Designation of Radiation Workers, Personal Monitoring and Dose Limits

Requirement for Registration

All members of the University working with ionising radiations - except undergraduates participating in supervised class work only - must be registered as radiation workers. The register is compiled by the Radiation Protection Office, and it is the duty of each Radiation Protection Supervisor (RPS) to ensure that the University Radiation Protection Officer (URPO) is informed immediately of all changes to the register. All radiation workers are required to be familiar with the requirements of the Radiation Policy, appropriate Guidance Notes and, if applicable, the Specific Local Rules applying to the area(s) they will be working in.

Undergraduates are not permitted to handle any unsealed radioactive sources.

All members of the University working with Unsealed / open sources of radiation must attend a training session, complete and pass the Radiation Safety Test (RST) and complete the departmental check list with their Trainer / Supervisor prior to starting unsupervised work.

All members of the University working with sealed sources and x-ray generators must register with URPO and undertake local training with the equipment or sources used.

Any person who is an employee of another establishment who intends to work with ionising radiation on the premises of the University must also be registered with the URPO prior to the commencement of such work and must provide evidence of previous training. The URPO must also be consulted when a Classified worker from another establishment requires access to a Controlled Area, in order to ensure that the requirements of Regulation 15 of the IRR99 may be complied with.

Classified Workers

As an employer of radiation workers the University is required to designate as Classified any employee who is likely to receive a dose of ionising radiation which exceeds three-tenths of any relevant dose limit. All Classified workers must be given medical examinations and the doses received by them must be determined by personal monitoring.

No employee under the age of 18 may be designated as a Classified radiation worker.

Classified workers must also notify URPO prior to leaving the employment of the University.

Non-Classified Workers

Employees who, as a result of their work activities, are not likely to receive a dose of ionising radiation which exceeds three-tenths of any relevant dose limit, but may receive a dose exceeding one-tenth of any such limit, will be registered by the University as Non-Classified radiation workers. Most radiation workers registered in the University will be in this category.
**Female Employees**

Dose limits for the abdomen of women of reproductive capacity are more restrictive than those for other radiation workers, and are intended to protect the foetus which, at some stages of development, is particularly sensitive to ionising radiation. Radiation workers who become pregnant are required to inform their employer as soon as possible so that advice may be given and, where necessary, steps taken to ensure that working conditions are such that it is possible to comply with the special dose limits recommended for the duration of the pregnancy. In most cases there should be no need to restrict work with radioactive materials as the doses received are unlikely to approach the permitted limit, but occasionally it may be considered prudent for a pregnant worker to curtail a particular aspect of her work e.g. iodinations.

**Medical Surveillance**

**Administration**

Every employer is required by IRR99 to provide medical surveillance to ensure that, before persons are Classified, they are examined and certified fit to commence work with ionising radiation.

In addition to the appointed doctor, the University Radiation Protection Sub-Committee may also appoint a medical consultant who is experienced in the biological effects of radiation. Although not involved in the day-to-day medical surveillance of the radiation workers they will be available when required to assist and advise the URPO and the Sub-Committee on non-routine matters.

**Appointed Doctor**

The duties of the Appointed Doctor will be fulfilled by doctors contracted to the **University Occupational Health** (UOH), who will maintain a confidential health record for each Classified person. This record will be kept for monitoring effects of radiation only.

**Classified Workers**

Any employee of the University who needs to be designated as a Classified radiation worker must undergo a full medical examination, and be certified as fit, before commencing work and annually thereafter. Medicals will be carried out by the appointed doctor. A further medical will be required on ceasing work with ionising radiations or leaving the University. The URPO must be informed prior to leaving the employment of the University.

When a Classified person changes employment the pre-employment medical examination need not be carried out if the person has been previously certified as fit within the last 12 months and their previous certification is made available for their new health record.

**Non-Classified Workers**

The majority of University employees who use ionising radiations are Non-Classified workers and as such require no routine medical examination or blood test.
Overexposure

Any employee, whether Classified or not, who receives a dose of ionising radiation in excess of twice the annual dose limit should, without delay, undergo a special medical examination.

