 days, and

(ii) where the stand-by supply is rechargeable, the requirements of Clause 2.2.1(b) may be reduced to 3 days.

NOTE: Where the stand-by power supply is external, the requirements of Clause 2.2.1(b) may be provided by either the smoke alarm or the external power supply unit.

2.3 BATTERIES AND BATTERY CONNECTIONS

2.3.1 General

Where a battery is required, it shall be supplied with the smoke alarm. Batteries shall comply with the requirements of Clause 2.2.1 and Clause 2.2.2, as appropriate.

2.3.2 Battery location

Batteries shall be located so that the cell terminals will not come in contact with uninsulated live parts, with terminals of adjacent cells, or with metal parts of the enclosure.

2.3.3 Battery compartment

Components housing replaceable batteries shall be arranged to facilitate battery replacement without damage to the smoke alarm. Dismantling of any part of the smoke alarm is not permitted, with the exception of removing a cover or equivalent. If tools are required, they shall be of a common type.

2.3.4 Battery connections

Connections to the terminals of replaceable batteries shall be either—

(a) positive snap action type; or

(b) a fixed butt type that exerts a minimum force of 6.6 N to each battery contact.

Battery connections shall be identified as to the correct polarity except for those with keyed connections (such as the positive snap action type) that prevent reverse polarity connection. Where required, polarity markings shall be on the unit adjacent to the battery terminals or leads. Reverse installation of the battery shall not damage the smoke alarm.

2.3.5 Battery leads

Each lead shall have a minimum cross-section area of 0.12 mm^2, and insulation not less than 0.4 mm thick. Battery leads shall be provided with strain relief.

2.3.6 Missing battery indication

Where the primary or stand-by supply source of the smoke alarm is a replaceable internal battery, an indication that the battery has been removed shall be provided.

This indication shall take of one of the following forms:

(a) A warning flag that will be exposed when the battery has been removed and the cover closed.

(b) A hinged cover that cannot readily be closed when the battery has been removed.

(c) An equivalent arrangement to (a) or (b).

(d) The extinguishment of a power-on indicator that normally illuminates at least once every 10 s.

The warning flag, hinged cover or equivalent must be marked with the words—'WARNING — Battery removed'.

The letters shall be a minimum of 9 mm high. If the warning is printed in a contrasting colour, the letters may be a minimum of 3 mm high.

2.3.7 Disconnect facility

A facility to disconnect the internal supply shall be provided for smoke alarms having an internal supply that is not accessible by the user.

Disconnection of the battery shall be indicated by one of the following means:

(a) A warning flag that will be exposed when the battery is disconnected and the cover closed.

(b) A hinged cover that cannot readily be closed with the battery disconnected.

(c) An equivalent arrangement to (a) or (b).

(d) The extinguishment of a power-on indicator that normally illuminates at least once every 10 s.

2.4 MATERIALS AND COMPONENTS

2.4.1 Resistance to corrosion

Components shall be either inherently resistant to corrosion or plated or otherwise treated to afford adequate protection against corrosion. Compliance with this requirement shall be determined in accordance with AS 2362.13.

2.4.2 Resistance to high temperatures

Materials and components shall not be adversely affected at temperatures less than 10°C above the maximum allowable service temperature specified by the manufacturer of the smoke alarm. Compliance with this requirement shall be determined in accordance with the dry heat test set out in AS 2362.12.

2.5 DESIGN AND CONSTRUCTION

2.5.1 Suitability

Smoke alarms shall be designed and constructed in accordance with the performance requirements of Section 3.

2.5.2 Electrical and electronic components

Electrical and electronic components shall withstand the maximum and minimum temperatures that will occur inside the smoke alarm when it is subjected to the appropriate tests specified in Section 3.

Smoke alarms shall be designed such that the conditions under which components operate do not exceed the limits specified by the component manufacturer.

2.5.3 Mechanical design

The mechanical strength of all smoke alarm parts, including the smoke alarm enclosure and subassemblies, shall be capable of supporting the weight of components mounted thereon. The enclosure shall also be sufficiently rigid to prevent any detrimental effects due to handling in service.

2.6 MOUNTING FACILITIES

The smoke alarm shall be provided with means for secure mounting, including fasteners suitable for attachment to a plasterboard ceiling, and shall not be supported by its electrical wiring.

2.7 SENSITIVITY ADJUSTMENTS

All smoke alarms with sensitivity controls that are adjustable in situ shall be fitted with appropriate and reliable means of securing the adjustment mechanism. The positions of maximum and minimum sensitivity shall be clearly indicated.

Any continuously adjustable or step-adjustable smoke alarm shall be designed so that the sensitivity of the smoke alarm cannot be reduced below the minimum level specified in Clause 3.2.

2.8 CONNECTING FACILITIES

2.8.1 General

The terminations shall be designed so that the conductors connected thereto can be rigidly and effectively clamped between metal surfaces, or soldered, to ensure that the connection made will not slacken or overheat under normal conditions of use.

2.8.2 Interconnection facilities

No fault on the interconnection, including the reverse connection, the open circuit and the short circuit, shall prejudice the operation of any of the individual smoke alarms.

