



Fire Industry Association

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IONISATION CHAMBER SMOKE DETECTORS (ICSD): APPLICABLE REGULATIONS FOR MANUFACTURING, TRANSPORT AND DISPOSAL

1. BACKGROUND

Ionisation Chamber Smoke Detectors (ICSDs) are point-type smoke detectors containing a small amount of radioactive material. This radioactive material is the key to how the ICSD senses smoke. Going back 20-30 years, the ICSD was the primary technology choice for a smoke detection device. This choice was mainly influenced by the relative simplicity of the sensor technology and the fact that photoelectric smoke sensor technology was expensive and not properly understood. The ICSD was considered to be a good general-purpose detector.

In the last 10 years this trend has totally reversed, with photoelectric smoke detectors becoming the preferred choice. This is mainly due to cost reductions in components, better designs and better manufacturing techniques, but also to the regulatory costs now being incurred in the manufacturing, distribution and disposal of detectors incorporating radioactive sources.

ICSDs respond well to the visible and invisible particles produced by fast flaming fires. Photoelectric smoke detectors, on the other hand, respond better to the darker smokes produced by smouldering fires and are less sensitive than ICSDs to fast flaming fires. ICSDs still offer, therefore, faster response to certain types of fire risk. Newer technologies, such as combined smoke/heat detectors, carbon monoxide (CO) fire detectors and combined CO/heat detectors, also respond faster than photoelectric detectors to certain types of fire, providing suitable alternatives to ICSDs for many risks and further reducing the need for ICSDs.

The availability of alternative detection technologies together with the increasingly stringent regulations and legislation relating to radioactive materials is reducing the numbers of ICSDs sold and this trend looks set to continue.

2. REGULATIONS AND LEGISLATION RELATING TO ICSDS IN THE UK

The following aspects of use of ICSDs are covered by regulations and/or legislation within the UK:

- Manufacture
- Transport
- Storage
- Handling
- Disposal

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Manufacture of Ionisation Chamber Smoke Detectors

Companies that manufacture or wish to manufacture ICSDs need to obtain from the Environment Agency a Certificate of Authorisation issued under the provisions of sections 13 and 14 of the Radioactive Substances Act 1993 to accumulate and dispose of specified radioactive wastes from the holders premises and a Certificate of Registration under the provisions of section 7 of the Radioactive Substances Act 1993 permitting the holder to keep and use radioactive materials at the specified premises. The quantities of radioactive materials that the license holder will be permitted to have on their premises will be determined by the Environment Agency any stated within the license.

It will be a pre-requisite for a manufacturing company to have appointed an accredited *Radiation Protection Advisor* and to have a set of *Local Rules in place that governs the way that radioactive materials are stored, used and disposed of*. In addition these Local Rules will set out the way that specific health and safety matters related to the use of radioactive materials will be dealt with and the training requirements for people working with radioactive materials.

Transport of Ionization Chamber Smoke Detectors

Transport by road

Transport of ICSDs by road is covered by the *Radioactive Material (Road Transport) Regulations 2002 [RM(RT)2002] Statutory Instrument 2002 No. 1093*. This legislation affects all road transport including the carriage of ICSD samples by sales representatives and spares by service staff. For a description of these regulations and how to comply, see BFPSA Fact File No. 8. See APPENDIX 2 for further information on relevant legislation.

Transport by rail

The regulations for transport of ICSD by rail include the Packaging, Labeling and Carriage of Radioactive Material by Rail Regulations 2002, SI 2002, number 2099 – sometimes known as RAMRAIL.

These regulations are linked with the convention governing the International Carriage of Dangerous Goods by Rail (COTIF) and other publications. Enforcement is by the Department for Transport and the HSE.

Transport by ship

For sea, the International Maritime Organisation and its International Dangerous Goods Code are linked with the following items of UK legislation:

- The Merchant Shipping Act 1995.
- The Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations, SI 1997, Number 2367
- The Merchant Shipping Notices (MSNs) – No. M1772 (M) “The Carriage of Dangerous Goods and Marine Pollutants in Packaged Form – Amendment 31-02 to IMDG Code”.

The Maritime and Coastguard Agency (MCA) is the competent authority.

Transport by air

For air, the International Civil Aviation Authority, ICAO and the “Technical Instructions for the Safe Transport of Dangerous Goods by Air” (2003/2004 edition) are linked to:

- The Air Navigation Order 2000, SI 2000, Number 1562
- The Air Navigation (Dangerous Goods) Regulations 2002, SI 2002, Number 2786.
- IATA Dangerous Goods Regulations 2005

The Civil Aviation Authority is the competent authority.

