

Radiation in schools

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EPA 985/17: The information contained in this fact sheet complies with Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) publication Radiation Protection Series No.18: Use of Radiation in Schools Part 1: Ionising Radiation (2012), and the relevant regulatory requirements of the South Australian Radiation Protection and Control Act (1982) and its regulations.

Introduction

Radiation sources used in schools are a valuable resource for teaching the fundamentals of ionising radiation to students through hands-on experience. Using radiation sources in science lessons can provide benefits for both teachers and students. As with any potentially hazardous material or equipment there are certain requirements that must be followed to ensure that radiation sources are used safely and appropriately. This fact sheet provides information on the types of radiation sources used in schools and describes the basic requirements for their safe use, storage and disposal.

What sources of radiation can schools have?

The most common sources found in schools are *sealed* and *unsealed* sources. Sealed sources (Figure 1) typically look like small, round, plastic buttons which are generally quite safe and are excellent sources to be used in schools for demonstrating how alpha, beta and gamma radiation penetrates matter.

Unsealed sources (Figure 2) are items such as rocks, soils, ores, liquids and cloud chambers. Such sources are also suitable for schools. However rocks, soils and ores do pose a slightly higher risk as they have the potential to generate dust containing radioactive particles which can be inhaled into the lungs or absorbed through the skin.

How should radiation sources be stored?

It is recommended that all radioactive sources, both sealed and unsealed, be stored in the same location at all times, regardless of the activity. A strong, fireproof steel container (eg a toolbox) labelled with the appropriate radiation symbol (Figure 3) is recommended for storage of all sources. Lead-lined containers are also suitable, provided they can be closed completely and secured. The container should only be opened when the sources are needed.

The container should be kept in a secure location, such as a metal filing cabinet. The location does not necessarily have to be made of metal, as a suitable and secure wooden cupboard or drawer is also sufficient, provided that the radioactive sources themselves are stored within a metal container. A radiation sign or sticker should be placed on the container, the place of storage and the door to the storage area so the sources can be easily identified and located.



Figure 1 Image of a typical sealed source found in schools, known as a 'button source'. They are usually made from either americium (alpha emitter), strontium (beta emitter) or cobalt (gamma emitter).



Figure 2 Image of a radioactive rock, a type of unsealed source. Small fragments and particles can be seen, which have the potential to contaminate surfaces or become airborne. Rock samples generally contain uranium and thorium radionuclides.

For unsealed sources stored in the metal container, such as rocks or soils, it is recommended they be kept in closed, airtight containers or zip-lock plastic bags. This is because unsealed sources have the potential to generate radioactive dust and/or radon gas.



Figure 3 Image of the radiation symbol, which is recommended to be placed on containers used for storing radioactive sources

How should radiation sources be handled?

When handling any radioactive source, the three principles of radiation protection should be applied – time, distance and shielding.

Time – keep the time you stay next to a radiation source to a minimum in order to reduce the total exposure.

Distance – keep the distance between you and the source as far as practicably possible, as the further away you are from a source, the lower your exposure. The inverse square law applies to physically small radiation sources and describes the relationship between distance and dose rate. For example, the inverse square law means that if you double the distance between yourself and the source, the dose rate will be one quarter of the original.

Shielding – barriers used for shielding are often made of materials such as perspex or lead. The thicker the barrier between you and the source, the less you will be exposed.

Sealed radioactive sources should never be picked up with fingers, but always with tongs or tweezers.

Extra care is required when handling unsealed radioactive sources. They should be handled with gloves and only be used for short periods of time. This is because of the possibility of spillage which can cause surface contamination and the possible generation of radioactive dust. Using these sources outside or in a fume hood is recommended.

What if the radiation source is unknown?

Each school is different, and it is likely that schools will have a variety of different sources which have been acquired over many years. Often records or knowledge about when the source was acquired, what the source is made from and the type of radiation it emits have been lost.

If you are unsure of the source and would like to know further, you can send the source to the EPA for testing. For further information, refer to the [How do I send my radioactive sources to the EPA for testing or disposal](#).

Who is responsible for storing and maintaining radioactive sources?

There should be an appointed radiation supervisor in every school that has radiation sources. The role of the radiation supervisor would be suited to a school's laboratory manager or head of science/physics. The radiation supervisor does not need any formal training or qualifications but should understand the basic principles of radiation protection, and safe storage and handling procedures.

It is the responsibility of the school principal to appoint the radiation supervisor. The principal should ensure that the radiation supervisor is competent and is fully aware of their role.

It is the responsibility of the radiation supervisor to check that each member of staff (teaching or non-teaching) who works with the radiation sources is competent and follows the correct procedures.

Who can use radioactive sources?

Students in Year 10 and under

Class work with radioactive sources for students in Year 10 and under should be restricted to teacher demonstrations. Students should be kept at least two metres away from these sources during demonstrations. However, closer inspection of devices containing low-level radioactive sources (eg small cloud chambers, smoke alarms, radioactive watch dials) is acceptable, provided the source is fully enclosed. Contamination of the fingers should be avoided by using gloves, particularly if handling radioactive rocks, soils and ores. Radioactive sources, regardless of their activity, should never be left unattended by the teacher in charge.