2.9 ELECTRICAL SAFETY

Where the maximum working voltage exceeds extra-low voltage (ELV), the smoke alarm shall—

(a) comply with the appropriate requirements of AS 3100; and

(b) be provided with a certificate of suitability by an appropriate regulatory authority.

2.10 SELF-TEST FACILITY

A test facility shall be provided to either mechanically or electrically simulate the presence of smoke in the sensing assembly. The test facility shall be accessible without the need to remove the cover of the smoke alarm when installed.

2.11 RADIOACTIVE MATERIALS

2.11.1 General

The manufacture or importation, distribution and disposal of smoke alarms containing a radioactive source is subject to the safety requirements of the relevant regulatory authority.

2.11.2 Design

The design of smoke alarms containing radioactive sources shall be such that under normal conditions of use the following apply:

(a) Direct contact with radioactive sources shall not be possible without the use of tools.

(b) The sources shall be sealed in compliance with the relevant requirements of ISO 2919, with a minimum classification of C32222. Their location shall be clearly indicated in the information supplied to the testing authority.

(c) The radio-nuclide used shall be—

(i) Americium-241, and the normal activity shall not exceed 37 kBq; or

(ii) if a radio-nuclide other than Americium-241 is used, the quantity used shall be such that the radiation exposure is not greater than that from the use of 37 kBq of Americium-241.

Radium-226 shall not be used.

(d) Sources shall not become detached or suffer loss of integrity during any of the tests in Section 3.

2.12 LIGHT-EMITTING DIODE (LED) SOURCE LAMPS

LEDs used as source lamps shall be operated at no more than 75% of their manufacturer’s maximum ratings.

2.13 ALARM-SILENCING MEANS

When an alarm signal silencing switch is provided, the ‘silenced’ position shall be—

(a) automatically reset after an interval not greater than 15 min; or

(b) clearly signified by—

  (i) a visual indicator; or

  (ii) an audible trouble signal.

Where the alarm signal silencing feature operates by reducing the sensitivity of the smoke alarm, Items (a) and (b) above do not apply if the reduced sensitivity is within the test limits specified in Table 3.1.

2.14 ALARM SIGNAL

The signal used to indicate the presence of smoke shall comply with ISO 8201 or ISO 7731.

SECTION 3 PERFORMANCE REQUIREMENTS

3.1 GENERAL

This Section sets out the performance requirements for smoke alarms.

Specimen pairs of smoke alarms shall be tested in accordance with the schedule given in Table 5.1.

3.2 SENSITIVITY

When tested in accordance with Appendix A, both average and individual results for all smoke alarms shall comply with the specified sensitivity range given in Table 3.1.

Smoke alarms with adjustable levels of sensitivity shall be tested at the maximum and minimum user selectable settings provided.

Where the manufacturer's data permits the smoke alarm to be mounted either horizontally or vertically, the smoke alarm shall be tested in both planes. Where the smoke alarm has been designed for use when mounted in one plane only, it shall be tested in that plane.

TABLE 3.1

SENSITIVITY LEVELS FOR SMOKE DETECTORS

	Sensitivity		
Value	**Nominal (S)**	**Individual minimum**	**Individual maximum**
%Obs/m	3 to 15	1.5S or S+2	0.5S or S–2

3.3 ELECTRICAL REQUIREMENTS

3.3.1 General

The sensitivity level of any smoke alarm following the electrical tests in Clauses 3.3.2 to 3.3.9 shall not exceed the limits specified in Clause 3.2.

3.3.2 Voltage stability

When tested in accordance with AS 2362.4, externally energized smoke alarms shall —

(a) not enter an alarm state for more than 10 s when the nominal operating voltage is applied, and

(b) not enter an alarm or fault state between the manufacturer's maximum and minimum rated voltages.

3.3.3 Insulation resistance

3.3.3.1 *Pre-corrosion test*

When externally energized smoke alarms are tested in accordance with AS 2362.5, the insulation resistance shall be greater than 10 MΩ immediately after pre-conditioning, at a temperature of 23 ±2°C and at a relative humidity of 50 ±10% for a period of not less than 24 h.

3.3.3.2 *Post-corrosion test*

The post-corrosion test shall be conducted in an environment in which the smoke alarm had been placed, of 23 ±2°C and 50 ±10% relative humidity not less than 24 h nor more than 48 h after completion of the corrosion test. The insulation resistance when tested in accordance with AS 2362.5 shall be not less than 1 MΩ.

3.3.4 Static discharge

When tested in accordance with AS 2362.6, the smoke alarm shall not enter an alarm state for more than 10 s after each discharge.

3.3.5 Electromagnetic interference

When tested in accordance with AS 2362.7 at the 1 V/m level, the smoke alarm shall not enter an alarm or fault state.

3.3.6 Impulse voltage withstand

When externally energized smoke alarms are tested in accordance with AS 2362.8, no damage shall occur. The smoke alarm shall not enter an alarm state for more than 10 s or generate a fault signal when subsequently re-energized.

