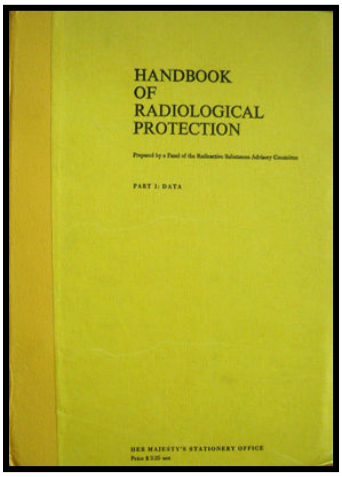
Newsletter - Welcome

Ionactive Consulting Limited Newsletter

Happy New Year and all the best for 2007! Welcome to our new company newsletter. You may have been emailed this directly or downloaded it from our front page at www.ionactive.co.uk. If you like what you see then please feel free to register your name in the box on our home page and receive this resource in your mail box – approximately every 8 weeks. We take your privacy & confidentiality very seriously; see our policy which can be read at www.ionactive.co.uk/privacy.

We know there are already a number of newsletters in circulation; not least from the Society for Radiological Protection (SRP), AURPO and the HSE. Our aim is to make this newsletter a little different so that it has as rightful and useful place amongst its peers. We aim to make this resource article focused – some of which will be offered by individuals outside our company.



In this issue we thought we would feature a publication which in our view is virtually seminal in UK Radiation Protection. The Handbook of Radiological Protection was prepared by the Panel of the Radioactive Substances Advisory Committee in 1971. It features constants, factors, graphs and data – much of which is still relevant today. We have obtained a PSI Licence (C2006010311) from HMSO which allows us to reproduce the data for your enjoyment.

We will be including a regular 'Rules of thumb' feature which will look at rules, tips, tricks, data and anything which assists in those *back of envelope* calculations.

Reviews of web based resource will also feature as will summaries of relevant radiation protection news from the UK and beyond. We will also provide some company updates (but you can always skip past any commercial plugs!).

Mark Ramsay

In this issue

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Our Feature – old news from 1971

Handbook of Radiological Protection (© Crown Copyright 1971)

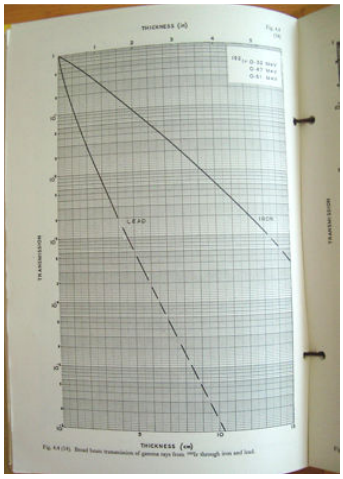
The Handbook of Radiological Protection sits proudly in our office in a prominent place next to more modern texts. It shares space with the 'Instrument Bible' (Knoll), 'Handbook of Health Physics & Radiological Health (Shleien et al)), several ICRP publications and a whole host of other data. There is little doubt that the modern texts are up-to-date, use SI units throughout, and in some cases are subject texts for courses in radiation protection. However, there is something about the *yellow handbook* that draws your attention. Perhaps it's the cute binding (with shoe laces it seems!), or perhaps it's the hand drawn graphs complete with evidence of 'rubbing out errors'.

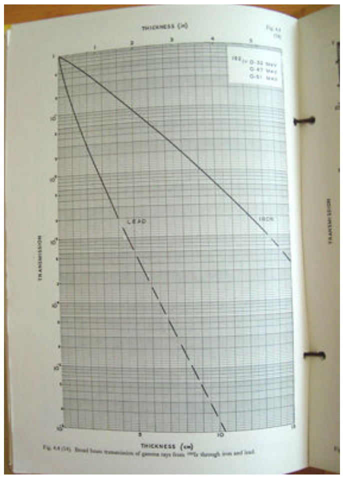
What ever it is, it encourages a read and in doing so opens the mind to perhaps the heyday of health physics – and certainly before modern computers were available which provide data (not necessarily good data) at the touch of the 'Google' button'.

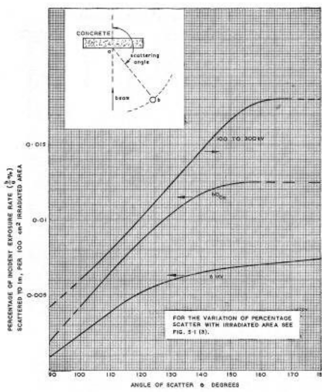
The beginning

The handbook was published in 1971 by Her Majesty's Stationary Office (HMSO) and was entitled 'Handbook of Radiological Protection; Part 1: Data'. It was prepared by the *Panel of the Radioactive Substances Advisory Committee* (then made up of the Department of Employment and Health and Social Security, with the Ministry of Health and Social Services in Northern Ireland). What is interesting is that whilst it was a committee for 'radioactive substances' much of the book considers x-ray generators and shielding for electrically generated sources of x-rays.

The panel membership contained names of individuals who to this very day are remembered for their contributions to radiation







protection (e.g. H.J Dunster who was working at UKAEA at Harwell during the time of publication).

The purpose

Part 1 of the handbook was aimed at providing readily accessible health physics / radiological protection data. It was intended that this data would supplement two issued codes of practice these being: 'Protection of persons exposed to Ionising Radiation in Research and Teaching' and 'Protection of persons against Ionising Radiation arising from Medical & Dental Use'. These were first issued around 1957 and used the latest ICRP data of that time. They have of course now been superseded by up to date publications like 'Medical and Dental Guidance Notes. A Good Practice Guide on all Aspects of Ionising Radiation Protection in the Clinical Environment' (IPEM).

However, since we are talking history we can put aside these modern publications and consider what was available in 1971. Most of the information contained in the handbook was reproduced from published sources (but re-represented in a standard form). For this reason those familiar with the BS Standards 4049 (parts 1 & 2) will recognise some of the data (but not necessarily presented in the same way).

The contents

The basic subject matter included in the handbook covers:

Introduction (references)	Scattering of x-rays and gamma rays
Constants & conversions	Data relating directly to human exposure
Radiation sources vs radiation dose rates	Miscellaneous data (e.g. meteorological)
Shielding (for x-rays and gamma rays)	

Examples

This newsletter is not big enough to include examples from all areas of the handbook. However one objective for 2007 is to publish the complete handbook to PDF under our PSI Licence and make is available for download. We should of course offer caution when using the data for anything other than historical interest. That said, if you know what you are doing (and we are

Radiation Protection Blog

If you are interested in the ramblings of a Radiation Protection Adviser then visit our Blog at:

www.ionactive.co.uk/blog.html

We are never sure what will go into this – sometimes it's serious and sometimes it's less so. Recently we featured our own comments on the Polonium-210 incident – from a health physics rather than political perspective. Other material from 2006 has included our impending new arrival (not a RPA, a baby), RPA 2000 certification, new equipment and the 'Paxman' treatment (read the Blog for more info…).

Data relating directly to human exposure (Section 6)

This is one section we would advise is read for historical interest only. Some of the radionuclide data is still valid today (e.g. half life, effective energy). However most of the internal exposure data is taken from ICRP 10 (1968) although some of the lung data comes from ICRP 2 (1960). As you know we have moved on some way from MPC (maximum permission concentrations).

sure must of our potential readership falls into this category) then much of the data is still valid (physics doesn't change much…). Our first example is the output of constant potential x-ray tubes over the range of 50-200 KV. The curves are given for a number of different filtrations including Be, Al and Cu. You will note the output for a given KV is given in R / mA min @ 1m. For approximating purposes 1R = 0.01 Gy (or 0.0087 Gy in air).

