



RADIATION PROTECTION AUTHORITY

**Code of Practice
for
Radiation Protection in Dentistry**

2018

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2018 Edition

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Table of Contents

1. INTRODUCTION	1
<i>Citation</i>	1
<i>Background</i>	1
<i>Purpose and Objectives</i>	2
<i>Scope</i>	2
<i>Structure</i>	2
2. RESPONSIBILITIES OF THE LICENSEE.....	3
3. RESPONSIBILITIES OF THE RADIATION SAFETY OFFICER.....	4
4. DENTAL X-RAY EQUIPMENT.....	4
<i>General Requirements</i>	4
<i>Intra Oral Dental X-ray Requirements</i>	5
<i>Panoramic/Cephalometric Dental X-Ray Requirements</i>	5
<i>Handheld Portable Dental X-ray Requirements</i>	6
5. DENTAL X-RAY ROOM.....	6
6. RADIATION PROTECTION FOR OPERATORS, PATIENTS AND MEMBERS OF THE PUBLIC.....	7
7. PERSONAL RADIATION MONITORING.....	9
8. INCIDENT REPORTING.....	9
9. RECORD KEEPING.....	9
ANNEXES	
<i>Annex A</i> - APPLICATION FOR A LICENCE TO CONDUCT DENTAL X-RAY PRACTICE	10
<i>Annex B</i> - REFERENCES.....	11

1. INTRODUCTION

Citation

This document is cited as the '***Code of Practice for Radiation Protection in Dentistry***', and is hereinafter referred to as the '*Code*'.

Background

Dental radiography is one of the most valuable imaging techniques used in modern dental health care. It makes possible the diagnosis of physical conditions that would otherwise be difficult to identify, and its judicious use is of considerable benefit to the patient. However, the use of dental radiological procedures must be carefully managed, because x-rays emitted from a dental x-ray machine has the potential of damaging healthy cells and tissues. Though cellular repair is expected, it is not necessarily perfect.

In general, during a dental radiological examination, the radiation dose received by an individual is relatively low. However, the effect of even low levels of exposure to ionising radiation over periods of time may accumulate and could represent a potential hazard to health. Thus, it is important to have adequate radiation protection measures in place to protect against the harmful effects of radiation while using x-ray in dentistry.

The aim of radiation protection in dentistry is to obtain the desired information with minimum radiation exposure to patients, operators and members of the public. There are typically four main concerns when dealing with radiation hazards associated with dental radiography. First, patients should not be subjected to unnecessary dental radiography. Second, patients need to be protected from unnecessary exposures. Third, it is essential that personnel in dental facilities be protected from unnecessary exposure to radiation in the course of their work. Finally, the public requires adequate protection from exposure to radiation. For patients, the risk involved with exposure to radiation must always be weighed against the clinical benefit of an accurate diagnosis, and there must always be a conscious effort to reduce patient doses to the lowest practical levels and to eliminate unnecessary dental x-ray procedures. All dental x-ray examinations must therefore be justified.

Purpose and Objectives

This Code establishes the specific requirements for the safe use of dental x-ray equipment to ensure the protection of all individuals who may be exposed to ionising radiation during the conduct of dental x-ray practices. It is to be highlighted that the requirements set in this Code are legally binding through the conditions attached to the licence issued by the Radiation Protection Authority (RPA) for the conduct of dental x-ray practices.

Below are the principal objectives of this Code are -

- (a) To minimise radiation risk to the patient during a dental radiography;
- (b) To ensure adequate protection of personnel operating dental x-ray equipment; and
- (c) To ensure adequate protection of the public near areas where dental x-ray equipment is operated.

The Code is intended to be used by licensees to ensure that all protection and safety measures are being implemented for the safe conduct of dental x-ray practices. The Code will also be used as a checklist for our inspectors to assess compliance with all regulatory requirements during inspections of dental x-ray practices.

Scope

The requirements stipulated in this Code are limited to the use of the following dental x-ray equipment -

- (a) Intra Oral Dental X-ray machine;
- (b) Handheld Portable Dental X-ray machine; and
- (c) Panoramic and/or Cephalometric Dental X-ray machine.

The Code also covers the roles and responsibilities of Licensees, the Radiation Safety Officers and the Operators to ensure the safe use of the above-mentioned equipment.