3.3.7 High-frequency disturbance

When externally energized smoke alarms are tested in accordance with AS 2362.9, no damage shall occur and the smoke alarm shall not enter an alarm state for more than 10 s or generate a fault signal.

3.3.8 Overload

When tested in accordance with AS 2362.20, smoke alarms with output circuits, other than those used in interconnections for common alarm purposes, shall be capable of operating in a normal manner and there shall be no electrical or mechanical failure of the switching circuit.

3.3.9 Endurance

When tested in accordance with AS 2362.21, the smoke alarm shall be capable of operating in a normal manner.

3.4 ENVIRONMENTAL REQUIREMENTS

3.4.1 General

The sensitivity level of any smoke alarm following the environmental tests in Clauses 3.4.1 to 3.4.7 shall not exceed the limits specified in Clause 3.2.

3.4.2 Low temperature

When tested in an environment with a temperature of 0°C in accordance with AS 2362.10, the smoke alarm shall not generate a fault signal nor enter an alarm state during the test.

3.4.3 Damp heat

When tested in an environment with a temperature of 40 ±2°C and 92 ±3% relative humidity in accordance with AS 2362.11, the smoke alarm shall not generate a fault signal nor enter an alarm state during the test.

3.4.4 Dry heat

When tested in an environment with a temperature of 10 K higher than the manufacturer's maximum working temperature or 55°C, whichever is the greater, in accordance with AS 2362.12, the smoke alarm shall not generate a fault signal nor enter an alarm state during the test.

3.4.5 Vibration

When tested in accordance with AS 2362.15, the smoke alarm shall not generate a fault signal nor enter an alarm state during the whole of the test.

3.4.6 Corrosion

When tested in accordance with AS 2362.13, the smoke alarm shall comply with the requirements of the insulation resistance test specified in Clause 3.3.3 and shall function normally and be capable of undergoing the subsequent tests specified in Table 5.1.

3.4.7 Air velocity stability

When tested in accordance with AS 2362.18 at an air velocity of 5 m/s, the smoke alarm shall not generate a fault signal nor enter an alarm state.

When tested in accordance with AS 2362.19, the sensitivity of the smoke alarm shall not be reduced below its lower limit without an alarm state or fault signal being generated.

3.5 SOUND PRESSURE LEVEL

When tested in accordance with AS 2362.22, the sound level output of the smoke alarm shall be not less than 85 dB(A) for 1 min, and not less than 82 dB(A) after the alarm has sounded continuously for 4 min when measured at a distance of 3 m during the ‘on’ phases of the signal.

Externally energized smoke alarms shall be tested with the primary energy supply connected and then disconnected.

3.6 STRENGTH OF SCREW THREAD AND FIXINGS

Screws used for electrical connections and servicing shall comply with the torque test requirements given in AS 3100. During this test, the threads of the screwed component and its fixing shall not strip and the insulating material shall not crack. There shall be no other failure that would render the screwed component non-reusable.

SECTION 4 PRODUCT INFORMATION AND MARKING

4.1 GENERAL

Product marking shall be in a contrasting colour or finish to the body of the unit, unless otherwise specified. Markings shall be at least 1.2 mm high, unless otherwise specified. Smoke alarms shall be permanently marked with the following readily visible information:

(a) Unique identifying name or trade mark.

(b) Model number.

(c) Serial or batch number.

(d) Year of manufacture, which may be coded into, or form part of the serial or batch number.

(e) Electrical rating in volts (maximum and minimum), amps (or watts) and frequency.

NOTE: This information is not required where the alarm is not designed to be powered from an external source.

(f) Recommended batteries (including the unique identifying name or trade mark or part/model number if special batteries are required), located adjacent to, or within the battery compartment. More than one battery model shall be nominated.

(g) For a battery-operated smoke alarm, the following notice, or equivalent, shall be included on the smoke alarm:

'CAUTION: USE ONLY SPECIFIED BATTERIES. THE USE OF DIFFERENT BATTERIES MAY HAVE A DETRIMENTAL EFFECT ON OPERATION OR MAY CAUSE THE BATTERY TO EXPLODE, RESULTING IN INJURY OR FIRE.'

The word 'caution' shall appear in letters a minimum of 3 mm high.

(h) A notice on the outer surface of the enclosure: 'DO NOT PAINT.'

The letters shall be not less than 3 mm high and so placed as to be plainly visible after the smoke alarm is installed.

(i) A marking on the outer surface of the smoke alarm indicating the detection technology employed. Where more than one type of detection technology is used, multiple markings shall be used, with the following symbols:

(i) 'P' for photoelectric.

(ii) 'I' for ionization.

(iii) 'CO' for carbon monoxide.

(iv) 'H' for heat.

The letters shall be not less than 5 mm high and so placed as to be plainly visible after the smoke alarm is installed.

(j) Where the smoke alarm contains radioactive material, the following information shall be marked on, or permanently attached to, the ionization chamber:

(i) The words 'WARNING—RADIOACTIVE MATERIAL' or equivalent.

