SECTION 1: INTRODUCTION

The Trust has an agreed Radiation Protection Policy which states that it is committed to keeping exposure to ionising radiation as low as reasonably achievable. In addition, the Policy lists individuals with specific responsibilities within the radiation protection programme, describes procedures for implementing the policy and lists relevant publications. A copy of the Policy is available in all Departments.

These local rules have been prepared to satisfy the Ionising Radiations Regulations 1999 (IRR 99). By following these rules you will be able to work safely and comply with IRR99. Your annual radiation doses should be well below legal limits for adult workers and in most cases will be less than the limit for members of the public (see APPENDIX V- IRR 99 Dose Limits).

The Trust has separate procedures relating to medical radiation exposures, which have been prepared to comply with the Ionising Radiation (Medical Exposures) Regulations 2000.

All members of staff who may be exposed to ionising radiation during the course of their work must be familiar with those sections of the Local Rules which apply to them and should sign a statement to this effect.

SECTION 2: RESPONSIBILITIES AND PERSONNEL

2.1 YOUR RESPONSIBILITY

2.1.1 If you work with ionising radiation you have a duty to work carefully and safely, exposing neither yourself nor other persons to radiation unnecessarily. For this reason you must become familiar with the local rules. Please read them carefully. You will be required to sign a statement agreeing to act in accordance with them.

2.1.2 You must

- not intentionally misuse x-ray equipment
- not interfere with X-ray equipment unless you have good reasons for doing so
- use the protective equipment, or clothing, and personal dosemeters provided
- report any defects in protective equipment, or malfunctions in radiation equipment, to the Radiation Protection Supervisor (see 2.2) or line manager as soon as possible.

2.1.3 If you become pregnant, it is important that you notify your Department Manager in writing as soon as possible (see section 11).

2.1.4 Staff employed by Private Contractors working on The Trust’s premises must also obey these Local Rules unless some other local rules have been specifically agreed.

2.2 RADIATION PROTECTION SUPERVISOR (RPS)............

The Trust must appoint an RPS to assist it in complying with the IRR 99. In particular the RPS should ensure that, as far as possible, the protective measures laid down in the Local Rules are followed by any staff working with ionising radiation.

The names of the Radiation Protection Supervisor(s) relating to x-ray work for this Trust are given in APPENDIX III - Appointed Officers
SEE APPENDIX I - Duties Of The Radiation Protection Supervisor
2.3 RADIATION PROTECTION ADVISER (RPA)

The Trust has to consult an RPA on matters relating to IRR99 such as controlled areas, periodic examination of engineering controls, prior risk assessments, local rules, quality assurance programmes and radiation incidents etc. Details of the RPA appointed for the Trust are given in APPENDIX III - Appointed Officers.

2. OTHER RESPONSIBILITIES.

2.4.1 Employing Authority
The Chief Executive is the accountable manager for the Trust and has the responsibilities for ensuring compliance with IRR 99 for all work with ionising radiation. These Local Rules have been written as part of that responsibility.

2.4.2 Head Of Department
The Head of Department is responsible to the Chief Executive/Managing Director for compliance with IRR99 in the local department. He or his deputy may delegate the day-to-day supervision of safe radiation practices to the Superintendent Radiographer.

2.4.3 Appointed Doctor
If any member of staff becomes a classified person, the radiation employer must inform the Health and Safety Executive to appoint an appointed doctor. The HSE appoints the Appointed Doctor who is responsible for medical supervision of Classified Persons. (See APPENDIX III - Appointed Officers).

SECTION 3: CLASSIFICATION OF AREAS

3.1 CONTROLLED AREAS

The Trust must identify areas on its premises where people need to follow special working procedures to ensure that they do not receive significant radiation doses. These areas are called controlled areas. You can only enter a controlled area if you are following these procedures (see SECTION 4: X-RAY DEPARTMENT/DENTAL CLINIC SYSTEM OF WORK) or if you have been designated as a classified person (See APPENDIX V- IRR 99 Dose Limits).

All permanent x-ray rooms are controlled areas. There are also controlled areas around mobile and dental x-ray equipment whilst it is in use. Further details are given in APPENDIX II - Complete List Of Designated Areas.

