

## **FRNSW Submission to Commonwealth Senate Inquiry into Smoke Alarms**

### **Executive Summary**

- Residential fires lead to approximately 20 fatalities and 550 injuries each year in NSW.
- New homes in Australia are required under the National Construction Code (NCC) to install a smoke alarm on each habitable level.
- NSW has had a retrospective requirement for installation of smoke alarms in existing buildings since 2006.
- Research has highlighted the inadequacy of current NCC requirements in meeting the needs of all occupants for early warning of fire.
- Modern furnishings contribute to faster fire development and earlier ignition of exposed combustible materials, otherwise known as flashover. The quick onset of flashover makes escape almost impossible. A single detector serving a whole house (or floor for two-storey houses) cannot provide sufficiently early warning across the range of fire scenarios.
- The NCC and relevant Australian Standard AS 3786 allow either photoelectric or ionisation alarms.
- Ionisation alarms have been shown to perform poorly in detecting smouldering fires which are a significant contributor to fatalities. They are also more prone to false alarms from cooking which prompts many occupants to disable them to avoid nuisance alarms.
- FRNSW recommends to home owners and occupiers that they install a photoelectric type smoke alarm that is hard wired and interconnected with other alarms, when present.
- FRNSW also recommends to home owners and occupiers that fire alarms be installed in all bedrooms, living areas and escape paths from these areas.

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### **The incidence of smoke and fire related injuries and deaths and associated damage to property**

Over the past six years (2010-2015), Fire & Rescue NSW (FRNSW) responded to 23,766 accidental residential fires, an average of 3,961 house fires per year. Of the accidental residential fires attended, there have been approximately 3,311 injuries over the six years, with an average of 552 injuries per year. In addition, FRNSW records indicate that accidental residential fires have unfortunately contributed to 115 fatalities in NSW over the six years.

These figures, while of serious concern to FRNSW, are believed to be only a small proportion of the true cost to the NSW community. FRNSW does not have complete statistics on fires to which it does not respond, either because they are managed by another agency (such as the NSW Rural Fire Service), or because the occupants have not called for the agency's assistance.

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### How the use, type and installation set-ups of smoke alarms could affect such injuries and deaths

The Australian Buildings Code Board commissioned Victoria University in 2009 to determine the most appropriate locations for smoke alarms in residential dwellings, considering both detection and occupant notification. The Victoria University report was completed in June 2010<sup>1</sup>.

The project experimentally determined the loudness of smoke alarms in five existing residential houses (Class 1a); for each room; with doors open and closed. The houses used were intended to represent typical Australian residential dwellings. The report also reviewed fire fatalities that occurred in Victoria between 1998 and 2006 from the CESARE Coronial Database (CCD).

The findings concluded that the (then) existing minimum requirements for smoke alarms were deficient in providing complete coverage for early detection and notification of fire. It was also identified that this could only be achieved with interconnected smoke alarms in every room in every house in Australia.

A key observation contained in the report is that of those occupants who died in a single fatality fire, 79% of the detailed 89 were known to have responded to the fire emergency via fire cues and/or a smoke alarm signal.

The main factors identified in the Victoria University report to enable a smoke alarm to effectively alert building occupants to a fire hazard included:

- The loudness of the smoke alarm signal
- The proximity of the smoke alarm to the occupant at time of alarm
- Occupant activity (awake or asleep)
- The ability for the occupant to perceive and be aroused by the signal (including impairment by drugs and alcohol or a physical disability).

The authors estimated that smoke alarms in every room in every dwelling in Australia would result in 17% to 30% fewer fatalities. This could be increased to 50% fewer fatalities if all alarms were interconnected, with the authors estimating approximately 50 lives per year could be saved. The report did not report on injuries or make an estimate of the injury avoidance.

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<sup>1</sup> Thomas, I. and Bruck, D. (2010) 'Smoke Alarms in Dwellings: Timely Activation and Effective Notification', Centre for Environmental Safety and Risk Engineering, Victoria University, June 2010:  
<http://www.abcb.gov.au/consultation/regulation-impact-analysis/~media/Files/Download%20Documents/Consultation/Smoke%20Alarms%20in%20Dwellings.ashx>

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### What smoke alarms are in use in owner-occupied and rented dwellings and the installation set-ups

#### New buildings

The National Construction Code, which includes the Building Code of Australia, sets standards for new buildings. Since 1997, it has been mandatory to install hard wired mains (240V) powered smoke alarms in most new residential properties under the Building Code of Australia. From 1 May 2014, all smoke alarms in new buildings were required to be interconnected. The current legislative framework permits the use of either photoelectric or ionisation type smoke alarms.

#### Existing buildings

Since May 2006, NSW has required smoke alarms to be retrospectively fitted to existing buildings under the Environmental Planning and Assessment Regulation 2000.

It is mandatory under the Environmental Planning and Assessment Regulation 2000 for NSW residents to have at least one working smoke alarm installed on each level of their home. This includes owner-occupied homes, rental properties, relocatable homes or any other residential building where people sleep.

It is an offence not to comply with the legislation and a maximum penalty of a \$550 fine applies.