(ii) A black and yellow radiation warning (trefoil) symbol, in accordance with AS 1319.

(iii) The type and activity of the enclosed radio-nuclide.

(iv) The name and address of the supplier.

If the chamber is concealed from normal access, duplicate labelling shall be marked on the outside of the smoke alarm.

(k) Any adjustable smoke alarm shall be marked with the maximum and minimum level of sensitivity (see Clause 2.7).

NOTE: Manufacturers making a statement of compliance with this Australian Standard on a product, on packaging or on promotional material related to that product should ensure that such compliance is capable of being verified.

(l) If the primary power source is disconnected when a user replaces the stand-by power source as when the user has to partly or completely remove the smoke alarm from its mount, the following warning, in white letters, 5 mm high on a red background shall be readily apparent to the user: 'WARNING—INOPERATIVE UNTIL RE-INSTALLED'.

4.2 INSTRUCTIONS

Each smoke alarm shall be provided with installation instructions, which shall include the following information:

(a) Drawings of typical installation layouts for the smoke alarm, indicating recommended locations.

(b) Typical locations where installation is not recommended, clearly labelled as such.

(c) Information on the correct mounting orientation and a warning of a decrease in operational effectiveness resulting from incorrect orientation.

(d) Information on correct mounting on the ceiling surface with respect to the aperture for smoke entry and a warning of a decrease in operational effectiveness resulting from incorrect positioning of the aperture for smoke entry.

NOTE: This applies, for example to recessed ceiling mountings.

(e) For externally energized smoke alarms intended to be directly connected to an electrical circuit to operate above ELV, a notice that the unit must be installed by a licensed electrical contractor.

(f) Interconnection instructions where applicable.

(g) Operation, testing and maintenance procedures.

(h) Information on replacement parts, such as lamps or batteries, including their part number or manufacturer's model number or the equivalent, and information on where to obtain the part in Australia.

(i) For a smoke alarm containing radioactive material, a warning against tampering with the sealed source.

(j) Information on the alarm and fault signals, and an indication as to the situations in which false alarms or fault signals might occur.

(k) Advice that the device not be installed in locations where the normal ambient temperature is lower than 5°C or higher than 45°C, unless the smoke alarm has been certified for installation at such ambient temperatures.

(l) Where a battery is used as a stand-by power supply, the recommended battery replacement interval. Where an internal re-chargeable battery is used, the expected life of the battery shall be specified.

(m) Where the smoke alarm contains a radioactive source, information about disposal.

(n) Information on periodic testing and inspection requirements.

4.3 PACKAGING

The outside of the point-of-sale package shall be clearly and conspicuously marked with the following information, in letters at least 1.2 mm high unless otherwise specified:

(a) That the product complies with the requirements of AS 3786.

(b) The type of detection technology used, in letters at least 5 mm high. Detection based on the light-scattering principle shall be marked 'PHOTOELECTRIC'. Detection based on the ionizing chamber principle shall be marked 'IONIZATION'.

(c) If the smoke alarm contains radioactive material:

(i) The words 'THIS DEVICE CONTAINS RADIOACTIVE MATERIAL'.

(ii) The radiation warning (trefoil) symbol.

(iii) Details of the radio-nuclide and its activity.

Where the marking and information requirements of Clause 4.3.1 can be clearly seen through the packaging, the packaging is not required to be marked with this information.

SECTION 5 ASSESSMENT OF COMPLIANCE

5.1 GENERAL

Smoke alarms shall be assessed for compliance with this Standard in accordance with this Section.

5.2 DOCUMENTATION

The information specified in Section 4, and any other documentation as required by the testing authority, shall be submitted by the manufacturer or his/her agent as part of the submission for approval testing.

5.3 CRITERIA FOR PRODUCT ACCEPTANCE AND TEST SCHEDULE

Smoke alarms shall be assessed for compliance with Sections 2 and 4, and be tested in accordance with Table 5.1, and satisfy the performance requirements of Section 3.

TABLE 5.1

TEST SCHEDULE FOR SMOKE ALARMS

Order	Characteristics	Clause	Specimen pairs					Standard AS
			1	2	3	4	5	
1	Sensitivity (horizontal and vertical)*	3.2	/	/	/	/	/	Appendix A
2	Voltage stability†‡	3.3.2	/					2362.4
3	Insulation resistance	3.3.3					/	2362.5
4	Static discharge†	3.3.4	/					2362.6
5	Electromagnetic interference†	3.3.5	/					2362.7
6	Impulse voltage†‡	3.5.2		/				2362.8
7	High-frequency disturbance†‡	3.3.7		/				2362.9
8	Overload†‡	3.3.8	/					2362.20
9	Endurance†	3.3.9	/					2362.21
10	Low temperature	3.4.2			/			2362.10
11	Damp heat	3.4.3			/			2362.11
12	Dry heat	3.4.4			/			2362.12
13	Vibration	3.4.5			/			2362.15
14	Corrosion	3.4.6					/	2362.13
15	Air velocity	3.4.7				/		2362.18
16	Dust	3.4.8				/		2362.19
17	Sound pressure level	3.5	/	/				2362.22
18	Screw thread strength†‡	3.6	/					3100
19	Insulation resistance	3.3.3					/	2362.5
20	Sensitivity (horizontal and vertical)*	3.2	/	/	/	/	/	Appendix A
22	Assess for compliance with Section 2†	—						3786
22	Assess of documentation†	Section 4						3786

LEGEND:

/ Test required for each test pair.

