6 LICENSING REQUIREMENTS AND CRITERIA

6.1 Reference Documents

The licensing requirements and criteria are based on the following documents ;

i. Law of Malaysia : Atomic Energy Licensing Act 1984 **(Act 304)** ;
ii. Atomic Energy Licensing Act 1984 (Act 304) : Radiation Protection **(Licensing)** Regulations 1986 ;
iii. Atomic Energy Licensing Act 1984 (Act 304) : Radiation Protection **(Basic Safety Standards)** Regulations 1988 ;
iv. Malaysian Standards **(MS 838)** : Code Of Practice For Radiation Protection **(Medical X-Ray Diagnosis)**

6.2 Person Resposible For The Licence

The person shall ;

i. be **a registered medical, veterinary or dental practitioner** ;
ii. possess a current Annual Practising Certificate (APC). **The address of practice specified in his/her current APC should be the same as the address where the apparatus is to be used or stored.**

6.3 Person Who Supervises The Use Of The Apparatus

The person shall ;

i. be **a registered medical or dental practitioner** ;
ii. possess a current Annual Practising Certificate (APC). If the person who supervises the apparatus is not the same as the person responsible for the licence, the address of practice specified in his/her APC should be the same as the address of where the apparatus is to be used or stored;
iii. be able to supervise directly the usage of the apparatus in the premises.

6.4 Person Who Operates The Apparatus

The person shall be ;

i. a **qualified radiographer**, full-time or part-time ; or
ii. an **X-ray operator** currently employed in the clinics and has been trained in the Orientation Programme conducted by the College of General Practitioners Society of Malaysia. He/she shall be **restricted to the procedures he/she has been trained to do** ; or
iii. a **worker trained** in the programmes approved by the licensing authority (inclusive of training already carried out). The training syllabus and facilities would be vetted before approval is given ; or
iv. a medical or dental practitioner.

6.5 Personnel Monitoring And Radiation Protection Programme

6.5.1 The licencee shall **provide personnel monitoring devices** for the person(s) who operate(s) the irradiating apparatus

6.5.2 The personnel monitoring devices shall be **film badges, thermoluminescene dosimeters (TLD) or other approved monitoring devices.**

6.5.3 The **film badge service** shall be obtained from ;

Director General,
Malaysian Institute for Nuclear Technology Research (MINT),
Ministry of Science, Technology and Environment,
Bangi, 43000 Kajang.

6.6 Irradiating Apparatus

6.6.1 The irradiating apparatus used shall be of the **approved type.**

6.6.2 In an institution in which there is only one irradiating apparatus, the apparatus **shall be of 11 kW power (100 mA at 110 kV).** With a high power apparatus the quality of radiographs will be upgraded and radiation hazards will be reduced.

6.6.3 The **performance and safety standard** of the apparatus and associated facilities shall meet the requirements as contained in **Malaysian Standard (MS 838 : 1985) : Code Of Practice For Radiation Protection (Medical X-Ray Diagnosis).**

6.7 Description Of The Room Where The Apparatus Will Be Installed And Other Associated Facilities

6.7.1 The detailed layout plan submitted for evaluation shall clearly specify the following information ;

i. **location and dimension** of the room ;
ii. **material used** and **thickness** of the **wall, ceiling and floor** (*to be state in term of lead equivalent thickness*);
iii. **position, size and material used** for the **windows, doors** and **other openings** (*to be state in term of lead equivalent thickness*);
iv. **position of the apparatus** in the room and the **position of the operating console** ;
v. **use of spaces/rooms adjoining to the room** including those above and below ;
vi. **radiation warning light/sign** at the door of the room ;
vii. position and dimension of the **dark room.**

6.7.2 All plans shall be in **technical drawings** and the scale shall be in **metric (S.I.) unit.**

6.7.3 All dimensions shall meet minimum standard specified in **Malaysian Standard (MS 838 : 1985) : Code Of Practice For Radiation Protection (Medical X-Ray Diagnosis).** The dimensions of the room where the apparatus will be installed and other associated facilities are summarized in **Appendix 5.**

Note : The applicant is advised not to initiate the construction of the room where the irradiating apparatus will be installed until the plan submitted for evaluation is approved.

6.8 Installation and Certification

6.8.1 **Certificate and Summary of Performance and Safety Test of the apparatus and associated facilities** after installation shall be completed and duly signed by an **accredited consultant;** dental and veterinary x-ray are not subjected to this requirement.