Fig. 3.2
(3)

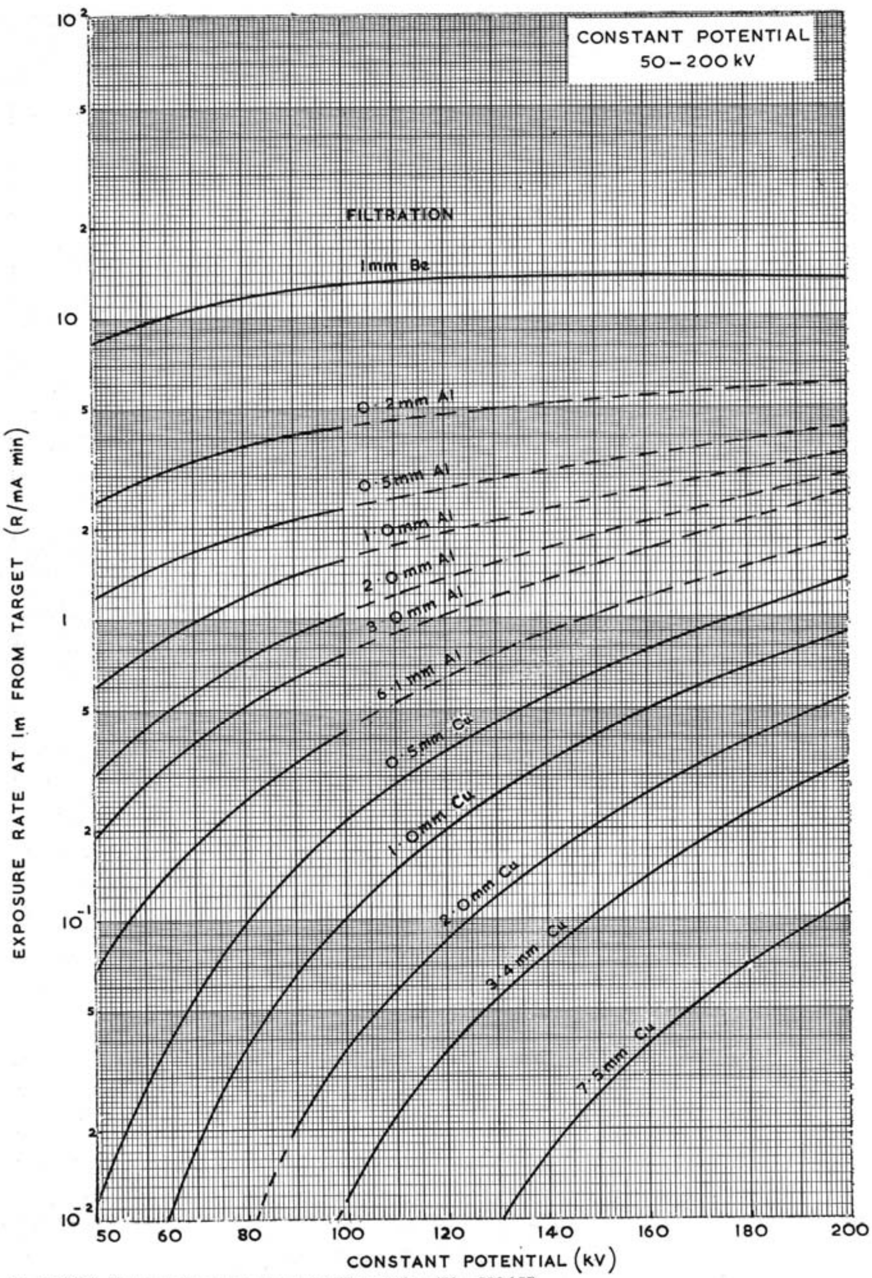


Fig. 3.2 (3). Output of constant potential X-ray tubes (50 – 200 kV).
For half-wave generators, the output is about ⅓ to ½ of that plotted.

Exposure rate from constant potential x-ray sources

You will note the output for a given KV is given in R / mA min @ 1m. For approximating purposes 1R = 0.01 Gy (it can be shown by calculation that in air 1R = 0.0087 Gy but this difference is trivial for the purpose of using this data). The doted curves are where extrapolation has occurred from known data.

It is illustrative how the degree of filtration changes the exposure rate (which for 200KV varies by two orders of magnitude). This is a useful reminder of the care needed when using such data – its easy to under estimate (although in reality what tends to happen is that one over estimates to compensate and the resulting shielding is over engineered).

As an example, we can see that the output of a 160 KV tube with 1.0mm Cu filtration will be 0.5 R/mA min. For a 1mA tube this is equivalent to 5mGy / min at 1m or 300 mGy / h at 1m. For a 1mm Be tube under the same conditions you are looking at some 7800 mGy/h at 1m.

These curves still serve some purpose today and are still present in the British Standard BS 4094 (where possible real measurements are much more reliable).

The next example presents some transmission data for Pb.