Structure

The role and responsibilities of Licensees and Radiation Safety Officers are spelled out in sections 2 and 3 of the Code. Sections 4 and 5 cover the requirements for dental x-ray equipment and dental x-ray room. The requirements for the protection of operators, patients and members of the public are stipulated in section 6. Sections 7, 8 and 9 of the Code cover the specific requirements as regard to personal radiation monitoring, incident reporting and record keeping. The required information and documents to be submitted for a licence to conduct dental x-ray practice and the references are annexed.

2. RESPONSIBILITIES OF THE LICENSEE

- 2.1 The Licensee shall have the prime responsibility for the safe use of any dental x-ray equipment at his facility and shall comply with all the requirements of the Radiation Protection Act and all regulations made thereunder.
- 2.2 The Licensee shall -
- (a) ensure that every dental x-ray equipment authorised under his licence is registered to the RPA prior to its use;
 - (b) ensure that every dental x-ray equipment authorised under his licence is being used only for the purpose(s) specified under Schedule 2 of his licence;
 - (c) maintain a safety assessment of the dental x-ray practice being carried out at his facility;
 - (d) ensure that clear instructions on radiation safety are provided, in writing, to all personnel for the safe conduct of the dental x-ray practice;
 - (e) notify the RPA of his intention to undertake any modification to the infrastructural design of the dental x-ray room whenever the modification could have significant implications for the protection or safety, and shall not carry out such modification unless authorised by the RPA;
 - (f) take all reasonable steps to ensure that every person under his supervision or control complies with all the requirements of the Radiation Protection Act and all regulations made thereunder;
 - (g) ensure that no dental x-ray equipment is left unattended when energised;
 - (h) ensure that handheld portable dental x-ray equipment are securely stored and under locked when not in use; and
 - (i) notify the RPA when a dental x-ray equipment will no longer be used for its intended purpose(s).

2.3 The Licensee shall **not** -

- (a) sell, give on loan or lease, or transfer ownership of any dental x-ray equipment to another person;
 - (b) remove any dental x-ray equipment from a facility, in which it has been authorised for use; or
 - (c) dispose any dental x-ray equipment;
- without prior approval from the RPA.

3. RESPONSIBILITIES OF THE RADIATION SAFETY OFFICER

3.1 The Radiation Safety Officer shall -

- (a) assist the Licensee to maintain a safety assessment of the dental x-ray practice being conducted;
- (b) advise the Licensee, in writing, of the protection and safety measures to be implemented for the safe conduct of dental x-ray practice;
- (c) assist the Licensee for effective implementation of all the protection and safety measures; and
- (d) advise the Licensee on any other matter related to radiation safety.

4. DENTAL X-RAY EQUIPMENT

General Requirements

4.1 The Licensee shall ensure that the dental x-ray equipment is of good quality and meet the International Standards. The equipment shall be ISO¹, IEC², EC³ or FDA⁴ certified or equivalent.

¹ ISO - International Organisation for Standardisation

² IEC - International Electrotechnical Commission

³ EC - European Commission

⁴ FDA - Food and Drug Administration

- 4.2 The Licensee shall ensure that every dental x-ray equipment is supplied, installed, repaired and maintained by a competent person approved by the RPA.
- 4.3 All dental x-ray equipment shall be marked with a radiation warning sign which is clearly visible.
- 4.4 Quality assurance test shall be performed on all dental x-ray equipment by a competent person approved by the RPA, at a frequency recommended by the manufacturer but not less than once every two years.
- 4.5 All dental x-ray equipment shall be fitted with light indicators which give clear and visible indication to the operator when:
 - (a) the main switch is in the 'ON' position and the control panel is energised;
 - (b) the x-ray tube is energised.

Intra Oral Dental X-ray Requirements

- 4.6 The Intra Oral dental x-ray equipment shall be operated at potential differences of between 60 kV (peak) and 90 kV (peak).
- 4.7 The focus-skin distance shall not be less than 200 mm.
- 4.8 The filtration in the primary beam shall be equivalent to at least 1.5 mm Al at x-ray tube voltages up to 70 kV (peak) and 2.5 mm Al if greater than 70 kV (peak).
- 4.9 The exposure switch shall be long enough to allow for the dental x-ray equipment to be operated from a distance of at least 2 metres from the x-ray tube during any examination.
- 4.10 The diameter of the x-ray beam shall not be greater than 60 mm at the outer end of the collimator.

