 Eskom	Standard	Nuclear Operating Unit
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Title: **Radiation Protection requirements for baggage inspection X-Ray devices**

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Area of Applicability: **Eskom Holdings SOC Ltd**

Functional Area: **Radiation Protection**

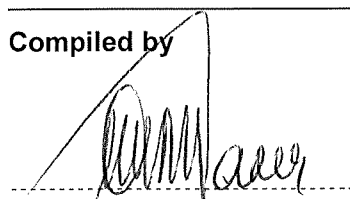
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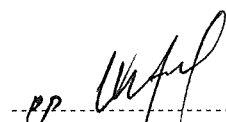


M Maree

Corporate Specialist  
Radiation Protection

Date: 17.12.2019

Functional Responsibility

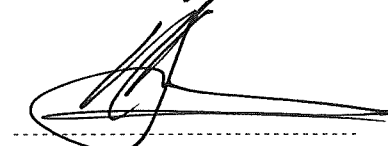


KG Featherstone

Senior Manager  
Nuclear Strategy and  
Regulation

Date: 2019/12/17

Authorized by



MR Bakardien

Chief Nuclear Officer

Date: 2019-12-17

## Nuclear Additional Classification Information

Business Level: 2

Working Document: 3 – For Reference

Importance Classification: **Applicable to Radiation Protection and Safety of Radiation Sources**

NNR Approval: **Yes – K26060N dated December 2019**

Safety Committee Approval: **No**

ALARA Review: **Yes**

Functional Control Area: **Radiation Protection**

### Note

***With the changes to the Eskom structure the names in documents will be inconsistent for a period of time***

***The terms Nuclear Division, Nuclear Operating Unit are to be seen as referring to the integrated high level description of the Koeberg Operating Unit***

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## **1. Introduction**

Insert text here.

This standard specifies the radiation protection requirements relating to baggage inspection X-ray devices for the Eskom Generation Divisions in terms of the Eskom Radiation Protection Policy EPL 32-227 and Standard EST 32-226. Eskom is committed to ensure that nuclear and radiation safety receives the highest priority to provide for the protection of persons and the environment against harmful ionising radiation in accordance with the safety principles and requirements addressed in the Eskom Radiation Protection Policy and Standard.

## **2. Supporting Clauses**

### **2.1 Scope**

#### **2.1.1 Purpose**

This standard specifies the radiation protection requirements for baggage inspection X-ray devices in terms of Eskom Policy 32-227, Eskom standard 32-226 and the Nuclear Division Manual 238-19 relating to radiation protection and safety of radiation sources.

#### **2.1.2 Applicability**

This procedure is applicable to Group III hazardous substances (electronic products) defined in the Nuclear Division Radiation Protection Manual 238-19.

#### **2.1.3 Effective date**

The document is effective from the authorisation date.

### **2.2 Normative/Informative References**

The following normative references contain provisions that, through reference in the text, constitute requirements listed in this document. Parties using this document shall apply the most recent edition of the documents listed below, unless otherwise specified in the applicable statutory and regulatory requirements.

#### **2.2.1 Normative**

[1] ISO 9001 Quality Management Systems

[2] EST 32-226: Eskom Standard, Requirements and rules for radiation protection and the safety of radiation sources.

[3] EPL 32-227: Eskom Policy, Radiation Protection and safety of radiation sources.

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[4] 238-19: Nuclear Division Radiation Protection Manual.

[5] 238-43: Requirements for Radiation Workers.

### 2.2.2 Informative

The following informative references were used during the development of this document. Although listed, the informative references are not mandatory requirements.

[6] 238-1: Nuclear Division Integrated Management System

## 2.3 Definitions

**2.3.1 Approved:** Approved by the Directorate: Radiation Control, Department of Health.

**2.3.2 Authority:** Written authority issued by the Directorate: Radiation Control, Department of Health.

**2.3.3 Detector:** The image receptor or other device that interacts with X-rays to produce a signal corresponding to the intensity of the x-rays incident on it.

**2.3.4 Exposure:** The act or condition of being subjected to irradiation.

**2.3.5 Functional radiation monitor:** A radiation-monitoring instrument with a valid calibration certificate that has been source-response checked.

**2.3.6 Eskom:** is used for Eskom Holdings SOC Limited, its divisions and wholly owned subsidiaries.

**2.3.7 Group III hazardous substance:** Any electronic product generating X-rays.

**2.3.8 Ionising radiation:** Radiation capable of producing ion pairs in biological material(s).

**2.3.9 Model designation:** Any combination of letters or figures by which a device that bears that designation is identified as having characteristics and design features that are uniform.

