Management of X-ray Generating Equipment

These arrangements apply to X-ray equipment and electrical equipment emitting ionising radiation and containing components operating at a potential of more than 5,000 volts, e.g. cathode ray tubes and electron microscopes.

Work with X-ray generating equipment is regulated under the Ionising Radiations Regulations, which amongst other things requires prior authorisation to the Health and Safety Executive unless the application is covered by a generic authorisation. However the generic authorisation requires that certain conditions be complied with.

There is a further requirement for the radiation risks to be assessed for any new, modified or relocated equipment in order that the radiation protection requirements may be identified and provided before first use.

The use of X-ray equipment for the exposure of human subjects is also controlled by the Ionising Radiation (Medical Exposure) Regulations 2000.

Consequently all X-ray generating equipment must be:

- Pre-notified to and approved by the Safety Office
- Recorded onto site and the location kept up to date,
- Access restricted and under the supervision of a designated person, and
- Regularly checked for leakage and recorded.

The Safety Office has responsibility for ensuring that the appropriate conditions are met.

The Radiation Protection Supervisor is responsible for:

- ensuring that the Safety Office is notified in advance of proposals to acquire any x-ray generating equipment or to make any material changes to it, for example to relocate, modify, decommission or dispose of it,
- prompt notification to the Safety Office of any problems relating to the equipment,
- describing the nature and frequency of monitoring checks in the local rules, and
- ensuring that monitoring is carried out and recorded as defined.

1. Acquisition of X-ray Generating Equipment

All intended purchases of X-ray generating equipment must be notified to the relevant Radiation Protection Supervisor and the Safety Office before purchase. The Safety Office will establish the applicability of the generic authorisation and if necessary obtain authorisation from the Health and Safety Executive.

Notification before acquisition of a new x-ray generator must be submitted to the Safety Office on Form Rad 3. This form should also be used for notifying proposals to modify or relocate the equipment. A risk assessment is also required with the notification - see guidance and form Rad 6, which may be used.

The Safety Office will assess the suitability of the location and establish the radiation protection requirements, seeking advice from the University's Radiation Protection Advisor as appropriate.

The equipment may only be brought onto site once the Safety Office has issued written approval. The Safety Office must be notified of the arrival of the equipment.

X-ray equipment for use with human subjects.

The use of X-ray equipment for the exposure of human subjects is controlled by the Ionising Radiations Regulations 1999 and the Ionising Radiation (Medical Exposure) Regulations 2000.

For all X-ray equipment to be used for the exposure of human subjects (for example diagnostic X-ray equipment) advice must be sought on equipment selection from a Medical Physics Expert, in relation to optimisation of patient dose.

In common with all X-ray equipment, a prior risk assessment of possible radiation hazards must be undertaken of the proposed siting and use of the equipment. A Radiation Protection Adviser must be consulted on:

- the plans for siting the equipment in order to determine any radiation protection implications,
- critical examination of safety features and warning devices, and commissioning before first use on human subjects,
- an adequate programme of maintenance and quality assurance, and
- procedures to be put in place to control the exposure of human subjects and the training of those involved.

A Medical Physics Expert or Radiation Protection Advisor may be contacted at the Medical Physics Department, QMC, through the University Safety Office.

2. Safe Use of X-ray Generating Equipment.

Critical examinations to ensure radiation safety.

When equipment is first installed it is the responsibility of the installer to ensure that a critical examination is undertaken. This is to ensure that adequate protection is provided from ionising radiations for those working with it and others, including students and members of the public, who might be affected by it. The critical examination should ensure that all safety features and warning indicators are functioning correctly and that dose-rates associated with use of the equipment are within design specifications.

The Safety Office should be consulted about the nature of the critical examination. Consideration will be given to performing a confirmatory survey and if necessary to check that shielding incorporated into the building fabric is performing to expectations. A survey will also need to be carried out whenever a machine is relocated or modified.

Safe Practice
Work must be carried out in accordance with University and School Local Rules. In particular the following engineering controls, design features, safety devices and warning devices need to be applied in so far as it is reasonably practicable to do so:

Contained or Enclosed Facility

(a) Where the work is to be carried out in a room, purpose made structure, other enclosure or a cabinet,

(i) adequate shielding as far as reasonably practicable; and

(ii) except in the use of X-ray sets for radiotherapy at or below 50kV, interlocks, or trapped key systems, or other appropriate safety devices in order to prevent access to high dose rate areas (e.g. in which employed persons could receive an effective dose greater than 20 mSv or an equivalent dose in excess of a dose limit within several minutes when radiation emission is underway). The control system for such safety devices should comply with the performance criteria for safety devices as described in the section below.

Uncontained or Open Facility

(b) In other cases, adequate local shielding as far as reasonably practicable and, in the case of site radiography, a suitable system for ensuring that:

i. persons other than those directly involved in the exposure are excluded from the area by means of a barrier or other suitable means;
ii. where employees of another employer may be present in the same workplace, there is co-operation and co-ordination with the other employer(s) for the purposes of restricting access to the controlled area;
iii. warning notices are displayed at the perimeter of the controlled area; and
iv. radiation levels are monitored to establish that controlled areas have been properly designated;

General Requirements

- Where there is a risk of significant exposure arising from unauthorised or malicious operation, equipment should be fitted with locking-off arrangements to prevent its uncontrolled use;
- Initiation of exposures should be under key control, or some equally effective means, to prevent unintended or accidental emission of a radiation beam;
- Suitable warning devices should be provided which indicate when the tube is in a state of readiness to emit radiation and, except for diagnostic radiology equipment, give a signal when the useful beam is about to be emitted and a distinguishable signal when the emission is underway, unless this is impracticable;
- Adequate and suitable personal protective equipment should be provided where appropriate, for example lead impregnated rubber gloves or aprons where there is a risk of hand or body exposure that cannot otherwise be prevented;
- Suitable maintenance and testing schedules for the control measures provided should be in place. These include visual checks of shielding and warning devices

etc, functional checks of interlocks, periodic monitoring for radiation leaks. In particular these should be carried out after repair, modification or adjustment etc affecting shielding. The equipment will also be monitored annually during the Safety Office inspection.

- For non-routine operations such as setting up or aligning equipment, where the safeguards for routine operation are not in use, a procedure for an alternative method of working that affords equivalent protection from the risk of exposure should be produced, documented and incorporated into the local rules. Such procedures are only to be carried out by named "Authorised Persons" working in accordance with the written procedure.

Performance Criteria for Safety Devices
Safety devices provided, as referred to in paragraph (a) (ii) above, should be configured so that the control system will ensure that an exposure:

i. cannot commence while any relevant access door, access hatch, cover or appropriate barrier is open, or safety device is triggered,
ii. is interrupted if the access door, access hatch, cover or barrier is opened, and
iii. does not re-commence on the mere act of closing a door, access hatch, cover or barrier.

3. Material Changes Affecting X-ray Generating Equipment

The Safety Office must be notified in advance of any intention to relocate or modify X-ray equipment. Notification procedures as for new equipment should be followed.

Proposals to decommission or dispose of X-ray equipment should also be notified to the Safety Office. This will enable the central inventory to be updated.