6.8.2 The **perfomance and safety standards of the apparatus and other associated facilities** shall conform to the requirements outlined in the **MS 838** document and/or other international standards. **Appendix 2** show the summary of the performance and safety standards for diagnostic radiology equipment and associated facilities.

6.9 Accredited Consultant

An accredited consultant shall possess **a valid Class H (certification) licence** issued by the Director General of Health Malaysia.

Appendix 1 : LICENCE FEE FOR THE IRRADIATING APPARATUS

i) Licence fee according to categories

Category	Type of irradiating apparatus	Licence fee per year
1	Dental X-ray units, mobile and fixed medical X-ray units, mobile veterinary X-ray units, X-ray gauges, other irradiating apparatus not specified in this table	**RM100.00** for the **first** apparatus **RM20.00** for **every additional** apparatus
2	Industrial radiography X-ray units, X-ray analysis units, chiropractic X-ray units, X ray therapy units not operable above 500 peak kilovolt	**RM300.00** for the **first** apparatus **RM60.00** for **every additional** apparatus
3	Computerised tomography units, accelerators, neutron generators, X-ray therapy units operable above 500 peak kilovolt	**RM1000.00** for the **first** apparatus **RM200.00** for **every additional** apparatus

ii) Licence fee for the sale or transfer of the irradiating apparatus

Licence fee in respect of the sale or transfer of irradiating apparatus shall be **RM200.00 (Ringgit Malaysia two hundred only) per year** for each licence **irrespective of the number or category** of apparatus to be sold or transferred.

iii) Payment of licence fee

Payment of the licence fee shall be made payable to the **Ministry of Health Malaysia in the form of money order / postal order / crossed cheque.**

Appendix 2: PERFORMANCE AND SAFETY STANDARDS AND CRITERIA FOR DIAGNOSTIC RADIOLOGY EQUIPMENT AND ASSOCIATED FACILITIES

Appendix 2A : Performance and Safety Standards for Processing Facilities

Parameters	Optimum Achievable Standard	Frequency
i. Condition of the darkroom	▪ *No light leakage*	*Annually*
ii. Conditions of all the cassettes	▪ *No light leakage* ▪ *Film and screen should be in good contact*	
iii. Sensitometry	*Base + fog index should be* ▪ *less than 0.20 OD (mammogram)* ▪ *less than 0.25 OD (other than mammogram)* *Variation of speed index should be less than 10%* *Variation of contrast index should be less than 10% daily*	*Daily*

Appendix 2B: Leakage and Scattered Radiation

No	Parameters	Optimum Standard	Frequency
1.	*Exposure rate at every occupied area outside the x-ray room and at the position normally occupied by the operator at the control area*	*0.1mGy (10mR) per week*	*Annually*
2.	*Exposure from the leakage radiation at 1m from the x-ray tube in an hour at every rating specified by the manufacturer*	*0.1mGy (10mR)*	*Annually*

Appendix 2C : Performance and Safety Standard : General X-Ray Equipment

No	Parameters	Optimum Achievable Standard	Frequency
1.	*X-Ray Generator*		
	i) Accuracy of kVp	*Maximum deviation : 5% or 5 kV whichever is greater*	
	ii) Accuracy of exposure time	*Maximum deviation: 10 %*	*Semi-annually*
	iii) Exposure reproducibility	*Maximum deviation: 10 %*	
	iv) Exposure linearity	*Maximum deviation: 10 %*	
2.	*X-Ray Beam Limitation*		
	i) Beam collimation	*Maximum misalignment: 2 % of source-image distance (SID)*	*Semi-annually*
	ii) Beam perpendicularity	*Less than 2^{o}*	
3.	*X-Ray Beam Filtration*	*refer to Appendix 2C-1*	*Acceptance*
4.	*Image Quality*		
	i) Resolution	*Please specify the resolution and contrast and attach test films*	*Semi-annually*
	ii) Contrast		

Appendix 2C-1: Useful Beam Filtration and Half-Value Layer (HVL) Requirements

i) Minimum total filtration in the useful beam

Normal operational kVp of the apparatus	*Minimum total filtration in the useful beam*
Below 70 kVp	*1.5 mm Al equivalent*
70 kVp to 100 kVp	*2.0 mm Al equivalent*

Above 100 kVp	*2.5 mm Al equivalent*

ii) Half-Value Layer (HVL)

Tube voltage operating range	*Measured operating potential*	*Minimum HVL (mm Al)*
Below 50 kVp	30	0.3
	40	0.4
	49	0.5
50 kVp to 70 kVp	50	1.2
	60	1.3
	70	1.5
Above 70 kVp	71	2.1
	80	2.3
	90	2.5
	100	2.7
	110	3.0
	120	3.2
	130	3.5
	140	3.8
	150	4.1

