Fire Safety Standard Guidelines

Smoke Alarms and Emergency Lighting

Queensland Government
Department of **Local Government and Planning**
Department of **Emergency Services**

Purpose

This guideline provides information on smoke alarms, smoke detection and alarm systems and emergency lighting for budget accommodation buildings. This guideline is intended to assist building owners, local government officers, consultants, and designers in bringing budget accommodation buildings into compliance with the new Fire Safety Standard.

Introduction

The safety of people from fire in a building is best achieved by preventing fires from occurring. However, should a fire occur, occupants need to be provided with a means of escape from the building.

The most important factors to consider for safe evacuation from a building are:

1. Alert the occupants that a fire has occurred via an automatic audible alarm (i.e. smoke alarms); and
2. Provide sufficient lighting so that occupants can see how to escape from the building (i.e. emergency lighting).

This guideline provides information on the different types of smoke alarms and emergency lights, how they operate, the locations in which they should be installed, their availability and how they should be maintained.

Smoke Alarms

Purpose

Smoke alarms, sometimes known in the fire protection industry as fire alarms can be either smoke detection or smoke alarm systems. These alarms give people in a building automatic (*i.e. without human initiation*) early warning of a fire. This is especially significant for building occupants who are asleep, because a sleeping person's sense of smell is largely diminished, and the smoke may render a sleeping person unconscious. A sleeping person's hearing however, is not diminished by the presence of smoke and, a person is more likely to be awakened and react to an audible alarm.

A fire alarm system can comprise either smoke alarm detection and alarm in the same unit as typically used in our residential homes, or smoke detectors connected to a separate alarm as typically used in commercial buildings. Fire alarm systems generally activate an alarm in the early stages of a fire's development before significant heat and smoke build up occurs. This enables people in the building to escape before conditions become dangerous.

Types of smoke alarms

There are two basic types of automatic smoke alarm systems suitable for budget accommodation buildings:

- Commercial type smoke detectors connected to a Fire Indicator Panel (FIP); and
- Residential type smoke alarms.

Commercial smoke detection systems have smoke detectors that sense for smoke, and if smoke is detected it sends an electrical signal to a Fire Indicator Panel (FIP). The FIP then activates an audible alarm through speakers located throughout the building. An automatic alarm signal may be sent to the fire service, alerting the nearest available fire crew to attend the fire. As the smoke detectors are controlled by the FIP, only one smoke detector needs to sense smoke to allow the FIP to generate an alarm throughout the entire building.

Residential smoke alarm systems differ from commercial smoke detection systems as the smoke sensor and audible alarm are combined in the one unit. When a smoke alarm senses smoke, it activates its own alarm. Smoke alarms can be interconnected with other smoke alarms to activate one another and sound a common alarm. Smoke alarm systems cannot be connected to an FIP. These alarms are either powered by an external power supply and have a back-up battery, or are battery powered.

Smoke alarms are characterised by the fact that they have a test button on each smoke alarm so that the building owner or manager can regularly test each smoke alarm.

Smoke alarms can operate individually or be interconnected. If installed individually, when a smoke alarm senses smoke it will only activate its own audible alarm and not any of the other alarms. This means that people near this smoke alarm may be alerted, but other people further away may not hear the alarm.

If smoke alarms are "interconnected" it means that if one alarm senses smoke, it will activate its own audible alarm plus all the other smoke alarms with which it is "interconnected". This means that any one of the interconnected smoke alarms may alert people further away from the fire. This is the main reason that interconnecting alarms are required in the enclosed corridors and common areas of budget accommodation buildings.

How do smoke alarms operate?

Smoke alarms have a built-in sensing chamber to measure how much smoke is in the air. Smoke alarms must be located on or near the ceiling, as smoke will rise to the ceiling due to the heating effect of a fire. When smoke is sensed by a smoke alarm it will sound an audible alarm to warn of a probable fire.

Smoke is an "aerosol" comprising of gases and other small particles. Hence, smoke alarms will not only sense smoke in the air, they will sense other aerosols such as cooking fumes from ovens, burnt toast and steam from bathrooms and showers.

Where should smoke alarms be installed?