3.2 SUPERVISED AREAS

The Trust must also identify areas where, although not controlled, it is necessary to keep the conditions in the area under review. These areas are called supervised areas.

Supervised areas exist within a room such as a ward or operating theatre, which is not designated wholly as a controlled area, but where mobile x-ray equipment is used in part of the room.
3.3 WARNING SIGNS

Entrances to permanent Controlled Areas are marked with appropriate warning signs.

Controlled and supervised areas around mobile and dental x-ray equipment do not usually have such signs.

SECTION 4: X-RAY DEPARTMENT/DENTAL CLINIC SYSTEM OF WORK

If you need to enter or remain in a Controlled Area you must follow this System of Work. Please read the appropriate sections.

General (All persons)

1. Only those persons whose presence is essential for the procedure or for training may remain in the controlled area when radiological examinations are being carried out.

2. Warning lights and notices at the entrances to x-ray rooms must be observed.

3. Persons who are not trained in the use or maintenance of x-ray equipment must not enter a Controlled Area, except under the supervision of an appropriately trained person, unless it has been ascertained that the electricity supply to the x-ray generator is switched off.

4. Persons whose duties require them to be in an x-ray room whilst x-rays are being generated should be behind the protective screen whenever possible. Anyone outside the protected area of the screen must wear correctly fastened protective clothing (e.g. lead aprons), should stand as far from the radiation beam as possible and minimise the time spent in the unprotected area.

5. A personal dose monitor should be worn in the approved manner by anyone who is closely involved in the use of x-rays. This applies to radiographers only. Dental staff and dental students do not require a personal dose monitor, under normal circumstances.

6. No one should operate x-ray equipment unless they are adequately trained to do so.

Relatives or Visitors

1. Relatives or visitors must be supervised by a member of the radiographic staff.

Cleaning & General Maintenance Staff

1. When a notice is posted at the entrance to an x-ray room indicating that the electricity supply to the equipment is disconnected (or a room in use light, if present, is not illuminated), access is no longer restricted and it is safe to enter the room. If in doubt, contact the Duty Radiographer.

2. If it is necessary for cleaning or maintenance to be carried out while the electricity supply to the x-ray equipment is still connected (in order to maintain electromagnetic locks for example), radiographic staff must give clear instructions to the other staff to avoid inadvertent initiation of exposure.

3. Non-approved operators must not interfere with any of the controls of the x-ray equipment.
Personnel involved with the maintenance of x-ray equipment

1. Any person who will be carrying out maintenance work on the equipment should report to the superintendent radiographer or designated deputy before commencing work and then follow the PROCEDURE FOR HANDOVER/HANDBACK DURING MAINTENCE OF X-RAY EQUIPMENT.

2. During the time the engineer etc. has charge of the equipment, they will be responsible for radiation safety precautions and the associated controlled area.

Outside Workers

1. An “outside worker”, as defined by the Ionising Radiations Regulations 1999 (IRR 99), Must

a) make their radiation passbook available to a designated person (Radiation Protection Supervisor, Head of Department or Radiation Protection Adviser (RPA)) before commencing work in a Controlled Area and

b) collect the passbook when work activities are complete.

See Outside Workers information sheet for further information.

Staff operating x-ray equipment

1. It is the responsibility of the operator of x-ray equipment to ensure that:
   a) all settings are correct before carrying out an exposure;
   b) no one other than the patient will be in the primary (unattenuated) beam;
   c) when necessary, verbal notification is given to indicate when x-rays are about to be emitted, thus enabling all appropriate personnel to retire to safe areas
   d) entrance doors to x-ray rooms are closed prior to and during the generation of x-rays unless the patient's clinical condition or safety dictates otherwise;
   e) at the cessation of activities, the equipment is disconneced from the electrical supply to allow safe access for cleaning and maintenance, and so on. If a room in use light is not available, a reversible sign on the x-ray room door should be set to indicate that the electricity supply to the x-ray equipment is off;
   f) any keys (which enable operation) are removed after use.

2. Appropriate operational procedures must be followed by all staff (see Section 5). For procedures specific to particular equipment see APPENDIX IV - Particular Features Of Certain Rooms.

