# Domestic smoke detectors are safe

health

Advice from the Department of Health

**Smoke detectors perform a life-saving function in the event of fire, which far outweighs any radiation risk from the small amount of radioactive material contained in the detectors. Smoke detectors are now more common as fire safety requirements have been introduced to have detectors installed in all Victorian houses. This leaflet has been prepared to provide information on the radiation risk from smoke detectors.**

## What are the benefits?

Smoke detectors perform a life-saving function in the event of fire. They are highly recommended by fire protection authorities around the world. The life-saving benefits of smoke detectors far outweigh any risk due to radiation exposure that may result from their use.

## How do smoke detectors work?

Smoke detectors contain a minute quantity of the radioactive material americium-241 (Am-241). The radioactive material is in the form of a foil and is rigidly mounted inside a steel chamber and is designed to be resistant to mechanical, chemical and thermal abuse. The Am-241 radioactive source emits two types of radiation, alpha radiation and gamma radiation. The alpha radiation ionises the air inside the chamber.

A low electric voltage applied across the chamber causes a current to flow through the ionised air. When smoke particles enter the chamber, the current flow is altered and this in turn triggers an alarm.

## What are the risks?

The risk of harm from radiation exposure from smoke detectors is considered to be minuscule. Alpha radiation, which is emitted by the radioactive source used to make the detector operate, will not even penetrate through air for more than a few centimetres and is therefore contained within the chamber of the detector. Gamma radiation emitted by the source is of low intensity (penetrating ability) and is substantially shielded by the detector housing. Gamma radiation intensity decreases rapidly with increasing distance from the source.

The gamma radiation at one metre from an unshielded americium-241 source of the typical activity found in domestic smoke detectors would expose a person to about 3,000 times less than the radiation dose they would receive from natural background radiation.[1] Everyone is exposed to natural background radiation. Natural background radiation includes radiation from rocks and soil and cosmic rays from the sun.

It should be noted that the actual dose received from the detector would be much less than this since the americium-241 source is shielded by the metal chamber and a person would not normally be at a distance of one metre from the smoke detector for any length of time. The radiation dose that individuals receive from smoke detectors installed in their house is therefore minuscule.

The probability of the source being removed from the tamperproof chamber and then swallowed is extremely remote. The internal radiation hazard is therefore minimal.

A case has been documented, where a worker in a factory making smoke detectors swallowed two of the radioactive sources. Even in this case, the radiation exposure was small as the sources passed through his body with very little leakage.

## How do I dispose of a smoke detector?

The individual hazard from a smoke detector being disposed of to landfill is very small.[1]

However, with the large numbers of detectors being sold, a conservative approach for controlling the disposal of detectors, in line with National Health and Medical Research Council (NHMRC) recommendations has been adopted.

Smoke detectors containing no greater than 40kBq of Americium-241 are no longer required to be returned to the supplier for disposal and can now be disposed of with normal household refuse.

Smoke detectors used for commercial or industrial purposes that contain Americium-241 in excess of 40kBq of activity or contain any other substance are still required to be returned to the seller for disposal.

One of the conditions of the licence to sell these types of smoke detectors is that the sales company must accept unwanted detectors for disposal. The detector is required to be marked with supplier return details followed by the name and address for return purposes.

Should there be any difficulty in returning unwanted detectors (particularly older detectors) to the supplier then the Radiation Safety Section can be contacted for further advice.

## What regulations apply to smoke detectors?

Smoke detectors containing 40kBq or less of Americium-241 are exempt from the provisions of the *Radiation Act 2005*.[2] No licence is required to possess or sell these devices.

A licence is required in order to sell smoke detectors containing greater than 40kBq of radioactive material. The licence is normally issued to the distributor or importer and is approved only after each brand of smoke detector authorised for sale has been demonstrated to meet the Australian Standard[3] - Fire Detection and Alarm Systems – Smoke Alarms on smoke detectors is used in order to be suitable for licensing.

## Further Information

Further information on smoke detectors can be obtained from:

Radiation Safety Section, Department of Health
GPO 4057 Melbourne, Victoria 3001

Phone: 1300 767 469 Fax: 1300 769 274
email: radiation.safety@health.vic.gov.au

Authorised by the Victorian Government, Melbourne. To receive this publication in an accessible format contact the Radiation Safety Section, Envronmental Health Unit, Health Protection Branch.

1 Robertson, M. 1990, 'Domestic Smoke Detectors - A Safe Investment', Radiation Protection News and Notes, National Radiation Laboratory, New Zealand, No. 9 January 1990.

2 Victorian Government Gazette, Special Edition 207, 31 August 2007

3 Australian Standard, AS 12239-2004: Fire Detection and Alarm Systems – Smoke Alarms