Students in Years 11 and 12

Students in Years 11 and 12 may handle sealed and unsealed radioactive sources in order to carry out standard investigations of the properties of ionising radiations. The teacher in charge should be satisfied that the students have an adequate understanding of radiation, are sufficiently responsible, have received appropriate instruction and understand the correct handling procedures for radioactive sources. The teacher should closely supervise all work.

Is there any danger with handling school sources?

The radiation sources used in schools are generally of very low activity and therefore do not pose a significant risk. A common misconception about radiation is that all radiation is harmful, no matter what the activity is. Provided that school radiation sources are handled in the correct way, the risk is negligible. For the correct method for handling radioactive sources, refer to the [How should radiation sources be handled?](#)

The hazards present in a science classroom should be put into perspective. Students are taught the correct procedure for handling dangerous chemicals in a chemistry class because of the health risks involved. In the same way, correct

procedures for handling radioactive sources should also be taught to minimise the risk. In reality, negative health effects are likely to be higher for the incorrect use of chemicals than for the incorrect use of school radiation sources.

Can a school source spread radiation and contaminate other objects?

Sealed sources, such as the button types, are encased in hard plastic which is very difficult to rupture and cause the source to leak. Together with the very low activity of these sources, leakage and subsequent contamination of other objects are negligible.

Unsealed sources such as rocks, fine grain materials, powder or dust-like particles do have the potential to spread low amounts of contamination if they are not stored or handled appropriately. For appropriate storage, refer to the [How should radiation sources be stored?](#) If the unsealed material is spread via leakage or accidental spillage, there is the potential for radioactive particles to be absorbed through the skin or inhaled into the lungs.

If you suspect that some surfaces have become contaminated with radioactive material, the EPA can provide a surface contamination wipe test kit. Please contact the EPA if you require this service. [Contact details](#) are at the end of this fact sheet.

How should a leaked or spilled source be cleaned up?

If there is an incident with a leaked or spilled source the material can be cleaned up using a damp cloth. Make sure protective gloves are being worn. If the source has the potential to generate dust, a mask should also be worn. Once the entire spill has been collected, place the cloth in an air-tight container or zip-lock plastic bag. For correct disposal, refer to the [How should unwanted radioactive sources or wastes be disposed of?](#)

If contamination is suspected to have spread to other surrounding areas, the EPA can provide a surface contamination wipe test kit. Please contact the EPA if you require this service. [Contact details](#) are at the end of this factsheet.

How should unwanted radioactive sources or wastes be disposed of?

Waste generated by the leakage of a source or accidental spillage should be cleaned up via the appropriate methods described in the [How should a leaked or spilled source be cleaned up?](#)

For sources the school no longer requires, it is recommended the school dispose of them as storing them indefinitely can add an extra safety hazard and cause unnecessary and time-consuming risk assessments.

Although the activity of the sources used by schools is low, disposal of radioactive sources or waste by the school without consultation with the EPA is forbidden. If you would like to remove radioactive sources from the school, or have your waste disposed of, you should discuss your options with the EPA. For information regarding how to send radioactive sources or waste, refer to the [How do I send my radioactive sources to the EPA for testing or disposal.](#)

Where can I find additional information?

If you require any additional or more in-depth information, please read Radiation Protection Series No.18: Use of Radiation in Schools Part 1: Ionising Radiation (2012). This can be found on the ARPANSA website <www.arpansa.gov.au/Publications/codes/rps18.cfm>.

The EPA website <www.epa.sa.gov.au/environmental_info/radiation> also provides some useful information on radiation including radiation basics, facts, safety, everyday uses and the South Australian regulatory frameworks.

How do I send my radioactive sources to the EPA for testing or disposal?

Provided that the radioactive sources are stored in the correct way, as described in this fact sheet, the school's radiation supervisor can transport the sources or waste themselves to the EPA Radiation Laboratory.

It is perfectly safe to transport these items because the activity of school sources is very low, and providing the appropriate storage methods have been used, the radiological risk is negligible.

If you wish to dispose of your sources or test for surface contamination please contact the Radiation Protection Branch using the following contact information:

Telephone: (08) 8463 7826

Email: radiationprotection@sa.gov.au

Further information

Legislation

[Online legislation](#) is freely available. Copies of legislation are available for purchase from:

Service SA Government Legislation Outlet
Adelaide Service SA Centre
108 North Terrace
Adelaide SA 5000

Telephone: 13 23 24

Facsimile: (08) 8204 1909

Website: <shop.service.sa.gov.au>

Email: <ServiceSAcustomerservice@sa.gov.au>

General information

Environment Protection Authority
GPO Box 2607
Adelaide SA 5001

Telephone: (08) 8204 2004

Facsimile: (08) 8124 4670

Freecall: 1800 623 445 (country)

Website: <www.epa.sa.gov.au>

Email: <epainfo@sa.gov.au>