Appendix 2D : Performance and Safety Standard : Computer Tomography Scanner

No.	Parameters	Optimum Standard	Frequency
1.	*X-Ray Generator*		
	i) Accuracy of kVp	*Maximum deviation: 5% or 5 kV*	*Semi- annually*
	ii) Accuracy of tiub current	*Maximum deviation: 5%*	
	iii) Accuracy of exposure time	*Maximum deviation: 10%*	
	iv) Exposure linearity(mR/mAs)	*Maximum deviation: 10%*	
2.	**Radiation Dosimetry**		
	i) Patient dosimetry (CTDI)	*± 20% of nominal value*	*Semi-annually*
	ii) Scout localisation image	*± 20% of nominal value*	
3.	*Scan Localization*		
	i) Axial scan localisation light accuracy	*± 2mm*	*Semi-annually*
	ii) Isocenter alignment, sagittal and coronal localisation light accuracy	*± 5mm*	
	iii) Gantry (or table) tilt accuracy	*± 3^{o}*	
	iv) Table index and position	*± 0.5mm - 2.0mm*	
	v) Image scan width (sensitivity profile)	*± 1mm (≥5mm prescribed scan width), ± 0.5mm (<5mm prescribed scan width)*	
	vi) Radiation dose profile	*± 1mm*	*Semi-annually*
	vii) Accuracy of scan prescription from scout localisation image	*± 1mm*	*Annually*
4.			
	i) Visual display	• *Luminance and contrast not significantly different from hard copy output*	*Daily*
		• *Geometric distortion not exceed ± 1mm*	
	ii) Hard copy display	• *5% and 95% patches must be visible, no noticeable artifacts*	*Daily*
		• *Geometric distortion not exceed ±1mm*	*Monthly*
		• *Optical density values must be within specified range*	
5.	*Image Quality*		
	i) CT number uniformity	*± 5HU*	*Monthly*
	ii) Image artifacts (transaxial and scan localsation images)	*No significant artifacts*	
	iii) Noise	*Standard deviation of CT numbers varies as reciprocal square root of mAs*	*Semi-annually*
	iv) Low contrast resolution	*5mm*	*Monthly*
	v) High contrast resolution	*1mm holes (5lp/cm)*	*Monthly*

6.	**Quantitative Accuracy**		
	i) Accuracy of distance measurements (transaxial and scan localisation images)	*± 1mm*	*Annually*
	ii) CT number calibration	▪ *Water: 0 ± 1.5HU* ▪ *Air: -1000 ± 3HU*	*Monthly*
	iii) CT number constancy	*Value and standard deviation for water remains relatively constant*	*Daily*
	iv) CT number dependence on scan thickness	*± 3HU*	*Semi-annually*
	v) CT number dependence on phantom size	*± 20HU*	*Semi-annually*
	vi) CT number dependence on phantom position	*± 5HU*	*Annually*
	vii) CT number dependence on reconstruction algorithm	*± 3HU*	*Annually*

Appendix 2E : Performance and Safety Standard : Fluoroscopy / Angiography Equipment

No.	Parameters	Optimum Standard	Frequency
1.			
	i) Accuracy of kVp	*Maximum deviation: 5% or 5kV, whichever is greater*	*Semi-annually*
	ii) Accuracy of exposure time	*Maximum deviation: 10%*	
	iii) Fluoroscopic timer	*Must provide an audible signal to the fluoroscopist at intervals not exceeding 5 minutes and provision must be made for the display to be set to zero for each patient*	
	iv) Exposure reproducibility	*Maximum deviation: 10%*	
	v) Exposure linearity	*Maximum deviation: 10%*	
2.	**X-Ray Beam Limitation**		
	i) Beam collimation	*Maximum misalignment : 2% of source-image distance (SID)*	*Semi-annually*
	ii) Beam perpendicularity	*Less than 2^0*	
3.	**X-Ray Beam Filtration**	*Refer to Appendix 2C-1*	*Acceptance*
4.	*Video Voltage output – calibrated beam at 70 kV and 1mm copper filter, in accordance with manufacturers' specifications*	• *V_o should be between 0.6V and 1.0 V although some systems give only 0.3 V_{max} even when correctly adjusted* • *Sync Pulse V_s should be between 0.3V and 0.4V* • *Difference between blanking and black level should be between 0.05 and 1.0 V* • *The imperfect transition from black to white levels denoted by V_x should not be more than 0.15 V_o*	*Semi-annually*

