Fire Protection Association Australia Life Property Environment

# FPA Australia Submission

## Senate Inquiry – Use of smoke alarms to prevent smoke and fire related deaths

FPA AUSTRALIA

This document is a submission in response to the Terms of Reference referred by the Parliament of Australia – August 2015

# Executive Summary

This submission has reviewed the current requirements under the Building Code of Australia (BCA) and state and territory legislation for smoke alarms in new residential buildings and the current requirements in state and territory legislation for smoke alarms in existing residential buildings to identify how these requirements can be improved to prevent smoke and fire related deaths.

It explores the principles behind smoke alarms and their use to achieve their purpose—to detect fire in its initial development stage and provide early warning of the fire to allow occupants time to escape. The submission also explores the variances in legislative requirements for smoke alarms in new and existing residential buildings in each state and territory.

The findings indicate that the BCA requirements are, for the most part, suitable as a minimum. However, the BCA requirements can be further improved at minimal cost by specifying the most appropriate detection technology for the type of fire expected at the period of highest risk—a photoelectric smoke alarm to cover smouldering fires producing visible smoke when occupants are sleeping. The BCA requirements can also be improved by providing more specific location requirements—especially that smoke alarms are provided in egress paths—to ensure smoke alarms achieve their purpose.

The review of the current legislative requirements for smoke alarms in existing residential buildings in each state and territory indicated that there are significant omissions in legislation. Most specifically, smoke alarms are not required in almost all existing ACT residential buildings and only tenanted residential buildings in Tasmania and tenanted, hired or sold residential buildings in WA. That in 2015 not all existing residential buildings in Australia are required to have smoke alarms is a significant life safety concern.

The type of existing residential buildings covered by each state and territory's legislative requirements for smoke alarms in existing residential buildings not only varied as well, but the actual smoke alarm requirements for each state and territory varied significantly too. As such, FPA Australia has provided a suite of recommendations for improvements to state and territory legislation for smoke alarms in existing residential buildings so that smoke alarms are provided in all residential buildings (owner-occupied and tenanted) and that smoke alarms are installed appropriately to ensure they achieve their purpose.

Also, to ensure that the requirements for existing residential buildings are consistent and remain consistent, FPA Australia has suggested development of a national document that is adopted by all states and territories.

FPA Australia has also highlighted the importance of maintenance to ensure that, after the initial installation, smoke alarms continue to be capable of achieving their purpose. It is suggested maintenance of smoke alarms also be incorporated into the abovementioned national document.

Finally, FPA Australia has recommended the revision of Australian Standard AS 1670.6 to specify the smoke alarm location and installation requirements to ensure that smoke alarms are located correctly so that they will achieve their purpose.

By ensuring that legislative requirements are provided for both new and existing residential buildings detailing the necessary requirements to ensure that smoke alarms are installed appropriately to ensure they achieve their purpose (and smoke alarms are maintained to ensure they will continue to achieve their purpose), state and territory governments can likely reduce the smoke and fire related injuries and deaths (and associated damage to property) that residential fires cause.

# Table of Contents

# Introduction

This Senate Inquiry provides the opportunity to highlight a variety of issues around the use of smoke alarms to prevent smoke and fire related deaths. FPA Australia's submission addresses each point of the Terms of Reference in turn. Particular emphasis is on Items c., d., e., f. and g. of the terms of reference, where information is provided on:

- The main principles of smoke alarms and their use;
- The current Building Code of Australia (BCA) requirements; and
- The current legislative requirements for smoke alarms in existing residential buildings in each state and territory.

Items c. and d. also highlight shortfalls in current requirements while Items e., f. and g., provide recommendations for the BCA, legislative requirements and other related matters, respectively, to address these shortfalls.

Note

In this submission the word "important" appears many times. The reason for this is that it is not one requirement or aspect of smoke alarms alone that ensures that they achieve their purpose of detecting fire in its initial development stage and providing early warning of the fire to allow occupants time to escape (and therefore reducing smoke and fire related injuries and deaths, and associated property damage). Rather, it is a combination of a significant number of factors that ensure that this result is achieved whereby if one factor is neglected this may mean the smoke alarm cannot achieve its purpose at all.

For example, a smoke alarm in a location where smoke will not readily reach it will render it useless regardless of the detection technology or alarm signal used or its interconnection with other alarms.

"Important" is therefore used to emphasis the critical nature of these aspects.

# About FPA Australia

Fire Protection Association Australia (FPA Australia) is Australia's major technical and educational fire safety organisation aiming to achieve continual improvement in fire safety through active membership and a range of related activities. FPA Australia is a not-for-profit organisation with the following strategic goals.

### *Our Vision*

*Leading and supporting a professional industry to minimise the impact of fire on life, property and the environment, for a safer community.*

### *Our Mission*

*To lead and support our members, government, business and the public to create a fire safety community through:*

- *advocating for continuous improvement of legislation codes and standards*
- *guidance and direction on industry best practice*
- *development and provision of business services and resources*
- *proactive engagement, education and communication*
- *development and promotion of professional products and services*

*Our Values*

- *Integrity: behaving ethically, acting with loyalty, honesty and transparency and being prepared to express our views.*
- *Independence: to pursue our vision, free of bias, coercion, favouritism and external commercial interest.*
- *Professionalism: being committed to the continuous professional development of our Association and industry.*

## FPA Australia members

FPA Australia members are involved throughout all phases of the fire protection industry as illustrated by figure 1 below.

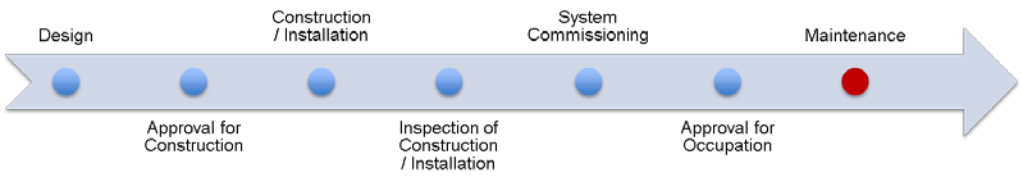


Figure 1– Phases of the Fire Protection Industry

Some of the fire protection systems and equipment our members cover through these phases include:

- Fire detection and alarm systems.
- Portable and mobile equipment.
- Fire sprinkler and hydrant systems, tanks and fixed fire pumps.
- Special hazard fire protection systems.
- Passive fire protection.

Our members also include students, certification bodies, insurers, fire brigades, government departments, universities and other relevant organisations as well as companies that offer services such as consultancy, training, emergency planning and procedures.

FPA Australia has three categories of membership as highlighted in figure 2 (next page).

- Personal membership – for individuals with an interest in fire protection and fire safety, wishing to receive regular communication and updates.
- Corporate membership – for businesses providing fire protection services and/or equipment and systems to the Australian market.
- Organisation membership – for business or institutional entities with an interest in fire protection and safety, but who are not involved in the manufacture and/or supply of fire protection equipment and/or services.

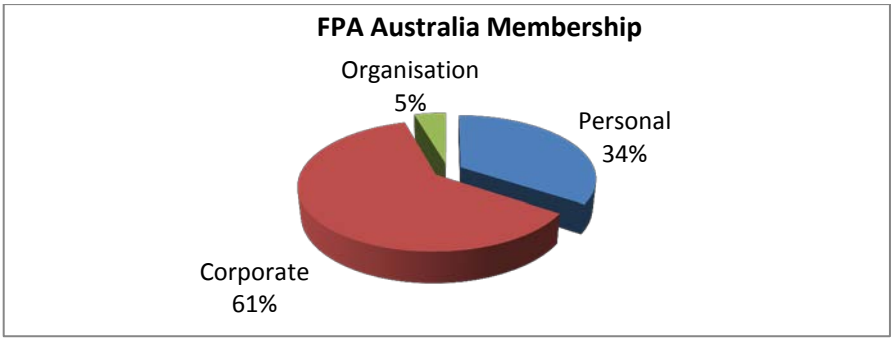


Figure 2 FPA Australia membership

# FPA Australia technical committees

FPA Australia contributes—through its Technical Advisory Committees (TACs) and Special Interest Groups (SIGs)—to the technical requirements for fire protection systems and equipment used in Australia.

These technical committees are made up of volunteers from the membership with an interest and expertise in particular areas of fire protection and a commitment to advance the industry.

The TACs and SIGs are managed and coordinated by the FPA Australia Technical Department and the National Technical Advisory Committee (NTAC) under the authority of the FPA Australia Board, see figure 3.