The Fire Safety Standard specifies the location and type of smoke alarm depending on the height and construction type of the building. The Standard also specifies for each case an Australian Standard. The following provides further guidance for these installations. Smoke alarms must be installed on or near the ceiling, as this is where smoke will accumulate. Systems installed by a licenced electrician must be installed in accordance with AS 3786, which is the applicable Australian Standard. Battery powered smoke alarms can be installed by anyone, and mains powered smoke alarms must be installed by a licensed electrician. Manufacturers' brochures / instructions with smoke alarms also provide guidance on the best locations for smoke alarms and smoke detectors.

Owners and operators of budget accommodation, who have identified from the standard their building as requiring an AS 1670 fire detection system, should only use contractors licensed by the Queensland Building Service Authority (QBSA). Owners should request proof of accreditation to ensure the correct installation to the appropriate Australian Standard.

Basic requirements for the installation of smoke alarms and smoke detectors in budget accommodation buildings include:

- a smoke alarm located on or near the ceiling in every bedroom;
- smoke alarms located on or near the ceiling outside the bedrooms (e.g. in enclosed or internal corridors, between bedrooms and the remainder of the building);
- smoke alarms outside the bedrooms (e.g. in enclosed or internal corridors, between bedrooms and the remainder of the building) "interconnected";
- smoke alarms should not be located inside or outside of bathrooms where steam could cause an unwanted alarm; and
- smoke alarms should not be located inside or outside of kitchens where cooking fumes could cause an unwanted alarm.

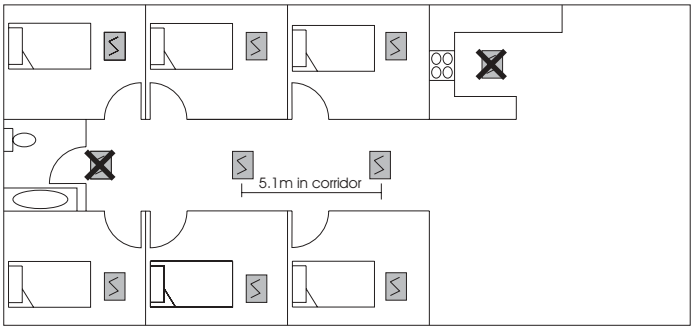


Figure 1: Location of smoke alarms

Smoke alarms should not be located within 300mm of walls (refer figure 2) and 500mm from the peak of sloped ceilings (refer figure 3), as these areas are known "dead-spots" of air movement.

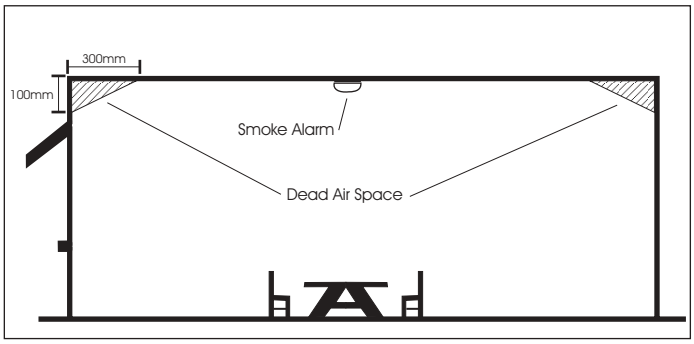


Figure 2: Illustration of the dead air space in the corner of rooms

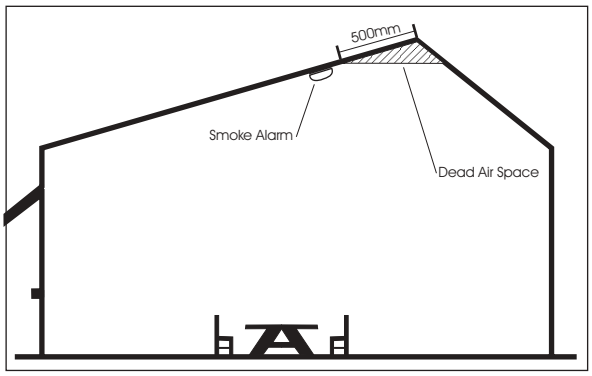


Figure 3: Illustration of the dead air space at the peak of sloped ceilings

Where are smoke alarms available from?

The 9 Volt DC smoke alarm commonly found at hardware stores etc. **cannot be used in budget accommodation buildings**. The 9 Volt DC tamper proof lithium battery powered smoke alarm (for use only where a 240 volt mains supply is not available) is not normally available through public retail outlets. These special types of smoke alarms are available through specialised trade suppliers.