		more than 0.15 V_o	

5.	*Image Quality (Subjective Assessment)* *a) Grey scale* *b) Limiting resolution* *c) Low contrast test object (at air kerma rates in the range 0.3 1.0 mGy/s). Results obtained graphically* *d) Minimum visible details*	*A black spot and white spot and all ten steps of the step wedge should be visible* *36cm field: 0.9 – 1.0 line pairs/mm* *30cm field: 1.12 line pairs/mm* *23cm field: 1.2 line pairs/mm* *15cm field: 1.6 line pairs/mm* *36cm field : 4%* *30cm field : 3.5%* *23cm field : 2.7%* *15cm field : 1.9%* *Graphical comparison*	*Semi-annually*
6.	*Minimum Focus to Skin Entrance Distance*	*i) Patient support permanently between x-ray tube and patient* • *Undertable x-ray tube: 400mm between x-ray tube focal spot and patient support* • *Overtable x-ray tube: 700mm between x-ray tube focal spot and patient support* *ii) Patient support may or may not be permanently in the useful x-ray* • *Mobile C-arm: 200mm between x-ray tube focal spot and patient's skin* • *Other fluoroscopic apparatus: 700 mm between x-ray tube focal spot and input surface of the image intensifier* *In operating a mobile fluoroscopic x-ray apparatus, the distance between the x-ray tube focus and the patient entrance surface should be as large as practicable and preferably not less than 300mm*	*Annually*
7.	Image Intensifier Input Dose Rate	*Maximum dose rate* • *120mGy/min for field size of 11 to <14cm* • *90mGy/min for field size of 14 to <23cm* • *60mGy/min for field size of ³23cm*	*Annually*
8.	Entrance Surface Dose Rate Limit	*With AEC: < 100mGy per minute* *Without AEC: < 50mGy per minute*	*Annually*

Appendix 2F : Performance and Safety Standard : Mammography Equipment

No.	Parameters	Optimum Standard	Frequency
1.	*X-Ray Generator* *i) Accuracy of kVp* *ii) Reproducibility*	 *Maximum deviation: ±2% of nominal kVp* *kVp coefficient of variation: <0.02*	 *Semi-annually*
2.	*Collimation Assessment*	*Maximum misalignment: 2% of source-image distance (SID)*	*Semi-annually*
3.	*Radiation Leakage* *i) 1 m from the focus* *ii) 30 cm from focus on chest wall side of collimator*	 ≤ 1mGy/h ≤ 10µGy/100mAs	 *Annually*
4.	*Focal Spot Size Measurement*	F_{perp} *or* $F_{parallel} \leq 2.0 \times F_{nom}$	*Acceptance*
5.	*Beam Quality (HVL) Measurement*	*Measured HVL <kVp / 100 (in mm Al) or measured HVL <kVp / 100 + 0.1 (in mm Al)*	*Acceptance*
6.	*Automatic Exposure Control (AEC) System Performance* *i) Reproducibility* *ii) Performance capability* *iii) Density control function*	 Coefficient of variation for mAs or O.D < 0.5 *O.D. range < ±0.3 of mean O.D.* *mAs and O.D. should increase as density setting is increased*	 Semi-annually
7.	*Breast Entrance Exposure and Average Glandular Dose*	*Average glandular dose <3 mGy (300 mrads) for 4.5cm effective breast thickness*	*Annually*
8.	*Image Quality Evaluation (RMI 156 phantom)* *a) Optical density at centre of phantom* *b) mAs or exposure time* *c) Minimum score*	 *Between 1.10 and 1.50 at 28kVp. Should not change by more than ±0.20* *Should not change by more than ±15% from 1 phantom image to another* *Should be able to image at least* • *4 of the 0.75mm nylon fibres* • *3 of the 0.32 simulated micro-calcification* • *3 of the 0.75mm tumour-like mass*	 *Monthly*

Appendix 3 : *AUDIT OF X-RAY RADIOGRAPHS*

10 X-ray films will be selected at random from every GPs' clinics for the purpose of audit. A panel of radiologist will audit these x-rays. The radiographs will be audited using the following criteria;

1. General Principles

1.1 Image Annotation

The patient identification, the date of examination, position markers and the name of the facility must be 'printed' legibly on the film. The annotation should not obscure the diagnostically relevant regions of the radiograph.

