Radiation Safety and Protection Plan

Intra-oral Dental Diagnostic Radiography

Name (possession licensee)

Signature Date
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1. Introduction

For the purposes of this document, the possession licensee is identified on page 1 of this document.

It is a requirement of the Radiation Safety Act 1999 that reasonable steps are taken to ensure that any person’s health and safety are not adversely affected by exposure to radiation. This requirement of the Act will be met if all persons in this practice comply with this plan.

This plan will also:

- help ensure that the radiation doses to all persons involved in the practice are minimised
- assist the possession licensee in attaining a satisfactory level of compliance with the Radiation Safety Act 1999.

2. Scope

This plan is specific to intra-oral dental diagnostic radiography.

All persons who are employed at this practice must comply with this plan. These persons must also comply with the following documents:


3. Hazard Assessment

Intra-oral dental X-ray units are used at this practice. X-ray units present a radiation hazard when they are being used.

Exposure to radiation is capable of causing injury or fatal illness to a person. This risk of injury or harm to health depends on the type of radiation and the extent of the exposure, and might only be observed after many years have elapsed. Consequently, the exposure of individuals to radiation must be either prevented or reduced to a level where the risk of adverse health effects is minimised.

In intra-oral dental radiography, radiation doses to users, other employees, patients and members of the public will depend on a number of factors such as the number of exposures, the exposure settings used and work practices.

Information on radiation doses from typical radiographic examinations may be found in Annex B of the ARPANSA Safety guide for radiation protection in dentistry (2005). Although the radiation doses to patients resulting from intra-oral dental radiography are relatively low in comparison with other diagnostic procedures such as chest X-rays, the doses should nevertheless be kept as low as reasonably achievable because, even at this low level of radiation dose, there is still believed to be some health risk.

It is important to take care with the exposure factors used in digital systems as it is possible to expose a patient to higher levels of radiation than is clinically necessary whilst still obtaining diagnostic images.

Provided this plan is complied with, and the X-ray units and premises continue to meet the relevant Radiation Safety Standards:

- the health risk to persons from the intra-oral dental diagnostic radiography practice should be minimized; and
- there is no requirement for personal radiation monitoring, personal alarm dosemeters or specific additional radiation related safety devices to be provided at this practice.
4. Functions of the Radiation Safety Officer

This practice has a radiation safety officer (RSO) who has been appointed to:

- monitor radiation safety
- report to the possession licensee about radiation safety
- maintain awareness of the radiation safety legislation and keep abreast of the trends in radiation safety.

The name of the RSO is displayed in a prominent location adjacent to the X-ray equipment control panel.

(a) On-going RSO duties

On an on-going basis, the RSO must:

- provide, or arrange for, training about radiation hazards and safe working practices
- monitor the radiation safety status of the X-ray equipment and premises to identify whether the relevant radiation safety standards are being complied with (for example, compliance may be affected by damage to, or modification of, the X-ray equipment or premises)
- maintain records of all X-ray equipment and the locations at which it is installed
- identify ways of minimising radiation doses
- advise staff on safe working practices
- investigate radiation incidents.

Additionally, the RSO must report to the possession licensee:

- any radiation incidents
- any contravention of this plan or relevant Radiation Safety Standard
- any action that needs to be taken to achieve compliance with this plan or relevant Radiation Safety Standard.

(b) Annual RSO duties

Each year, the RSO must check and record the results of the following items in an appropriate log book, and ensure that any identified problems are rectified as soon as possible:

- Users and all other employees understand, and are complying with, this plan
- The details of each X-ray unit (including its current location) in the possession of the possession licensee are accurately recorded and match the current inventory attached to the Possession Licence
- The Possession Licence is current and appropriate
- All users of the X-ray equipment hold Use Licences which are current and appropriate
- All users of X-ray equipment are authorised by the possession licensee to use the X-ray equipment
- All maintenance and operational checks, as required by this plan, are conducted within the stated timeframes and recorded, and any relevant problems have been appropriately rectified.
All repairs to the X-ray equipment and film processors are recorded
Personal protective equipment, as required by this plan, is readily available
A suitable reference radiograph¹ is available
Film processing solutions are suitable for the type of film in use
Compliance certificates for the X-ray equipment and premises have been obtained/renewed within the necessary time frames (three and five years respectively)
The effectiveness of, and extent of compliance with, this plan.