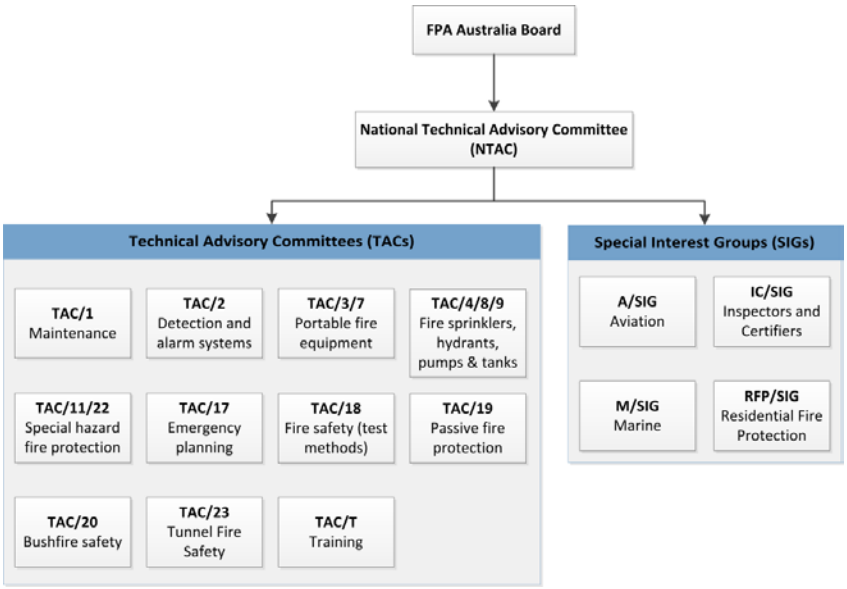


Figure 3 FPA Australia Technical Committee structure

TACs and SIGs are also supported and engaged with FPA Australia's State and Territory Membership Groups to identify and treat state based issues and also for identification of local issues that might impact nationally.

FPA Australia's TACs and SIGs contribute to a wide variety of organisations and documents including legislation (State, Territory and Commonwealth), Building and Plumbing Codes, Australian Standards, fire brigade documentation, industry guidelines and FPA Australia's own technical documents, see figure 4 (next page).

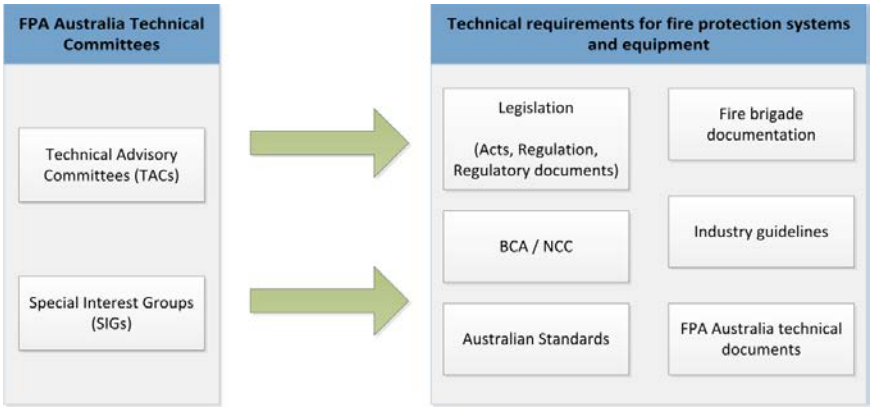


Figure 4 FPA Australia Technical Committee input to technical requirements for fire protection systems and equipment

FPA Australia is also a member of the Australian Building Codes Board (ABCB) Building Codes Committee (BCC).

## Terms of reference

*On the 25 June 2015 the following matter be referred to the Legal and Constitutional Affairs References Committee for inquiry and report:*

*The use of smoke alarms to prevent smoke and fire related deaths, with particular reference to:*

a. *the incidence of smoke and fire related injuries and deaths and associated damage to property;*
b. *the immediate and long term effects of such injuries and deaths;*
c. *how the use, type and installation set-ups of smoke alarms could affect such injuries and deaths;*
d. *what smoke alarms are in use in owner-occupied and rented dwellings and the installation set-ups;*
e. *how the provisions of the Australian Building Code relating to smoke alarm type, installation and use can be improved;*
f. *whether there are any other legislative or regulatory measures which would minimise such injuries and deaths; and*
g. *any related matter.*

## The use of smoke alarms to prevent smoke and fire related deaths, with particular reference to:

## a. the incidence of smoke and fire related injuries and deaths and associated damage to property;

FPA Australia does not maintain statistics on fires and the incidence of smoke and fire related injuries and deaths and associated damage to property and is therefore unable to comment on this item. This information is collected by each state and territory's fire services (brigades) and as such we would recommend contacting those organisations directly for this information.

Anecdotally, there is agreement by fire services across the world that smoke alarms save lives and are one of the most significant fire safety advancements in a generation. This is reflected in their ongoing dedication to awareness campaigns on smoke alarms.

Please note that there is no central source for the statistics collected by fire services (one reason for this is that the collection methods are different between each fire service and therefore the information

is difficult to collate accurately). As such, information would need to be sought from each individual fire service.

For the purposes of future research and analysis into the effectiveness of fire protection measures, FPA Australia would support the establishment of a co-operative database of fire losses, injuries and fatalities.

## b. the immediate and long term effects of such injuries and deaths;

Like Item a. above, FPA Australia does not have information on this area as our expertise is in fire prevention and fire protection. This information may be able to be sourced from the fire services as well as relevant healthcare facilities such as the burns units at major hospitals like the Alfred in Melbourne.

## c. how the use, type and installation set-ups of smoke alarms could affect such injuries and deaths;

This section will cover the principles of smoke alarms and their use. It informs Items d., e., f. and g. below, which discuss the requirements for smoke alarms under the Building Code of Australia (BCA) and legislation. These items also provide recommendations to improve these requirements to ensure that smoke alarms achieve their purpose of detecting a fire in its initial development stage and providing early warning of the fire to allow occupants time to escape.

The purpose of smoke alarms is to detect fire in its initial development stage and to provide early warning of the fire to allow occupants time to escape. As such, smoke alarms must be able to detect smoke (indicating a developing fire) and emit an audible alarm signal (sound) to warn occupants of the fire. To be able to do this, smoke alarms must not only have the necessary components to detect smoke and emit the alarm signal but they must also be located appropriately to ensure that:

- smoke readily reaches the alarm;
- the audible alarm signal is heard by the building occupants; and
- the smoke alarms are installed in egress (exit) paths so that suitable warning can be provided before smoke and/or fire causes these paths to become impassable.

Smoke alarms that are installed correctly and operate as intended should achieve their purpose of detecting fire in its development stage and providing early warning of the fire to allow occupants time to escape and thereby can reduce the incidence of smoke and fire related injuries and deaths and associated damage to property.

> Note
>
> It is important to recognise that smoke alarms do not prevent, contain or suppress fires. They detect smoke and provide warning to occupants of the fire. As such, they do not in themselves prevent smoke and fire related injury or death but can alert occupants of a fire so that they can take themselves out of harm of smoke and fire. Fires are time critical events in terms of safety and smoke alarms reduce the time to respond.

The following covers key considerations in regards to smoke detection and warning and the impact of location in regards to both. It also addresses the power source for smoke alarms which ensures that the smoke alarm has the necessary power to perform these functions.

# Smoke detection

## Smoke detection technology—Ionisation vs Photoelectric

The type of smoke detection technology that should be used for smoke alarms in residences has been a contentious topic for many years. However, various research—most recently the Building Research Establishment (BRE) Briefing paper (see Appendix B for details of this and other referenced documents)—has strongly indicated, as thought by industry, that ionisation type smoke alarms are more effective at detecting smoke from flaming fires and photoelectric type smoke alarms are more effective at detecting smoke from smouldering fires. As such, the question is not whether one technology is better than another. Instead, it is when is the risk greatest, what fires are most likely to occur at this time and therefore which detection technology is the most appropriate for that type of fire.

To understand this, the following is a brief explanation of these different types of fire and how the different smoke detection technologies work. This information has been drawn from FPA Australia's Position Statement *PS-01 Selection of residential smoke alarms*, the BRE Briefing paper and the National Institute of Standards and Technology (NIST) Statement for the record. Please note that this information has been simplified and, as such, these documents should be referred to for a more detailed explanation.

### Types of fire:

- *Smouldering Fires*

  Smouldering fires represent a slow surface reaction between a solid fuel and oxygen in the air resulting in inefficient burning of the fuel. Oxygen required for smouldering fires is consumed at a much lower rate than flaming fires; however, smouldering fires can produce more visible smoke and gases as products of incomplete combustion. These smoke particles are relatively large (greater than one micrometre).

  It is difficult to predict if and/or when a fire transitions from smouldering to flaming. However, it usually occurs after conditions near the fire's point of origin have already become untenable due to the elevated concentration of carbon monoxide gas and/or other toxic gases.