1.2 Patient Positioning

Correct patient positioning plays a major role in determining the success of any radiological examination.

1.3 X-ray Beam Limitation

X-ray beam should be limited to the smallest field giving the required diagnostic information. This will result in improved quality and reduced patient dose.

1.4 Film Processing

Optimal processing of the film has important implications both for the diagnostic of the image and for the radiation dose to the patient. Film processor should be maintained at their optimum operating conditions as determined by regular and frequent (i.e. daily) quality control procedure.

1.5 Image Viewing Conditions

Radiographs should be viewed under proper lighting condition for proper assessment and accurate reporting.

2. Good Image Criteria

2.1 PA Chest Radiograph

2.1.1 Performed at deep inspiration (as assessed by the position of the ribs above the diaphragm – either 6 anteriorly or 10 posteriorly) and with suspended respiration.

2.1.2 In a correct exposed film, the degree of penetration should be such that the ribs and spine, but not the intervertebral disc space are visible through the heart shadow.

2.1.3 Symmetrical reproduction of the thorax (inner end of the clavicles are equidistant from the spinous process of the thoracic vertebrae.

2.1.4 Medical border of the scapulae to be outside the lung fields.

2.1.5 Reproduction of the whole rib cage above the diaphragm.

2.1.6 Reproduction of the vascular pattern in the whole lung, particularly the peripheral vessels.

2.1.7 Visually sharp reproduction of

a) the trachea and proximal bronchi, the border of the heart and aorta;

b) the diaphragm and costo-phrenic angles.

2.1.8 Visualisation of the retrocardiac lung and the mediastinum.

2.2 Extremities

2.2.1 At least 2 projections at right angles to each other should be done.

2.2.2 Joints above and below should be included, in case of trauma.

2.2.3 Visually sharp reproduction of the cortex and trabecular structures.

2.2.4 Reproduction of the adjacent soft tissues.

3. Rating of Radiographs

a) Chest Radiographs	Score
1.1	1
1.3	1
2.1.1 to 2.1.8 (1 score each)	
Total	**10**

b) Extrimities Radiograph	Score
1.1	1
1.2	1
1.3	1
1.4	1
2.2.1	2
2.2.3	2
2.2.4	2
Total	**10**

For each radiograph a minimum score of 7 is required to pass the audit.

4. Audit Requirements

The Class H licencee/Consultant will give an audit report together with the certification of calibration of the x-ray unit to the doctor. The doctor will then submit these reports together with other licence requirements to MOH for the renewal of licence. GPs who fail the audit will be given a warning and a grace period to improve. If the GP fails the re-audit after the grace period his or her licence will be suspended.

5. Services Providers

5.1 The maintenance, periodic servicing and calibration of the x-ray unit will be done by the suppliers of the x-ray unit or any other qualified person approved by the appropriate authority.

5.2 The approved Class H licencee/Consultant who is appointed by licence holder and approved by appropriate authority will provide the following services:

i) Inspect and certify the calibration and maintenance of the x-ray equipment;

ii) Provide the x-ray audit services;

iii) Provide training for the doctors and x-ray machine operators;

iv) Provide advisory services to the doctor on the maintenance and operation of the x- ray services.

Appendix 4: *TRAINING OF PERSONNEL/OPERATORS*

Training programme for personnel/operators working in GPs' clinics is divided into two categories, i.e;

i) Category 1 (for licenced doctors and trained operators)

Licenced doctors and trained operators are required to undergo continuous medical education (CME) to update their knowledge on a yearly basis. The training syllabus should comprise of at least the following;

- radiation protection pertaining to the use of x-ray equipment;
- radiographic techniques;
- image quality criteria and requirements;
- x-ray reporting ; and
- management of QAP

ii) Category 2 (for doctors applying for new licences and new operators)

Doctors applying for new licences and newly employed operators are required to undergo the following courses before they are permitted to use the x-ray equipment;

Module/Topics	Credit Hours
Module 1: Radiation Safety Awareness	9
1. Basic Information on Ionising Radiation	1
2. Radiation Hazards and Effects of Ionising Radiation on Man	1
3. Principles of Radiation Protection	2
4. Basic Radiological Monitoring and Measurements	1
5. Safety Measures in Exposure Room	2
6. Radiation Safety Audit	1
7. Legislative Requirements	1
Module 2: X-Ray Equipment and Associated Facilities	10
1. Equipment, Components and Production of X-Ray	2
2. Characteristic of X-Ray, Effects and Control	1
3. Maintenance & Calibration of Equipment (x-ray machine, x-ray cassette/screen, darkroom/processors)	5
4. Quality Assurance: Image Production and Film Quality	2