* Test only as required.

† These tests may be carried out at any time in the sequence.

‡ Those tests do not apply to smoke alarms that do not have external connections.

APPENDIX A

SENSITIVITY TEST

(Normative)

A1 SCOPE

This Standard sets out the method of testing the sensitivity and performance of smoke alarms with respect to detecting smoke from smouldering fires (see Clause 3.2).

A2 PRINCIPLE

A smoke alarm is exposed to an environment containing a measured amount of smoke and its sensitivity is monitored.

A3 APPARATUS

A3.1 Test facility

A thermally insulated room with facilities for mounting smoke alarms on a horizontal surface, and drop-down panels for mounting actuating devices on vertical surfaces.

A3.2 Measuring apparatus

A3.2.1 *Measuring ionization chamber (MIC)*

The MIC is a standardized measuring chamber whose current is proportional to the quantity of smoke. The chamber shall have a parallel plate electrode configuration (see Figure A1), in which the alpha-source (Americium 241) is part of one of the electrodes. The configuration shall provide a measuring volume in which the ionization is uniform and approximately parallel to a constant electrical field.

The air is drawn through the chamber in order to reduce wind dependence, but the air in the measuring volume between the electrodes is stationary, since the drawn air flows in a duct that is separated from the measuring volume by means of a wire mesh. Smoke is transferred from the airflow to the measuring volume by diffusion.

The clean air quiescent current of the chamber shall be 10^{-10} A, corresponding to a chamber voltage of approximately 20 V.

The current in the chamber is measured either directly with an electrometer or by means of a special amplifier. When the latter method is used, an impedance-transforming circuit placed inside the MIC transforms the high impedance level of the ionization chamber to a lower impedance level. The transformation means that the length of the connecting cable between the MIC and the amplifier becomes non-critical.

NOTE: The MIC readings are relative smoke densities expressed in terms of an *'X' v*alue.

The ‘X’ value is given by the following equation:

$$X = \frac{I_o - I}{1_o} \quad \ldots (1)$$

where

I_o = the no smoke MIC current

I = the current in the presence of smoke

The ‘Y’ value is proportional to the particle density and can be derived from the ‘*X*’ value using the following equation:

$$Y = \frac{X(2 - X)}{1 - X} \quad \ldots (2)$$

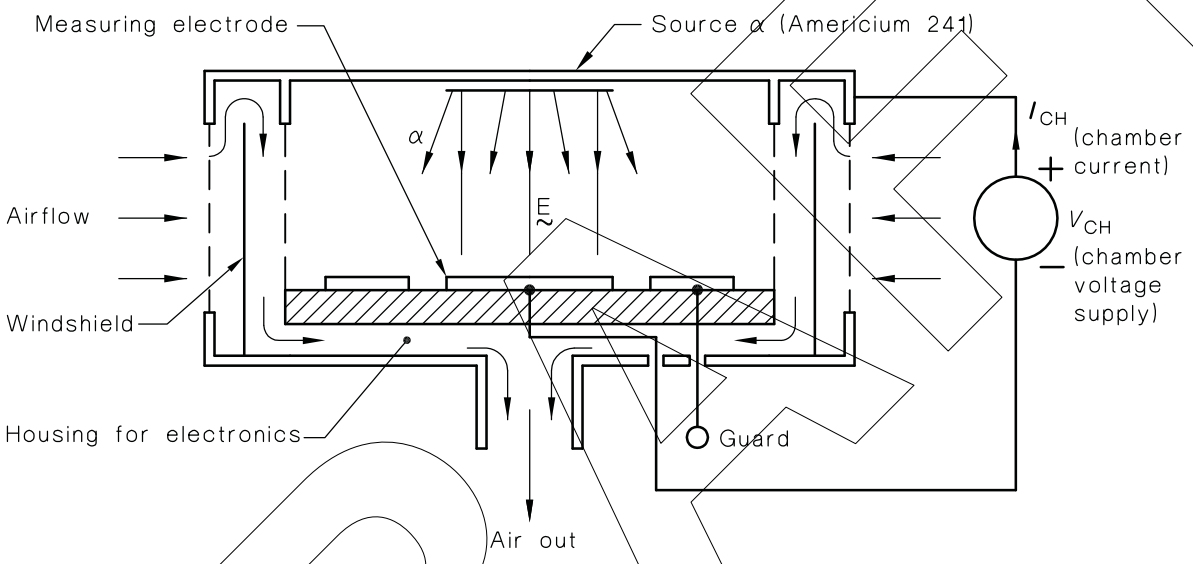

FIGURE A1 CONFIGURATION OF THE MIC

A3.2.2 *Light obscuration monitor (optical beam)*

The optical beam shall use a green (λ = approximately 560 nm) light-emitting diode (LED) as the source and a photodiode as the sensor. The light shall be pulsed, so that the instrument is not affected by variations in the ambient light level.