Records

The University is required to retain the health record of each Classified worker for fifty years from the date of the last entry.

A worker has the right of appeal against medical decisions entered on his/her health record. An appeal, in writing, must be made to the HSE within three months of the date of notification of the original decision.

Personal Monitoring

General Requirements for Personal Monitoring

Personal dosimeters (whole-body dose monitors and/or extremity monitors, as appropriate) record the radiation dose received by the wearer, and must therefore be worn correctly, as instructed, at all times when working in a radiation area whether with radioactive materials or with equipment producing radiation such as X-rays. They are needed to ensure that workers are not exceeding the relevant dose limits and that all exposures are as low as reasonably achievable (ALARA). Care must be taken to ensure that personal dosimeters are not inadvertently exposed by being left near a source of ionising radiation when not being worn. Any such accidental exposure must be reported to the URPO.

All personal dosimeters must be treated with respect and not tampered with. Body badges should always be used in the holder provided and must be removed from laboratory coats before these are laundered! All badges must be kept away from sharp pointed items and direct heat. Persons issued with extremity dosimeters should carefully check that the dosimeter is not inadvertently discarded after the removal of surgical gloves.

Personal dosimeters will be issued for such periods of time as considered appropriate by the URPO, taking into consideration both the type of dosimeter and the nature of the work. **All dosimeters must be returned promptly at the end of the wear period.** Failure to do this will result in additional costs being paid by the School.

Classified Workers

All Classified radiation workers are required to have their doses monitored. For those exposed to external radiation fields this will normally be with personal dosimeters such as whole-body dose monitors and/or extremity monitors (e.g. film badges or thermoluminescent devices (TLDs)). Where the use of personal dosimeters is inappropriate (e.g. in work with low energy beta emitters), an assessment of dose will be made by other methods such as environmental or biological monitoring.
If a dosimeter issued to a Classified person becomes lost or damaged, an investigation to estimate the actual dose received during the monitoring period will be required. In the absence of sufficient information a dose pro-rata to the annual dose limit will be recorded.

Non-Classified Workers

Personal dosimeters may be issued to non-classified radiation workers to demonstrate that classification is not required, by monitoring both technique and the working environment. Such monitoring will not necessarily be continued once an adequate estimate of the risks has been obtained.

Radiation workers regularly using x-ray, gamma-ray, or high energy beta emitting radioisotopes, may be issued with personal dosimeters. From the information given, the URPO will estimate the radiation dose likely to be received. Where the estimated doses exceed 0.1 mSv per quarter (whole body) or 0.3 mSv per quarter (extremity), a whole body badge and/or extremity (finger) badge will be issued. Dosimeters may also be issued to persons who have not previously worked with ionising radiation regardless of the result of the dose assessment (“reassurance dosimetry”).

All radiation workers at Newcastle University are designated as non-classified radiation workers. Any worker who receives or expects to receive a whole body radiation dose of >6mSv in any one year or >1mSv per month in three consecutive months must inform URPO who will inform the approved dosimetry service (ADS) and the URPA. The University adopts a dose constraint of 2mSv per year for whole body radiation doses and 30mSv per year for extremities.

Any radiation worker using the isotopes and activities listed in the table must inform the URPO and arrange to have the appropriate personal radiation monitoring arranged. All work involving ionising radiation must have a prior radiation risk assessment which must be authorised by the URPO. If this has been undertaken the user will be made aware of their need for personal monitoring.

Open Sources.

<table>
<thead>
<tr>
<th>Isotope</th>
<th>Minimum activity (MBq)*</th>
<th>Extremity Monitoring</th>
<th>Whole Body Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>18F (all PET Isotopes)</td>
<td>0</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>32P</td>
<td>18.5</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>36Cl</td>
<td>18.5</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>22Na</td>
<td>0.065</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>51Cr</td>
<td>3</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>65Zn</td>
<td>0.2</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>125I</td>
<td>1.25</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*This is the minimum activity of a material to give a dose to the fingers of >20uSv.h⁻¹
#Whole body monitoring can be provided for reassurance and confirmation of negligible dose to trunk.

