

Summary of Submissions and Responses
Safety Guide for the Use of Radiation in Schools – Part 1: Ionizing Radiation
Submissions closing date: 3 October 2008

SUBMITTER	COMMENT	RESPONSE
<p>01 Mike Carter</p>	<p>Use of Radiation in Schools. Part 1 Ionising Radiation. Comments</p> <ol style="list-style-type: none"> 1. One purpose of this guide should be to get the message to students that we are all exposed to low levels of radiation and that low levels are not hazardous. This is not sufficiently covered. A list, or table, of sources of low exposures such as flying to Europe, the low levels of radon present in many houses, moving from the coast to a mountain area etc. would help. 2. The sections on source storage need to be expanded. <ul style="list-style-type: none"> • The storage cupboard should be checked during the period when the sources are not being used, to be sure that all sources are present. A check once a month or every other month would be sufficient. The time taken to check that the sources were present would only be a matter of minutes. Failing to check in the period of 10 or 11 months between the brief periods when the sources are used for teaching would be very poor practice. • If there were a number of radium sources in storage it would be good practice to ventilate the cupboard to prevent a build up of radon. While not very likely, a build up of radon could be sufficient to deliver a dose over the public limit to the teacher doing an inspection of the cupboard. [I know that the ICRP recommendations allow for inhalation of radon a higher dose than the public limit, but ALARA would suggest that ventilation to the outside would be appropriate to reduce the dose. 3. The suggestion that the school has a scaler and a GM tube is inadequate. Scalers are usually laboratory instruments, mains operated and not easily portable. A scaler will be needed in the laboratory but some portable equipment would also be needed. GM tubes detect gamma radiation but depending on their housing, and window thickness, may not detect beta radiation 	<p>Some comparison is already given in lines 259-266. A table of typical exposures to ionizing radiation has been added as Table 1 in Section 1.4.</p> <p>Disagree. Record keeping already considered too onerous by other submitters. Text in Section 2.4.2 amended to include: line 661: 'A formal check should be carried out immediately if any changes are made to the storage location or in the event of break-in, theft or school trespass.'</p> <p>Text added at line 704: 'Should your school have several (e.g. more than 10) radium sources, then the store should be in a well ventilated area to prevent any build up of radon.'</p> <p>There is a need to keep requirements as simple as possible. Current measuring instruments have been adequate for the uses for which schools require them for many years.</p>

	<p>and will not detect alpha radiation. As all types of radiation are to be demonstrated there will be a need for more instruments than just a GM tube and a scaler.</p> <p>4. Assuming that an alpha detector is available, measurement of radon and its decay products in the classroom would be a very useful demonstration. An air sampler would be needed, but it could be a very simple one. [In the 1950s air samplers made from domestic vacuum cleaners were widely used]. Measurement of natural radiation in the classroom demonstrates that we are always exposed to radiation, and counting the filter paper at short intervals not only allows the radon concentration in the air to be calculated but also demonstrates radioactive decay.</p> <p>5. While Annex 7, “Calibration” of Geiger counters” is OK; it would be advisable to have one doserate instrument calibrated each year by an appropriate organization. This would ensure that correct doserate measurements could be made but more importantly let the students know that annual calibration is a legal requirement.</p> <p>6. Annex 8 is written with the view that the LNT hypothesis is correct. Lines 1456 and 1457 give a risk value for 1 mSv as if it is a fact. I suggest that this is modified to say that while the 1 in 100 risk for a 100 mSv dose is widely accepted the risk from a 1 mSv dose is anything from zero to 1 in 20,000. It would be appropriate to point out that the population cancer risk is 1 in 4 [or 1 in 3, we don’t know it with any accuracy] from all sources and that 1 in 20,000 is undetectable.</p>	<p>Alpha detectors may be out of reach of many schools’ budgets but such an experiment could be suggested to schools e.g. in a newsletter.</p> <p>This is a good suggestion but could add significantly to the science budget.</p> <p>Noted. This is the standard annex for all RPS publications.</p>
<p>02 Courtney Sharman Laboratory Technician The Friends’ School, TAS</p>	<p>I found the document very helpful overall. I am a laboratory technician myself with previous experience as medical scientist but still found the background information on radioactive sources quite useful. Having a list of recommended radiation sources would have been of great benefit if we were in a position to by new sources, it simplifies things much to know that these would meet all requirements if the defined procedures were met. The only possible addition I could think would be useful to many schools whom have sources that do not comply would be more information on what to do with these sources. This</p>	<p>Comments noted and very useful.</p>

