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GUIDELINE FOR MONITORING OF RADIATION WORKERS IN A THEATRE

This document has been prepared to serve as a guideline in monitoring Radiation workers in a Theatre. It represents South African Health Products Regulatory Authority's (SAHPRA's) current thinking on the safety, quality and efficacy of medicines. It is not intended as an exclusive approach. SAHPRA reserves the right to request any additional information to establish the safety, quality and efficacy of medicines and may make amendments in keeping with the knowledge which is current at the time of consideration of safety data.

Document History

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Glossary

Abbreviation/ Term	Meaning
ALARA	As Low As Reasonable Achieveable
ICRP	International Commission of Radiation Protection
NCRP	National Commission of radiation Protection and Measurements
Effective Dose	is a biological dose commonly used in radiation protection, as it determines how dangerous an individual's exposure to radiations can be
Occupational exposure	Radiation exposure to persons classified as radiation workers
Equivalent Dose	Refer to a radiation dose absorbed by a specific organ or any part of the body

1. INTRODUCTION

All full-time theatre personnel must be monitored with dosimeters. In cases where the workload of the X-Ray unit is very low, the requirement for the monitoring of workers must be determined individually. Radiographers are responsible to distribute dosimeters to staff before commencing with fluoroscopy. Without eye protection wear dosimeter outside the apron at the collar facing the source of exposure.

1.1 Purpose

The purpose of personnel monitoring is to provide early notice if your exposure is not below the limits and kept ALARA. The monitoring program also provides a permanent record of your exposure.

1.2 Scope

The recommendations of this document are based on the international commission of radiation protection (ICRP) and National Council of Radiation Protection and Measurements (NCRP).

2. LEGAL PROVISION

The guideline is implemented in promulgating the Hazardous Substances Act 15, 1973 (Act15 of 1973). Provisions regarding medical control and monitoring of radiation workers is stipulated in the Regulation No.R 1332 of 3 August 1973.

3. RECOMMENDATIONS AND REQUIREMENTS

3.1 ICRP Recommendations

3.1.1 ICRP 60 (Paragraph 266)

“In occupational exposure, it is usually feasible to monitor the doses received by individuals. Often, however, there is no clear-cut line between workers closely involved with radiation sources and others who are exposed only casually, either because they are rarely present in the relevant locations or because they are remote and receive only trivial doses. To avoid a wasteful use of resources in monitoring and record keeping, it is necessary to identify groups of workers for whom individual monitoring is needed”.

3.1.2 ICRP 60 (Paragraph 267)

“The decision to provide individual monitoring for a group of workers depends on many factors. Some of these are technical and others are concerned more with industrial relations. The decision should be taken by the operating management but should be subject to review by the regulatory agency. Three major

technical factors should influence the decision; the expected level of dose or intake in relation to the relevant limits, the likely variations in the dose and intakes, and the complexity of the measurement and interpretation procedures comprising the monitoring programme”.

3.1.3 ICRP 35 (Paragraph A.10)

“If it can be established by survey or by a limited program of individual monitoring that operating procedures are of a high standard, some types of work can be identified as calling for no routine individual monitoring. Examples of these types of work are as follows:

- a) non-radiological work in departments which deal with X-Ray and gamma-ray radiography;
- b) dental radiography; and
- c) process work on industrial processes involving radiological control of measurement, e.g. thickness and level gauging.”

3.1.4 Dose Limits

Table 1: ICRP Recommended dose limits

DOSE LIMITS		
Application	Dose limit	
	Occupational	Public
Effective dose	20 mSv per year, averaged over defined periods of 5 years (not more than 50 mSv in any one year)	1 mSv in a year
Annual equivalent dose to the		
lens of the eye	20 mSv	1 mSv
skin	500 mSv	50 mSv
hands and feet	500 mSv	-----

3.2 Requirements

In view of the above-mentioned recommendations of the ICRP, the following requirements are valid for a theatre:

- 3.2.1 All full-time theatre personnel must be monitored. In cases where the workload of the X-Ray unit is very low, the requirement for the monitoring of workers must be determined individually.

