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RADIATION PROTECTION AUTHORITY OF ZIMBABWE

RADIATION PROTECTION ACT (CHAPTER 15:15)

CHECKLIST FOR INSPECTION OF MEDICAL X-RAY FACILITIES

A. GENERAL INFORMATION

(i) Name of Institution: ……

(ii) Address of facility: ……...

……

(iii) Telephone: ……....

(iv) Fax: ……..

(v) E-mail: ……..

(vi) Licence number: ……...

(vii) Name and qualifications of qualified experts:

(a) Radiation Safety Officer

Name: ……..

Qualification: ……..

Certification: ……...

Experience: …….

(b) Responsible Radiologist/Radiographer

Name: …….

Qualification: ……...……..

Certification: ……..

Experience: ……

(viii) Name and title of the responsible representative: ……..
…….....

B. VERIFICATION OF RADIATION SAFETY

Radiation generating equipment

Purpose	Type	Manufacturer (country , year)	Licence number	SN: Tube	SN: Generator	SN: Collimator	Max kV	Max mA	Weekly workload
	Compare the x-ray generator with application descriptions and the design specifications. Note any differences and determine the standards to which the devices were built.								

(i)

Identify any differences between inspected equipment and that approved by RPAZ:
……
……
……
……

(ii) Licensed Operators

Name and title	Licence Number

(iii) Operator's Shielding

	Yes	No
1) Are appropriate protective devices available and in use?		
(a) Protective barrier		
(b) Lead apron		
(c) Gonadal shields		

Identify any modifications/differences made from the standards set by RPAZ (e.g. shielding design, construction material, control cubicle…….

…….

……..

(iv) Safety, Control and Equipment design

		Yes	No
(a) Radiology			
1. Light beam diaphragm available?			
2. Diaphragm opening symmetrically?			
3. Grid movement satisfactory?			
4. Chest stand lead backing satisfactory?			
(b) Fluoroscopy			
1. Fluoroscopy screen brightness satisfactory?			
2. Table-screen alignment satisfactory?			
3. Beam confinement to screen at maximum field size and table to screen maximum?			
4. Shutter movement satisfactory?			
5. Footswitch	Available? Used?		
6. Diaphragm control knobs shielded?			
7. Red light provided inside the room?			
8. Room darkening adequate?			

(v) Warning Systems

		Yes	No
(a) Trefoil, exposure signals and posted explanation (e.g. audible or visible alarms, illuminated signs)	Provided? Legible? In local language?		
(b) Warning notices	Provided? Local language?		
(c) Security monitoring systems	Provided? Up to date?		

(vi) Facility design

		Yes	No
(a) Was a safety assessment by a qualified expert performed prior to any modifications			
(b) Is the treatment room protected from adverse environmental conditions (heat, moisture, etc)	Provided? Working?		
(c) Is fire detection and protection in the radiation areas (tested periodically)	Provided? Working?		
(d) Is the thickness and type of shielding appropriate	Provided? Working?		
(e) Mechanical door interlocks	Provided? Working?		
(f) Prevention of unauthorized personnel entering X-ray room and control cubicle.	Provided? Working?		
(g) Means of communication among personnel	Provided? Working?		

Describe any facility modifications/differences made from the standards set by RPAZ and considered in the safety assessment (e.g. shielding design, construction material, controls etc)……
……
……
……

(vii) Safety operations management

	Yes	No
(a) Is management knowledgeable about the certificate of authorization and its restrictions and requirements?		
(b) Does management provide adequate staffing levels?		
(c) Has management provided adequate powers to the radiation safety officer to stop unsafe operations?		
(d) Has management provided adequate monitoring equipment?		

(e) Does management provide adequate resources for personnel training (time, money)?		

(viii) Safety Operations- Technical

	Yes	No
(a) Does the radiation safety officer (RSO) have adequate knowledge and expertise?		
(b) Is the RSO convenient with the terms and conditions of the authorization certificate?		
(c) Has the RSO sufficient time to give priority to attention radiation safety?		
(d) Does the RSO conduct initial and continuing training of workers?		
(e) Does the RSO maintain adequate records to demonstrate worker and public protection?		