Additionally, the RSO must provide an annual written report to the possession licensee. This report is to include the following:
- The results of the annual checks stipulated in section 4(b)
- Any contravention of this plan or relevant Radiation Safety Standard
- The results of a review of the plan to ensure its continued effectiveness against actual clinical practice
- Recommendations about any necessary changes to the plan.

5. Training

The RSO must provide, or arrange for the provision of, appropriate training to all persons who are employed at this practice. All employees must undertake and satisfactorily complete the following training when they start employment, and undergo annual refresher training thereafter. Participation at this training is recorded in the training log book.

(a) Training for all employees

A radiation safety training program is provided to all persons. This training program addresses the following:
- Radiation hazards specific to this practice
- Specific responsibilities of each category of employee
- Safe work practices, including minimising radiation dose to patients and users
- Regulatory obligations
- Other details of this radiation safety and protection plan.

(b) Additional training for users

In addition to the above, users will also be provided specific instructions on the:
- features of, and how to use, the X-ray equipment
- selection of the lowest exposure factors to achieve the desired clinical outcome.

Additional training for users involved in operating digital imaging systems

Users will also be provided refresher training in the following aspects of digital imaging systems:
- Use of digital imaging systems

¹ A reference radiograph is an image that exhibits the desired qualities of contrast, density and sharpness. Radiographs should be compared to the reference radiograph. Changes in appearance may indicate problems with equipment, exposure or processing. The reference radiograph should last for the life of the processor.
Post processing procedures.

(c) **Additional training for persons involved in processing film**

In addition to the training provided to all employees, all persons involved in processing film will be provided refresher training in correct processing techniques.

6. **Safe Work Practices**

Users must take reasonable steps to ensure that the radiation dose received by any person is as low as reasonably achievable. To achieve this, the following safe work practices must be adhered to at this practice.

(a) **Use of X-ray equipment**

*General requirements*

- Only Authorised Persons listed in Schedule 6 of the *Radiation Safety Regulation 2010* may request intra-oral dental radiography.

- Only Use Licensees who are authorised to use the equipment by the possession licensee have access to, and are allowed to use, the X-ray equipment.

- No person employed at this practice, who is under the age of 16, will be directly involved in work with radiation.

*Radiography*

- A person must not hold any part of the X-ray tube head during radiography.

- Under no circumstances must any person, other than the patient, be exposed to the primary beam.

- The image receptor must not be held in position by the operator or any member of staff either by hand or with forceps.

- A person must not be present in the room during radiography unless their presence is necessary for the conduct of the examination.

- A person should not hold a patient during radiography. If parents or other persons are called to assist, they must be 18 years or older and must not be pregnant. The same individual should not be asked to hold patients repeatedly.

- Users must take reasonable steps to ensure that the patient does not move during radiography.

- Users must be able to observe the patient during radiography.

- Users must ensure that appropriate exposure factors are used. Exposure settings for specific examinations are marked on the X-ray unit. Exposure techniques must not be adjusted to compensate for inadequate film processing.

*Reporting to the RSO*

- Users must report any contravention of this radiation safety and protection plan to the RSO.

- Users must report any radiation incident to the RSO.
Personal protective equipment

- Lead aprons ($\geq 0.25$ mm Pb) are provided and are to be worn by comforters (e.g., parents who hold a child) during intra-oral dental diagnostic procedures to minimise dose.
- Lead aprons and thyroid collars ($\geq 0.25$ mm Pb) are provided at this practice and are to be worn, wherever practicable, by children.
- Lead aprons ($\geq 0.25$ mm Pb) are provided at this practice and are to be worn, wherever practicable, by pregnant women when the X-ray beam is to be directed downwards towards the patient’s trunk.
- Lead aprons and thyroid collars are to be stored unfolded to help prevent the formation of cracks.

(b) Register of exposures

- This practice keeps the following information about each exposure:
  - patient’s name, gender, and date of birth
  - date the radiographic investigation is performed
  - particulars of the radiographic examination performed
  - the name of the user of the X-ray equipment
- Users must ensure that this information is recorded after each examination (including any rejects).
- Users must incorporate the radiograph into the patient’s records. For conventional film, the radiograph must be placed into an X-ray sleeve (or envelope), with the name of the patient and date of exposure written on the sleeve.