	<p>would be useful but not essential as contact information for advice is given. All the information on handling, storage, spills and decontamination I thought was written in a very easy to understand practical way, useful for all levels of understanding. One of the most useful appendices for me was the examples of risk assessments and local rules which we can easily adapt for our own circumstances. Also the leak testing information was particularly useful for me as our school has to my knowledge not been doing this and I intend to implement it shortly. So, as I have indicated already, I found the document overall very helpful in understanding the procedure required to safely handle radioactive sources.</p> <p>Thank you for your help and information and I look forward to viewing the final draft and receiving information on what is to be done with our non-compliant sources when a decision has been reached.</p>	
<p>03 Sue Macalpine Senior Radiation Policy Officer Department of Environment and Climate Change (NSW)</p>	<p>The Department of Environment and Climate Change (DECC) and members of the Radiation Advisory Council have reviewed the draft Safety Guide for the Use of Radiation in Schools Part 1: Ionizing Radiation dated 7 August 2008. We are generally supportive of the document and provide the following comments.</p> <p>General Comments</p> <p>The Radiation Safety concerns regarding the use of radiation in schools parallel Occupational Health and Safety (OH&S) concerns. It is strongly recommended that the draft Safety Guide is circulated to the Commonwealth and/or state OH&S regulators to ensure the document is consistent with the OH&S risk management framework.</p> <p>Consideration could also be given to extending the scope of the document to include sections on:</p> <ul style="list-style-type: none"> • Radiation instrumentation <ul style="list-style-type: none"> ○ The use of various instruments to detect specific types of radiation so that the right monitor is used for the right job ○ The use of instruments that show dose rate rather than, or in addition to, counts per second ○ Instrument calibration and checking prior to use • Specific training and education requirements for the responsible persons, teachers and support-staff. 	<p>Noted. Text and a web link to Workplace Safety Authorities have been added to the end of Annex 1 and also in Annex 4, line 1167.</p> <p>See response to point 5, submission 01.</p> <p>This is covered in Sections 2.1 and 2.2.</p>

	<p>Specific Comments</p> <p>Introduction</p> <p>In the introductory photographs, it would be informative to include a photograph of rock samples to highlight that some mineral samples may emit radiation e.g. pitchblende, uranium ore.</p> <p>Line 59 and elsewhere throughout the document. The document very conservatively recommends that tongs and tweezers should be used to manoeuvre radiation sources. It is suggested that the word ‘handling’ is replaced throughout the document.</p> <p>Line 79 and throughout the document. For clarity and consistency it is suggested that the words ‘recommendations document’ are replaced with ‘Safety Guide’.</p> <p>Lines 128, 133 and 136. The word ‘ionisation’ or ‘ionization’ appears in each of these lines. DECC suggests that the Australian spelling is used throughout.</p> <p>Lines 165-166. It would be sensible for Education departments (both state and private school authorities) to be fully briefed on these matters since it is likely that teachers or heads of schools would look to their own authorities for information rather than the ‘radiation regulator’. DECC does not consider it appropriate for the radiation regulator to be the first port of call for every school that has queries, especially given that typical school sources are to be exempted from regulatory control under Schedule 5 of the NDRP.</p> <p>Line 191 As ICRP60 is currently under revision it is suggested that the words ‘from ICRP’ are replaced with ‘proposed by the ICRP and published in Australia as RPS1’.</p> <p>Line 218. It is suggested that the word ‘inculcate’ is replaced by the word ‘instil’</p> <p>Lines 247 and 248. The terms ‘sealed’ and ‘unsealed’ should be defined in the glossary.</p>	<p>A photo of a rock sample is included in Annex 4 on model risk assessments.</p> <p>“Handling” does not mean using fingers to manoeuvre a source. No change made.</p> <p>Agreed. The term “recommendations document” has been replaced by “Safety Guide” throughout the document.</p> <p>Agreed. The term ‘ionization’ is now used throughout the Safety Guide for consistency with other Radiation Protection Series (RPS) publications.</p> <p>This is a very important implementation issue. No change is required to the document.</p> <p>Agreed and amended.</p> <p>Agreed and amended.</p> <p>Done. The terms ‘sealed radioactive source’ and ‘unsealed radioactive source’ have been added to the Glossary.</p>