- *Flaming Fires*

  Flaming fires result when heat transferred to the surface of a burning fuel (that may have been initially smouldering) forms combustible volatiles or gases which mix with oxygen in the air and burn in a hot luminous region referred to as the flame. Flaming fires develop rapidly and produce fine particles of smoke (less than one micrometre).

  Flaming fires in residential buildings commonly occur in kitchens where stoves and ovens create high sources of heat and gas cooktops introduce naked flame. The instances of flaming fires can also be considered to correlate with direct occupant involvement or activity, or after a fire has been smouldering for some time.

### Type of detection technology:

- *Photoelectric smoke detection*

  Photoelectric smoke alarms (sometimes called optical smoke alarms) contain a chamber with a light source projected into it. When smoke particles enter the

chamber, it scatters and disturbs the light source which is detected by a light sensitive receiver, causing the alarm to sound.

As noted in the NIST Statement for the record (p2) “Because large particles have much more surface area than small particles, a photoelectric detector is more sensitive to the large particles produced in a smoldering fire”.

Due to this detection method, research has shown that photoelectric smoke alarms are superior to ionisation smoke alarms in detecting the large particles that make up the visible smoke produced by smouldering fires. However, they can be slower to respond in relation to flaming fires, which produce smaller smoke particles.

- *Ionisation smoke detection*

  The operation of this smoke detection method is well described in BRE Briefing paper (p3):

  > *“Ionisation detectors use a small radioactive source (americium-241) inside an ionisation chamber that contains charged electrodes. The chamber is arranged to allow a flow of air from outside. As the air enters it becomes ionized, generating an electric current between the charged electrodes. When smoke particles pass into the chamber the ions become attached to them and are carried away, leading to a reduction in the current. More ions are stripped away when there are many small particles, such as those generated during flaming fires. When a material is smouldering it tends to produce fewer but larger particles than it does when in flames. As these cause less current reduction, ionisation detectors are inherently less responsive to the large smoke particles generated during smouldering fires.”*

In summary, photoelectric smoke alarms are more suitable for detecting the larger smoke particles from smouldering fires while ionisation smoke alarms are more suitable for detecting the smaller particles from flaming fires.

Residential buildings contain a wide spectrum of fire safety risks due to diversity in lifestyle and culture, occupant characteristics, construction types and contents such as furniture and appliances. Activities such as cooking and sleeping also impact, as they can introduce heat sources and reduce the alertness of occupants respectively.

Considering all these risk factors, the level of fire safety risk to building occupants is considered highest when occupants are sleeping. This is because human senses are dulled during sleep and response time to any fire that is likely to start is increased, meaning that the occupants may have insufficient time to avoid the effects of fire.

Accordingly the minimum smoke alarm requirements must reflect the detection technology best suited for the smoke type of the most likely type of fire to occur when occupants are asleep. This is considered to be critical to reducing the incidence of smoke and fire related injuries and deaths (and associated damage to property).

Given the types of materials used in furnishings and floor coverings etc. and the likely ignition sources within a residential occupancy, the most likely fire type to be encountered whilst occupants are asleep is a smouldering fire producing visible smoke.

As photoelectric smoke alarms have been proven to detect the larger visible smoke particles from smouldering fires better than ionisation smoke alarms, FPA Australia considers that the minimum smoke alarm requirements be that all residential buildings should be installed with photoelectric smoke alarms to detect the type of fire expected at

the time of highest risk—a smouldering fire producing visible smoke when occupants are sleeping. Ionisation smoke alarms may be used in addition to these minimum requirements and based upon the defined risk. A multi-technology detector with both photoelectric and ionisation technology would provide the best chance of detection allowing for different fire types. However, if you only have one technology it should be photoelectric as this is most likely to respond to the most likely risk.

It is acknowledged flaming fires still occur; however this recommendation covers the most likely fire type and, as per the "Summary of Results" from the BRE Briefing paper (p11)—"a flaming fire will eventually produce sufficient heat that will radiate onto other materials and lead to the production of smouldering [visible] smoke to which the optical detectors would be expected to respond." The probability of a fire developing from a single fuel which produces no visible smoke is extremely unlikely in a residential building.

Another relevant factor in determining the most suitable detection technology for smoke alarms in residential buildings is that smoke alarms are intended to detect fire in its initial development stage and *provide early warning of the fire to allow occupants time to escape*, i.e. ensuring that warning is provided before smoke becomes so thick that it obscures the egress path making it difficult for occupants to determine where it is and where they are on this path. As obscuration is caused by visible smoke, photoelectric smoke alarms are more suitable where obscuration/visibility is a relevant criterion.

Smoke detection technology and cost

When smoke alarms were first introduced, photoelectric type smoke alarms were much more expensive than ionisation smoke alarms. Since then, technology and demand has changed and there is now minimal disparity in price between a photoelectric type smoke alarm and an ionisation smoke alarm. As such, cost is no longer a factor of any significance in the choice of detection technology.

## Location of smoke alarms

While the type of smoke detection technology used is an important part of smoke detection, it is equally important that smoke alarms are correctly located so that:

1. Smoke detection is provided in egress (exit) paths to ensure an alarm will be raised before smoke causes the egress paths to become impassable.
2. Smoke alarms are located in a position where smoke will readily reach them.
3. Smoke alarms are not in a location where they will be subject to frequent nuisance/false alarms (these often result in occupants disabling the smoke alarms and therefore removing the protection they provide).

The location of alarms is also important for warning occupants but this aspect of location is covered later.

### *Detection in common exit paths*

The need for smoke alarms to be located in egress (exit) paths to ensure that an alarm will be raised before smoke causes the egress path to become impassable is mentioned in the explanatory information to Part 3.7.2 of Volume 2 of the BCA for Class 1 buildings, but it is not a requirement. Location of smoke alarms in egress paths is a requirement in Specification E2.2a of Volume 1 of the BCA for Class 2, 3 or 4 buildings but only for storeys not containing any bedrooms.

> Note
> See Part A3 of Volume 1 of the Building Code of Australia (BCA) for a description of the different classes of building. Class 1, 2, 3 & 4 are all different residential buildings or residential parts of buildings.

In regards to existing residential buildings, the ACT, NT, QLD, SA and WA legislative requirements all reference the BCA for location requirements (note these state and territory legislative requirement do not cover all Class 1 to 4 buildings, see Item d. and Appendix A). The NSW and TAS legislative requirements are similar to the BCA but do not include reference to egress paths. The Victorian requirements mention egress paths for storeys in Class 1 buildings not containing bedrooms but not for any other class.

As such, this requirement is inconsistently referenced, required only for storeys not containing bedrooms or not mentioned at all. Given the purpose of smoke alarms is to detect fire in its initial development stage and provide early warning of the fire to allow occupants time to escape, it is essential that detection is provided in the paths of egress to ensure warning is provided while egress paths are still passable.

### *Smoke alarms to be located where smoke will reach them*

The explanatory information to Part 3.7.2 of Volume 2 of the BCA makes reference to the need for smoke alarms to be installed on or near the ceiling (to detect smoke, which will rise to the ceiling as it is more buoyant than air due to temperature). It also advises special care be taken to avoid dead air spaces which are described as “area[s] in which trapped hot air will prevent smoke from reaching the alarm”. As such, the explanatory information to Part 3.7.2 of Volume 2 of the BCA provides suggestions for where to install (or not install) smoke alarms and at what clearance from a wall (and ceiling, if wall mounted).

The requirement for smoke alarms to be installed “on or near the ceiling” is consistent across the BCA (applies to Class 2, 3 and 4 buildings too) as well as all state and legislative requirements for existing residential buildings. However, this additional information on suggested locations and clearances is not carried over beyond the BCA to retrospective state requirements except in the Victorian Building Authority (VBA) Practice Note. It should be noted, however, that the smoke alarm information provided by each state and territory’s fire services generally includes this advice.

### *Smoke alarms are not in a location where they will be subject to nuisance/false alarms*

As covered above, photoelectric smoke alarms best detect large particles while ionisation smoke alarms best detect small particles. However, what is not always readily understood is that this is simply detection of particles of a certain size—not exclusively smoke particles but any airborne particles of a similar size to smoke particles. As such, any other particles of this size will cause the smoke alarm to go into alarm. When an alarm is caused by particles other than smoke from a fire, this is known as a nuisance or false alarm.

Common examples of instances where smoke alarms are exposed to similar sized particles that will cause them to go into alarm include:

- Bathrooms—steam from bathrooms can cause photoelectric smoke alarms to go into alarm.
- Kitchens—cooking fumes consist of small particles that can cause ionisation alarms to go into alarm.
- Cleaning products—cleaning products can produce fumes that cause false alarms.
- Insect bombs—the fumes these produce cause false alarms.