The LED source and sensor housings shall be mounted with brackets onto a rigid support so that the lens covers are separated by a distance of 1.00 m. Any reduction in the signal is then read directly as percent obscuration per metre.

The voltage output of the unit shall be proportional to the light falling on the sensor.

The optical beam shall be calibrated with clean air used as 0% and complete blockage of the optical beam as 100%. A calibrated neutral density filter of approximately 50% transmittance shall be used for an intermediate point to ensure that the optical beam response is linear to within 1%. If this degree of accuracy cannot be achieved, a correction curve shall be created by taking measurements at four points along the working range using appropriately calibrated filters.

A3.3 Smouldering fires

A 300 mm × 300mm sheet of untempered hardboard 4.8 mm thick, clamped by three straps 100 mm × 3 mm nominal to prevent warping, shall be laid nap (rough) side down on a heater.

NOTES:

1 4.8 mm 'Masonite' has been found suitable for this test.

2 The heater should comprise six flatstrip-type elements capable of producing 600 W each at 240 V of approximately 400 mm × 40 mm. The elements should be spaced 10 mm apart. The heat should be controlled to obtain the required rate of increase of obscuration.

The density of the smoke shall be increased at a rate of 5 ±0.5% Obs/m per min (obscuration per metre per minute), as determined by the light obscuration monitor.

A4 PREPARATION

A4.1 Monitoring smoke

The smoke produced shall be continuously monitored by an optical beam and an ionization chamber.

The light obscuration monitor shall have its light beam projected 170 ±10 mm below the ceiling and as close as practicable to the centre-line of the actuating device heads. The light obscuration monitor readings shall be expressed as percent obscuration per metre.

The MIC shall be mounted in line with the actuating devices under test, with the centre of the sensing chamber at approximately 45 ±5 mm below the ceiling. The MIC readings are relative smoke densities expressed in terms of an '*X*' value that is related to the number of smoke particles in a unit volume of air.

A4.2 Fuel conditioning

The untempered hardboard sheets shall be conditioned at 23 ±2°C and 50 ±5% relative humidity for 24 h.

A4.3 Room conditioning

The room shall be conditioned at 23 ±2°C and a relative humidity of 0–70% for not less than 30 min prior to each test.

A5 NUMBER OF TESTS

Smoke alarms of each type shall be tested simultaneously in four separate exposures to the smouldering fire. Smoke alarms shall not be cleaned between tests.

A6 PROCEDURE

The procedure shall be as follows:

(a) Mount the smoke alarms on the underside of the ceiling of the thermally insulated room, not less than 50 mm apart at a radial distance of 3 m from a point on the ceiling vertically above the centre of the fire.

NOTE: Actuating devices may be mounted on panels, provided that the mounting surface is not more than 5 mm below the plane of the ceiling.

Where the smoke alarms are to be tested on a vertical surface, they shall be mounted on a removable vertical panel (see Figure A2) attached to the ceiling such that the top of the device is 150 ±10 mm below the ceiling.

NOTE: The vertical panel is removed when testing actuating devices on the ceiling.

(b) Connect the smoke alarms to the appropriate control and indicating equipment and allow them to stabilize in accordance with the manufacturer's instructions.

NOTE: A timer should be connected to each actuating device through the control and indicating equipment.

(c) Mount the fire source on a stand 2.7 m below the ceiling, at the centre of the room (see Figure A2).

(d) Vacate and close off the room, and turn off all fans at least 10 min prior to the start of the test.

(e) Start the timers and apply power to the heater so that the density of the smoke, when it appears, increases at 5 ±0.5% Obs/m per min as determined by the light obscuration monitor.

(f) Continue the test until either all the detectors have entered the alarm state or the test limit has been exceeded.

(g) Record the time, MIC '*X*' value and degree of obscuration at which each smoke alarm entered the alarm state.