**2.3.10 Monitoring:** The measurement of dose or contamination, for reasons related to the assessment or control of exposure to radiation or radioactive substances, and the interpretation of results.

**2.3.11 Primary x-ray beam:** That x-radiation emitted directly from the target of the x-ray tube and emerging through the window of the x-ray generator.

**2.3.12 Protection and safety:** The protection of people against exposure to ionising radiation or radioactive substances and the safety of radiation sources, including the means for achieving such protection and safety, such as the various procedures and devices for keeping people's doses and risks as low as reasonably achievable.

**2.3.13 Radiation:** See ionising radiation.

**2.3.14 Radiation Protection Officer (Source control):** The Radiation Protection Officer (Source Control) is appointed by the Eskom Power Station or Installation Manager in writing to ensure that baggage inspection X-ray devices are controlled in accordance with the requirements contained in this standard. The Radiation Protection Officer (Source Control) shall have successfully completed the relevant Eskom training.

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**2.3.15 Radiation worker:** Any employee who is potentially exposed through his/her occupation to more than 1 mSv per year.

**2.3.16 Regulatory authorities:** Authorities designated by government for regulatory purposes in connection with radiological protection and occupational health and safety i.e. the National Nuclear Regulator and the Directorate: Radiation Control, Department of Health.

**2.3.17 Source:** Anything that may cause radiation exposure, by emitting ionising radiation or releasing radioactive substances or materials.

**2.3.18 Source container:** The shielding container in which a sealed radioactive nuclide is transported and stored.

**2.3.19 X-ray generator:** An assembly of components, including an x-ray tube and its housing and shielding, designed and constructed for the controlled generation of x-rays shall comply with requirements prescribed in Eskom standard, 238-43: Requirements for Radiation Workers

## 2.4 Abbreviations

Abbreviation	Explanation
ESKOM	Eskom Holdings SOC Limited, its divisions and wholly owned subsidiaries
mSv/h	millisievert per hour

## 2.5 Roles and Responsibilities

Not Applicable

## 2.6 Process for Monitoring

Not Applicable

## 2.7 Related/Supporting Documents

Not Applicable

## 3. Requirements

### 3.1 Administrative requirements

3.1.1 An application for authority to possess and use an X-ray device shall be submitted to the Directorate: Radiation Control, Department of Health.

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- 3.1.2 An application for authority to repair or dispose of an X-ray device shall be submitted to the "Directorate: Radiation Control, Department of Health".
- 3.1.3 Eskom shall appoint a Radiation Protection Officer (Source Control) as well as an Assistant Radiation Protection Officer for the control of baggage inspection X-ray devices.

## **3.2 Equipment Specifications**

- 3.2.1 A baggage inspection x-ray device shall be designed and constructed to include the following safety features:
  - 3.2.1.1 In order to limit the occurrence of stochastic effects, the effective dose to a worker shall not exceed 20 mSv per year; averaged over 5 years (100 mSv in 5 years), with a further provision that the effective dose may not exceed 50 mSv in any single year. (Footnote 3 and Footnote 5).
  - 3.2.1.2 Where applicable, interlocking of all doors or panels so that, if any of those doors or panels are opened, x-rays cannot be generated.
  - 3.2.1.3 Warning lights or other indicators that clearly indicate to the operator when the device is powered and when x-rays are generated.
  - 3.2.1.4 A lock that requires the insertion of a key before x-rays can be produced.
  - 3.2.1.5 The average radiation exposure rate, external to the device during operation, shall not exceed  $5 \times 10^{-3}$  mSv/h, at a distance of 50 mm from the device.
  - 3.2.1.6 The x-ray device shall have a model designation.

## **3.3 Requirements for operators**

- 3.3.1 Operators shall be trained to operate the x-ray device safely.
- 3.3.2 Operators do not have to be qualified radiation workers, however, a basic knowledge of radiation and the radiological hazards associated with operating the device is a prerequisite.

## **3.4 Requirements for warning signs**

- 3.4.1 The x-ray devices on Eskom premises shall be labelled with readily discernible signs bearing the radiation symbol and the words:
  - 3.4.1.1 "CAUTION – X-RAYS PRODUCED WHEN ENERGIZED" or words having a similar meaning, on the x-ray source housing; and
  - 3.4.1.2 "DO NOT INSERT ANY PART OF THE BODY WHEN SYSTEM IS ENERGIZED – X-RAY HAZARD" or words having a similar meaning on the x-ray source housing; and
  - 3.4.1.3 "TO BE USED BY AUTHORISED PERSONS ONLY" or words having a similar meaning.