There is some information on potential causes of false alarms included in the explanatory information to Part 3.7.2 of Volume 2 of the BCA and in the VBA Practice Note. As such it would be valuable to provide similar guidance nationally so that installation of smoke alarms is in locations where they less likely to be subject to nuisance/false alarms. FPA Australia would be happy to assist in the development of such a document. This issue, and the others above in regards to location for the purposes of smoke detection, could perhaps be addressed through a revision of Australian Standard AS 1670.6, *Fire detection, warning, control and intercom systems - System design, installation and commissioning - Smoke alarms* and its adoption by the BCA and by the legislative requirements for smoke alarm requirements in existing residential buildings in each state and territory. This would ensure consistent requirements for new and existing residential buildings throughout Australia. This suggested revision and adoption of AS 1670.6 is covered further in Item g.

# Warning

## Alarm signal

All smoke alarms include a sounder which emits an audible alarm signal to alert occupants that smoke has been detected. While there is research (mainly from Dorothy Bruck and Ian Thomas, Victoria University) suggesting that the current alarm signals may not be particularly effective in waking sleeping children, elderly people or the hearing impaired, these signals do work on most adults and to change to the suggested more effective signal is not practical given the current technology—the suggested signal (520 Hz square wave) is difficult to implement within a standard smoke alarm. The current practice is to provide supplementary measures in these specific occupant risk profiles. Such supplementary measures may include additional sounders at the 520Hz, visual alarm devices and pillow shakers.

## Location of smoke alarms

The location of the smoke alarm also impacts on how much of the sound of the alarm signal is lost. In particular, smoke alarms are typically installed in the hallways outside bedrooms rather than in bedrooms. With the door closed, the sound level is generally reduced to 55-65 dBA (Thomas & Bruck, Victoria University).This is less of a risk for adults but can be significant for children, the elderly and the hearing impaired.

This could be improved by installing smoke alarms in bedrooms themselves however the cost benefit of this would need to be determined.

A potential alternative solution between the current installation in hallways and installation in all bedrooms may be installation of a smoke alarm in the master bedroom.

BCA 2014 introduced the requirement for where more than one smoke alarm is installed then they must be interconnected. Interconnection means that when one smoke alarm goes into alarm (sounds) all go into alarm (sound) thereby alerting all occupants within the building simultaneously and at the earliest stage. By installing a smoke alarm within the master bedroom the occupants of the master bedroom (in a family situation, the parents) are effectively the fire warden, who could then assist others if possible. This recognises, as part of the overall provision of fire safety within the building, the occupants must know what to do when the alarm sounds. An escape plan, known to all occupants, must be prepared and practiced. Preparation and practice of an escape plan is an important element highlighted in the smoke alarm information provided by the fire services.

### Interconnection

Mentioned in the previous section above, interconnection is another very important factor in warning occupants of a developing fire.

A smoke alarm provides “point type detection”. That is, it detects smoke only in the location (point) where it is installed. However, houses and other residential premises can have multiple storeys or layouts that mean if a fire started in one part of the house, which may be unoccupied at night while the occupants sleep, it may take significant time for the smoke from a fire in that location to reach other smoke alarms. During this time, the fire could progress past the smouldering stage by which time smoke may have caused the egress (exit) paths to become impassable.

This is especially concerning for multistorey residences where there will almost always be only one stair meaning the only alternative exit will be from, at minimum, a first storey window where there are no requirements to provide for such egress (e.g. a ladder or fire stair) and therefore the risk of injury (or even death) from such an exit is high.

Interconnection means that when one smoke alarm goes into alarm (sounds) all of the smoke alarms go into alarm (sound). As such, interconnection means that wherever in a residence a fire originates, all occupants will be warned so they can evacuate safely.

FPA Australia applauds the introduction of an interconnection requirement into the BCA as one positive step to increasing life safety in residential buildings. Subject to cost/benefit analysis, this is a design aspect that should also be introduced for existing buildings.

## Power source

The provision of appropriate detection and warning are key to the performance of smoke alarms however, none of this can be achieved without power to the smoke alarm.

There are essentially three (3)* power source options:

- Hard-wired smoke alarms connected to consumer mains supply.
- 10 year non-removable battery.
- Replaceable battery.

*Australian Standard AS 3786 does not describe the power supply options in these terms but this is how such requirements are implemented in practice and referred to in the BCA or legislative requirements

Hard-wired smoke alarms connected to consumer mains supply are required under AS 3786 to have a secondary power source (battery back-up). This provides a redundancy—if the power is disconnected (blackout or because of a fire itself) the smoke alarm can operate off the battery backup; alternately, if the back-up batteries are nearing their expiry or have been removed, the mains power will continue to operate the smoke alarm while a new battery is obtained.

The 10 year non-removable battery smoke alarm is considered an effective alternative to hard-wired smoke alarms. Mains power may not be available in all locations or connection to mains power may be impractical (e.g. concrete walls in an apartment building or create costs in retrospective installations). The battery is required to power the smoke alarm for its 10 year service life and the smoke alarm cannot be disabled by simply removing the battery. There is no need for the occupant to remember to replace the batteries which for a replaceable battery type smoke alarms needs to be done yearly.

Replaceable battery smoke alarms are the cheapest but also the easiest to disable. These smoke alarms are very much reliant on the diligence of the occupant.

It should be noted, however that hard-wired and 10 year non-removable batteries can cause some distress when false alarms or faults occur, especially where interconnected, because they are more difficult to disable. However, this is conversely the reason they are preferred to replaceable battery alarms—they are less likely to be disabled by occupants and therefore have the protection they provide eliminated (an important factor for tenanted premises).

## d. what smoke alarms are in use in owner-occupied and rented dwellings and the installation set-ups;

It is important to recognise that—before differentiating dwellings into owner-occupied and rented (tenanted)—the first point of difference is whether it is a new or existing residential building as the requirements for new and existing residential buildings are different. It is also important to recognise that these requirements vary widely between the different states and territories.

It is also important to recognise that places where people sleep are not limited to houses (Class 1a buildings) but also cover:

- Shared accommodation (Class 1b);
- Apartment buildings (Class 2);
- Residential parts of hotels, schools, aged care facilities etc. (Class 3); and
- Dwellings in building that are Class 5 to 9 (commercial buildings) if it is the only dwelling in the building (Class 4).

> Note
> Building classifications are covered in Part A3 of Volume 1 of the BCA and should be referred to (along with the Guide to the Volume One) for full descriptions of each building class as it is not always easy to identify what class a building comes under.

### Smoke alarm requirements for new residential buildings

For new residential buildings, the requirements are fairly consistent because each State and Territory's building legislation adopts the Building Code of Australia (BCA)—Volumes 1 and 2 of the National Construction Code (NCC)—for new construction.

The BCA requirements for smoke alarms in Class 1, 2, 3 and 4 buildings are summarised as follows.

All residential building classes (1, 2, 3 and 4) require smoke alarms:

- in accordance with Australian Standard AS 3786-1993 or AS 3786-2014;

  > Note
  > As per the "Documents adopted by reference" sections of the BCA (Specification A1.3 of Volume 1 and Part 1.4 of Volume 2), reference to AS 3786-1993 (including amendments 1 to 4) has been retained for a transition period ending 30 April 2017 meaning as of 1 May 2017 only smoke alarms to AS 3786-2014 can be used to meet the requirements of the BCA.
  >
  > This is to provide a reasonable overlap for industry to migrate to the requirements of the latest standard.

- to be interconnected, where there is more than one smoke alarm.

- installed on or near the ceiling in:
    - Any storey containing bedrooms—
        - Between each part of the dwelling containing bedrooms and the remainder of the dwelling; or
        - Where bedrooms are served by a hallway, in that hallway; and
    - Any other storey not containing any bedrooms

However, there are several differences:

- While all Classes require smoke alarms to be connected to mains power there is an exception for Class 1 buildings where there is no consumer power supplied to the building (consumer power is not required to be installed to Class 1 buildings simply to power mains powered smoke alarms).
- Class 1b buildings not only require smoke alarms to be installed in the above locations but also in every bedroom.
- Class 1b buildings also require a system of lighting that is activated by the smoke alarms not installed in bedrooms (i.e. in hallways or between bedrooms and rest of dwelling). This lighting is to assist evacuation of occupants in the event of a fire.
- A smoke detection system can be used instead of individual smoke alarms for Class 2, 3 and 4 buildings and must be used instead of smoke alarms in certain Class 3 buildings.

> Note
> For full details of the BCA requirements refer to Part 3.7.2 of Volume 2 of the BCA for Class 1 Buildings and Clause E2.2a and Specification E2.2a of Volume 1 of the BCA for Class 2, 3 and 4 buildings.

Finally, it is important to remember that while building legislation in each state and territory adopts the BCA for new buildings that same local legislation—or other legislation—may apply additional requirements.

There are two jurisdictions with additional requirements:

- Northern Territory

  The NT Fire and Emergency Regulations requires smoke alarms of the photo-electric type that are hard wired or powered by a sealed 10 year lithium battery unit.