- 3.2.2 Workers that do not need to perform duties on a regular base, say every third or fourth month, may be exempted from being monitored. This exemption must be re-evaluated, however, should the workers mentioned in paragraph 1 receive a higher dose than the permissible limit (see Table).
- 3.2.3 Every licence holder shall regularly estimate the dose to those workers who routinely work in a designated area but who are considered unlikely to receive an effective dose or an equivalent dose greater than three- tenths of the relevant occupational dose limits referred to in the Table.

3.3 NCRP Recommendations

3.3.1 NCRP Report No.102

The regulatory requirement is guided by the NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS as stated in NCRP Report No. 102 regarding the following aspects:

- 3.7.4 (h) “Only persons whose presence is necessary shall be in the theatre during exposures. All such persons shall be protected (e.g., provided with leaded aprons, leaded gloves, eye protection (leaded glasses), thyroid shields and/or portable shields)”.
- (j) “The operator shall stand behind a barrier if possible and shall observe the patient during radiographic exposures.”
- (q) “People who must move around the room during the procedure should wear a wraparound protective garment.”
- (aa) “When possible, the specialist and all other personnel required in the room should step back from the table and behind portable shields during fluoroscopy and serial radiography procedures. Comment: This action can decrease the exposure of the specialist and other personnel by a factor of three or more.”
- (cc) “All personnel not required in the room shall leave the room during serial radiographic exposures.”

3.3.2 Radiation Control Recommendation

It can thus be stressed that all full-time personnel in the theatre must be monitored and that eye protection (leaded glasses) shall be added to the list in paragraph (h). The Department accepted the recommendations of the ICRP 57 (Radiological Protection of the Worker in Medicine and Dentistry) regarding protective aprons and gloves, namely “If workers cannot remain in the protected area when the X-Ray machine is

operated, they shall wear a protective apron of at least 0.25 mm lead equivalent. As far as reasonably practicable they should occupy areas of the room where the levels of radiation exposure are low. Any person required standing within 1 metre of the X-Ray tube or patient shall wear a protective apron of at least 0.35 mm lead equivalence, eye protection (leaded glasses) and thyroid protection. Protective gloves should be of at least 0.35 mm lead equivalence. All such protective clothing should bear an identifying mark and shall be examined for holes and cracks at 3 monthly intervals and if suspect perform an X-Ray test. Defective items should be withdrawn from use.

4. REFERENCES

The following related documents are referenced:

- 4.1 ICRP, 1982. General Principles of Monitoring for Radiation Protection of Workers. ICRP Publication 35. Ann. ICRP 9 (4)
- 4.2 ICRP, 1991. 1990 Recommendations of the International Commission on Radiological Protection. ICRP Publication 60. Ann. ICRP 21 (1-3)
- 4.3 ICRP ref 4825-3093-1464 (21 April 2011). <https://www.icrp.org/docs/2011%20Seoul.pdf>
- 4.4 National Council on Radiation Protection and Measurements (1989) NCRP Report No 102: Medical X-Ray, Electron Beam and Gamma-Ray Protection for Energies up to 50 MeV (Equipment Design, Performance and Use)
- 4.5 South Africa, 1973. Hazardous Substances Act, 1973 (Act of 15 of 1973). <https://www.sahpra.org.za/radiation-control-acts-and-regulations/>
- 4.6 South Africa, 1973. Regulations Concerning the Control of Electronic Products. Regulation Gazette No 3991. <https://www.sahpra.org.za/radiation-control-acts-and-regulations/>

5. VALIDITY

This guideline is valid for a period of 5 years from the effective date of revision and replaces the old guideline for Monitoring of Radiation Workers in a Theatre, revised November 2011. It will be reviewed on this timeframe or as and when required.