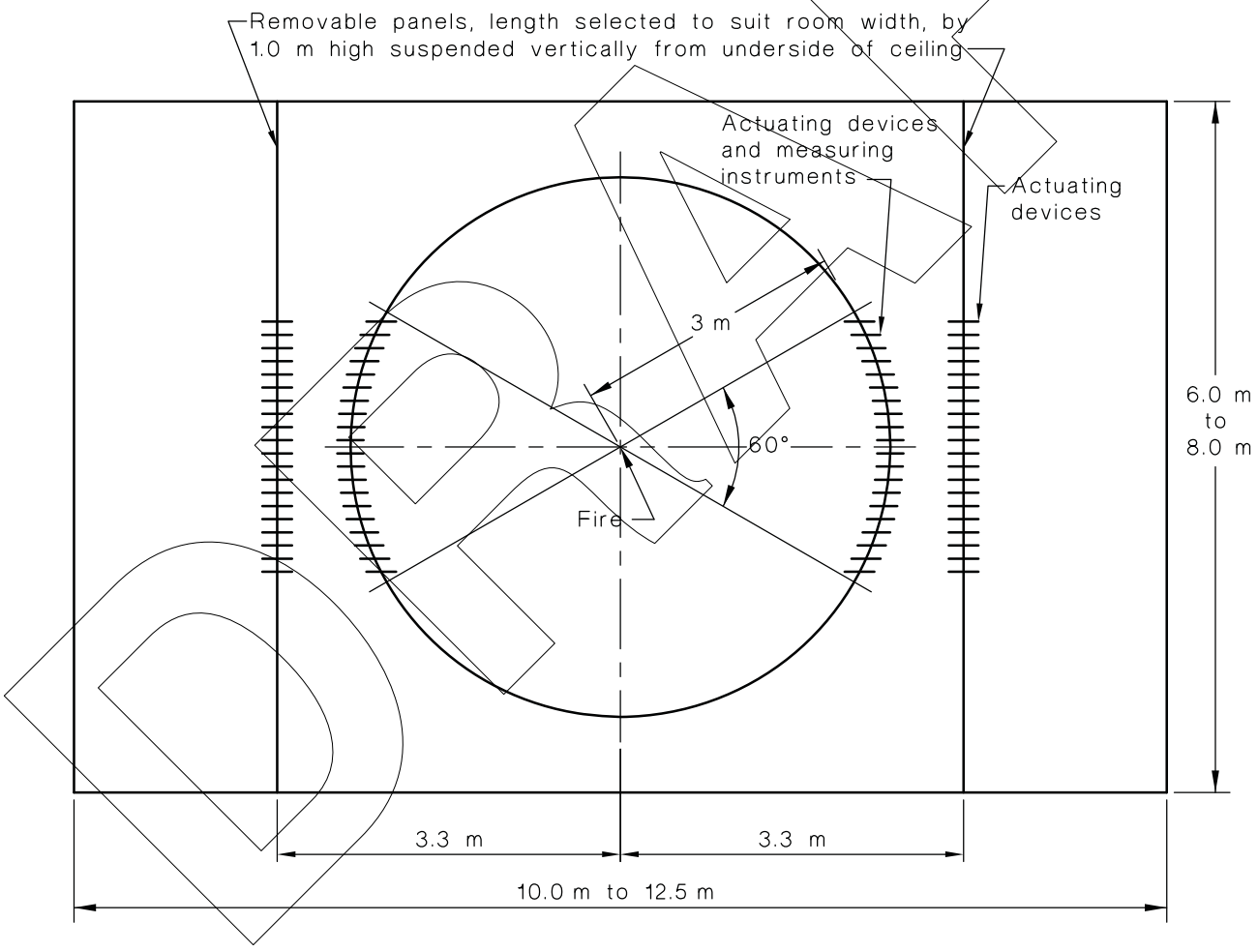

FIGURE A2 PLAN OF TEST FACILITY

A7 REPORTING RESULTS

The following shall be included in the report:

(a) Information identifying the smoke alarm.

(b) The plane in which the smoke alarm is mounted.

(c) The temperature and humidity in the room at the start of the test.

(d) The time at which the 5% Obs/m per min increase in smoke density started.

(e) The time, MIC '*X*' value and smoke density at which the smoke alarms entered the alarm state when mounted on the horizontal surface.

(f) The time, MIC 'X' value and smoke density at which the smoke alarms entered the alarm state when mounted on the vertical surface (where required).

(g) Reference to this test method, i.e. Appendix A, 3786.

APPENDIX B

BIBLIOGRAPHY

(Informative)

AS		
1670	Fire detection, warning, control and intercom systems—System design, installation and commissioning	
1670.1	Part 1:	Fire
1670.6	Part 6:	Smoke alarms

APPENDIX C

SUMMARY OF CHANGES TO AS 3786—1993

(Informative)

NOTE: This Appendix will not appear in the published Standard.

The following table summarizes the reasons for the major changes to AS 3786.

Clause No.	Clause title	Change required to AS 3786—1993	Reason for change	Potential impact
1.1	Scope	Delete 'However, such an interface is not intended for connection to a fire control station.'	This matter is the prerogative of regulations.	No impact.
1.1	Scope	Delete 'This Standard applies to smoke alarms intended for installation within residential accommodation where connection to a fire station is not required.'	This matter is the prerogative of regulations.	No impact.
1.2	Application	Delete 'A network of interconnected smoke alarms shall not be substituted for installations which require compliance with AS 1670.1.'	Updating to align with AS 1670.1. AS 1670.1 now recognizes smoke alarms.	No impact.
1.3	Interpretation	Clause deleted.	Not in line with current Standards Australia protocols.	No impact.
1.6	Definitions	Reference to AS 2484 deleted.	AS 2484 has not been revised since 1990 and many of its definitions are outdated.	No impact.
1.64	Definitions	Delete definition for measuring ionization chamber (MIC).	Editorial. See 3.2.	-
1.6.5	Definitions	Amended definition for multiple station smoke alarm.	Clarification.	No impact.
1.6.9	Definitions	Amended definitions for single station smoke alarms and multiple station smoke alarms.	Clarification.	No impact.