  This means that ionisation type smoke alarms cannot be used to meet the Regulations. Similarly, smoke alarms with replaceable batteries cannot be used to meet the Regulations.

- Tasmania

  The Residential Tenancy (Smoke Alarm) Regulations 2012 require tenanted premises as of 1 May 2016 to have smoke alarms powered by mains power or a 10-year non-removable battery.

  While this is not applicable for owner occupied buildings, this means that if the building is to be tenanted the smoke alarms need to be powered by mains power or a 10-year non-removable battery as of 1 May 2016 (smoke alarms with replaceable batteries cannot be used for tenanted premises as of 1 May 2016).

# Smoke alarm requirements for existing residential buildings

Note

This section covers the legislative requirements for smoke alarms in existing residential buildings for each state and territory. For ease of reading and comprehension, states and territories will be referred to in shorthand, i.e. ACT, NSW, NT, QLD, SA, TAS, VIC and WA.

It is important to recognise that the Building Code of Australia was only introduced in some jurisdictions in 1988 and generally adopted in all jurisdictions by the mid-1990s. However, while the BCA has applied to new construction for approximately 20 years, the majority of building stock existed before that time. Therefore, the requirements for existing residential buildings are just as important as those for new construction.

The requirements for smoke alarms in existing residential building are included in state and territory legislation. This may be the same building legislation that adopts the BCA but could be different legislation—either fire services legislation or legislation specific to smoke alarms or building use. As the smoke alarm requirements for existing buildings are detailed in each state and territory's legislation, and not an adopted national document like the BCA, the requirements vary significantly.

Appendix A includes tables that detail the legislative requirements for smoke alarms in existing residential buildings in each state and territory. The following highlights the key information from these tables.

## Which existing residential buildings have requirements for smoke alarms?

The two significant matters to recognise in regards to the requirements for smoke alarms in existing residential buildings is what classes of building they cover and when do these requirements come into effect.

Table 2 in Appendix A shows that Class 1a buildings (houses) and Class 1b buildings (shared accommodation) are covered by all states and territory's legislative requirements for smoke alarms in existing residential buildings however this is the only consistency:

- Class 2 buildings are covered by all states and territories except ACT.
- Class 3 buildings are only covered in NSW, NT, TAS and VIC.
- Class 4 buildings are covered by NSW, NT, TAS, VIC and WA.

The above clearly shows that not all residential buildings are covered by the legislative requirements for smoke alarms in existing residential buildings for each state and territory.

Note

Table 2 of Appendix A not only includes Class 1a, 1b, 2, 3 and 4 buildings it also acknowledges that some states cover other classes where people may sleep (Class 9a). It also acknowledges that there are non-classifiable buildings such as relocatable homes where people also sleep which should have requirements and that currently only NSW, NT and VIC have such requirements.

The above also gives a false sense of security that at least all existing Class 1a and Class 1b buildings require smoke alarms. This is not the case. Among the many different aspects of the legislative requirements for smoke alarms in existing residential buildings for each state and territory shown in Table 3, one of the most important aspects is whether these

requirements apply to all existing residential buildings or are only 'triggered' by certain factors (e.g. if the premises are tenanted, hired, sold or altered).

NSW, NT, QLD, SA and VIC requirements apply to all existing residential buildings. However, the ACT's requirements only apply to residential buildings that are substantially altered, the TAS requirements only apply to tenanted premises and the WA requirements only apply to tenanted, hired or sold residential buildings.

In fact, under legislation in the ACT the only situation where smoke alarms would be required in an existing Class 1a or Class 1b building built prior to the adoption of the BCA is where the building is substantially altered. As such, **the majority of ACT residential buildings do not currently require smoke alarms under legislation**.

This situation is replicated, though to a lesser extent, in TAS and WA. **In TAS and WA only tenanted premises (plus those hired or sold in WA) require smoke alarms under legislation**. As such, owner occupied residential buildings built prior to the adoption of the BCA in these states do not require smoke alarms under legislation.

In addition to the above, it is also important to recognise that this legislation may also apply secondary 'trigger' requirements. That is, existing residential buildings may need to meet certain requirements but if a particular event occurs (e.g. the building is tenanted or a legislative deadline passes) additional requirements apply.

The most consistent such requirement is that existing smoke alarms are deemed to meet the current, retrospective legislative requirements. However, when they no longer function or are removed, the current, retrospective legislative requirements must be applied. For example, under the NSW requirements a functioning smoke alarm in a class 1a, 2 or 4 building (or relocatable home) is deemed to meet the requirements of the NSW legislation. This is generally so that if smoke alarms are currently in place and functioning a cost is not imposed on such building owners. Such requirements exist in NSW, NT, TAS and WA.

Other secondary 'trigger' requirements that exist whereby existing smoke alarms or no smoke alarm is sufficient until the premises are tenanted, hired or sold:

- Tenancy—triggers requirements in NT, TAS and WA
- Sale—triggers requirements in NT, SA and WA
- Hire—triggers requirements in NT and WA

## What smoke alarm requirements apply to existing residential buildings?

Acknowledging the significant issues under the previous heading of what existing residential buildings are covered and what triggers there are for these requirements, the actual smoke alarm requirements in each state and territory are for the most part somewhat consistent:

- The building owner is responsible for the installation of smoke alarms
- Smoke alarms are required to AS 3786 (although with the release of AS 3786-2014 which edition may be applied in each state is not always clear, see breakout box below)

> **Note**
>
> The NSW, SA, TAS and VIC legislation refers to AS 3786-1993 "as published from time to time".
>
> The ACT and WA legislation refers to smoke alarms in accordance with the BCA requirements and therefore can use AS 3786-1993 (including amendments 1 to 4) until 1 May 2017, as per the BCA.
>
> The NT legislation does not include the year/edition of AS 3786.

QLD legislation specifically refers to AS 3786-1993 (does not include "as published from time to time").

- The detection type (ionisation or photoelectric) is not specified—except for the NT where photoelectric is specified
- A hard-wired smoke alarm or 10 year non-removable battery is required in the ACT, NSW (Class 1b and 3 only), NT, SA, TAS (post 1 May 2016), VIC (Class 1b and 3 only) and WA—only TAS (pre 1 May 2016) and VIC (Class 1a, 2 and 4) allow replaceable battery smoke alarms.
- Location requirements are as per the BCA (ACT, NT, QLD, SA and WA) or similar to the BCA (NSW or TAS). The exception being Victoria where it is similar but has some specific differences *(NSW or TAS simply rewrite the BCA requirements they do not add requirements)*.
- AS 1670.1 can be used instead of smoke alarms in most states except the ACT and QLD (though this may be restricted to certain building classes).

The requirements that differ greatly between the different states and territories include that:

- Interconnection is required for ACT, NT, QLD, SA and WA (because they reference the BCA requirements)
- A heat alarm can be used in place of a smoke alarm in NSW, QLD, SA and WA but not in the ACT, NT, TAS or VIC.
- Only NSW, NT, TAS and WA specifically state that the alarm must be functioning. This may be a general requirement (NSW) or something that is to be checked before tenancy or other trigger (NT, TAS and WA).
- Only NSW and TAS make mention of whether consent is required from the owners corporation or strata to install smoke alarms required under legislation (they specifically state it is not required).
- Only NSW and NT have specific requirements where if existing smoke alarms are removed or cease to function that smoke alarms to the current requirements are to be installed.
- Only NSW, NT, QLD and TAS have penalties in place for the removal or interference with smoke alarms.

The above highlights a number of national inconsistencies, especially in whether smoke alarms are required in all existing residential buildings. Some states and territories do not require them in all building classes or for all existing buildings of those classes (only those that are tenanted, hired or sold). While somewhat consistent in the actual requirements for smoke alarms greater consistency is desired particularly to ensure that smoke alarms are installed in a manner which will ensure they achieve their purpose.

Recommendations to address the above concerns and inconsistencies are included in Item f., below.

## e. how the provisions of the Australian Building Code relating to smoke alarm type, installation and use can be improved;

The current provisions of the Building Code of Australia (BCA) are considered, for the most part, to be suitable as a minimum. This does not mean, however, they are adequate for all building designs. Consideration must always be given to the risk of fire in each building or dwelling.

Also, to further reduce the incidence of smoke and fire related deaths, FPA Australia suggests the following low cost recommendations:

- Smoke alarms should be of the photoelectric type to cover the visible smoke from the likely fire type to occur when the risk is highest (a smouldering fire when occupants are sleeping), see Item c. for more information.
- Smoke alarms to be provided in at least master bedrooms to provide better occupant response to a fire, see Item c. for more information.
- Explicitly require that smoke alarms are to be installed in egress paths. This is especially important for multi-storey buildings and dwellings.
- In future, consider adoption of AS 1670.6 once revised to ensure that considerations such as smoke alarms in egress paths are already covered and do not require further reference in the BCA, see Item g. for more information.