All other smoke alarms (e.g. 240 volt AC) must be installed by either a licensed electrician or a smoke alarm contractor. Smoke alarms can also be supplied in two different types, known as either "ionisation" or "photo-optic". An ionisation type can be more sensitive to cooking odours and less sensitive to steam, whereas photo-optic type is usually less sensitive to cooking odours and more sensitive to steam. Unwanted alarms can sometimes result from installing an inappropriate type of smoke alarm. Owners should therefore consult with their installer to determine the most appropriate type of smoke alarm, depending on the intended environmental location.

How do I maintain my smoke alarm system?

Commercial smoke detection systems, that are controlled by a Fire Indicator Panel (FIP) and connected to the fire service, should be maintained and tested by a qualified contractor. Non-qualified people should not test these systems. For example, if it is not isolated properly before testing, the system could inadvertently signal the fire service who will charge a fee for turning up to a false alarm.

Some alarm systems, either 240 Volt AC mains powered systems or 9 Volt DC tamper-proof lithium battery powered smoke alarms, can be maintained and tested by the building owner or manager (refer to guideline "Inspection and Maintenance").

Emergency Lighting

Purpose

Emergency lighting is required in buildings to provide some light (low intensity) so that people are able to find the escape routes. A power failure in a building could be caused by an electrical failure (e.g. short-circuiting), which may also cause a fire. Emergency lighting is required so that building occupants can see and find the escape routes before conditions inside the building become dangerous.

How does emergency lighting work?

Normal electrical lights are powered by the 240 Volt AC consumer mains. If the mains supply fails, the building lights will fail. Dedicated emergency lights either have their own back-up battery power supplies, or are connected to a central back-up battery power supply. Emergency house lighting activated by a smoke alarm will not have a supplementary battery backup.

Emergency lights have special electrical circuits that detect when the normal electrical lighting power supply fails, and upon detecting a failure activates the emergency lights. Emergency lighting systems are designed to provide only a fraction of the normal lighting provided by a building's lights, but enough to allow people in the building to find their way out.

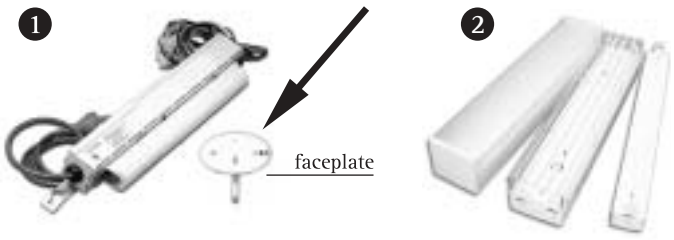
Back-up battery power supplies used with emergency lights are continually charged by the building's 240 Volt AC consumer mains supply (with the exception of those that form part of a smoke alarm system).

Types of emergency lighting

Emergency lighting systems are available in various types and sizes, and for different applications. These examples of common types are:

1. **Spitfires** (indicated by the arrow below) are small-dedicated emergency lights that have their own battery supply. These lights contain a small bulb set in a faceplate (see picture) with a test button and power indicator. These lights are not used as part of the building's normal lighting.

2. **Fluorescent lights** used as part of the building's normal lighting system can be provided with an emergency power supply. If the mains power supply fails, these lights can draw electrical power from their back-up battery power supply.



Use of guidelines

These guidelines are intended for use by-

- Building owners;
- Local governments;
- Building certifiers for acceptable solutions;
- Building certifiers with competence in fire safety for performance decisions; and
- Fire engineers, architects and building designers.

Associated guidelines

Other guidelines relating to fire safety in budget accommodation buildings provide specific guidance on various parts of the legislation, as well as illustrative examples using actual buildings as case studies.

The list of guidelines includes:

- How to Comply with the Fire Safety Standard;
- Development Application Process;
- Budget Accommodation Buildings;
- Smoke Alarms & Emergency Lighting;
- Enforcement, appeals, extensions of time;
- Inspection and Maintenance Options;
- Fire Safety Audits;
- Fire Safety Management Plans;

Case studies on actual buildings include:

- Fully compliant building;
- Large single storey building;
- Small supported accommodation building;
- Two storey timber hotel;
- Three storey boarding house; and
- Two storey backpacker hostel.

Guideline and case studies are available on the following websites:

www.dlgp.qld.gov.au
www.fire.qld.gov.au/building safety

A copy of the legislation and the Fire Safety Standard are also available from these websites.

For further information

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