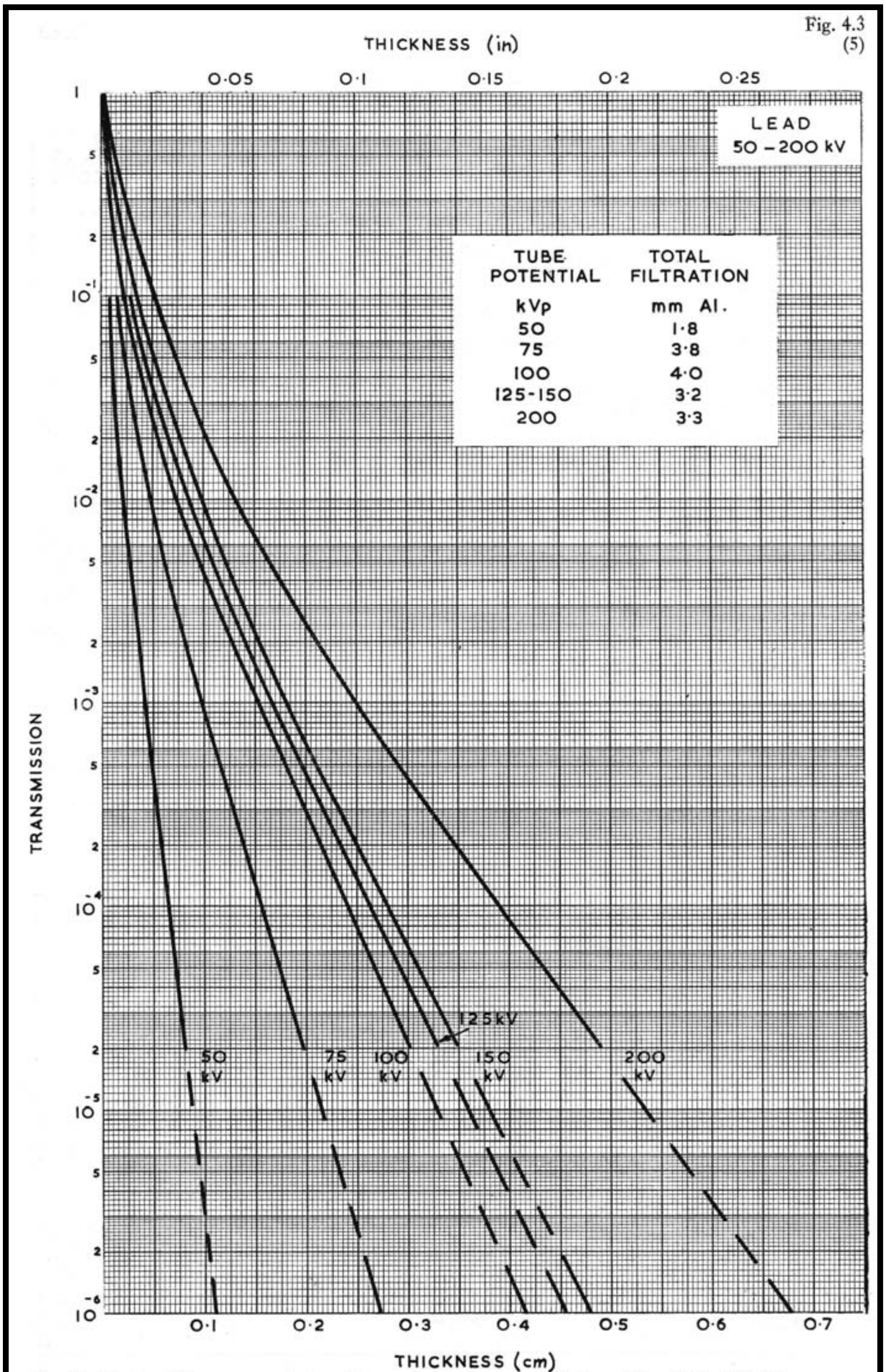


Fig. 4.3 (5). Broad beam transmission of X-rays (pulsating potential) through lead (50 – 200 kV).

Transmission data for X-rays (pulsating potential)

This data is for pulsating potentials and note that the filtration changes depending on the tube potential. If this data is used for shielding purposes and the known tube filtration is different from the transmission data curve (for the same KV), then an adjustment can be applied (which is explained in the handbook text).

It is illustrative that TVT (10^{th} value thickness) are not linear across the KV range (most prominent at higher KV).

Radiation Incident Data

If radiation incidents and accidents interest you (lets face it, its human nature to be interested) then you might wish to visit our links section on this subject found at:

www.ionactive.co.uk/links.html

Accidents / incidents is the first link category providing links to Accidents in Radiotherapy, IAEA Accident Response Publications and much more.

The above data is useful for scope shielding calculations, and since its broad beam conditions and derived from real measurements, build-up is taken care of.

The next example presents transmission data for lead and iron using Ir-192.

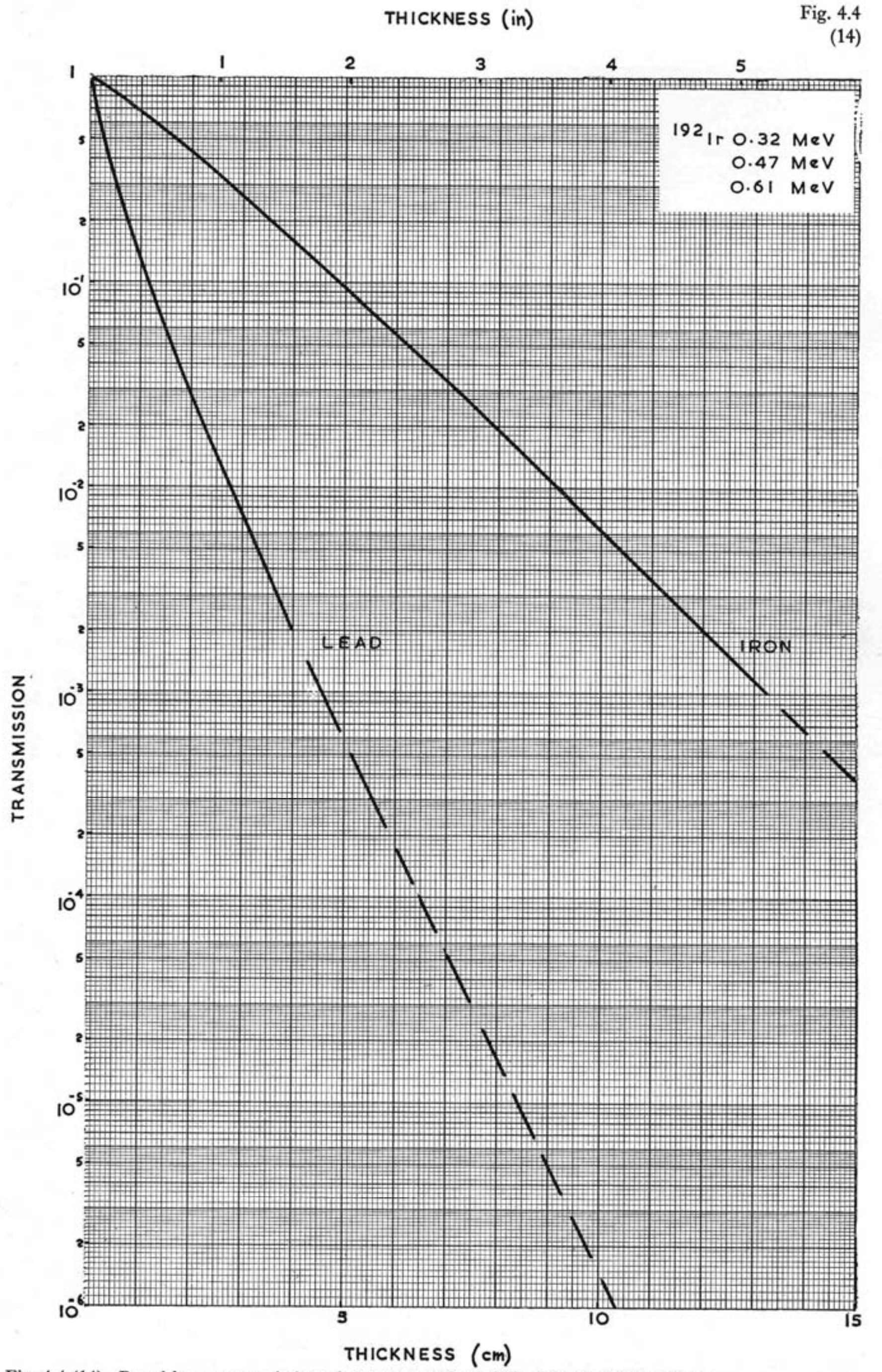


Fig. 4.4 (14). Broad beam transmission of gamma rays from ^{192}Ir through iron and lead.