## f. whether there are any other legislative or regulatory measures which would minimise such injuries and deaths; and

As per Item d., the majority of Australia's building stock is existing buildings. The BCA has only applied since the mid-1990s and only for new building construction. As such, while the BCA has set reasonable requirements (which could be improved as per Item e.) for new construction since that time it does not cover the majority of existing residential buildings.

Item d. clearly demonstrates there are significant issues with the current state and territory legislative requirements for smoke alarms in existing residential buildings. Changes and improvements are required not only to ensure all existing residential buildings (owner occupied or tenanted) have smoke alarms to provide early warning of a developing fire and provide occupants with time to escape but to also ensure that the requirements are consistent across Australia.

The following is a list of recommendations for change to the current legislative requirements for smoke alarms in existing residential buildings in each state and territory. Each state and territory should require:

- All existing residential buildings (owner-occupied or tenanted) to have smoke alarms installed*.

  *It should be made clear that this only applies to the sole-occupancy units/dwellings within these buildings

- Smoke alarms of the photoelectric type.

  > Note
  > As per Item c., smoke alarms of the photoelectric type should be considered the minimum requirement. Ionisation type smoke alarms may be used in addition to these minimum requirements and based upon the defined risk.

- Smoke alarms that comply with AS 3786 as published from time to time.
- Smoke alarms powered by consumer mains or a 10 year non-removable battery.
- Interconnection of smoke alarms in all buildings*.

  *Again, this should only apply to each sole-occupancy units/dwellings within these buildings. That is, they are only interconnected with other smoke alarms within that SOU/dwelling.

This may be viewed as cost prohibitive for existing building stock in which case this could perhaps be required only under certain significant triggers, e.g. when a building is altered, sold or a new tenancy begins.

- Location requirements in accordance with the requirements of the BCA (i.e. referencing the specific clause of the BCA) rather than including location requirements within the legislation itself.

  This ensures consistency and means that if the requirements are changed in future only one document, the BCA, needs amendment. It also avoids the need for multiple regulatory amendments, which is time consuming and less likely to be achieved.

- That a heat alarm can be used in place of a smoke alarm in any kitchen or other areas where smoke alarms are likely to be subject to false alarms. However, in doing so, it must be stated that smoke alarms must still be installed elsewhere in the residence—heat alarms react to heat from an established fire not smoke from a developing fire. It must also be stated that any heat alarm provided must be interconnected to the smoke alarm(s) installed.

- A statement that the smoke alarm must be functioning—there is no point having a smoke alarm that does not work.

- A statement that existing, functioning smoke alarms are deemed to meet the current, retrospective legislative requirements. However when such existing smoke alarms are removed or cease to function that smoke alarms to the current, retrospective legislative requirements are required to be installed, see Item d. for more information.

  This is **extremely important** because smoke alarm requirements for existing residential buildings are **retrospective**. If there is no such statement then when the requirements change theoretically everyone must now meet the new requirements regardless of whether they have a functioning smoke alarm to the previous requirements. By including this statement, upgrading to meet current requirements is only required when existing smoke alarm are removed or cease to function. This ensures costs associated with complying with smoke alarm requirements are minimal and appropriate.

- Penalties for removal or interference with smoke alarms without reasonable excuse, see NSW Environmental Planning and Assessment Regulation 2000 Regulation 186C (1) and (3) for example.

  Smoke alarms are the only mandatory fire protection device in most residences therefore penalties for the removal or interference with such devices are required to discourage their removal or interference which could result in a lack of warning in the event of a fire potentially resulting in injury or death of building occupants.

In addition to above specific recommendations, consideration should be given to creating uniform requirements for tenanted premises as it is assumed there is a higher risk and duty of care. For an owner-occupied building the owner is responsible for themselves and their household. For tenanted premises the owner is providing premises for another party and is responsible for ensuring the protection in the premises is suitable. This creates an obvious case for litigation should something go wrong therefore this increased risk warrants greater requirements. For example, if tenanted, smoke alarms should be upgraded to current requirements for important aspects (e.g. power source, detection technology and interconnection).

How this consistency in legislation is achieved requires discussion. Each state and territory could adopt the suggested changes within their current legislative requirements however while this would initially be suitable it is open to inconsistency reoccurring as jurisdiction may later change their requirements in isolation of other jurisdictions. A better solution is the development of a document in the style of the

BCA in that it is simply adopted by each jurisdiction. It is recognised that regulators would not adopt such a situation where changes can occur to such a document without their review or input and therefore it is suggest that, like the BCA, this document is developed by a COAG appointed or otherwise suitable body so that these concerns are eliminated. This is considered an optimal solution because unlike each state having its own requirement or adopting model legislation, their legislation adopts one specific document which can only be changed by an appropriate body (and therefore inconsistency between jurisdictions will not occur in future).

## g. any related matter.

### Revision of AS 1670.6

In Item c. reference was made to a proposal for the revision of Australian Standard AS 1670.6, *Fire detection, warning, control and intercom systems - System design, installation and commissioning - Smoke alarms* and its adoption by the BCA and legislative requirements for smoke alarm requirements in existing residential buildings in each state and territory.

As covered in Item c. there are a range of requirements around the location and installation of smoke alarms that need to be considered to ensure that:

1. Smoke detection is provided in egress (exit) paths so that an alarm can be sounded before smoke causes the egress path to become impassable.
2. Smoke alarms are located in a position where smoke will readily reach them.
3. Smoke alarms are not installed in locations where they will be subject to nuisance/false alarms (these often result in occupants disabling smoke alarms and therefore removing the protection they provide).
4. Smoke alarms are located to maximise the potential that the audible alarm signal will be heard by occupants (especially in regards to wake sleeping occupants—the highest risk scenario).
5. Smoke alarms are interconnected so that if one goes into alarm (sounds), all go into alarm (sound). Therefore, all occupants may be alerted to a developing fire and can escape before smoke and/or fire cause egress paths to become impassable.

Currently, the BCA and state and territory legislative requirements for smoke alarms in existing residential buildings do not require all of the above to be provided. A smoke alarm is simply required to be installed. However, as detailed in Item c., it is clear that without being correctly located and installed, smoke alarms will not achieve their purpose.

FPA Australia recommends that AS 1670.6 be revised to include the above requirements so that it can be adopted by the BCA and state and territory legislation to ensure that these important factors are implemented when installing smoke alarms. This will help ensure smoke alarms achieve their purpose of detecting a fire in its initial development stage and provide early warning of the fire to allow occupants time to escape and also thereby address the concerns of this Inquiry about smoke and fire related injuries and deaths (and associated property damage).

The revision and adoption of AS 1670.6 is considered the most appropriate solution to this problem as the level of detail required is not appropriate for inclusion in the BCA or legislation. As the BCA does not describe the specifics for the installation of other fire protection or building systems, the BCA and legislation should not describe the specifics of

smoke alarm installation. Instead, it should adopt an Australian Standard (a revised AS 1670.6) which provides the necessary detail required.

## Maintenance of smoke alarms

The focus of the terms of reference for this Senate Inquiry has been on the use, type and installation setups for smoke alarms and their effectiveness in reducing smoke and fire related injuries and deaths (and associated damage to property). However, maintenance of smoke alarms is equally important because it ensures that, after the initial installation, the smoke alarm continues to function and achieve its purpose. It also ensures that when smoke alarms cease to function, or reach the end of their 10 year service life, they are replaced to ensure that the protection provided by smoke alarms is maintained.

Like the requirements for smoke alarms in existing residential buildings in each state and territory, the requirements for the maintenance of smoke alarms vary significantly.

Some states and territories have no specific maintenance requirements for smoke alarms but do have general maintenance requirements for fire protection systems and equipment in buildings (which would cover the maintenance of smoke alarms). However, these requirements are typically restricted to Class 1b to 9 buildings—Class 1a buildings are not covered. States with general requirements but no specific requirements for smoke alarm maintenance include NSW, SA and VIC.

Other states and territories have both specific maintenance requirements for smoke alarms and general maintenance requirements for fire protection systems and equipment in buildings. NT, QLD, TAS and WA have requirements for tenanted, hired (NT and WA only) and sold (WA only) buildings whereby the owner must ensure smoke alarms operate before tenancy, hire or sale. Also, during tenancy, the tenant is required to ensure smoke alarms continue to function and if they find a smoke alarm ceases to function they must notify the owner who is then required to replace the smoke alarm (if confirmed that it has ceased to function).

Finally, the ACT does not have specific maintenance requirements for smoke alarms nor does it currently have general maintenance requirements for fire protection systems and equipment in buildings.

As per Item f., FPA Australia recommends consistent requirements for smoke alarms be introduced across Australia and suggests that further to the above, maintenance be included among these requirements to ensure smoke alarms continue to be capable of achieving their purpose.