Clause No.	Clause title	Change required to AS 3786—1993	Reason for change	Potential impact
2.3.7	Disconnect facility	Amended to the following: 'A facility to disconnect the internal supply shall be provided for smoke alarms having an internal supply that is not accessible by the user. Disconnection of the battery shall be indicated by one of the following means: (a) A warning flag that will be exposed when the battery is disconnected and the cover closed. (b) A hinged cover that cannot readily be closed with the battery disconnected. (c) An equivalent arrangement to (a) or (b). d) The extinguishment of a power-on indicator that normally illuminates at least once every 10 s.'	Clarification. To reflect the original intention of this Clause.	Minimal impact, as part of this facility already exists. Prevents inappropriate implementations. Permits the user to silence a faulty smoke alarm while providing unambiguous indication that the smoke alarm has been disabled.
3.2	Sensitivity	Replace the following, ' User adjustable units shall be tested for sensitivity at the manufacturers recommended normal settings, as well as at the least sensitive and most sensitive settings', with the following, 'Smoke alarms with adjustable levels of sensitivity shall be tested at the maximum and minimum user selectable settings provided..'	Testing the recommended setting as well as the maximum and major settings is unnecessary.	Less testing. Potential for decreased cost of testing for user adjustable models.
3.2	Table 3.1, Sensitivity levels for smoke detectors	Delete current table and add table giving the sensitivity requirements from AS 1603.2 for light obscuration from point type smoke detectors	To provide technology independent performance criteria, based only on light obscuration.	10-15% short-term minimal cost implications. Medium to long-term, no cost impact. See Preliminary Impact Assessment (Version 2) for clarification.
3.4.7	Air velocity stability	Increase air velocity stability criteria of acceptance from 2.5 m/s to 5 m/s	To reduce the incidence of nuisance alarms from non-fire phenomena. To align with ISO 12239.	No additional testing required. Positive life-safety impact in the community by reducing the incidence of user-disablement of alarms due to nuisance alarms.

Clause No.	Clause title	Change required to AS 3786—1993	Reason for change	Potential impact
3.4.7	Air velocity stability	Deleted the sentence, 'Photoelectric type detectors are not required to be subjected to this test.'	To provide technology independent performance criteria.	This is a simple test with very minimal cost impact. Cost of testing is one-off for type approval. This would have an insignificant impact when amortised over the total units sold.
4.1 (i)		Added the following to Clause 4.1: '(i) A marking on the outer surface of the enclosure indicating the detection technology employed. Where more than one type of detection technology is used, multiple markings shall be used, with the following symbols: (i) 'P' for photoelectric. (ii) 'I' for ionization. (iii) 'CO' for carbon monoxide. (iv) 'H' for heat. The letters shall be not less than 5 mm high and so placed as to be plainly visible after the smoke alarm is installed.'	To allow identification of the operating principle by building certifiers and fire services.	Minimum cost impact. Stick-on labels could be used in the short-term.
4.2 (d)	Instructions	The following requirement added: '(d) Information on correct mounting on the ceiling surface, with respect to the aperture for smoke entry and a warning of a decrease in operational effectiveness resulting from incorrect positioning of the aperture for smoke entry. NOTE: For example, with regard to recessed ceiling mountings.'	AS 1670.6 used to include a requirement to install smoke alarms so that the aperture for smoke was at least 25 mm from the ceiling. To avoid being overly prescriptive, it was decided that manufacturers should inform customers of this potential operational limitation, as appropriate.	Minimum cost impact. Stick-on labels could be used on printed material in the short-term. This will alert installers to the limitations of placing smoke alarms in recessed ceiling spaces where they may not operate effectively.
4.2 (j)	Instructions	Delete requirement to instruct on returning the ionisation type alarm to the supplier or Department of Health, and only require information on safe disposal.	This is a regulatory issue and should not be included in an Australian Standard.	No cost impact.
New Appendix A	Sensitivity test	2362.17-2001 has been copied into this Appendix	See 3.2.	No change to current requirements.

Clause No.	Clause title	Change required to AS 3786—1993	Reason for change	Potential impact
New Appendix B	Bibliography	Separated the informative references from the normative references	Will help the reader differentiate the two types of references.	Will enhance the readers' understanding of recommendations/informative text from mandatory text.

*** END OF DRAFT ***

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During the development process, Australian Standards are made available in draft form at all sales offices and through affiliated overseas bodies in order that all interests concerned with the application of a proposed Standard are given the opportunity to submit views on the requirements to be included.

The following interests are represented on the committee responsible for this draft Australian Standard:

Audio Engineering Society

Australasian Fire Authorities Council

Australian Building Codes Board

Australian Chamber of Commerce and Industry

Australian Electrical and Electronic Manufacturers Association

Australian Industry Group

Australian Institute of Building Surveyors

CSIRO Manufacturing & Infrastructure Technology

Deafness Forum of Australia

Department of Defence (Australia)

Fire Protection Association Australia

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National Electrical and Communications Association

National Fire Industry Association

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