7. Image Receptors and Film Processing

To ensure that radiographs are of consistent diagnostic quality, the following procedures must be adhered to.

(a) Digital imaging systems

- The image receptor must be of an appropriate size and compatible with the X-ray unit.

(b) Film sizes and applications

- Films that have passed the manufacturer’s recommended expiry date must not be used.
- Films must only be used for applications appropriate to their size.
- Intra-oral films must comply with ISO Standard 3665.
- Film must be ‘E’ speed or faster.

(c) Storage of unexposed films & film processing chemicals

- Unexposed X-ray films must be stored in accordance with manufacturer’s recommendations, in a container away from excessive heat, humidity or chemical
contamination (e.g. from film processing chemicals), and adequately shielded against ionizing radiation or in an area remote from any X-ray unit.

- Film processing chemicals must not be stored in the same refrigerator or cupboard as foodstuffs.

(d) **Processing of films**

- Films must not be processed by sight.

- Manual processing of films must be in accordance with the manufacturer’s recommendations and must satisfy the following requirements:
  - Temperature of developing solutions must be measured
  - An appropriate time-temperature chart must be used to determine processing time
  - The time of processing must be measured.

- The concentrations of developing solutions must be in accordance with the manufacturer’s specifications.

8. **Repair and Maintenance**

Repair and maintenance is conducted on the X-ray equipment and film processors to ensure that images are produced with optimal diagnostic quality and that radiation doses continue to be minimised.

Records of all repair and maintenance conducted at this practice are kept in the equipment maintenance log book.

(a) **X-ray equipment**

All maintenance must be carried out in accordance with the schedule specified by the manufacturer. Maintenance and repairs must be conducted by a qualified service person. If the equipment is to be used (i.e. energised) during repair and maintenance, the radiation safety officer must ensure that the person holds a licence to use intra-oral dental X-ray equipment for maintenance, repair or commissioning.

Following the repair of an X-ray unit, the radiation safety officer must ensure that the unit continues to comply with Radiation Safety Standard HR005, this may necessitate having the equipment tested for compliance with this standard by an accredited person.

(b) **Film processors**

*Automatic processor*

All maintenance must be carried out in accordance with the schedule specified by the manufacturer. The procedures detailed in the manufacturer’s operation manual must be followed. These procedures will be performed by an appropriately trained person authorised by the possession licensee.

Major processor repairs and routine service must be handled by a qualified service person.

*Manual processor*

Maintenance of the manual processor involves cleaning the processor and replacing the chemicals at least every two weeks.
The maintenance procedure is displayed in a prominent location adjacent to the processing equipment. This procedure will be performed by an appropriately trained person authorised by the possession licensee.

9. Operational Checks

The operational checks detailed in the following table are to be performed by appropriately trained persons authorised by the possession licensee. Any identified problems are to be rectified.

Results of all operational checks are to be recorded in the operational check log book.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Operational Check</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>Check the quality of a test film/digital image (e.g. first clinical image of the day) by comparing it with a reference radiograph</td>
</tr>
<tr>
<td>Monthly</td>
<td>Perform a retake/reject analysis to determine the reason for the retake or reject (which may include problems with the film, developing process, the X-ray unit or the user)</td>
</tr>
<tr>
<td>Six monthly</td>
<td>Check that the processing box is free of light leaks</td>
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<td></td>
<td>Check the condition of personal protective equipment</td>
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<td></td>
<td>Check that the X-ray film is stored in accordance with this plan</td>
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<td></td>
<td>Check that the oldest X-ray film is used first</td>
</tr>
<tr>
<td></td>
<td>Check that film is within the expiry date specified by the manufacturer</td>
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<tr>
<td></td>
<td>Check that exposure factors for specific examinations are readily available</td>
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<tr>
<td></td>
<td>Check that the RSO details are displayed in a prominent location adjacent to the X-ray equipment and are correct</td>
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<td></td>
<td>Check that the processor maintenance procedures are displayed in a prominent location adjacent to the film processor</td>
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<tr>
<td></td>
<td>Check that instructions for mixing chemicals and processing films are available</td>
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<tr>
<td></td>
<td>Check that a time/temperature chart, a timer and a thermometer are available for manual processing</td>
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<tr>
<td></td>
<td>Check that X-ray equipment warning signs are displayed on each control panel and are in good condition</td>
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</tbody>
</table>