FPA Australia is aware that regulators generally do not wish to require maintenance in homes (Class 1a buildings). As such, the approach may be to require maintenance only in tenanted premises where there is deemed a greater duty of care (as per Item f.) and to provide good practice advice that complements the information currently provided by the fire services.

Such maintenance would be as per the requirements in NT, QLD, TAS and WA:

- The owner is responsible for confirming smoke alarms are functioning before a new tenancy begins.
- During the tenancy:
    - the tenant is responsible for ensuring smoke alarms continue to function and notifying the owner if they identify a smoke alarm has ceased to function.

- the owner is responsible for replacing a smoke alarm that has ceased to function as soon as practicable after notification that the smoke alarm has ceased to function.

The specific maintenance tasks required to confirm smoke alarms are functioning will need to be developed and FPA Australia would be happy to contribute to the development of these requirements.

## Increasing awareness of smoke alarm requirements

The fire services are the most proactive of stakeholders in promoting awareness of smoke alarms to the general public. However, most of this promotion focusses on replacing the battery—fire services in the states where daylight savings occurs often run awareness campaigns promoting the change of batteries in replaceable battery smoke alarms when changing your clocks for daylight savings. There is little promotion of the complex issues surrounding the installation of smoke alarms in the first place, although fire services do have such information available on their websites.

In 2004, FPA Australia worked with the Australian Competition and Consumer Commission (ACCC) to develop the Fire Safety at Home 'Be Prepared' brochure which provided guidance on how to prepare your home to prevent fire and how to use fire safety equipment. It covered smoke alarms, fire blankets, portable fire extinguishers, home escape plans and general information on how to prepare your home to prevent fire (how to reduce fire safety risks). This brochure was distributed via various channels to the general public. Although this was updated in 2006, it is now no longer available.

FPA Australia considers there is now sufficient need to develop a similar document again to promote awareness of smoke alarms (and other home fire safety issues) to the general public and to do so in a consistent manner. FPA Australia would welcome the opportunity to contribute again to such a document.

# Conclusion

We consider that there is a need for improvement in the current legislative requirements for smoke alarms throughout Australia.

While the BCA provides, for the most part, reasonable requirements for smoke alarms in new buildings they can be improved at minimal cost by specifying the detection technology to be used and the specific location requirements to ensure smoke alarms will achieve their purpose of detecting fire in its development stage and providing early warning of the fire to allow occupants time to escape.

Current legislative requirements for smoke alarms in existing residential buildings for each state and territory, however, need significant improvement to provide the level of protection that the Australian community expects—that smoke alarms are installed in all existing residential buildings (owner occupied and tenanted) and in a way that will ensure that they will achieve their purpose. Improvement and consistency in maintenance of smoke alarms is also required to ensure that, ongoing, smoke alarms are capable of achieving their purpose. How this is achieved requires discussion and FPA Australia believes this would be best achieved by a national document adopted in full by each jurisdiction to ensure that current inconsistency across jurisdictions is never repeated. FPA Australia is eager to lend its expertise to assist in the development of such a document.

FPA Australia also believes that smoke alarm location and installation requirements should not be described in the BCA or legislation itself. Instead the BCA and legislation should adopt an Australian Standard (a revised AS 1670.6) which provides the necessary detail required.

Finally, FPA Australia believes that not only do the legislative requirements need improvement, they also need to be promoted so that the public is aware of these requirements.

# Appendix A—Summary of legislative requirements for smoke alarms in existing residential buildings in each state and territory

**Disclaimer**

The following is a summary of the legislative requirements for smoke alarms in existing residential buildings in each state and territory. The intent is to provide a brief summary and to be able to easily compare the requirements in each jurisdiction. This has sometimes meant that the nuances of each state or territory's requirements have been lost. As such, this information is indicative—not definitive—and we **strongly** recommend that you refer to the legislation itself for the full requirements.

The following three tables outline:

- The legislation that requires smoke alarms in existing residential buildings and from which the information in the second and third tables is drawn from (Table 1)
- The classes of building covered by the legislative requirements for smoke alarms in existing building for each state and territory (Table 2)
- The different requirements for smoke alarms and which apply in each state and territory (Table 3)

## Table 1—Legislation that requires smoke alarms in existing residential buildings

| State or Territory | Legislation | Relevant part(s) |
|---|---|---|
| Australian Capital Territory | Building (General) Regulation 2008 | Regulation 24 Unaltered parts need not comply with building code—Act, s 29 (2) (b) |
| New South Wales | Environmental Planning and Assessment Regulation 2000 | Part 9 Fire safety and matters concerning the Building Code of Australia—Division 7A Smoke Alarms (Regulations 186A to 186G) |
| Northern Territory | Fire and Emergency Regulations | Part 2A Requirements relating to smoke alarms (Regulations 13 to 13H) |
| Queensland | Building Act 1975 | Section 115 Compliance with relevant BCA and QDC provisions for occupation and use of building<br><br>Chapter 7 Fire safety for budget accommodation buildings |
| | Fire and Emergency Service Act 1990 | Chapter 3 Queensland Fire and Emergency Service—Part 9A Building fire safety—Division 5A Smoke alarms for domestic dwellings (Regulations 104RA to 104RM) |
| | Queensland Development Code Mandatory Part (MP) 2.1 Fire Safety in Budget Accommodation Buildings | All |
| South Australia | Development Regulations 2008 | Regulation 76B Fire safety requirements—smoke alarms in dwellings |
| Tasmania | Residential Tenancy Act 1997 | Part 3A Smoke alarms (sections 36B to 36H) |
| | Residential Tenancy (Smoke Alarms) Regulations 2012 | All |
| Victoria | Building Regulations 2006 | Regulation 707 Self contained smoke alarms and Regulation 709 Hard-wired smoke alarms or detection system |

| State or Territory | Legislation | Relevant part(s) |
|---|---|---|
| | Victorian Building Authority Practice Note 2006-27 | All |
| | Residential Tenancies (Caravan Parks and Movable Dwellings Registration and Standards) Regulations 2010 | Regulation 35 Smoke alarms for movable dwellings |
| Western Australia | Building Regulations 2012 | Part 8 Existing buildings—Division 3 Smoke alarms (Regulations 55 to 62) |

## Table 2—Building classes covered by the legislative requirements for smoke alarms in existing residential building for each state and territory

| | ACT | NSW | NT | QLD | SA | TAS | VIC | WA |
|---|---|---|---|---|---|---|---|---|
| Class 1a | ✓[1] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Class 1b | ✓[1] | ✓ | ✓ | ✓[2] | ✓ | ✓ | ✓ | ✓ |
| Class 2 | | ✓[3] | ✓[3] | ✓[3] | ✓[3] | ✓[3] | ✓[3] | ✓[3] |
| Class 3 | | ✓[3] | ✓ | | | ✓[3] | ✓ | |
| Class 4 | | ✓[3] | ✓[3] | | | ✓[3] | ✓[3] | ✓[3] |
| Other | | Class 9a | | | | | Class 9a | |
| Moveable dwelling[4] | | ✓ | ✓ | | | | ✓ | |

[1] Only applies to Class 1 buildings that have been substantially altered—"substantially altered" is defined in Regulation 23 of the ACT Building (General) Regulation 2008.

[2] Queensland legislation does not refer to requirements for smoke alarms in "Class 1b buildings" but rather to "Budget accommodation buildings". "Budget accommodation buildings" is defined in Section 216 of the Queensland Building Act 1975 and while it could potentially cover other classes of buildings (such as Class 3 or 4) as well the description clearly covers Class 1b buildings.

[3] Requirements only apply to the SOU(s) within the buildings—public areas (corridors, lobbies, etc.) of these buildings are not covered.

[4] The definition of moveable dwellings varies between states and territories but generally covers relocatable homes, manufactured homes, caravans, campervans, holiday vans, etc.