Panoramic/Cephalometric Dental X-Ray Requirements

- 4.11 The Panoramic/Cephalometric dental x-ray equipment shall be operated at potential differences of between 55 kV (peak) and 125 kV (peak).

kV - Kilovolt

mm - millimeter

Al - Aluminium

Handheld Portable Dental X-ray Requirements

- 4.12 For the use of the handheld portable dental x-ray equipment, the Licensee shall already be in possession of fixed or mobile dental x-ray equipment and the handheld portable dental x-ray equipment shall be used as a second dental x-ray equipment.
- 4.13 The handheld portable dental x-ray equipment shall -
- (a) have clear indication when the battery power is low and the tube current or the operating potential is below the intended level; and
 - (b) be equipped with some form of shielding to adequately protect the operator from backscattered radiation.

5. DENTAL X-RAY ROOM

- 5.1 There shall be a control access to the dental x-ray room and there shall be adequate measures in place to prevent any inadvertent entrance to the room.
- 5.2 For the use of a dental x-ray equipment, there shall be sufficient space in the dental x-ray room to allow the operator and any other personnel to maintain a distance of at least 2 meters from the x-ray tube and to allow them to position themselves outside the primary beam during the dental x-ray examination.
- 5.3 The operator shall be able to observe the patient during a dental x-ray examination.
- 5.4 For the purpose of designing a dental x-ray room and for the development of a safety assessment for the safe conduct of dental x-ray practices, the following dose constraint levels shall be applied -
- (a) 6 mSv per year for a radiation worker; and
 - (b) 0.3 mSv per year for a member of the public.

6. RADIATION PROTECTION FOR OPERATORS, PATIENTS AND MEMBERS OF THE PUBLIC

- 6.1 The operator (i.e. the person operating the dental x-ray equipment) or any other personnel shall under no circumstances be exposed to the primary beam during a dental x-ray examination or during testing or repair of the dental x-ray equipment.
- 6.2 During any dental x-ray examination using intra oral dental x-ray equipment, the operator shall stand outside the primary beam and shall be -
- (a) at least 2m away from both the x-ray tube head and the patient; or
 - (b) behind structural shielding of adequate area and of at least 2mm lead equivalence; or
 - (c) behind a protective screen of adequate area and of at least 2mm lead equivalence; or
 - (d) wearing a protective apron of lead equivalence not less than 0.25 mm.
- 6.3 During any dental x-ray examination using panoramic or cephalometric dental x-ray equipment, the operator shall stand outside the primary beam and shall be -
- (a) behind structural shielding of adequate area and of at least 2mm lead equivalence; or
 - (b) behind a protective screen of adequate area and of at least 2mm lead equivalence.
- 6.4 The operator or any other personnel shall not hold the patient during a dental x-ray examination. If any other person is requested to assist, he/she shall -
- (a) be 18 years or older;
 - (b) not be pregnant;
 - (c) be provided with protective apron of lead equivalence not less than 0.25mm;
 - (d) be positioned so as to avoid being exposed to the primary x-ray beam; and
 - (e) not regularly perform these duties.
- 6.5 If the presence of any person other than the operator and the patient is required in the dental x-ray room, the Licensee shall ensure that the presence of this person is justified, and that this person is -

- (a) behind a shield of at least 2 mm lead equivalence; or
 - (b) wearing a protective apron of lead equivalence not less than 0.25 mm; or
 - (c) at least 2 m from the x-ray tube and outside the primary beam.
- 6.6 The Licensee shall ensure that no patient undergo a dental x-ray examination unless the examination is prescribed by a Dental Practitioner registered to the Dental Council of Mauritius and that the dental x-ray examination is justified.
- 6.7 The operator or any other personnel shall not hold the dental x-ray film or digital detector or the x-ray tube head during a dental x-ray examination. The dental film or digital detector shall be held by the patient or a holding device.
- 6.8 The primary beam shall not be directed through doors or windows or wooden floors behind which persons may be situated.
- 6.9 The Licensee shall ensure that the radiation exposure of the operator, any other personnel or any member of the public, resulting from the conduct of the dental practice, is kept as low as reasonably achievable and is well below the following dose limits -
- (a) Dose limits for radiation workers -
 - (i) An effective dose of 20 mSv per year;
 - (ii) An equivalent dose to the lens of the eye of 20 mSv per year; and
 - (iii) An equivalent dose to the extremities (hands and feet) or the skin of 500 mSv per year.
 - (b) Dose limits for members of the public -
 - (i) An effective dose of 1 mSv per year;
 - (ii) An equivalent dose to the lens of the eye of 15 mSv per year; and
 - (iii) An equivalent dose to the skin of 50 mSv per year.
- 6.10 The Licensee, after being notified that a female radiation worker is pregnant, shall adapt the working conditions in respect of her occupational exposure so as to ensure that the embryo or foetus is afforded the same broad level of protection as is required for members of the public.

