

Document Preparation Profile (DPP)

1. IDENTIFICATION

Document Category **Safety Guide**

Working ID: **DS471**

Proposed Title: **Radiation Safety of X-ray Generators and Radiation Sources Used for Inspection Purposes and for Non-Medical Imaging**

Proposed Action: **new document**

Review Committee(s) or Group: **RASSC, WASSC, TRANSSC, NSGC**

Technical Officer(s): **Trevor Boal**

2. BACKGROUND/RATIONALE

This Safety Guide was included in the “Reference Set of Safety Guides for the Long Term” (2009).

The Safety Guide will provide guidance for implementing the Safety Requirements publication GSR Part 3 (Interim edition) “Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards” (the BSS) with regard to the safe use of X ray generators and other types of radiation sources that are used for inspection purposes and for non-medical imaging. The 2011 edition of the BSS (GSR Part 3) contains additional requirements over the 1996 edition in relation to human imaging for non-medical purposes, to strengthen the regulatory control over such practices.

The BSS defines an “inspection imaging device” as “an imaging device designed specifically for imaging persons or cargo conveyances for the purpose of detecting concealed objects on or within the human body or within cargo or a vehicle”.

In the past 10 years, there has been a large increase in the use of inspection imaging devices to screen postal items, baggage and cargo to detect concealed objects either within cargo or vehicles, or on or within the human body.

In relation to the screening of cargo and vehicles, guidance is required on the safe use of such equipment and in relation to protection of workers and the public. The use of such devices may lead to the inadvertent exposure of people inside the cargo (people smuggling), or the exposure of workers inside vehicles being screened, or of members of the public driving vehicles through screening devices.

The recently revised BSS strengthened the requirements in relation to human imaging for purposes other than medical diagnosis, medical treatment or biomedical research (non-medical imaging), by introducing requirements to ensure the regulatory control of such practices. It is not appropriate to include guidance on such practices in the draft Safety Guide DS399: Radiation Safety in Medical Uses of Ionizing Radiation. While some non-medical imaging procedures are carried out using medical radiological equipment, there are others that are carried out on specially designed equipment that is operated by non-medical personnel.

This Safety Guide is part of a series of Specific Safety Guides for facilities and activities such as industrial, research and educational uses of ionizing radiation e.g. for industrial irradiators, industrial radiography, nuclear gauges, isotope production facilities, well logging, and the use of radiation sources in research and education that have been published or are currently under development.

3. OBJECTIVE

The objective of the proposed Safety Guide is to provide guidance on safety measures specific to meet the requirements on the use of X ray generators and radiation sources for inspection purposes and for non-medical imaging. The Safety Guide will provide guidance on meeting the requirements of the

BSS and other relevant Safety Requirements publications in the Safety Standards Series in carrying out these practices.

4. JUSTIFICATION

There is currently no Safety Guide addressing the safety of X ray generators and other radiation sources used for inspection purposes, or on the protection of workers and the public from exposure due to such devices and due to undergoing non-medical imaging procedures. The draft Safety Guide DS401 deals with the justification of category 1 and category 2 practices for non-medical imaging, whereas this Safety Guide will deal with practical issues and radiation protection. The categorization of practices for non-medical imaging is briefly explained in Section 6 of this document.

5. PLACE IN THE OVERALL STRUCTURE OF THE RELEVANT SERIES AND INTERFACES WITH EXISTING AND/OR PLANNED PUBLICATIONS

This specific Safety Guide belongs to the thematic area of the application of radiation sources.

The proposed Safety Guide will provide recommendations of measures that should be taken to ensure fulfilment of the safety requirements included in the following documents:

1. INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, Safety Standard Series No. GSR Part 3 (Interim), (2011).
2. INTERNATIONAL ATOMIC ENERGY AGENCY, Governmental, Legal and Regulatory Framework for Safety, Safety Standard Series No. GSR Part 1 (2010).
3. INTERNATIONAL ATOMIC ENERGY AGENCY, Predisposal Management of Radioactive Waste, Safety Standard Series No. GSR Part 5, (2009).
4. INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Facilities Using Radioactive Material, Safety Standard Series No. WS-R-5, (2006).
5. FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANIZATION, OECD NUCLEAR ENERGY AGENCY, OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, PAN AMERICAN HEALTH ORGANIZATION, WORLD HEALTH ORGANIZATION, Preparedness and Response for a Nuclear or Radiological Emergency, Safety Standard Series No. GS-R-2, (2002).
6. INTERNATIONAL ATOMIC ENERGY AGENCY, Regulations for the Safe Transport of Radioactive Material 2012 Edition, Safety Standard Series No. SSR-6, (2012).
7. INTERNATIONAL ATOMIC ENERGY AGENCY, The Management System for Facilities and Activities, Safety Standard Series No. GS-R-3, (2006).
8. INTERNATIONAL ATOMIC ENERGY AGENCY, Safety Assessment for Facilities and Activities, Safety Standard Series No. GSR Part 4 (2009).

The proposed Safety Guide will take account of the guidance provided in, and will include references to, the following Safety Guides:

1. INTERNATIONAL ATOMIC ENERGY AGENCY, Building Competence in Radiation Protection and the Safe Use of Radiation Sources, Safety Standard Series No. RS-G-1.4 (2001).
2. INTERNATIONAL ATOMIC ENERGY AGENCY, Occupational Radiation Protection, Safety Standard Series No. RS-G-1.1 (1999).
3. INTERNATIONAL ATOMIC ENERGY AGENCY, Radiological Protection for Medical Exposure to Ionizing Radiation, Safety Standard Series No. RS-G-1.5 (2002).

4. INTERNATIONAL ATOMIC ENERGY AGENCY, Categorization of Radioactive Sources, Safety Standard Series No. RS-G-1.9 (2005).
5. INTERNATIONAL ATOMIC ENERGY AGENCY, Safety of Radiation Generators and Sealed Radioactive Sources, Safety Standard Series No. RS-G-1.10 (2007).
6. INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Safety of Gamma, Electron and X Ray Irradiation Facilities, Specific Safety Guide No. SSG-8, (2010).
7. INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Safety in Industrial Radiography, Specific Safety Guide No. SSG-11, (2011).
8. INTERNATIONAL ATOMIC ENERGY AGENCY, Regulatory Control of Radiation Sources, Safety Standard Series No. GS-G-1.5 (2004).
9. INTERNATIONAL ATOMIC ENERGY AGENCY, Decommissioning of Medical, Industrial and Research Facilities, Safety Standard Series No. WS-G-2.2, (1999).

Draft Standards

The proposed Safety Guide will interface with the following draft standards:

1. Justification of Practices, including Non-Medical Imaging, DS401.
2. Radiation safety in medical uses of ionizing radiation, revision of RS-G-1.5, DS399.
3. Occupational Radiation Protection, revision of RS-G-1.1, RS-G-1.2, RS-G-1.3, RS-G-1.6, and GS-G-3.2, DS453.
4. Radiation Protection of the Public and the Environment, DS432.
5. Radiation Safety in Well Logging, DS419.
6. Radiation Safety for Nuclear Gauges, DS420.
7. Radiation Safety of Radioisotope Production Facilities, DS434.
8. Radiation Safety and Regulatory Control for Consumer Products, DS458.
9. Decommissioning of Medical, Industrial and Research Facilities, revision of WS-G-2.2, DS403.
10. Radiation Safety of Radiation Sources used in Research and Education, DS470.
11. Decommissioning of Facilities, revision of WS-R-5, DS450
12. Preparedness and Response for a Nuclear or Radiological Emergency, revision of GS-R-2, DS457

Security publications

The proposed Safety Guide will interface with the following documents in the Nuclear Security Series:

1. INTERNATIONAL ATOMIC ENERGY AGENCY, Nuclear Security Recommendations on Radioactive Material and Associated Facilities, Nuclear Security Series No. 14, (2011).
2. INTERNATIONAL ATOMIC ENERGY AGENCY, Security in the Transport of Radioactive Material, Nuclear Security Series No. 9, (2008).
3. INTERNATIONAL ATOMIC ENERGY AGENCY, Security of Radioactive Sources, Nuclear Security Series No. 11, (2009).