Module/Topics	**Credit Hours**
Module 3: Clinical Practices	31
1. Introduction to Radiography	*1*
2. Overview of Anatomy & Topography ▪ *Chest* ▪ *Upper Extremities: Shoulder, Humerus, Scapula, Clavicle* ▪ *Upper Extremities: Forearm, Elbow, and Wrist, Hand* ▪ *Lower Extremities: Tibia/Fibula, Knee and Ankle, Foot* ▪ *Upper Extremities: Pelvis, Hip Joint, Femur*	*4*
3. Radiographic Techniques and Practical Demonstration & Practicle	*4*
- *Chest*	*2*
- *Foot*	*2*
- *Ankle*	*2*
- *Tibia/Fibula*	*2*
- *Knee*	*2*
- *Femur*	*2*
- *Hand and Wrist*	*2*
- *Radius/Ullna*	*2*
- *Elbow Humerus*	*2*
- *Shoulder*	*2*
4. Care and Maintenance in Film Processing, Film Fault, and Artefacts	*1*
5. Patient Cares and Handling	*2*
6. Record Keeping	*1*
Module 4: Radiographic Techniques and QAP	*21*
1. Radiography Techniques (positioning/coning) for Extremities and Chest	*4*
2. Radiographic Anatomy	*4*
3. Normal Chest X-ray & Criteria for Good Radiography	*2*
4. Interpretation of Normal X-rays (attachment)	*10*
5. QAP & Responsibility	*1*
Total (Modules 1, 2 & 3 - for operators)	**50**
(Module 1, 2 & 4 - for doctors)	**40**

Appendix 5 DIMENSION OF THE ROOM WHERE THE APPARATUS WILL BE LOCATED AND OTHER ASSOCIATED FACILITIES

Type of irradiating apparatus	**Dimension of the room** *(internal)*	**Dimension of the darkroom** *(internal)*	**Thickness of shielding at the door and wall**	**Dimension and thickness of lead at the wall** *(behind chest)*	**Dimension of lead glass window** *(thickness 2.0mm Pb equivalent)*	**Dimension and thickness of lead at the floor** *(if the premises is at the upper floor)*
General X-ray *(control panel inside- without table)*	2.5m x 4.0m	1.5m x 2.0m	2.0mm *Pb eq (*lead equivalent)	1.2m x 1.2m x 2.0mm Pb eq.	> 100kVp; 35cm x 30cm < 100kVp; 25cm x 20cm	1.2m x 2.5m x 2.0mm
General X-ray (*control panel inside - with table)*	3.0m x 5.0m	1.5m x 2.0m	2.0mm Pb eq	1.2m x 1.2m x 2.0mm Pb eq.	> 100kVp; 35cm x 30cm < 100kVp; 25cm x 20cm	1.2m x 2.5m x 2.0mm
General X-ray *(control panel outside - without table)*	2.5m x 3.5m	1.5m x 2.0m	2.0mm Pb eq	1.2m x 1.2m x 2.0mm Pb eq.	> 100kVp; 35cm x 30cm < 100kVp; 25cm x 20cm	1.2m x 2.5m x 2.0mm
General X-ray *(control panel outside - with table)*	2.5m x 4.0m	1.5m x 2.0m	2.0mm Pb eq	1.2m x 1.2m x 2.0mm Pb eq.	> 100kVp; 35cm x 30cm < 100kVp; 25cm x 20cm	1.2m x 2.5m x 2.0mm
Dental X-ray	2.0m x 3.0m	not applicable	1. 0 mm Pb eq	not applicable	not applicable	not applicable
X-ray OPG	2.5m x 3.5m	not applicable	1.5 0 mm Pb eq	not applicable	not applicable	not applicable
Flouroscopy	6.0m x 4.0m	1.5m x 2.0m	2.0mm Pb eq	not applicable	100cm x 50cm	1.2m x 2.5m x 2.0mm
Mammography	2.5m x 3.5m	1.5m x 2.0m	1.0mm Pb eq	not applicable	35cm x 30cm	not applicable
Angiography	6.5m x 4.5m	1.5m x 2.0m	2.0mm Pb eq	not applicable	100 cm x 50cm	1.2m x 2.5m x 2.0mm
C.T. Scanner	5.5m x 4.0m	1.5m x 2.0m	2.0mm Pb eq	not applicable	100 cm x 50cm	1.2m x 2.5m x 2.0mm