IATA Dangerous Goods Regulations 2005

The *IATA Dangerous Goods Regulations 2005 (DGR)* are principal regulations for the shipping of hazardous materials by air. The regulations cover the classification, marking, labelling and documentation of dangerous goods shipments. Although low in activity, ionization smoke detectors are classed as dangerous goods by IATA.

Storage of Ionization Chamber Smoke Detectors

Installers and distributors of ICSDs are permitted to store a quantity of ICSDs that is less than 500 in a single building or premises. The radioisotope in the ICSD must be Americium 241 and the activity must not be more than 40kBq. The authorisation to permit the storage of ICSDs in unlicensed premises is set out in Certificate of Approval No TA3 that can be downloaded from:

<http://www.hse.gov.uk/radiation/ionising/apparatus/ta3.htm>

Handling of Ionization Chamber Smoke Detectors

Ideally, ICSDs should be returned to the manufacturer for internal cleaning, repair and servicing; they should not be dismantled by anyone that has not been authorised by the manufacturer to do this type of work. Should a manufacturer authorize an agent to service ICSDs on their behalf then it is the responsibility of the manufacturer to carry out any necessary training and ensure that the equipment and tooling that is required is in place. It is the responsibility of the agent to ensure that they comply with any local radiological safety legislation. This may require consultation with a Radiation Protection Advisor or a national radiological safety organization, such as NRPB.

Disposal of Ionization Chamber Smoke Detectors

The disposal of products containing radioactive materials is covered by the Radioactive Substances Act 1993, which requires that products containing radioactive materials are returned to an organisation with license to safely remove the radioactive material. The BFPSA recommends that smoke detector manufacturers receiving large quantities of old ICSDs should have a mechanism in place for customers to return old ICSDs for disposal. The following general information is required to be supplied with the ICSDs for disposal:

- Quantity of detectors to be returned
- Manufacturer of each ICSD
- The model number of each ICSD
- The Ionising source: Americium 241 is used in modern detectors, but Radium 226 was used in detectors made before about 1976), the ionising source details should be on the detector label, but it does not appear on some very old detectors (if in doubt, contact the chosen manufacturer for guidance).
- Activity level. The manufacturer will need to know the activity level for each type/model of detector. The activity level can be quoted in micro-curies (μCi) or kilo Becquerels (kBq). Note: 1 micro Curie (μCi) is 37 kilo Becquerels (kBq)

There have been in the past, instances of 'dumping' of Ionisation detectors, which eventually resulted in Prosecution by the Environment Agency, and fines of up to £20,000 have been imposed on those responsible. Bulk quantities of Ionisation detectors MUST be disposed of in accordance with the published guidelines.

Naturally the transportation of ICSDs being returned for disposal is subject to the transport requirements stated above.

The majority of domestic smoke detectors are discarded by the public in normal household waste. The Radioactive Substances (Smoke Detectors) Exemption Order 1980 permits the consumer to dispose of a smoke detector into household waste provided that the activity level does not exceed 40 kBq.

A new European Directive covers the disposal of all electrical and electronic waste (both domestic and commercial). This Directive (2002/96/EC on Waste Electrical and Electronic Equipment), known as the WEEE Directive, sets out responsibilities for manufacturers of electrical and electronic equipment to dispose of their products at the end of their lifetime. The directive has yet to be fully transposed into UK law (expected summer 2005), but further details can be found at:

<http://www.dti.gov.uk/sustainability/weee/>

See APPENDIX 1 for additional information on applicable legislation.

APPENDIX 1

IONISATION RADIATION LEGISLATION

IRR99

The ***Ionising Radiation Regulations 1999 (IRR99)*** are the principal set of UK radiation protection regulations and are essential reading for those involved in radiological protection, and radiation employers who work (or intend to work) with ionising radiations. IRR99 Regulation 13 requires that from January 1st 2005 any radiation employer using the services of a Radiation Protection Adviser (RPA) must ensure the following:

- The RPA must have an individual certificate of competence to act as an RPA (issued by an assessing body recognised by the HSE), or be part of an RPA Body recognised by the HSE.
- The RPA must have the relevant knowledge, expertise and competence to advise on your particular uses of ionising radiation.
- The RPA must be formally appointed in writing.

IRR99 (regulation 17) the employer must appoint one or more suitable Radiation Protection Supervisors to assist in ensuring regulatory compliance.