(ix) Investigation and Quality Assurance

		Yes	No
(a) Were there any incident or accident?			
(b) If so, were incident and or accident investigation reports prepared?			
(c) Were safety assessment reviewed or made based upon lessons learned from any accident or accidents at similar facilities			
(d) Is maintenance and repair work in accordance with manufacturers recommendations?	Scheduled? Performed?		
(e) Are quality assurance procedures performed?			
(f) Are maintenance/repair procedures	Schedule? Performed?		

C. VERIFICATION OF WORKER PROTECTION

(i) Classification of areas

		Yes	No
a) Are controlled areas demarcated?			
b) Are approved signs at access points?	Provided? Legible? Local language?		
i) Radiation warning notices	Provided? Legible? Local language?		
c) Are supervised areas demarcated?			
d) Are approved signs at access points?	Provided? Legible? Local language?		

(ii) Local rules and supervision

		Yes	No
a) Are rules established in writing?			
b) Do rules include investigation levels and authorized levels and the procedure to be followed when a level is exceeded?			
c) Are workers instructed in the implementing procedures?			
d) Do workers have adequate supervision to ensure rules, procedures, protective measures and safety provisions are followed?			
e) Specifically, are operating and working procedures for:			
i) Setting up controlled areas, including barriers and surveillance.	Provided? Adequate? Followed?		
ii) Set –up of exposures(radiation source output beam direction ,use of collimators, beam height);	Provided? Adequate? Followed?		
iii) Use of personal dosimetry and use of protective equipment such as alarming rate dosimeter	Provided? Adequate? Followed?		
iv) Performing repairs and maintenance of safety Systems	Provided? Adequate? Followed?		
v) Making surveys	Provided? Adequate? Followed?		
vi) Responding to alarm:	Provided? Adequate? Followed?		

(iii) Monitoring

	Yes	No
a) Do radiation workers have personnel dosimeters?		
b) Are the dosimeters:		
a. Worn properly?		
b. Calibrated?		
c. Exchanged at required frequency?		
c) Are personnel exposures within limits?		
d) Are area and portable survey instruments:		
a. Appropriate?		
b. Calibrated?		
c. Operational?		
d. Operational check performed before use?		
Record independent measurements made during the inspection……..…….. ……..……		

Type/Model No. of Survey Meter: …….		
Date last calibrated: ……..…		
Do the inspectors independent surveys agree with the survey results of the Facility RSO?		
Document any significant differences and any agreed upon plan to resolve the different results……		

D. VERIFICATION OF PUBLIC PROTECTION

i. Control of visitors

	Yes	No
a) Are visitors accompanied in controlled area?		
b) Is the adequate information provided to visitors entering controlled areas?		
c) Is there adequate control over entries into supervised areas and appropriate postings?		

ii. Sources of Exposure

	Yes	No
(a) Are the shielding and other protective measures optimized for restricted public exposure to x-ray operation?		
(b) Are the floor plans and arrangement of equipment appropriate considering public and adjacent to the installation?		

iii. Monitoring of public exposure

	Yes	No
(a) Are routine measurements made of dose rate at places occupied by the members of the public by the RSO or qualified expert?		
(b) Are the inspector-independent measurement in agreement with those made by RSO or qualified expert?		
(c) Do the survey measurements indicate that adequate shielding is provided so that dose rates outside controlled and supervised areas meet authorized radiation levels?		
Indicate any difference and assign reasons for the discrepancies: …… …… ……		
Type/Model/No of survey meter used: ……..		
Date of last calibration: …….		

E. EMERGENCY PREPAREDNESS

i. Emergency Plan

	Yes	No
(a) Is there a written plan?		
(b) Is the plan periodically reviewed and updated?		
(c) Does the plan take account of lessons learned from operating experience and accidents at similar facilities?		
(d) Have workers involved in implementing the plan received adequate training?		
(e) Have provisions been made for the plan to be rehearsed at suitable intervals (e.g. fire accident, exposure does not terminate at a present time)?		