10. Records

The following records are maintained, and are kept in a readily accessible location:

- Current Possession Licence issued under the *Radiation Safety Act 1999*
- Current radiation safety and protection plan approved by the Chief Executive of Qld Health
- Annual reports by the radiation safety officer
- Approvals to acquire or relocate the X-ray equipment
- X-ray equipment disposal records
- Inventory and location of X-ray equipment
- Training log book
- Equipment maintenance log book
- Operational check log book
11. General Regulatory Requirements

This section outlines the legislative requirements associated with the movement or change of ownership of X-ray equipment, and testing of the X-ray equipment and the premises in which it is used. The RSO must be contacted in relation to these matters.

(a) Acquisition

Approval of the Chief Executive of Queensland Health must be sought and obtained prior to acquiring (purchasing, borrowing, exchanging etc) each X-ray unit.

(b) Supply

Within Queensland

An X-ray unit must not be supplied (sold, lent, exchanged etc) to another person in Queensland, unless that person has obtained an ‘Approval to Acquire’ that specific X-ray unit.

Outside Queensland (relocation)

An X-ray unit must not be relocated (moved, sold, lent, exchanged etc) outside of Queensland, unless an ‘Approval to Relocate’ has been obtained for that specific X-ray unit. The Chief Executive of Queensland Health must be notified within 7 days after its relocation.

(c) Disposal

To dispose of X-ray equipment, the X-ray unit must be rendered permanently incapable of producing X-rays. Following this, the possession licensee must give the Chief Executive of Queensland Health written notice of the disposal within 7 days of the disposal.

(d) Register of X-ray equipment

An inventory of X-ray equipment in possession of the possession licensee, including its current location, must be maintained by the possession licensee. The Radiation Health Unit should be notified about any change of location (room number change, physical address etc) of an X-ray unit.

(e) Compliance testing of X-ray equipment

Before initial use, and every three years thereafter, the X-ray equipment must be assessed, by an appropriately accredited person, for compliance with Queensland’s Radiation Safety Standard HR005:2010 Standard for radiation apparatus used to carry out intra-oral dental diagnostic radiography. Only equipment which has a certificate of compliance may be used.

(f) Compliance testing of premises

Before initial use, and every five years thereafter, each room where X-ray equipment is used must be assessed, by an appropriately accredited person, for compliance with Queensland’s Radiation
12. Incident Response

A radiation incident is an incident adversely affecting, or likely to adversely affect, the health or safety of any person because of the emission of radiation.

The most likely radiation incident at this practice is an actual or suspected malfunction of the X-ray equipment. In this case, the following procedure must be observed:

- The user must switch off the X-ray unit as quickly as possible at the main supply.
- The user must take precautions to prevent the use of the X-ray unit by:
  - posting a sign which states that the X-ray unit must not be used
  - removing the key to the X-ray unit, or taking other appropriate action.
- The user must advise the RSO of the incident.
- The X-ray unit must not be used until it has been repaired (and if necessary compliance tested) and the possession licensee authorises its use.
- The RSO must determine the radiation dose to each person involved in the incident.

(a) Notification

After any radiation incident, a written incident report is to be produced by the RSO and submitted through the possession licensee to the Radiation Health Unit within 7 days of the occurrence of an incident. This report will include:

- incident description including details of the X-ray equipment involved and its location
- estimates of radiation exposure to individuals (if applicable)
- action taken
- proposals to prevent a recurrence.

In addition, the Radiation Safety Act 1999 specifies that the possession licensee must immediately notify the Chief Executive of Queensland Health, either orally or in writing, if one of the following events happen:

- The source is, or appears to have been, lost or stolen
- There is a radiation incident in relation to the source, for which there are no remediation procedures stated in the radiation safety and protection plan
- Equipment that uses, measures or controls radiation emitted from the source malfunctions with the result, or likely result, that there is, or will be, an unintended emission of the radiation or a person is, or will be, unintentionally exposed to the radiation.