	<p>The Summary for teachers in a hurry and line 376. It is stated that polonium 210 is included in sets of school sources. It is suggested that exemption levels for Polonium 210 should be added to Table 1.</p> <p>Line 381 refers to C7 and line 367 to C8. It is unclear what these references relate to.</p> <p>Line 429. The phrase ‘must be exempted’ addresses the regulators’ obligation. As the audience for this document is teachers and responsible person(s) it is suggested that this reads ‘are exempted’ instead.</p> <p>Administrative Procedures</p> <p>Line 451-452. The statement that all existing OH&S requirements should also apply to radiation sources is rightfully stressed. To this end it would be appropriate that this document is checked by OH&S specialists to ensure consistency with the OH&S framework and terminology.</p> <p>Line 638. It is suggested that words to the effect of “an inventory should be maintained” are inserted in this line.</p> <p>Line 658. More frequent audits of sources should be considered. Perhaps once a month or once a term and in event of break-in, theft or school trespass. The time taken to check that the sources are present would only be a matter of minutes.</p> <p>Storage of Radiation Sources</p> <p>Line 692. It would be informative to include an illustration of a trefoil warning sign with the wording ‘radioactive material’.</p> <p>Line 716. It is suggested that further details of ‘a sturdy tin’ are included as the phrase appears to degrade the heading ‘Construction of the store’.</p>	<p>Agreed and included.</p> <p>‘C7’ changed to ‘Section 7’ and ‘C8’ changed to ‘Section 8’. Other similar references have also been amended.</p> <p>Agreed and amended.</p> <p>Wording added in Annex 4.</p> <p>Text amended.</p> <p>Text amended.</p> <p>An example radiation warning sign has been added.</p> <p>The term “a sturdy tin” has been replaced with “a tool box”.</p>
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	<p>It is suggested that radon is discussed in the context of radioactive ore sample(s) in storage. If there were a number of radium sources in storage it would be good practice to ventilate the cupboard to prevent a build up of radon. While not very likely, a build up of radon could be sufficient to deliver a dose over the public limit to the teacher doing an inspection of the cupboard.</p> <p>Handling of Radiation Sources</p> <p>Line 761. Encapsulated radioactive sources with total activities below those specified in Table 1 can generally be handled safely by holding the perspex perimeter.</p> <p>Line 794. It is suggested that the reference to smoking is removed as it dates the document and/or suggests that the document has not been prepared carefully.</p> <p>Lines 825 and 1219-20 There is inconsistency in the requirement at line 825 that spills must be reported to an appropriate person ‘e.g. the radiation supervisor’ and the requirement at lines 1219-20 that the radiation supervisor must be advised in the event of an incident resulting in contamination (In the latter case the radiation supervisor is the sole person to be advised not an example of a person to be advised).</p> <p>Spills and Decontamination</p> <p>Line 922 refers to C6. It is unclear what this reference relates to.</p> <p>Radiation Monitoring and Testing of Sources</p> <p>It is questioned whether the suggestion that schools have a scaler and a GM tube is adequate/appropriate. Scalers are usually laboratory instruments, mains operated and not easily portable. GM tubes detect gamma radiation but depending on their housing and window thickness, may not detect beta radiation and will not detect alpha radiation. If all types of radiation are to be demonstrated there will be a need for more instruments than just a GM tube and a scaler.</p>	<p>Text added at line 704: ‘Should your school have several (e.g. more than 10) radium sources, then the store should be in a well ventilated area to prevent any build up of radon.’</p> <p>There are many different types of sources. No change made.</p> <p>Agreed and removed.</p> <p>Lines 1219-1220 are an example of local rules where the school has determined that the radiation supervisor is the appropriate person.</p> <p>‘C6’ changed to ‘Section 6’.</p> <p>See response to Submission 01.</p>
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	<p>Transport of Radiation Sources</p> <p>Line 951. It is suggested that both the Code of Practice and the new Safety Guide for the Safe Transport of Radioactive Materials are referenced.</p> <p>Disposing of Radiation Sources</p> <p>The return of unwanted sources to the manufacturer should be stated as the preferred disposal option for unwanted radioactive sources.</p> <p>The specification of levels for which radioactive materials are suitable for land fill is premature. This issue needs to be discussed and agreed to by State and Commonwealth jurisdictions through the national uniformity process.</p> <p>Annex 3 Properties of some radiation sources</p> <p>Line 1131. The reference should be updated to the current version <i>Radiation Protection Dosimetry Vol. 98 No 1 2002</i>.</p> <p>This annex is considered to be too technical. If retained it needs to specify specific circumstances for the measurements. For instance is the source a 'point source' or assumed to be spread over an infinite plane? What is the distance from the source for which the external exposure relates etc?</p> <p>Annex 4 Model risk assessments for radioactive sources</p> <p>The risk assessments are seriously lacking from an OH&S standpoint. As previously stated this document should be reviewed by the OH&S regulator(s) to ensure compatibility with this framework</p> <p>Annex 7 “Calibration” of Geiger counters</p> <p>To improve readability it is suggested that superscripts are used in the measurement units.</p>	<p>Agreed and words added to the text and References section.</p> <p>This option is generally not available for sources of the activities in this Safety Guide.</p> <p>Table 2 removed and guidance is now to contact the relevant radiation regulator.</p> <p>Agreed and amended.</p> <p>This type of information was requested by teachers. Lines 1107-1108 explain what is meant by a point source.</p> <p>Explanatory wording has been added in Annex 4.</p> <p>Agreed and amended.</p>
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<p>04 John Shanahan Project Manager - Maths and Science Teaching Learning & Standards Division Dept of Education and Training NT Government</p> <p>For Trevor Collins Casuarina Senior College, Moil NT 0810</p>	<p>I think the models and guidelines are sensible. From our point of view we had all our samples inspected by radiation and health and any suspect samples removed. We have only those exempt samples mentioned in the document.</p> <p>These seem to be sufficient to cover our courses.</p>	<p>Noted.</p>
<p>05 Jill Reade President Science Teachers Association of Tasmania, Convenor CONASTA 58</p>	<p>I have collected a range of replies from a number of teachers and lab technicians. I have not edited the comment just collated it. Other conversation suggests that a minority of our high schools include radiation related activities as most sources have been removed several years back.</p> <p>Comment list.</p> <p>1. This is a much more detailed set of general information and handling and management expectations than we have at the moment with the 1986 document.</p> <p>I can only speak for high schools, (year 10). Whilst CosHS has and uses some of the sources, in the low ranges of activity, mentioned for year 10 advanced science and the handling guidelines listed are followed, other protocols detailed are not: like the detailed and specific record keeping proposed, the training steps for all staff, the log of use, the regular storage and contamination checks, the written set of operating conditions and usage expectations etc we don't do and I would think few High schools do.</p> <p>My feeling is that few high schools actually have many or any of the sources or equipment mentioned or carry out experiments using radioactive sources or equipment. Some years ago High schools had the opportunity to hand in all old sources not used and many did this.</p>	<p>Noted.</p> <p>Noted.</p> <p>Noted.</p>