Transmission data for broad beam gamma rays

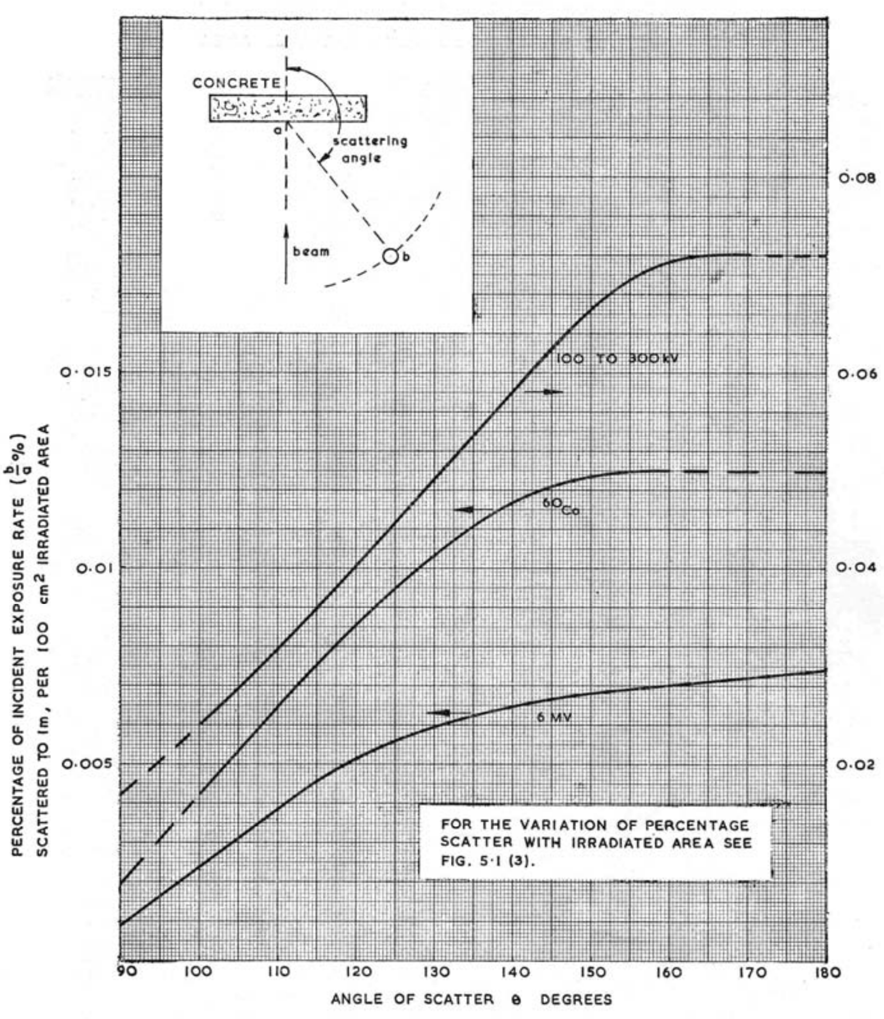
Anyone familiar with BS 4094 may recognise this graph – the handbook notes that most of the gamma transmission data through shielding is a direct copy from that standard.

The section is comprehensive dealing with shielding materials including iron, lead, uranium, brick, concrete and water. The radioisotopes considered include Na-24, Co-60, Kr-85, Sb-124, I-131, Cs-137 and Ir-192 (illustrated on the left).

The two transmission examples illustrate well the difference in penetration between 200 KV x-rays and Ir-192. For example, 10^{-5} transmission for 200 KV x-rays (3.3 Al filtration) is achieved with 0.525 cm of lead where as over 8cm of lead is required to achieve the same for Ir-192.

Our final example presents one of a set of x-ray / gamma scattering graphs. We have used these graphs (also available in BS 4094) to undertake scoping calculations for shielding and found them to be similar in many cases to results obtained by modern codes (e.g. the software MicroShield and similar).

Fig. 5.1
(2)



So there you have it – a very quick walk through the 1971 Handbook of Radiological Protection. This short article can not do the handbook justice but we hope it's wetted the appetite for those interested in classic radiation protection texts. As mentioned above the complete work will be converted into a PDF during the early part of 2007 and made available for download at www.ionactive.co.uk.

Scattering of x-ray & Gamma ray photons

Perhaps the calculation of scatter is an art form, a science or a finger in the wind. Certainly modern day treatment of scatter uses at the very least a version of point kernel integration and probably Monte Carlo simulation. In many shielding examples scattering is the forgotten element, which either means your radiography enclosure leaks, or its mass would probably survive a small nuclear bomb.

When you get scattering right it leads to an optimised shielding solution. In this regard the handbook is not completely redundant. We have used scattering data like that shown to the left with reasonable results (checked of course by more elaborate methods).

IONACTIVE consulting

NEWSLETTER – JANUARY 2007 (ISSUE 1)

Rule of Thumb

Tips, tricks & data for back of envelope calculations

Future issues of the newsletter will tend to have themes for this section – for now we present an odd collection of bits and pieces that might be useful to some. We don't want you to suck eggs so please contribute to this section (see panel opposite). As you might expect this information is for entertainment value only and we do not warrant its validity (even though we are fairly happy with it).

Background in buildings

The difference in background measured outside and then inside a building may differ by at least factor of 10 – in either direction. For example, in London typical measurements in the street have been 0.06 μSv/h (ambient equivalent dose), and then down to 0.02 μSv/h or up to 0.2 μSv/h once inside. Differences in values for known radon areas will be more dramatic. The bottom line … as radiation monitoring equipment becomes more sensitive do not let this be a 'red herring' particularly when undertaking clearance monitoring.

X-ray scatter measurements and 'correction factors'

When measuring 'leakage' from an x-ray source (e.g. a baggage scanner) there is sometimes a temptation to apply the 'correction factor' that you might have been given for your favourite monitoring device. Typically what ever you use (e.g. a Mini Type D), its energy response will not be uniform – some testing centres will give you a factor that might relate its response to Cs-137 or Am-241. Forget them for x-ray scatter – the scatter energy will potentially be anything from the excitation energy of the x-ray tube downwards. The x-rays may have undergone multiple scatter around the baggage and inside the layers of lead shielding – your correction factor is redundant! Instead consider using a range of instruments where you know their individual energy responses and compare what you get with each. We sometimes use a portable NaI spectrometer to characterise the scatter energy before measuring its significance. Don't use an ion chamber – unless it's a very small thimble chamber as your scatter will not fill the detector volume

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Newsletter

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signup

To view a sample PDF of our latest newsletter, **Click here and download it >>**

If you like what you have seen so far sign up for a regular PDF in your mailbox. You can do this on our front page at: www.ionactive.co.uk

Rule of Thumb

We are hiring!

Well actually we are after some volunteers and input to this regular article. If you have any tips, tricks or useful data you would like to share with the radiation protection community then please feel free to do it here.

Friends, colleagues or competitors are all welcome. We can not offer you a dime but we will put up your website details / contact details in lights if you wish. Please send ideas to:

mark.ramsay@ionactive.co.uk

and it will therefore under read. Generally you are looking to prove the negative rather than quantify the positive, so leak detection with a sensitive monitor (e.g. counts per second) is more important than the dose rate in μSv/h.

Half Life

The activity of a radioactive substance is reduced to 1% after 7 half lives and to less than 0.1% after 10 half lives. The '10 half life rule' has been used by some for determining radioactive waste 'inactive sentencing' in the UK – particularly for short lived material like P-32. However, it alone is not a reliable tool since if applied to say 1GBq of P-32 waste you will still be left with 1MBq after 140 days. To meet a criteria of < 0.4 Bq/g (SOLA) would require a mass of some 2500 kg of waste (with activity homogenous throughout). To meet the Very Low Level Waste (VLLW) Criteria of < 400 KBq/0.1m^3 would require 0.25 m^3 of waste (more manageable but do you know if each individual item also meets the < 40KBq limit?). Use it with care but remember – monitoring is key.

Know your monitors

This little set-up is fabulous (it's a Berthold LB 125 coupled to a lap top with spectrometry software). The LB125 will feature as a full review in a later newsletter.

The LB125 gamma spectrometry capability is amazing, particularly so when compared to what was available only 10 years ago. There are similar instruments on the market by Exploranium and Thermo. As good as these instruments are they are not a replacement for experience. For every time we have used such a device and it has got something right – another time it has got it wrong (particularly with mixed radionuclides). They can lead you down a path to nowhere if you are not careful. Use them with respect - they are then an essential part of the Radiation Protection Adviser toolkit.