## Table 3—Legislative requirements for smoke alarms in existing residential buildings and which requirements apply in each state and territory

**Important:** The following table must be read in the context of Table 2 which identifies what class of building these requirements apply to including if it is to only the SOU (e.g. in a Class 2 building).

| Requirement | Options | Applicable State or Territory |
|---|---|---|
| Compliance with AS 3786 | AS 3786-1993 as published from time to time | ACT*<br>NSW<br>SA<br>TAS<br>VIC<br>WA*<br>**Smoke alarms required in accordance with the BCA* |
| | AS 3786-1993 | QLD |
| | No year/edition specified | NT |
| Interconnection | Yes | ACT[1]<br>NT[1]<br>QLD[1 2]<br>SA[1]<br>WA[1 3]<br>*[1] Smoke alarms required in accordance with the BCA*<br>*[2] Not required for Class 1a buildings but required in Class 2 buildings because the clause in the BCA that has been referenced by the Act now requires interconnection (this unintended effect on the Act may not have been picked up when the BCA introduced interconnection)*<br>*Also required in common areas of Class 1b buildings as per QDC MP 2.1.*<br>*[3] Only where a building permit for the construction, erection, assembly or placement of the dwelling was granted post 1 May 2015 (see Regulation for detail)* |
| | Not Specified | NSW<br>TAS<br>VIC |
| Photo-electric or ionisation type specified? | Photoelectric | NT |
| | Ionisation | None |
| | Not specified | ACT<br>NSW<br>QLD<br>SA<br>TAS<br>VIC<br>WA |

| Requirement | Options | Applicable State or Territory |
|---|---|---|
| Power source | Replaceable battery, 10 year non-removable battery or hard-wired (or not specified and therefore any of these options may be used) | NSW (Class 1a, 2 and 4)<br>TAS (pre 1 May 2016)<br>VIC (Class 1a, 2 and 4) |
| | 10 year non-removable battery or hard-wired | ACT*<br>NSW (Class 1b, 3, 9a only)<br>NT<br>QLD<br>SA*<br>TAS (post 1 May 2016)<br>VIC (Class 1b, 3 and 9a only)<br>WA (if impractical to hardwire and/or dispensation given then 10 year battery type can be used instead of hardwired smoke alarms)<br>**To BCA requirements* |
| Location requirements | References BCA requirements | ACT<br>NT<br>QLD (Class 1a and 2 only)<br>SA<br>WA |
| | Similar to BCA requirements | NSW<br>TAS |
| | Different to BCA requirements | QLD* (Class 1b)<br>VIC*<br>**Some similarity to BCA but noted differences* |
| Can a smoke detection system to AS 1670.1 be used instead? | No | ACT*<br>QLD<br>**Requirements are as per BCA and AS 1670.1 is not applicable to Class 1 buildings* |
| | Yes<br>Not specified | NSW<br>NT (Class 3 only)<br>SA (as per BCA for Class 2)<br>TAS<br>VIC (Class 1b and 3 only)<br>WA (as per BCA for Class 2 and 4) |
| Heat alarm can be used in place of smoke alarm where appropriate? | Yes | NSW<br>QLD<br>SA (as per BCA for Class 2)<br>WA |
| | Not specified and therefore no | ACT<br>NT<br>TAS<br>VIC |

| Requirement | Options | Applicable State or Territory |
|---|---|---|
| Specifically stated that it must be a functioning / working smoke alarm? | Yes | NSW<br>NT (for tenanted/hired)<br>TAS<br>WA |
| | No | ACT<br>NT (for owner occupied)<br>QLD<br>SA<br>VIC |
| Is an existing smoke alarm deemed to meet the current requirements? | Yes | NSW<br>NT (ionisation only, unclear if photo-electric but doesn't meet other requirements of regulation)<br>TAS (if to AS 3786-1993)<br>WA |
| | Not specified | ACT<br>QLD<br>SA<br>VIC |
| Consent required from owners corporation or strata to install smoke alarms required to be installed in existing residential buildings? | No | NSW<br>TAS |
| | Not specified | ACT<br>NT<br>QLD<br>SA<br>VIC<br>WA |
| Do the requirements apply to all existing residential buildings?*<br>*Subject to Classes covered in Table 2 | All existing residential buildings | NSW<br>NT<br>QLD<br>SA<br>VIC |
| | Not all existing residential buildings | ACT (only those substantially altered)<br>TAS (tenanted premises only)<br>WA (tenanted, hired or sold buildings) |
| Owner responsible for installation of smoke alarms? | Specifically stated | NSW<br>NT<br>QLD<br>TAS<br>VIC<br>WA |
| | Not stated but assumed | ACT<br>SA |

| Requirement | Options | Applicable State or Territory |
|---|---|---|
| Tenancy agreement triggers requirements? | Yes | NT<br>TAS<br>WA |
| | Not specified and therefore no | ACT<br>NSW<br>QLD<br>SA<br>VIC |
| Sale of building triggers requirements? | Yes | NT<br>SA<br>WA |
| | Not specified and therefore no | ACT<br>NSW<br>QLD<br>TAS<br>VIC |
| Hire of building triggers requirements? | Yes | NT<br>WA |
| | Not specified and therefore no | ACT<br>NSW<br>QLD<br>SA<br>TAS<br>VIC |
| Does removal of existing smoke alarms or their ceasing to function trigger requirements? | Yes | NSW<br>NT (ionisation only, unclear regarding photo-electric smoke alarms that do not meet current regulations) |
| | Not specified and therefore no | ACT<br>QLD<br>SA<br>TAS<br>VIC<br>WA |
| Penalties in place for removal or interference with smoke alarms? | Yes | NSW<br>NT<br>QLD<br>TAS |
| | No | ACT<br>SA<br>VIC<br>WA |

| Requirement | Options | Applicable State or Territory |
|---|---|---|
| Maintenance | No specific smoke alarm maintenance requirements but general requirements for maintenance of fire protection systems and equipment | NSW *(General maintenance requirements exist for Class 1b to Class 9 buildings, they do not cover Class 1a buildings)*<br>SA *(General maintenance requirements exist for Class 1b to Class 9 buildings, they do not cover Class 1a buildings)*<br>VIC *(General maintenance requirements exist for Class 1b to Class 9 buildings, they do not cover Class 1a buildings. Also, the requirements differ between buildings constructed prior to 1 July 1994 and post 1 July 1994. For buildings constructed post 1 July 1994, the maintenance requirements exclude smoke alarms in SOUs in Class 1b, 2 and 4 buildings. For buildings constructed prior to 1 July 1994 there is no such exclusion therefore any required smoke alarms in SOUs in Class 1b, 2 and 4 building will need to be maintained)* |
| | Specific smoke alarm maintenance and general requirements for maintenance of fire protection systems and equipment | NT *(General requirements for maintenance exist for Class 1b and Class 3 buildings, some Class 4 buildings and other Classes of buildings (under Class 5 to 9), they do not cover Class 1a buildings; Specific smoke alarm maintenance requirements exist for both owner occupied and tenanted Class 1, 2, 3 and 4 buildings)*<br>QLD *(General requirements for maintenance exist for Class 1b to Class 9 buildings, they do not cover Class 1a buildings; Specific smoke alarm maintenance requirements exist for tenanted Class 1a buildings and SOUs in Class 2 buildings)*<br>TAS *(General requirements for maintenance exist for Class 1b to 9 building however the Director's Specified List, Schedule 4, Table 1.7 only mentions smoke and heat alarm system to Clause 3 of Specification E2.2a, its does not cover Class 1 buildings; Specified smoke alarm maintenance requirements exists for tenanted Class 1, 2, 3 and 4 buildings).*<br>WA *(General requirements for maintenance exist for Class 2 to 9 buildings, they do not cover Class 1 buildings; Specific smoke alarm maintenance requirements exist for Class 1 buildings, SOUs in Class 2 buildings and Class 4 dwellings)* |
| | No specific smoke alarm maintenance or general requirements for maintenance of fire protection systems and equipment | ACT |

# Appendix B—Bibliography


- **"BRE Briefing paper"**—Chagger, R 2014,Characterising the smoke produced from modern materials and evaluating smoke detectors, Briefing paper, Building Research Establishment (BRE) Group, UK, http://www.bre.co.uk/filelibrary/Briefing%20papers/BRE-Trust-briefing-paper---Test-Fires.pdf
- **"FPA Australia's Position Statement PS-01 Selection of residential smoke alarms"**—FPA Australia 2011, PS-01 Selection of residential smoke alarms, Position Statement, Version 1.1, FPA Australia, Australia, http://www.fpaa.com.au/media/139827/fpa_australia_-_ps_01_v1.1_selection_of_residential_smoke_alarms.pdf
- **"NIST Statement for the record"**—NIST 2007, Statement for the Record, National Institute of Standards and Technology to the Boston City Council Committee on Public Safety, August 6 2007, NIST, USA, http://www.nist.gov/el/fire_protection/buildings/upload/StatementfortheRecordWG1finalsmokealarmstatement.pdf
- **"Thomas & Bruck"**—Thomas, I & Bruck D 2010, Awakening of Sleeping People – a Decade of Research, Centre for Environmental Safety and Risk Engineering, Victoria University, Melbourne, Australia, http://www.researchgate.net/publication/226066704_Awakening_of_Sleeping_People_A_Decade_of_Research
- **"Victorian Building Authority Practice Note"**—Victorian Building Authority 2006, Self-Contained smoke alarms to existing buildings, Practice Note 2006-27, May 2006, Victorian Building Authority, Victoria, Australia, http://www.vba.vic.gov.au/__data/assets/pdf_file/0004/20389/PN-27-2006-Self-Contained-Smoke-Alarms-to-Existing-Buildings.pdf