

DISPOSAL OF RADIOACTIVE MATERIALS USED IN SECONDARY SCHOOLS

The purpose of this document is to provide information to schools on how to safely dispose of radioactive substances used in school experiments.

THE USE OF RADIATION IN SCHOOLS

Many schools have radioactive materials, which are used in school experiments to demonstrate the fundamental properties of radiation as part of the science curriculum. Most of the radioactive materials used in schools are of sufficiently low activity to be exempt from registration in Victoria. Although the degree of hazard from radioactive materials used in schools is very small, these materials must still be disposed of properly when they are no longer required. According to current legislation, all radioactive materials should be disposed of in ways which safeguard human health and minimise impact on the environment. This is necessary to ensure that the exposure of people to radiation from radioactive materials is minimal.

TYPES OF RADIOACTIVE MATERIALS USED IN SCHOOLS

Radioactive substances used in schools generally include the following sealed radioactive sources: Cobalt-60, Strontium-90, Caesium-137, Radium-226 and Americium-241. Unsealed sources used in schools include uranium and thorium ore samples, Yttrium-90 and Barium-137. Other items used in schools that may generate ionising radiation are high voltage electronic tubes (such as cold-cathode gas discharge tubes) and cloud chambers that incorporate Radium-226.

RESPONSIBILITY FOR DISPOSAL OF RADIOACTIVE MATERIALS

In Victoria, the Radiation Safety Program (RSP) of the Department of Human Services is responsible for monitoring the use and transport of radioactive materials and for establishing safe practices for the disposal of radioactive wastes. However the individual users of radioactive materials are responsible for the disposal of these substances once they are no longer required. The RSP can provide advice and guidance on the safe use of ionising radiation and on the disposal of radioactive materials. Although the RSP does not directly supervise such disposal, they will check on the operation of the user-disposal systems from time to time.

RESPONSIBILITIES OF THE SCHOOL

It is the responsibility of the school to maintain good management practices and to keep accurate records of the purchase and use of radioactive materials as well as the disposal of radioactive materials that are no longer required. All relevant staff should be educated in the handling of radioactive materials. A teacher with some scientific training should be nominated to take care of the handling and disposal of radioactive materials. If the service of a commercial waste disposal company is employed, the school should ensure that the company holds an appropriate licence. This information can be obtained from the RSP.

DISPOSAL OF RADIOACTIVE MATERIALS

(i) Sealed Radioactive Sources

Sealed radioactive sources are radioactive materials that are totally enclosed in a protective capsule or container such that no material can escape. They are the most common radioactive material found in schools. Sealed sources can give rise to a potential external radiation hazard. Before disposing of a sealed radioactive source, the activity should be measured to determine whether it is still considered radioactive. Most of the sealed sources found in schools have very long half lives so it is unlikely that the source would have decayed to an activity that is acceptable for disposal with normal garbage. There are some exceptions, such as Co-60, which has a relatively short half life of around 5 years. If the activity of the source or its activity concentration is below the inclusion level as specified in the *Radiation Regulations 2007*², then it is no longer considered radioactive and can be disposed of with normal garbage. If it is above this level then it should be returned to the manufacturer or supplier for disposal. One of the conditions of licence to sell radioactive materials is that the individual or company selling the material must also accept it for disposal when it is no longer wanted. The source should be marked with the name of the manufacturer / supplier. If these details are not marked on the source and the supplier is unknown, then advice on disposal can be obtained from the RSP.

(ii) Unsealed Radioactive Sources

Unsealed radioactive sources are radioactive materials that are not encapsulated or otherwise sealed. They can be hazardous as they give rise to internal irradiation if they enter the body. The Code of Practice¹ relevant to schools specifies that only sealed radioactive sources should be used in secondary schools and that unsealed sources are to be used for demonstration purposes only. Teachers demonstrating the use of unsealed sources should wear disposable gloves which should be treated as radioactive waste. At the completion of the experiment, the area should be checked for contamination with a suitable radiation monitor. Any expendable material that has become contaminated should be treated as radioactive waste. A waste bin with disposable waterproof liner should be provided for contaminated laboratory ware and disposable towels. Because of the low levels of activity involved,

usually the liner and contents can be disposed of with normal garbage and hence should not be labelled as radioactive waste.

Some schools may have uranium and thorium ore samples of varying degrees of radioactivity. Usually these compounds represent a low radiological hazard as the radioactivity per gram is extremely small, but there have been samples found in schools where the radiation levels measured around the ore were quite high. These ore samples can also be quite toxic chemically. Unwanted mineral samples should be returned to the supplier, if known. If the supplier is unknown, advice on disposal can be obtained from the RSP.

(iii) Other Sources of Ionising Radiation

High voltage electronic tubes (such as cold-cathode gas discharge tubes), which are used in some schools, may produce unwanted X-rays incidental to their intended use. When these tubes are no longer wanted they should be disabled so that they are no longer operable and then disposed of with normal garbage. Alternatively they may also be donated to other schools or universities.

Some schools may also have cloud chambers which are used to investigate alpha particle tracks. These cloud chambers may incorporate Radium-226 in the form of a pin. The RSP should be contacted for disposal of these devices.

COMMERCIAL DISPOSAL

There are a number of commercial waste disposal companies in Victoria that can assist in the disposal of any radioactive materials. A fee is usually charged for such a service. All commercial waste disposal companies must hold an appropriate licence with the RSP. A list of licensed companies providing such a service can be obtained from the RSP.

SUMMARY OF DISPOSAL OPTIONS

If the activity of a radiation source or its activity concentration is less than the amount prescribed in the Regulations, then it can be disposed of with normal garbage.

If the activity of the radiation source and its activity concentration is greater than the level prescribed in the Regulations, then they should be returned to the manufacturer or supplier for disposal.

Radioactive materials may be disposed of commercially for a fee.

High voltage electronic tubes should be disabled and disposed of with normal garbage.

Contact the RSP for disposal of cloud chambers.

REFERENCES

1. National Health & Medical Research Council *Code of Practice for the Safe use of Ionizing Radiation in Secondary Schools* (1996)
2. Radiation Regulations 2007

Contact Details

Further information can be obtained from:

Radiation Safety Program
Department of Human Services
GPO Box 4057
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