Ionactive Links (part 1)

The Ionactive website contains a whole host of link categories which can be accessed from:

www.ionactive.co.uk/links.html

Link Categories

ACCIDENTS / INCIDENTS
Links to resource providing news and information on radiation and nuclear related accidents and incidents.

CALCULATORS / RP DATA
Try out a host of free online calculators dealing with decay, dose rate calculations, x-rays, shielding and much more. Also find data tables, coefficients & charts.

CBRN / CONTINGENCY
Links to CBRN & Contingency related resource (preparedness, decontamination, emergency response, exercises). Ionactive Consulting provides RPA advice in this field.

CLEARANCE & EXEMPTION
A list of links to resource which covers local, European and International publications for clearance / exemption levels.

DOSIMETRY / ADS
Links for dosimetry and ADS suppliers for the UK

HAVE A BREAK
Links to other useful and interesting web sites, resources and articles relating to all areas of radiation protection and other nuclear matters.

HEALTH & SAFETY
Some of our favourite general health & safety sites on the web.

Web Review – Rad Pro Calculator

www.radprocalculator.com

We have for a long time been very impressed with this resource – not only for its technical merit but because it is provided free to all interested parties. Getting something for nothing these days is a rare occurrence indeed. This review provides some brief examples of what the resource can do – for a fuller demonstration just visit the website at the address above and have a play.

The developer, Ray McGinnis, has 30 years of experience in US nuclear programs, including nuclear power and USDOE projects. He is currently a radiation safety engineer in California. His graduate studies lead to achievement of a Masters Degree in Information Technology. He has combined his IT and nuclear skills and created the software which is shared freely with the nuclear community and is currently being used by industry and university health physicists worldwide. [This is taken from our website at www.ionactive.co.uk/credentials_ray.html].

Basic Layout

The basic calculator has the following form.

As indicated above, each calculator is started by simply clicking on the appropriate access button. In addition to the online calculator there are also options for downloading a desktop based version and work is in progress to produce versions that will run on portable PDA equipment.

We actually prefer playing with the online version and since wireless internet is becoming more and more common you are never far away from the resource you need.

Ray sensibly includes a disclaimer and states clearly that '*software were never designed to conform to any nuclear or*

Ionactive Links (part 2)

www.ionactive.co.uk/links.html

HEALTH PHYSICS HISTORY

A collection of links taking you back over 100 years of Health Physics / Radiation Protection, atomic history and related matters.

LEGISLATION (UK)

Find all current uk legislation relating to ionising radiation and radioactive substance regulation

ORGANISATIONS

UK and world wide official organisations, societies, groups and committees linked to all areas of radiation protection.

RADIATION MONITORS

A selection of links to radiation & contamination monitor resources

RADIATION SHIELDING

Resources for beta / gamma shielding

RADIATION SIGNAGE

Warning labels, signs and online sign creators

RADIOACTIVE SOURCES

A selection of links to suppliers of radioactive materials and sources

RADIOACTIVE WASTE

Links to radioactive waste resource, disposal & recycling services

REGULATORS (UK)

This section provides links for all the relevant UK regulators who regulate ionising radiation protection and related matters.

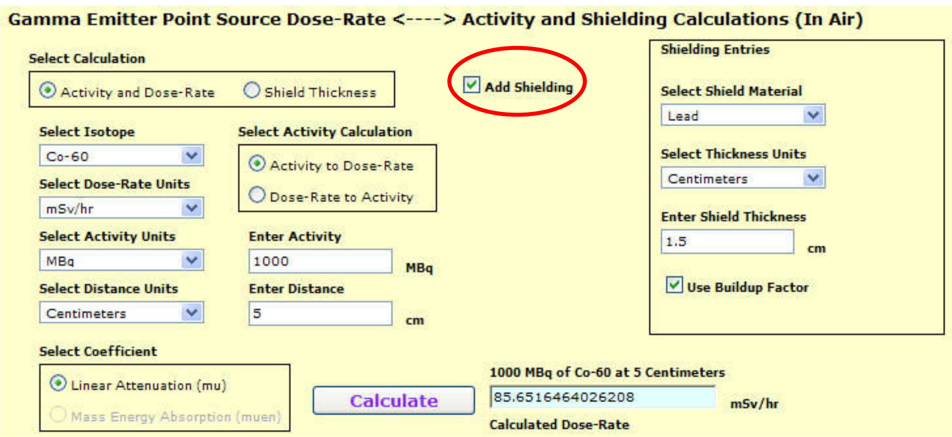
TRANSPORT

Links for the transport of radioactive

radiological codes or legislations'. However, whilst we would not use this application for client work in isolation, it is a useful check tool and compares favourably with our commercially available software.

Calculation Examples

Let's look at the calculator in action. The first example uses the *Gamma Emitter Point Source Dose-Rate <----> Activity and Shielding Calculations (In Air)* calculator…. Phew some title!



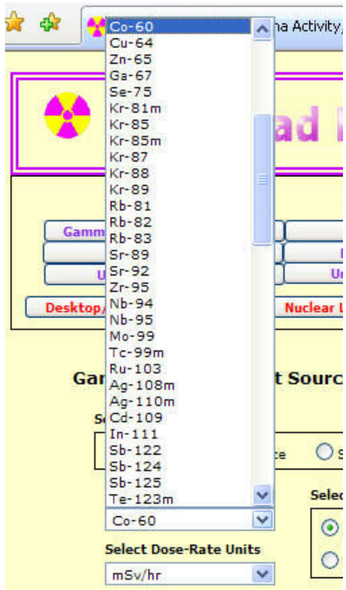
The first thing to note is that you can change the function of this page to calculate an activity from a known dose rate (with or without shielding). In our example we are using it in the default mode – calculating a dose rate from a known activity. We have selected Co-60 from the drop down list (see panel opposite for options), and chosen mSv/h as the dose rate, MBq as the activity, and cm as the distance. At 5 cm form this imaginary source the calculator indicates a dose rate of 123 mSv/h (we ignore everything past the decimal point at these dose rates).

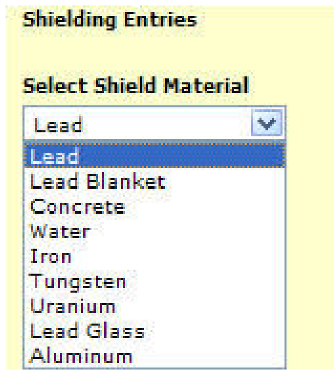
We then selected the 'Add shielding' box (circled above) and picked lead of 1.5 cm thickness. We selected 'linear attenuation' as the coefficient on this occasion. The resulting dose rate figure reduced to 45mSv/h without buildup being taken into account and 85 mSv/h with the buildup factor selected (as shown above). If nothing else this is an excellent educational tool and shows how important buildup is – ignore it and get your shielding badly wrong.

The figures in this rather extreme example compare well with our other sources of information. For example in our 1971 Handbook (reviewed earlier from page 2 onwards) the exposure

Clear Menu Selection

The calculator features a set of clear drop down menus which are used to select radionuclides, shielding materials and well as units of dose rate, activity and distance.