There is no legal requirement to appoint the RPS in writing. However it is recommended good practice to do so. It is helpful to issue an appointment letter which outlines the scope of the duties required whilst demonstrating management support for supervisory decisions made by the RPS
IRR99 Regulation 17 requires that "local rules" must be produced for any controlled or supervised area. This should contain, at least, emergency contact details.

IRR99 Regulation 19 requires that levels of radiation should be routinely monitored

JPIR04

The ***Justification of Practices involving Ionising Radiations 2004*** introduces the international radiological protection principle of generic "justification" of classes of practices involving exposure to ionising radiation. They are designed to weigh the health detriments of such practices against economic, social or other benefits. The regulations should not impose any new significant compliance burden on small users because they will have previously had to obtain site-by-site justification under RSA 93. Innovative practices belonging to a new class or type of practice are likely to be made by the larger users - justification will then be valid after due process under the regulations (and will then be valid for all users).

REPPIR2001

The ***Radiation (Emergency Preparedness and Public Information) Regulations 2001*** implement basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation and impose requirements for that purpose on operators of premises where radioactive substances are present (in quantities exceeding specified thresholds). Most small users do not need to worry about compliance with REPPIR since their holdings of radioactive materials is likely to be less than the set threshold limits. That said, there could be circumstances where a small user holds a large radioactive source in an irradiator that no longer has a valid 'special form' certificate.

RSA93

The ***Radioactive Substances Act 1993 (RSA93)*** provides essential reading for those involved with the use of radioactive materials and sources, and who accumulate and dispose of radioactive waste in the UK. This is another principal piece of legislation for UK radiation protection.

RSA 93 requires that premises holding radioactive materials and sources (this includes smoke detectors) are registered under section 7, registration should be made through the Environment Agency. A fee is payable for this, and the premises will be inspected by the Environment Agency on a regular basis, and all records will be reviewed.

The Certificate of Approval No TA3 of 1999 issued by HSE under the IRR99 regulations approves for less than 500 ICSDs, as defined in the NEA OECD 1977 publication, to be kept in a building or premises. The detectors can be stored or handled, but cannot be dismantled. This TA replaces the Certificate of Approval TA1 of 1989, which expired on 31 December 1999.
See reference:

<http://www.hse.gov.uk/hthdir/noframes/ta 3.htm>

Certificate of Approval No TA1 of 1999 permits ICSDs containing Americium 241 to be installed within the workplace; a copy of this document can be downloaded from:

<http://www.hse.gov.uk/radiation/ionising/apparatus/ta1.htm>

This document only applies to ICSDs that conform to the requirements of the Nuclear Energy Agency as set out in the 1977 publication "Recommendations for ionization chamber smoke detectors in implementation of radiation protection standards".

See reference:

<http://www.hse.gov.uk/hthdir/noframes/ta 1.htm>

Radiation protection programme

A Radiation protection programme (RRP) is required for transport operators i.e. carriers who routinely carry radioactive packages. The programme consists of three principle elements, as follows:

- risk assessments
- quality management system and
- local rules for transport.

This is not applicable to most smoke detector manufacturers unless they have their own transport for products, otherwise they are just consignors of radioactive packages.

APPENDIX 2

TRANSPORT REGULATIONS

For transport by road in the UK, the relevant legislation is:

- The Radioactive Material (Road Transport) Act 1991
- The Radioactive Material (Road Transport) (Definition of Radioactive Material) Order 2002 SI 2002, Number 1092
- The Radioactive Material (Road Transport) Regulations 2002, SI 2002, Number 1093 –
- It is sometimes known as RAMROAD
- The Radioactive Material (Road Transport) (Amendment) Regulations 2003, SI 2003, Number 1867
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These are derived from the European Agreement concerning the International Carriage of Dangerous Goods by Road (the so called ADR), currently in its 2005 edition.

APPENDIX 3

FURTHER INFORMATION

Further information can be obtained from the following agencies referred to in the Fact File.

- The Health & Safety Executive
<http://www.hse.gov.uk/index.htm>
- The Environment agency
<http://www.environment-agency.gov.uk/>
- The Department for Transport
http://www.dft.gov.uk/stellent/groups/dft_control/documents/homepage/dft_home_page.hcsp
- International Maritime Organisation
<http://www.imo.org/index.htm>
- International Civil Aviation Organisation
<http://www.icao.int/>
- Civil Aviation Authority
<http://www.caa.co.uk/>

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