	<p>I am happy with the set of protocols from a High School perspective, even though they will require a lot more attention to bureaucratic detail than before. If anything it will ensure that even fewer HS actually do any practical radiation experiments. It is a pity because there is a great ignorance and irrationality based on ignorance amongst students, their parents and most teachers about radiation and its use and sources.</p> <p>I will be interested to hear what year 11 physical science teachers think.</p> <p>2. I like the language in which this written but certainly the record keeping is I believe a bit onerous. I wonder how concerned the police would be if they were informed of a lost (perhaps stolen) source considering the strength of the sources we are permitted to use. We also use the Cs/Ba generator and it is a brilliant experiment, really demonstrates the concept of half-life. I would be concerned if the radiation regulator may say we cannot use it, particularly as it is a commercially available kit! I will forward this to our science staff for comment as well.</p> <p>3. I agree with Rob that few high schools seem to use radioactive sources. I suspect that none of them currently follow the protocols listed. However, despite the number of pages, I don't think that the protocols are too onerous for schools who really want to use / store radioactive sources. I like the fact that the document is written in a way that seems to encourage the use of radioactive sources (for the reasons that Rob alludes to), rather than discourage their use.</p> <p>4. The record keeping is totally ridiculous. They are commercially available sources surely all we should be required to do is know what we have, where and how it is stored and when and buy whom it is removed? Please forward this as a comment from the person who would have to actually do the tasks required. Unbelievable! For some of our old sources which have been tested and deemed to be safe when the disposal round was done in 2007 (?) we have none of those details anyway.</p>	<p>Noted. Hopefully, the document will have the opposite effect.</p> <p>Stories about lost sources occasionally make the front page of a newspaper.</p> <p>The SG is for guidance. If a risk assessment shows that use of such a source is OK in your school, then you can use that source.</p> <p>Noted.</p> <p>The submissions have provided conflicting opinions on the record keeping. No changes made. Older sources may well have incomplete information.</p>
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	<p>5. Some interesting stuff here. They do seem a bit obsessed with the record keeping, especially as we essentially deal with sealed sources!</p> <p>Radiation supervisor indeed! I seem to recall that it took about thirty years for 'someone' to come and get our really nasty samples.</p> <p>I agree with your comments about the police. I wonder if they have to deal very often with incorrect disposal of the Am-241 smoke detectors that end up in landfill. Surely all our sources are so innocuous as not to bother with all of this hullabaloo?</p>	<p>Noted.</p> <p>See response above.</p>
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