Additional requirements for the use mobile equipment on clinics & Day Stay theatre etc

3. A temporary controlled area exists during the (temporary) use of mobile x-ray equipment on the wards, theatre and other departments. When x-rays are about to emitted and during the exposure, the controlled area normally extends for a distance of 2 metres (see APPENDIX II - Complete List Of Designated Areas) in any direction from the x-ray tube or patient, and within the primary beam until it has been sufficiently attenuated by material or distance. All staff whose presence in the controlled area is not essential should retreat as far as is practicable. The further the distance the smaller the radiation dose will be, but it is
not necessary to leave a large ward or room provided you can get at least 3 m from tube and the patient. See Footnote i.

4. Patients in adjacent chairs do not need to be moved unless they will be in the main x-ray beam and no mobile lead screen is available.

5. When using mobile x-ray equipment, it is the responsibility of the operator to ensure that
   a) no-one enters the Controlled Area unless they are wearing protective clothing, or are protected by other suitable means.
   b) the main beam is pointed in a safe manner - i.e. towards a solid brick, lead lined or concrete floor or wall, an unoccupied area or towards a mobile protective screen.

6. Those persons who remain in, or enter, the controlled area must
   a) wear correctly fastened lead aprons
   b) should stand as far away from the x-ray beam as their duties permit. Under no circumstances should they be within the direct line of radiation.
   c) wear, in an approved manner, any personal dose monitor that have been issued to them.

7. When left unattended, close to an electricity supply, all mobile units must either be parked in an area where they can be supervised.

**Dental Radiography**

1. Under normal conditions no-one, other than the person, is permitted to enter the controlled area. The X-ray film or digital detector should normally be placed in a holder or held by the patient.

If this is not possible, e.g. when a child or handicapped person can not hold it for themselves, the accompanying adult will need to enter the Controlled Area to hold the film or detector and possibly to support the patient. The following restrictions apply:
   a) The film or digital detector should normally be placed in a film holder, or when this is not possible, held by using a pair of forceps to avoid direct irradiation of the fingers. It should not be hand held by the operator.
   b) The accompanying person should be positioned so that they will not be in the direct beam, and should ideally stand as far away from the patient and tube as possible.
   c) Manual support should not be regularly provided by any one person.
   d) It is not essential for the person supporting the patient to wear a protective apron, provided that the number of films taken does not exceed 10.
   e) It is not necessary for the person supporting the patient to be issued with a personal radiation monitor, provided that steps a) to c) are followed.

2. In the event that the x-ray unit fails to terminate an exposure, the unit must be switched off at the mains. In many cases at Birmingham Dental Hospital, this can only be done by the operator entering the controlled area. For this reason such operators should wear a personal monitor.

   i) This distance has been evaluated on the assumption that the radiographic workload at any particular location will be less than 20 radiographs or 40 minutes screening per week

   Unless the x-ray examinations are being carried out in a dedicated area (e.g. a pacing room) which has radiation shielding included in its design the radiation protection supervisor or adviser (RRPPS, 0121 627 8461) should be informed if the workload is greater. Such a workload may not present a problem (because of the types of procedures being performed) but notification will enable the RPA to carry out a more detailed check, possible including environmental monitoring.
The operator must switch off the equipment as quickly as possible at a full arms reach, and note the approximate time taken to do so.

The Radiation Protection Supervisor: Mr P. G. J. Rout
The Head of Department: Mr P. G. J. Rout
Superintendent Radiographer: Mrs J Kelly

SECTION 5: OPERATIONAL PROCEDURES

5.1 GENERAL FEATURES

1. X-ray examinations should be carried out in rooms designed for the purpose (and designated as Controlled Areas), except in those exceptional situations when it is necessary for the examination to be carried out in the Operating Theatre with suitable protection.

2. X-ray rooms should not be used for more than one x-ray procedure at a time, unless so designed.

3. It is the duty of all staff who use protective clothing (lead aprons, gloves, thyroid shields etc.) to
   a) store them correctly - they should not be folded or placed on the floor
   b) handle the fastening devices carefully
   c) visually inspect prior to use and report any faults.

4. Lead aprons of at least 0.35 mm lead equivalence should be worn if tube voltages greater than 100 kV are regularly used.

5. The operator should always have a clear view of the patient.

5.2 SUPPORT OF PATIENTS

1. Manual support of sick, weak or anaesthetised patients for x-ray examinations should not be performed regularly by any one person. Mechanical devices or sponge supports should be used for immobilisation whenever possible.