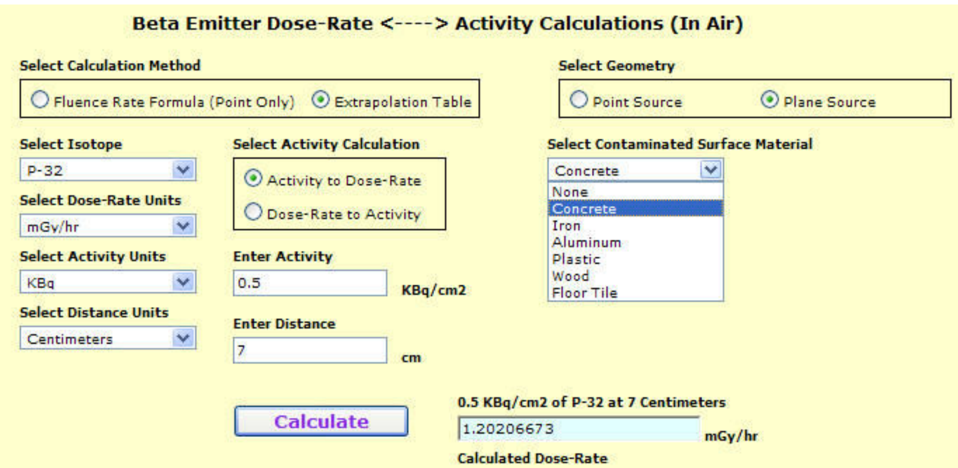


rate for Co-60 is given as 1.32 R/h at 1m for 1Ci. Therefore this (roughly) equates to 0.011484 Sv/h at 1m for 1Ci, or 124 mSv/h at 5cm for 1GBq (as used in our example above). We believe Ray has calculated his values from first principles (see his reference page) so this is a very good match.

If we change the lead shielding thickness to 10cm Rad Pro Calculator gives a dose rate of 0.58 mSv/h (using buildup factor). Therefore the transmission through the shielding is about 4.7×10^{-3}. If you compare this with Figure 4.4 (3) of our reviewed handbook (Broad beam transmission of gamma rays from Co-60 through lead), you will note that 10cm of lead gives a transmission of … 4.7×10^{-3}. This is remarkably consistent and more so when you consider that the handbook references its graphical data to '*Harrison J.R unpublished calculation 1963*', whilst Ray appears to use build up data and attenuation coefficients from '*ANSI/ANS-6.4.3-1991*'.

Finally you can also select 'Shield Thickness' as the type of calculation. There is clearly some hefty programming going on here as the buildup factor will of course change with shielding thickness which itself will be dependent on the desired endpoint dose rate.

Moving on, we can turn our attention to another calculator from the Rad Pro Calculator selection: *Beta Emitter Dose-Rate <----> Activity Calculations (In Air)*.



For this example we used P-32, a dose rate in mGy/h, a plane source of 0.5 KBq/cm^2 over concrete and a distance of 7cm perpendicular to the source. Calculated dose rate was 1.2 mGy/h (not something you would want in your research lab).

Unit Conversations

The unit conversions calculator is a simple tool with four sections: activity, dose equivalent, absorbed dose and miscellaneous.

For each section you are given a number of input units to choose from and a choice of converted units. A nice comfort check we think.

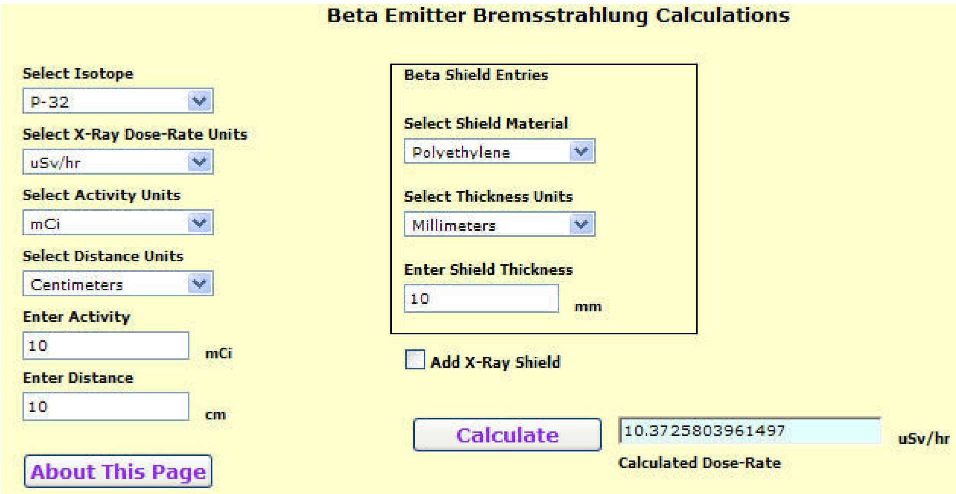
Decay Calculations

This neat calculator lets you choose an element (ranging from actinium to zirconium) followed by the isotope (e.g. Ac-225, 227, 228). You then choose the units (e.g. CPM, DMP, pCi, MBq etc). Finally select the initial activity and a start and end time and the calculator will give you your decayed activity.

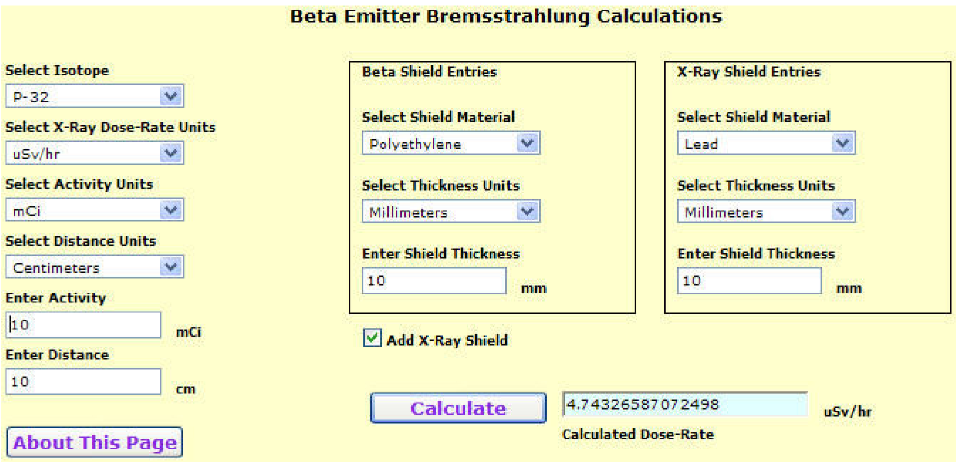
Half Life

The half life calculator is really the reciprocal of the decay calculator noted above. Specify original and new activity (using your chosen units), and the start and end dates. The calculator will then give you the half life in your selected units (e.g. years, days, seconds etc).

The *Beta Emitter Bremsstrahlung Calculations* calculator is also very neat.



Like all the calculators this is a good educational tool for demonstrating beta shielding. We selected P-32, µSv/h, 10 mCi (i.e. a non SI unit to be different) and a source distance of 10cm. We then looked at the resulting brem x-rays with a 10mm polyethylene shield which gave us around 10 µSv/h. Following this we added some lead shielding as shown below.



We see that 10mm lead reduces the x-ray dose rate to around 5 µSv/h (i.e. a transmission of 0.5). This very well illustrates the importance of stopping the creation of Bremsstrahlung in the first place rather than trying to deal with the resulting x-rays. With a P-32 beta max energy of 1.71 MeV and average energy of 0.69 it is little surprise that the resulting x-rays (which will have a range of energies) are a challenge to shield.

U & Pu Gram Calculations

This calculator is perhaps more specialised and likely to be less useful to the majority. It will calculate masses of uranium and plutonium from known activities and vice versa. For each you can select the number of isotopes (e.g. U-233, 234, 235, 236, 238).