7. PERSONAL RADIATION MONITORING

- 7.1 An operator shall be provided with a personal radiation dosimeter to monitor his/her occupational exposure to ionising radiation if he/she is -
- (a) likely to receive a dose of more than 1.0 mSv per year resulting from the conduct of the dental x-ray practice; or
 - (b) using a handheld portable dental x-ray equipment.
- 7.2 The Licensee shall ensure that, where personal radiation monitoring is required, the personal radiation dosimeters are provided by a service provider approved by the RPA.

8. INCIDENT REPORTING

- 8.1 The Licensee shall have suitable arrangements in place, to prevent, in so far as is possible, the loss or theft of any dental x-ray equipment.
- 8.2 The Licensee shall notify the RPA of the loss or theft of any dental x-ray equipment as soon as practicable, but not later than 24 hours after the occurrence of the incident.
- 8.3 In the event of an incident, the Licensee shall:
- (a) carry an investigation on the incident; and
 - (b) submit a complete report of the incident, including the preventive action to avoid a recurrence, to the RPA within 7 days.

9. RECORD KEEPING

- 9.1 The Licensee shall maintain -
- (a) a complete list of all dental x-ray equipment being used at his facility;
 - (b) relevant records for all dental x-ray equipment, including information on their acquisitions, installations and maintenance;
 - (c) records of all dental x-ray examination;
 - (d) records of any incident related to the use of any dental x-ray equipment; and
 - (e) any other relevant record as may be required by the RPA.

Annex A

APPLICATION FOR A LICENCE TO CONDUCT DENTAL X-RAY PRACTICE

The following information and documents should be submitted for a licence to conduct dental x-ray practice:

- (a) The duly completed Application Form for a Licence.
- (b) A copy of the Business Registration Card (BRC) of the applicant issued by the Government of Mauritius (if applicant is a company) or; a copy of the National Identity Card (NIC) (if applicant is an individual) or copy of the first two pages of the passport (if the applicant is a non-citizen of Mauritius).
- (c) A copy of the certificate of registration and the annual practicing certificate, issued by the Dental Council of Mauritius, of the Dental Practitioner who will be either operating the dental x-ray equipment or supervising its operation.
- (d) A location plan of the facility where the dental x-ray equipment will be used.
- (e) A plan layout of the dental x-ray room, with dimensions, clearly showing the occupancies of the surrounding areas. The plan layout should also provide details of any openings (windows, doors, etc), the position of the dental x-ray equipment, the operator's console area and details of any shielding materials used on the walls, doors, and windows, etc.

Annex B

REFERENCES

1. International Atomic Energy Agency - Authorisation and Inspection of Radiation Sources in Diagnostic and Interventional Radiology.
2. Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), December 2005, Radiation Protection Series Publication No. 10 - Code of Practice & Safety Guide - Radiation Protection in Dentistry.
3. Minister of Health, Canada, Revised 2000, Safety Code 30 - Radiation Protection in Dentistry Recommended Safety Procedures for the Use of Dental X-Ray Equipment.
4. EUROPEAN COMMISSION 2004, Radiation Protection 136 -European guidelines on radiation protection in dental radiology.
5. Radiological Protection Institute of Ireland Revised March 1996 - Code of Practice for Radiological Protection in Dentistry.
6. A D Gulson and J R Holroyd, Public Health England's Dental X-ray Protection Services, Centre for Radiation, Chemical and Environmental Hazards, Leeds, February 2016 - Guidance on the Safe Use of Hand-held Dental X-ray Equipment.
7. Atomic Energy Regulatory Board INDIA, March 2016, SAFETY CODE NO. AERB/RF-MED/SC-3 (Rev. 2) - Radiation Safety in Manufacture, Supply and Use of Medical Diagnostic X-Ray Equipment.
8. Radiation Protection, Environmental Health Services, Vancouver - Guideline for Determining the X-ray Shielding Requirements for a Panoramic and Cephalometric Facility.



“Protecting people and the environment from the harmful effects of ionising radiation”

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