2. Child patients should normally be held only by their parents, or other accompanying adult.

3. Any person (whether staff or e.g. an adult carer) supporting a patient who is being radiographed, or anyone holding films, should
   • been clearly instructed on the procedure by the radiographer involved
   • wear protective clothing and
   • be positioned so that their hands are outside the primary beam and their bodies are as far as possible from the primary beam.
   • be adequately informed of the level of risk involved by the radiographer involved

This is particularly important if the carer is a pregnant woman. The dose and hence risk will usually be very small. For example, the dose to the carer from a periapical examination using fast films will be less than 2.0µSv. This dose is small compared with the 2000 µSv each member of the UK receives on average each year from background radiation. (For more information please see, information sheet - scattered doses from x-ray examinations). Please note that as it is most unlikely that any person accompanying a patient for simple radiographic procedures will
receive a dose of more than 1 mSv (1000 µSv) these people do not need to be
classified as a "comforter & carer" as defined in the IRR 99.

4. If there is a serious likelihood that the person supporting a patient will receive a significant
whole body dose, e.g. more than 5 exposures of 80kV, 100mAs a film badge or pocket
dosimeter should be worn.

5. A record should be kept of persons holding a patient including either the dose measured or
details of their positioning and the examination so that a retrospective dose can be
calculated.

6. Patients and carers should not be left unattended in an x-ray room, unless the equipment
has been left in a "safe" condition where hand and footswitches will not produce x-rays.

7. Examinations or circumstances where carers regularly hold patients are given in
APPENDIX IV - Particular Features Of Certain Rooms.

5.3 RADIOGRAPHY
Adjustable beam limiting devices, or cones, should be used to restrict the beam to the
minimum size necessary for a satisfactory examination. For dental intra-oral X-ray sets,
rectangular collimation is recommended, except where conversion attachments do not
permit accurate cone alignment with the film holder.
The operator should stand behind the protective screen when making exposures.

5.4 DENTAL RADIOGRAPHY
1. Approved beam limiting devices must be used for all radiographic exposures. The beam
size should not exceed the size of the film. Rectangular collimators should be used so that
the beam size at the end of the tube does not exceed 40 x 50 mm. Equipment for intra-
oral radiography must be provided with the correct field defining spacer cone; for
equipment operating above 60kV, the focus-skin distance must be 20cm minimum, while
for equipment operating at lower voltages, the focus-skin distance must be 10cm minimum.
In addition, the field diameter at the patient end of the cone should not exceed 6cm.

2. All persons should stand as far away as practicable from the patient and tube - at least; the
distance 1.5 m, unless protective screens or aprons have been provided.

3. All staff involved in the routine use of dental X-ray equipment should be provided with
personal dosimeters (film badges) if their individual combined workload of intra-oral and
OPG films is more than 50 per week.

SECTION 6: MODIFICATIONS TO EQUIPMENT
1. The RPS should be informed of any maintenance undertaken on, or modifications to, x-ray
equipment which might alter the x-ray output, beam quality or protection of the tube.

2. Such details should be entered in a log kept for this purpose for each piece of equipment.

3. Details of any change in output, beam quality or protection of the tube, should be fixed to
the equipment by the person responsible for the change.

4. Staff should pay due attention to such notices.
SECTION 7: NEW X-RAY INSTALLATIONS OR PROCEDURES

The RPS and manager must be informed of any proposed new x-ray installation or change in technique which might significantly alter the dose that staff receive. The manager should ensure that plans of new installations are submitted to the RPA for advice and approval and a critical examination, commissioning tests and prior risk assessment are completed before the new facility or techniques begins operation. The RRPPS should be informed when new tubes are to be fitted so that the appropriate tests can be arranged before the unit is used.

