COST-EFFECTIVE RADIATION PROTECTION FOR SCHOOLS AND COLLEGES IN THE UNITED KINGDOM

K W Bowker

Hinton & Higgs (Consultants)
Abingdon, Oxon
United Kingdom

ABSTRACT

This paper describes how schools and colleges in the United Kingdom can meet the requirements of the Ionising Radiations Regulations 1985 in a simple and cost-effective manner.

INTRODUCTION

In the United Kingdom, the storage, handling and use of radioactive materials is controlled by the Ionising Radiations Regulations 1985. Students, usually in the 16-18 age group studying Advanced Level Physics in schools and colleges carry out a number of practical experiments using radioactive sources. The sources are principally closed sources of low activity and their usage is of corresponding low risk. Nevertheless, there is a need for the school or college to comply with the legislation and this paper describes how this can be achieved in a cost-effective way.

SOURCES USED

Appendix 1 shows typical closed sources used in the Advanced Level Physics course, together with their activities. In addition, cloud chamber sources are of very low activity (740 Bq). Thoron generators typically use 100 grams of thorium carbonate powder in polythene squeeze bottles. Radioactive rocks sets are a mixture (usually for four different rocks) of naturally occurring minerals containing radioactivity.

MAIN POINTS OF THE LEGISLATION

An essential aspect of the legislation is the requirement for the employer to appoint a Radiation Protection Adviser (RPA) who, as the title implies, provides advice on all aspects associated with the safe use of radiation sources in the school or college. In addition, each establishment must appoint a Radiation Protection Supervisor (RPS) to oversee the day to day arrangements for the radiation sources. The person usually appointed as RPS is the head of physics in the school, occasionally the head of science.

The main duties of the RPS in a school or college are principally to ensure that:

1 The list of sources is kept up to date and to notify the RPA of any changes;

2 Sources are kept in a locked, fire-proof cabinet, properly signed;

3 A log book is kept with the sources and that details of source movements are being maintained;

4 Local rules have been formulated and are kept up to date;

5 Leakage tests on appropriate closed sources are carried out;

6 To arrange, usually via the RPA, for the safe disposal of unwanted sources.

LEAKAGE TESTING

The Regulations require that all closed sources with a surface dose rate greater than 100 microsieverts per hour and with any dimension greater than 5mm are tested for leakage every twenty-six months. The method of test is a wipe followed by counting the activity removed onto the wipe. The limit of leakage test activity is 185 Bq. A sensible and cost-effective arrangement that can be adopted in schools involves an initial in-house screening process which is followed, but only where necessary, with testing by an appropriate external organisation. The RPS carries out the wipe test using a moistened paper and counts the wipe using school counting equipment. Where a significant quantity of activity is found on the wipe, the RPA is notified and arrangements for quantitive testing made. Schools must keep records of the test in a format laid down by the Regulations.

Most Radium-226, Strontium-90 and Cobalt-60 sources used in schools require leakage testing. In the author's experience, an insignificant few are found to have any measurable leakage activity. Thus, for the main part, this requirement of the Regulations can be carried out in-house by the school at a time to suit their convenience and at minimal cost.

TRAINING

The Regulations require that a RPS is not appointed until such time as he/she is aware of the Regulations such as they affect their particular work activity. Training is therefore essential. All RPS's are expected to attend a training course, typically of one half day's duration. A syllabus for a school/college RPS training course is shown in Appendix 2.

RADIOACTIVE WASTE DISPOSAL

In addition to commercially purchased sources, schools and colleges often 'acquire' additional sources, usually from well-meaning parents or teachers themselves. These 'acquired' sources tend to be either naturally occurring ores/minerals or apparatus containing luminising material. Many contain more activity than the commercially bought sources. In most cases, the teacher in charge is pleased to see such sources put for disposal. A collection of unwanted sources, including those commercial sources that have decayed to a level where they are no longer useful, is most cost-effective when carried out on a basis involving as many schools as possible in an area. Disposal by individual schools is not recommended on cost grounds.

CONCLUSION

Perhaps with the exception of thoron generators, the use of radioactive sources in schools is of a low order of risk. Compliance with the UK regulations can be achieved simply and in a cost-effective manner. There is a further positive benefit in that schools and colleges are able to demonstrate to their students, whose opinions are at a critical stage of development, a sensible radiation protection regime.

APPENDIX 1

CLOSED SOURCES USED IN SCHOOLS AND COLLEGES

SOURCE	TYPICAL ACTIVITY (kBq)
Americium-241	185
Cobalt-60	185
Strontium-90	185
Radium-226	185
Plutonium-239	3.7

APPENDIX 2

SYLLABUS FOR RADIATION PROTECTION SUPERVISOR TRAINING

Radiation harm.
Radiation protection objectives and methods by which objectives are achieved.
Dose limits - units of activity and dose.
Methods of dose reduction.
Summary of typical sources used in schools and associated doses and risks.
Thoron generators, cloud chamber sources.
Naturally occurring radioactive sources used in schools.
Ionising Radiations Regulations 1985 - main points of legislation as they affect the school.
Role of the Radiation Protection Adviser and Radiation Protection Supervisor.
Duties and responsibilities of the Radiation Protection Supervisor.
Local rules.
Waste disposal requirements.
Leakage test - demonstration - records to be kept.