Personal monitoring is not routinely required for the following commonly used isotopes:

3H  14C  33P  35S
Sealed Sources (including Mobile)

Users of the mobile sealed sources, Density gauges or large calibration sources are required to have whole body dosimetry. Extremity monitors should be worn if carrying out wipe testing of sources.
Although the cell irradiator contains a sealed source it is adequately shielded. Persons using this equipment do not need personal monitoring.
Scintillation and Gamma counters containing sealed sources are also suitably shielded.

X-ray equipment

All users of X-ray Crystallography equipment, dealing with alignment should use finger / extremity dosimetry. Any other x-ray equipment in the university is suitably shielded to prevent inadvertent irradiation. Users of the PET-CT systems are issued with monitoring badges.

Accidental Exposure

When an accident or any other incident occurs which is likely to result in a person being exposed to ionising radiation in excess of three-tenths of any relevant dose limit, it will be necessary to arrange for an immediate dose assessment, where applicable by examination of the personal dosimeter, or by other means such as examination of biological specimens or computation of dose received from measurements of dose rates, contamination levels, exposure time and distance etc. The circumstances leading to the accident will be fully investigated so that appropriate action may be taken both to deal with the current situation and to prevent future occurrences. Such incidents may be reported to the relevant Union Safety Representatives in accordance with University Safety Office procedures.

Biological Monitoring

Biological monitoring involves measuring radioactivity in samples such as urine, to calculate the activity in the body. It is normally required only if very large activities of open sources are being handled and there is a significant risk of intake of radioactivity or excessive skin contamination, or following an accident, but users of radiiodine should regularly monitor their thyroids to check for possible intake.

In cases of accidental intake and/or contamination the RPS must be notified immediately as it may be possible, after consultation with the URPO/RPA, to enhance the rate of elimination from the body.

Records

Doses received by Classified workers have to be assessed by an approved dosimetry service, and records kept for 50 years from the last entry. Records of dose assessments made following an accident or other incident must also be kept for 50 years.

Classified workers will be sent a copy of their termination dose record on ceasing employment with the University. This can only be done when the classified worker has notified URPO that they are leaving the employ of the University.
Formal Investigation Levels (IRR99 Regulation 8(7))

Should any worker receive an effective dose of ionising radiation >2mSv for the whole body exposure or >30mSv for an extremity in any calendar year, a formal investigation will be undertaken by the URPO in order to ensure that exposure to ionising radiation is being restricted as far as is reasonably practicable.

Dose Limits from IRR99 Schedule 4

Table A1: Dose limits for any calendar year (external + internal radiation)

<table>
<thead>
<tr>
<th></th>
<th>Employees aged 18 years or over&lt;sup&gt;(1)&lt;/sup&gt; (mSv)</th>
<th>Trainees aged under 18 years&lt;sup&gt;(2)&lt;/sup&gt; (mSv)</th>
<th>Others (mSv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole body</td>
<td>20</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Hands, Forearms</td>
<td>500</td>
<td>150</td>
<td>50</td>
</tr>
<tr>
<td>Feet, Ankles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skin (any 1cm&lt;sup&gt;2&lt;/sup&gt;)</td>
<td>150</td>
<td>50</td>
<td>15</td>
</tr>
<tr>
<td>Lens of the eye</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>(1)</sup> = Limits for Classified Radiation Workers at Newcastle University

<sup>(2)</sup> = Limits for Non-Classified Radiation Workers at Newcastle University

Table A2: Dose Limits relating to the female abdomen

<table>
<thead>
<tr>
<th>Dose limit for the abdomen:</th>
<th>mSv</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>of a women of reproductive capacity</td>
<td>13</td>
<td>in any consecutive three month interval</td>
</tr>
<tr>
<td>of a pregnant woman (Reg.8)</td>
<td>1</td>
<td>during the declared term of pregnancy</td>
</tr>
</tbody>
</table>