SECTION 8: CONTINGENCY PLAN

1. A warning indicator, e.g. on the control panel, will indicate that x-rays are being emitted and there may also be an audible signal. If you notice that the x-ray set is producing x-rays at a time when x-ray emission is not intended, you must
   a) switch off the mains supply immediately (or get help to do so if necessary) without standing in any direct beam,
   b) attach a notice to the generator saying that it must not must not be used and
   c) inform the RPS informed as soon as possible

2. Similarly if you have any doubt regarding the safe exposure of an x-ray set, you should inform the RPS immediately and the equipment taken out of service until the fault has been investigated. If the unit produces diagnostic error messages and, provided it is safe to do so, it is better not to turn off the equipment until the fault has been discussed with the service engineers and perhaps the Medical Devices Agency.

3. These incidents may need to be reported - see separate PROCEDURE FOR RADIATION INCIDENTS.

4. Although it is unnecessary to rehearse these contingency arrangements any staff who operate the equipment must establish the location of the main power switch before using a generator.

SECTION 9: SUSPECTED HIGH EXPOSURE/RADIATION INCIDENT

1. If any member of staff believes that they, or any other person including the patient, may have been involved in an incident, they should report the incident to the RPS immediately. The RPS should carry out an immediate investigation - in conjunction the Radiation Protection Adviser if necessary. The Health and Safety Executive (HSE) or Department of Health (DoH) will need to be informed if the dose received was above certain values. See separate PROCEDURE FOR RADIATION INCIDENTS.

2. In addition most staff should routinely receive very small doses. The Trust has therefore set the following local investigation levels:

   **Staff involved with diagnostic X-ray use** 2 mSv in a year

The department manager must carry out a formal investigation if the effective dose received in a calendar year exceeds the above level.
SECTION 10: RADIATION MONITORING AND RECORD KEEPING

1. If you have been issued with a personal radiation dosemeter you
   a) **MUST**
      i) wear it in the correct position. TLD dosemeters should be positioned either at chest or waist level, under a protective apron if worn.
      ii) wear them the correct way round TLD dosemeters have a side which should face the radiation (open window)
      iii) keep it away from excessive heat, moisture or chemical fumes
      iv) be responsible for the proper use and its replacement at the specified time
      v) inform the RPS if you suspect that
         a) your TLD dosemeter is damaged, accidentally exposed to radiation or has been exposed to excessive heat, moisture or chemicals
         b) you have lost or misplaced your TLD dosemeter (so another one can be issued)
   b) **MUST NOT**
      i) wear it whilst you are undergoing an medical radiation exposure yourself.
      ii) wear a dosemeter which has been specifically issued to someone else

Further information is available in the leaflet 'Your personal film dosemeter' and instructions relating to TLDs issued by the dosimetry service.

2. Records of doses received are kept at RRPPS. Monthly and annual records are sent to the x-ray department and staff may ask to see their records.

SECTION 11: INFORMATION FOR FEMALE AND PREGNANT STAFF

1. As an employee in the Trust your work may require you to enter rooms where radiation may be present because x-ray equipment is in use. The IRR 1999 require employers to inform all their female staff who are engaged in work with ionising radiation of the possible hazards arising from radiation exposure, particularly to an unborn child.

2. The risks to the unborn child are very small. If you wear a film badge, your dose will already be known. If you do not normally wear a film badge, this is because your work involves either negligible amounts of radiation, or no radiation at all, and your dose will be much less than for film badge wearers. For many years it has been the practice to minimize the radiation dose to staff during pregnancy to avoid any unnecessary risk to the baby. In hospitals there are few staff, whether pregnant or not, who would be likely to exceed 1 mSv, even in a whole year. For comparison, on average, each member of the UK receives more than 2 mSv every year from natural background radiation. The value ranges from 1 mSv to 8 mSv depending where you live in Britain. The wide variation is mainly due to exposure from a gas called radon. Although you are exposed to radon, your baby will not have any significant exposure. During pregnancy, your baby will therefore only receive about 1 msv from (other sources) of background radiation. The added exposure at work should be no more than this, and in practice, is likely to be considerably less.

3. If you become pregnant it is important that you notify your Departmental manager (and hence your employer) in writing as soon as possible.
4. Once notified, your Departmental and line managers must take steps to ensure that the dose to your baby from radiation received at work will be less than 1 mSv. In many cases you will be able to continue your normal duties. You should not take on any extra duties that would increase your whole body dose during pregnancy.

5. Staff involved with heavy interventional workloads may need to alter their working patterns.

6. Further information is available in the HSE leaflet "Expectant and Breast Feeding Mothers"