F. MEDICAL EXPOSURE

i. Responsibilities

	Yes	No
(a) Are patients exposed unless prescribed by a qualified medical practitioner?		
(b) Are there adequately trained medical and paramedical staff available to discharge assigned duties?		
(c) Are diagnostic imaging and QA requirements fulfilled with the advice of a qualified expert in radiodiagnostic physics?		

ii. Justification

	Yes	No
(a) Are standards available and followed for radiological examination for screening of large populations or for occupational, legal, or health insurance purposes?		

iii. Optimization

	Yes	No
(a) Does newly acquired equipment conform to National Standards, or any applicable International Standards such as IEC and ISO?		
(b) Are acceptance tests performed by a qualified expert in radiodiagnostic physics before equipment is accepted for clinical use?		

iv. Operational Considerations

	Yes	No
(a) Do the medical practitioners, radiographers and other imaging staff select parameters such that their combination produces the minimum patient dose consistent with acceptable image quality and clinical purpose of the examination?		
(b) Are the radiological examinations causing exposure of the abdomen or pelvis of women who are pregnant avoided unless there are critical clinical reasons for such examinations?		
(c) Are examinations causing exposure of the abdomen or pelvis of women of reproductive capacity planned to deliver the minimum dose to any embryo or foetus?		

v. Calibration

	Yes	No
a) Is the calibration of the x-ray machine used for medical exposure traceable to a secondary standards dosimetry laboratory?		
b) Was calibration done during commissioning?		
c) Is calibration done after each maintenance and at regular intervals?		

vi. Clinical Dosimetry

	Yes	No
a) Are representative values of adult patient entrance surface doses measured for the most common diagnostic procedures and documented?		
b) Did any equipment failure, accident, error, mishap or other unusual occurrence with potential for causing a patient exposure significantly different from that intended to occur?		
c) If any incident/accident occurred: (i) Did the registrant / licensee estimate the dose received by the patient? (ii) Was the patient and his/her doctor informed about the incident/accident.		

vii. Verification Of Records

	Yes	No
a) Does the registrant/licensee display the authorization certificate?		
b) Are personal dosimetry records being kept?		
(i) Current dose and analyzed?		
(ii) Collective dose and analyzed?		
c) Are area Surveys records being kept?		
d) Are records for maintenance and repair being kept?		
e) Are clinical dosimetry records being kept?		
f) Are instruments tests and calibration records being kept?		
g) Are incident/accident records and reports being kept?		
h) Are training program records being kept?		

i) Is there evidence of health surveillance records?		
j) Is there documentation on audit and review of radiation safety program		

viii. Quality Assurance

	Yes	No
a) Are quality assurance measurements and verification of physical parameters done at the commissioning and periodically thereafter?		
b) Are written records of relevant procedures and result kept?		
c) Are verification of calibration and operating conditions of dosimetry and monitoring equipment kept?		
d) Are there procedures for verifying patient identification?		
e) Are regular and independent quality audit reviews done?		

ix. Darkroom Procedures

	Yes	No
a) Is the darkroom light proof checked?		
b) Are film storage conditions satisfactory?		
c) Cassette PACs box available?		
d) Timer available?		
e) Are daily darkroom QC performed? (i.e. base+fog,speed Index& contrast Index)?		
f) Temperature control in the dark room adequate?		

x. Film Processing

(a) Type of film used……
(b) Film developed/weak……..
(c) Type of developer……
(d) Developing Time……..
(d) Frequency of change of processing solutions……
(e) Type of Processor…….

xi. Investigation of accidental medical exposures

	Yes	No
a) Were investigations done where a diagnostic exposures was substantially greater than intended or resulting in dose repeatedly and substantially greater than guidance levels?		

G. INSPECTION FINDINGS

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H.RECOMMENDATIONS

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Name of Inspector……

Facility representative……..……

Date……..