Uranium Enrichment

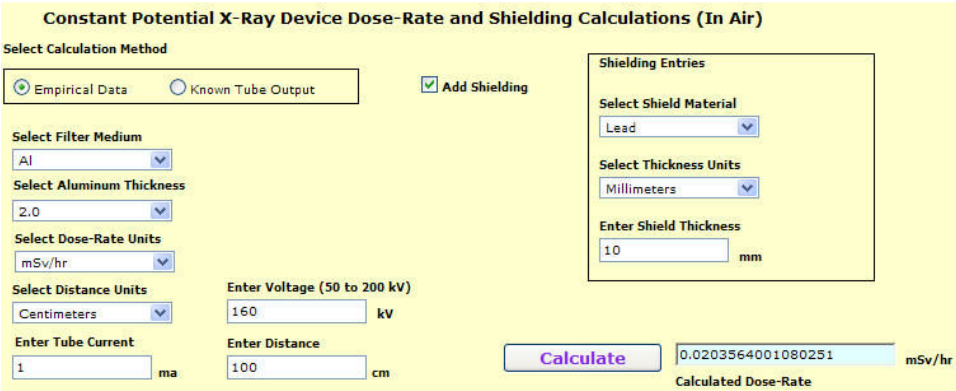
Quite a complicated but interesting calculator. This will calculate uranium enrichment from U-234 and U238 laboratory sample data. The calculator can deal with a variety of activity units and even liquid samples. In addition to enrichment, activity / mass (ratios / fractions) are provided.

Uranium Fuel Loading

For educational use no doubt!

Enter uranium enrichment and mass data and the calculator will provide the total mass and the uranium isotope activities in your selected fuel load.

For our final example we turn our attention to the *Constant Potential X-Ray Device Dose-Rate and Shielding Calculations (In Air)* calculator.



There is no doubt that x-ray calculators are a challenge. Dose rate calculators based on radioisotopes are generally easier because the physical properties used are fixed (decay schemes, half life, photon energy etc). This is not true for x-ray generators despite the fact that one can fix the KV (acceleration potential) and the current (the 'amount' of radiation). Indeed it is possible to use some reasonably simple theoretical bremstrulung type calculations to provide a (very) ball park figure but this is not good enough – even for scoping calculations. Ray appears to think so too and therefore most of the data used in this calculator is derived from *BS 4094-2:1971, Recommendation for Data on shielding from ionizing radiation — Part 2: Shielding from X-radiation*. It is therefore interesting that our handbook review is again linked to the data used in this calculator.

Our selection of 2mm Al filtration, 160 KV, 1mA and a 10mm lead shield yielded a dose rate of 0.02 mSv/h at 100cm which is what would reasonably be expected. The calculator also allows known tube output data to be used where available.

In summary it is true that this short review can not do justice to this excellent online (and downloadable) radiation protection resource. Clearly Ray McGinnis has spent many hours programming this but without getting too tied up in the software side of things – the health physics is clearly there. All online resource should be used with caution and it goes without saying that professional Radiation Protection Advisers are going to use validated commercial tools. However we believe Ray should be commended – he is clearly a valuable member of the radiation protection community.

Inverse Square Law

A nice simple calculator to finish with. Choose either dose rate or distance and then select your units of choice. Then input three of your known values (i.e. two dose rates and a distance, or two distances and one dose rate) and the calculator will give you your unknown.

Feature Here!

Do you have web based software or resource that should be featured here?

Have you come across resource on the web that you think could be reviewed here?

If so please forward your ideas to:

mark.ramsay@ionactive.co.uk

Radiation Protection News

Other newsletters will probably provide a more complete roundup of news but please find here a few issues that we have decided to highlight.

Stories of 2006

Alexander Litvinenko Polonium -210 Poisoning

This story could not escape our attention – it's less of an occupational radiation protection issue (although those dealing with Mr Litvinenko were potentially occupationally exposed), and in our view more to do with how 'UK PLC' coped with the issue and how the public reacted to it.

Without being too over dramatic we do feel this issue, as unfortunate as it was, tested UK reaction to the aftermath of a dirty bomb (radiological dispersal device). In this regard we concede that the actual radiological issues were modest (excluding Mr Litvinenko of course) and that Po-210 is hardly the best dirty bomb making material (it's too difficult to detect). However, the important test was how the UK organisations (e.g. Health Protection Agency, NHS Direct) would deal with the public and how the public / media would deal with the 'radiation issues'.

Whilst we do not intend to criticise any particular organisation, we do feel that the overall reaction to the incident leaves us wondering how 'UK PLC' would cope with a radiological dispersal incident. For example, we are aware that one or two recent clients (for our RPA services) were turned away from their initial choice due to RPA support being unavailable in the time frame required. Factor this up with a larger incident and one wonders what would happen then.

The media reaction was interesting and perhaps somewhat predictable. Some of the headlines feature in the boxes opposite.

For better or worse we threw our hat into the ring – by providing some information on Po-210 and the (simplified) mechanisms of how the intake of a *mass* of material, will have a certain *activity* which will lead to a certain internal *absorbed dose*.

Radiation 'trace' at German homes

'*Police in Germany say they have found indications of radiation in two properties apparently used by a contact of murdered spy Alexander Litvinenko*'.

[BBC Website 10 December 2006]

We ask 'what radiation'

BA passengers in radiation alert

'*British Airways is trying to contact 33,000 passengers after radioactive traces were found on two of its planes.*
…The low grade radiation was found by scientists
…BA so far taken calls from 2,500 customers on a dedicated helpline
…(HPA) "What we have heard is that it's either traces or very low levels"
…(HPA) "it doesn't seem to pose a significant health threat"
'

[BBC Website 30 November 2006]

We all have to do better than this…

Poison Spy - It was in his tea!

'*Seven bar staff {Pines Bar at the Millennium Hotel} who served them {Mr Litvinenko & Co} have been sent home showing signs of radiation poisoning. Colleagues say four are already suffering from a "flu like" illness.*'

[Mirror Newspaper 09 December 2006]

No comment ..

We even had a go at predicting the likely intake that would have lead to the deterministic effects seen in Mr Litvinenko. This was pure speculation and estimation but we did come up with the same answer as the US Health Physics Society (www.hps.org/documents/po210_information_sheet.pdf) who did not publish their methodology.

You can read our detailed comments on this news story at:

www.ionactive.co.uk/news_article.html?n=42

You may also be interested in our Blog:

www.ionactive.co.uk/blog.html

Overexposure - irradiation facility

The overexposure occurred at Fleurus (Belgium) which is the site of a Sterigenics irradiation sterilization facility. The facility uses Co-60 sources to provide a medical sterilisation service.

As most will probably know the Co-60 is likely to be in the PBq range and is stored in a deep pool of water when ever access is required into the irradiation cell.

On Saturday March 11th, an employee went into the irradiation cell and observed that the plant gamma monitor was in high level alarm state. It has since been found that this individual did not have a real time electronic personal dosimetry device or a radiation workplace monitor.

It was some while later after he left the cell (having been in it for around 20 seconds) that he had nausea and was vomiting. It was some weeks later that he was discovered to have had a massive exposure (initial estimates based on biological monitoring put this at between 3 and 5 Gy whilst later estimates were between 4.4 to 4.8 Gy).