## **3.5 Requirements for repairs and maintenance**

- 3.5.1 Permission shall be obtained from the "Directorate: Radiation Control, Department of Health" before sending X-ray devices from Eskom premises for repair and maintenance.

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- 3.5.2 The X-ray devices shall be switched off when any maintenance or repairs are conducted on the device. Radiation measurements shall be conducted during subsequent testing and before commissioning the unit after repairs or maintenance.

### **3.6 Radiation monitoring requirements**

- 3.6.1 Radiation monitoring shall be conducted routinely to measure ambient radiation levels while the x-ray device is energized.

### **3.7 Requirements for disposal**

- 3.7.1 Permission shall be obtained from the "Directorate: Radiation Control, Department of Health" before X-ray devices on Eskom premises are disposed of.

## **4. Acceptance**

The document was seen and accepted by:

<b>Name</b>	<b>Designation</b>
Conradie Thomas	Power Station Manager : Lethabo
Dean John	Middle Manager : Renewables
Featherstone Keith	General Manager : Nuclear Support
Fourie Julian	Senior Manager : Engineering
Govender Thegan	Senior Manager : Nuclear
Hector Jason	Senior Manager : Engineering
Jappie Shamiel	Power Station Manager : Arnot
Karsten Tersius	Middle Manager : Radiation and Protection
Khehla Shandu	Middle Manager : Projects
<b>Khumalo IF Phil</b>	
<b>Kuzelj Anthony</b>	
Lacock Ryno	Power Station Manager
Mkwai Gladman	Power Station Manager : Majuba
Mokoto Naomi	Senior Physicist : Nuclear
<b>Nair Julian</b>	
Nani Christopher	Power Station Manager : Kendal
Nemadodzi NM Marcus	Senior Manager : Deliver
Nicholls Dave	General Manager : Nuclear
Prince Shireen	Senior Manager : Projects
<b>Prinsloo Johan</b>	<b>Power Station Manager:</b>

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Rakgolela NM Karabo	Senior Manager : Projects
<b>Ramluckun Saluja</b>	
Van Geuns Arnold	Senior Manager : Technology
Van Niekerk Christo	Senior General Manager : Coal
Woodhall Douglas	Senior Consultant Engineering

## **5. Revision**

<b>Date</b>	<b>Rev.</b>	<b>Compiler</b>	<b>Remarks</b>
	0B	M Maree	
May 2012	0	M Maree	This radiation protection standard was compiled in accordance with the Nuclear Division Radiation Protection Manual, 238-19 and supersedes Eskom Standard ESKASACC9 and Generation Standard GGS 1310.

## **6. Development Team**

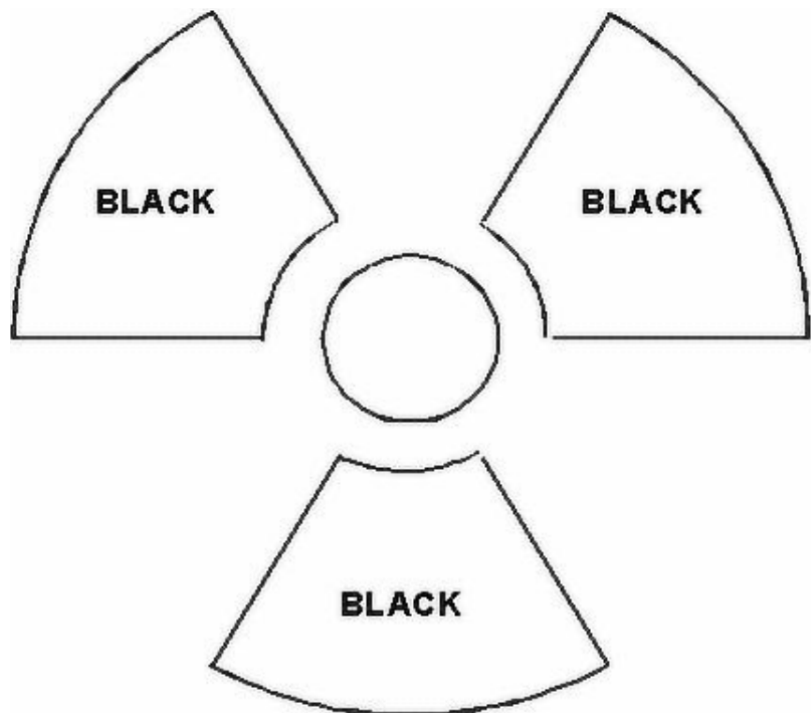
This document has been developed on behalf of the Generation Division by Marc Maree.

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## Appendix A: Radiation Trefoil Sign



BACKGROUND COLOUR OF:	
TREFOIL	BACKING
BLACK	YELLOW

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