The Regulation stipulates that smoke alarms must be functioning and must comply with Australian Standards (AS3786). The alarm must be marked as:

- Approved to AS3786
- Accredited to AS3786, or
- Scientific Services Laboratory listed. Scientific Services Laboratory is part of the Australian Government Analytical Laboratories.

Alarms installed prior to 1 May 2006 that do not meet AS3786 are deemed to comply with the legislation.

The NSW Office of Fair Trading has defined the responsibilities for landlords and tenants. In most cases:

- Landlords are responsible for supplying the smoke alarm(s) and for their installation. They will also be required to install a new battery for each smoke alarm at the commencement of each new tenancy.
- Tenants are responsible for the replacement of batteries in battery-powered smoke alarms not in hard wired smoke alarms.

The above provisions apply as a minimum, but there are further requirements for other building types such as shared accommodation and apartment buildings. For these building types the provisions of the Building Code of Australia may require more advanced smoke detection and alarm systems as per AS1670.1.

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### **How the provisions of the Australian Building Code relating to smoke alarm type, installation and use can be improved**

There are two main types of domestic smoke alarms available in the market: photoelectric and ionisation. The alarms work in different ways to detect smoke. Both types are capable of meeting Australian Standard AS 3786.

FRNSW has now had almost two decades of experience observing the performance of smoke alarms in real settings. They have made an important contribution to public safety but performance has been patchy. Many fatalities and near-miss situations result from smouldering fires and ionisation alarms have a documented inferior performance in these circumstances. Further, FRNSW officers often encounter situations where occupants have disabled the alarm to avoid the nuisance of regular false activations. These false alarms are often attributable to the placement of ionisation alarms too close to cooking areas. There have also been cases where the simple presence of a closed bedroom door has prevented smoke from activating the alarm in the hallway losing valuable time before notification. For many homes only one smoke alarm is required and so these issues diminish the effectiveness of early warning which is necessary if a successful escape is to be achieved.

FRNSW strongly recommends to home owners and occupiers that they install a photoelectric type smoke alarm that is hard wired and interconnected with other alarms, when present. Photoelectric alarms appear to be superior to ionisation alarms in most circumstances, and there appears to be little appreciable difference in performance during flaming fires. Therefore, photoelectric alarms may provide a faster warning in many circumstances. To confirm this view, FRNSW has commenced a research program to better understand the performance of smoke alarms under different fire scenarios.

Research undertaken by the FRNSW Fire Investigation and Research Unit, as well as external research, indicates that photoelectric alarms are less likely to produce false alarms than ionisation alarms in and around kitchens and bathrooms. This is important as a high incidence of false alarms leads to occupant complacency and an incentive to disconnect the alarm. FRNSW observes this problem regularly when it conducts its Home Fire Safety Checks, a home visitation program that is a non-punitive and voluntary. Fire service personnel target 'at risk' households to promote fire safety awareness and check on the fire safety measures in the house, such as working smoke alarms, fire blankets, heating and electrical appliance safety.

Although FRNSW makes these recommendations to home owners and occupiers, it is currently voluntary as to whether these recommendations are heeded. Many people underestimate the risk from fire due to their (fortunate) lack of experience in dealing with them.

Above any minimum requirements under the Building Code of Australia or NSW legislation, FRNSW recommends the installation of smoke alarms in the following locations:

- outside all sleeping areas
- inside all bedrooms if the occupant/s sleep with the door closed,
- in all paths of travel between sleeping areas and exits to the open air, and
- in the path of travel between each level for multi-level buildings.

FRNSW recommends that where the bedroom doors are closed, additional smoke alarms should be installed in the bedrooms, interconnected where possible to the alarms in the passageway and other parts of the dwelling.

FRNSW also recommend that if there are bedrooms at both ends of the house, interconnected alarms should be installed in the passageways to each of these areas. Where there are two or more storeys, smoke alarms must be installed on each level and interconnected if possible.

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### **Whether there are any other legislative or regulatory measures which would minimise such injuries and deaths**

Smoke alarms are a critical early warning device for occupants to alert them to a growing hazard. They are essential for smouldering fires, which are responsible for many fatalities, as sleeping occupants are unaware of the accumulating carbon monoxide and other smoke products. Smoke alarms also provide warning to flaming fires, but in this scenario, time is very critical. Once a fire transitions to the flaming stage, it can very quickly progress to flashover, making escape impossible.

FRNSW in conjunction with CSIRO reproduced results from the US National Institute of Standards and technology that showed typical home layouts with modern furnishings can progress to flashover in as little as 2-3 minutes, whereas similar tests conducted in the 1970s resulted in typical flashover times of 10-20 minutes. This is particularly concerning as the early warning provided by smoke alarms may no longer be a sufficient protection for occupants and so cannot form the cornerstone of public policy for fire safety.

Some form of suppression may be necessary to improve levels of fire safety. The costs involved in making any reform of this type, however, would likely preclude the option from being a regulatory requirement. This barrier can be overcome if a range of issues related to urban growth are bundled together so that innovative solutions can be explored that are cost effective.

A substantial amount of work has been done developing the Australian Standard on home sprinklers, capitalising on international experience. An underlying principle driving this work has been affordability. Making progress in this area would seem to rest on further research, analysis and refinement of infrastructure solutions.