For some reason it appears that the source rack was not located at the bottom of the tank pool and was partly raised causing significantly enhanced dose rates. The incident was report on the IAEA Nuclear Events Web Based System (NEWS). We understand an investigation was conducted and plant modifications have been made. We also understand the employee has survived the initial deterministic irradiation effects.

Radiation Protection News

News

UK NEWS

The latest radiation protection news from around the UK.

INTERNATIONAL NEWS

The latest radiation protection news from the International community.

NEWS ARCHIVE

Entire listings of UK and International radiation protection news since the beginning of this site. Click here for the full archive in cronological order.

Alternatively, use the search box below to search the archive by keyword.

search

www.ionactive.co.uk/news.html

Other 2006 News Headlines

- **Drums of radioactive waste missing**
- **Dounreay waste shaft work begins**
- **Lorry leaked radioactive beam**
- **Girl, 15, given radiation overdose**
- **The R&N in CBRN**
- **RPS Training - Great start for 2006**

www.ionactive.co.uk/news.html

Other Radiation Protection News

UK Radiation Protection Legislation

Not a massive range of new legislation to delve into from 2006 (or end of 2005).

- The Radioactive Substances (Emergency Exemption) (England and Wales) Order 2006 [Alexander Litvinenko]

  www.ionactive.co.uk/exemption_orders.html

- Radioactive substances (Testing Instrument) Exemption Order 2006

  www.ionactive.co.uk/exemption_orders.html

- The Ionising Radiation (Medical Exposure) (Amendment) Regulations 2006

  www.opsi.gov.uk/si/si2006/20062523.htm

- The High-activity Sealed Radioactive Sources and Orphan Sources Regulations 2005 (S.I. 2005 No. 2686)

  www.opsi.gov.uk/si/si2005/20052686.htm

International Radiation Protection (legislation related)

The second round of public consultation on the draft new Recommendations of the ICRP is now complete. It is understood that ICRP will now amend the draft in the light of the comments received.

The final version is expected to be published sometime in 2007.

www.icrp.org

Other UK Radiation Protection News

November HSE Statement on Radiation Protection Advisers

www.hse.gov.uk/radiation/ionising/rpa/statementrpa.htm

We have been waiting some time for this. Not a radical departure from what was said before (*in reality*) it seems, although it does mean that RPA 2000 need to amend their own procedures. The new statement is designed to improve the clarification of the 'role of the RPA' by better defining the scope and the importance of 'practical experience'. We understand that RPA 2000 is in the process of amending their procedures in light of the new statement (the practical implementation of the new statement will not need to take effect until 31 March 2007).

We are glad we (Mark Ramsay) obtained a new certificate in November 2005 which keeps us going for the next 5 years whilst these change take effect and are tested.

Surplus Source Disposal Programme (SSDP) – Disposals without an Environment Agency Authorisation

You may recall the Environment Agency (EA) put out some guidance regarding surplus source disposals for schools (info can be found here: http://www.cleapss.org.uk). At the time we voiced some concern (on the SRP email groups) regarding the eligibility of using the various Exemption Orders when considering the 2005 Hazardous Waste Regulations (Regulation 10). The relevant words were:

Radioactive waste

15. - (1) This regulation applies where radioactive waste within the meaning of section 2 of the Radioactive Substances Act 1993[28] -

(a) is exempt for the time being from the requirements of-
(i) section 13 (disposal of radioactive waste); or
(ii) section 14 (accumulation of radioactive waste),
of that Act by or pursuant to section 15 of that Act; and

(b) has one or more hazardous properties arising other than from its radioactive nature.

(2) Notwithstanding regulation 2(1)(b)(ii), radioactive waste to which this regulation applies is treated as waste for the purposes of these Regulations,

and accordingly it is treated as hazardous waste and these Regulations apply to that waste.

Our concern was that we did not see how the *Radioactive Substances (Prepared U & Th) Exemption Order 1963* could be applied with respect to disposing of such materials to landfill.

We never did get a qualified answer but the indications (via third parties) was that Regulation 10 was never intended to be used in this way (fine: but its still the law is it not?).

Anyway, we have had some success for a few clients who needed to get rid of uranium and thorium compounds, did not want to (or could not) use the Exemption Orders, and who did not have an existing authorisation under the *Radioactive Substances Act 1993*. A very helpful and pragmatic EA inspector has written us a letter allowing one off disposals (under the SSDP) to go ahead without the need to apply for an authorisation. It is hoped that these wastes will therefore go to Winfrith whilst saving a lot of time and money (i.e. avoiding the need for a formal application). Many thanks EA for this pragmatic and useful approach.

Exemption Order Update

www.ionactive.co.uk/exemption_orders.html

We understand that there is a new review of Exemption Orders under way by DEFRA (programme of work is due to run until 2008). This is most timely indeed.

It seems that where 'UK PLC' matters (rather than single users) then things get done. Look how quickly the emergency exemption order was put in place (see page 17 of this newsletter). Also consider why the *Radioactive Substances (Testing Instruments) (England & Wales) Exemption Order 2006* order was put in place over and above the others. Did it not have something to do with our protectors buying a job lot of chemical detectors employing Ni-63 sources (which under the 1985 order could not be used as mobile devices)? In our opinion Mike Thorne / J Smith-Briggs wrote a very sensible and readable draft on a new set of orders. For interested parties this draft can be read here:

www.defra.gov.uk/environment/radioactivity/publications/complete/pdf/defra_ras-02-013.pdf

Ionactive News

We conclude this newsletter with Ionactive News. We have deliberately shoved this at the back so no one complains that this newsletter is a ploy to sell our commercial services!

2006 was certainly a busy and exciting year for the Company. Our client based has grown – so has our experience and suitability in more and more areas of ionising radiation use.

Mark Ramsay received a new RPA certificate from RPA 2000 (certificate number 00000581). The application procedure took the full three months (and a bit more) but we are now covered for a further 5 years.

After some reflection we are not likely to seek RPA Body status (via HSE approval) during 2007. This is despite the fact we are advertising soon for an additional RPA. Our current business model is not to provide any RPA advice that is not direct from a certificated RPA.

Our 2 day RPS Training Courses go from strength to strength and clearly is supplying a market need. The delegates come from a diverse selection of practices and appear to enjoy themselves (yes training is supposed to be enjoyable). The courses currently cost £332 (plus VAT) and are priced to sell rather than make us a profit (they don't). The provision of training for us is very important as it encourages our own continuing professional development. This is enhanced further as every course is different.

In the interests of delegate interaction we all attend a fine 3 course meal with table wine at the end of day 1 to unwind (we need to unwind even if no one else does!).

So there you have it – 20 pages of our new newsletter. We hope you have found at least some of it interesting. Feel free to provide feedback which would be much appreciated (email us at mark.ramsay@ionactive.co.uk).

Next instalment will be ready **1 March 2007**. Register your email address on the home page at www.ionactive.co.uk.

RPA 2000 Certificate


Certificate of Competence to be a Radiation Protection Adviser

The Board of RPA 2000 certifies that

Mark Stuart Ramsay

RPA 2000

RPS Training Courses

Jan: Monday 22 – Tuesday 23

Feb: Monday 26 – Tuesday 27

Mar: No course (baby arrival)

Apr: Monday 23 - Tuesday 24

May: Monday 21 - Tuesday 22

June: Monday 25 - Tuesday 26

July: Monday 23 - Tuesday 24

Aug: Monday 20 - Tuesday 21

Sept: Monday 24 - Tuesday 25

Oct: Monday 22 - Tuesday 23

Nov: Monday 19 - Tuesday 20

www.ionactive.co.uk/training_services.html