Naturally Occurring Radioactive Materials (NORM) and prepared Uranium and Thorium Compounds

Misunderstandings frequently occur regarding the controls necessary when arrangements are made to hold, use or dispose of naturally occurring radioactive materials (e.g. within geological samples) or prepared Uranium or Thorium compounds (e.g. uranyl acetate used in electron microscopy).

'Naturally occurring' may refer to elements which are commonly recognised as 'radioactive' – for instance Uranium, Thorium and Radium, but the term also refers to less obvious radioactive materials – such as laboratory uses of naturally occurring Samarium, Cerium, and Zirconium (there are others, these often described as rare earths or phosphatic substances). Supplier's MSDS will usually identify if a natural material has significant radioactive properties, and if it has, *may* indicate if legislation applies, and if specific control measures are required. Artificially separated isotopes, or isotopes prepared in a nuclear reactor, are not generally defined as 'naturally occurring', and are treated differently under the relevant legislation.

The use and disposal of prepared compounds, for example, Uranyl acetate/nitrate, Thorium nitrate and Uranium oxides, are also covered by environmental and safety legislation as described below.

The RPO (Radiation Protection Adviser and Radioactive Waste Adviser) must be consulted regarding any new work with naturally occurring radioactive materials or Uranium/Thorium compounds or significant changes to existing work.

There are two main strands of regulatory compliance that must be observed for naturally occurring radioactive materials:

1. <u>The Environmental Permitting Regulations (EPR) and associated requirements</u>

All of these 'natural' materials, in terms of 'small' typical laboratory reagent bottle sizes will normally be either:

- completely exempt from the EPR ("*Out-of-Scope"*) or
- partially exempt BUT subject to certain conditions ("*Conditional Exemption").*

However *larger* quantities – Kgs upwards of some materials, *may* require managing under the full terms of an EPR Permit.

Advice from the RPA at the University Safety Office (SO) must be sought before purchase of any such material (particularly Uranium or Thorium) occurs, including formal notification of the proposed stock limits and any disposal arrangements. Plans to purchase any other naturally occurring radioactive materials must also be discussed with the RPA who will be able to confirm, or add to the information provided by the supplier of the materials.

All Uranium and Thorium stocks must be subject to a departmental inventory that identifies location and user(s), and is reported, on an annual basis, to the Safety

Office. Advice must always be sought from the RPO in terms of the conditions and limits applicable for disposal of these materials.

Records must also be kept in departments indicating the date and to whom any Uranium and Thorium stocks are transferred to (other departments or outside Institutions). Similarly, details of all disposals of these materials – to drain or to solid waste routes, must be maintained. An annual report on transfers and disposals of Uranium and Thorium must be sent to the Safety Office along with the stock information report discussed above.

In terms of other naturally occurring materials with radioactive properties, each department should keep stock records of what is ordered and what and where it is held on the premises, transferred or disposed. but annual reporting to the Safety Office is *no*t normally required.

2. Health and Safety / Ionising Radiations Regulations requirements

Potentially, all naturally occurring radioactive materials will present an internal and/or external radiation risk, and fall under the requirements of the Ionising Radiations Regulations 2017. *The determining factor is generally the amount (activity) of the material held or used (this factor may differ depending on the material in use). 'Small' quantities may be exempt from some or all of the requirements of IRR17.* The RPA must be consulted regarding any new work with naturally occurring radioactive materials or Uranium/Thorium compounds. Additionally, there will risks relating to their chemical properties, and consideration under COSHH is required.

Because of the 'risk' of exposure and the associated regulatory compliance issues, departments must keep track of stocks of these materials and who is using them and how. This can be managed on an inventory basis and by an appropriate risk assessment usually based on the COSHH format but with an appropriate reference, and identification of any additional control measures in terms of the radioactive properties. In general, external hazard will be very low or low (although prolonged skin contact must be prevented), but measures will be needed to prevent internal 'dose' through ingestion, inhalation, injection and skin contamination. Note that many of these materials are alpha emitters and therefore avoidance of internal dose is of particular importance, although the control measures employed are not likely to be greater than those employed in normal good practice in handling other hazardous chemical reagents. However, advice should be sought from the RPA in terms of appropriate risk assessment procedures and suitable control measures with respect to the radioactive properties of these materials.

From the risk assessment, the required control measures including: information, instruction and training, PPE and contingency arrangements need to be confirmed with all users of naturally occurring radioactive material, appropriate training provided, together with a regular review of the risk assessment and control measures, if and when situations change – i.e. to users, uses and quantities.