6. SCOPE AND OVERVIEW

There are three distinct types of activities to be covered by the Safety Guide:

1. The use of inspection imaging devices that are used to detect concealed objects inside cargo or a vehicle. Cargo is a very broad term that would include postal items, baggage, or large containers transported by vehicles. The types of radiation sources used for such practices include X ray generators, linear accelerators, radioactive sources and devices generating neutrons. Co-60 sources used in some inspection imaging devices are category 2 sources according to RS-G-1.9. Some cargo may contain people and involve the inadvertent exposure of people.
2. The use of inspection imaging devices that are used to detect concealed objects on or within the human body. Such devices may be used to screen passengers to detect concealed objects on passengers prior to boarding aircraft, or on visitors to prisons etc, and include devices that generate an image from backscattered X rays or from transmitted X rays. These practices are classified as category 2 practices in the draft Safety Guide DS401.
3. The human imaging for purposes other than medical diagnosis, medical treatment or biomedical research conducted by medical personnel using medical radiological equipment. Such procedures are carried out to detect the smuggling of drugs inside the human body, for determination of age for legal purposes, the assessment of physiological suitability for a career or a sport, for immigration or emigration purposes, etc. These practices are classified as category 1 practices in the draft Safety Guide DS401.

These activities are planned exposure situations. They involve occupational exposure and public exposure. They do not cover medical exposures.

This Safety Guide will be divided into two parts.

The first part will cover the use of inspection imaging devices that are used for detection of concealed objects in cargo and vehicles.

The principal contents of this part of the Safety Guide will cover:

- Types and description of inspection imaging devices
- Justification
- Responsibilities of the regulatory body;
- Source strength and radiation type of imaging sources;
- Responsibilities of licensees;
- Radiation Protection Programme
- Optimization of protection and safety
- Protection of workers (workers operating equipment, workers driving vehicles undergoing screening process);
- Training of workers operating inspection imaging devices;
- Local rules;
- Protection of the public (dose constraints, protection of: people in vehicles undergoing screening process; people that may be inadvertently exposed during screening process);

- Safety of inspection imaging devices (design, etc);
- Radioactive waste management;
- Transport of radioactive material;
- Emergency preparedness and response;
- Testing and maintenance of inspection imaging devices.

The interface between safety and security for radioactive sources will also be addressed.

The second part will cover the non-medical imaging of humans. Such imaging can be carried out on either medical radiological equipment that is operated by radiological medical practitioners (category 1 practices) or on inspection imaging devices that is operated by non-medical personnel (category 2 practices).

The principal contents of this part of the Safety Guide will cover:

- Justification;
- Types and descriptions of imaging equipment;
- Source strength and radiation type of imaging sources;
- Responsibilities of the regulatory body;
- Responsibilities of the licensees;
- Protection of workers operating equipment;
- Training of workers operating inspection imaging devices;
- Local rules;
- Protection of individuals undergoing non-medical procedures, including the establishment of dose constraints;
- Safety of inspection imaging devices (design, etc);
- Testing and maintenance of inspection imaging devices.

The proposed table of contents below gives further details.

7. PRODUCTION SCHEDULE: Provisional schedule for preparation of the document, outlining realistic expected dates for:

STEP 1: Preparing a DPP	DONE
STEP 2: Approval of DPP by the Coordination Committee	September 2012
STEP 3: Approval of DPP by the Safety Standards Committees or the relevant group where appropriate	September 2012
STEP 4: Approval of DPP by the CSS	March 2013
STEP 5: Preparing the draft	2013-2014
STEP 6: Approval of draft by the Coordination Committee	March 2014
STEP 7: Approval by the Safety Standards Committees for	June 2014

submission to Member States for comments or the relevant group where appropriate	
STEP 8: Soliciting comments by Member States	July-October 2014
STEP 9: Addressing comments by Member States	November 2014
STEP 10: Approval of the revised draft by the Coordination Committee Review in NS-SSCS	March 2015
STEP 11: Approval by the Safety Standards Committees for submission to the CSS or the relevant group where appropriate	June 2015
STEP 12: Endorsement by the CSS	October 2015
STEP 13: Establishment by the Publications Committee and/or Board of Governors (for SF and SR only))	n/a
STEP 14: Target publication date	2016

8. RESOURCES

Estimated resources involved by the Secretariat (person-weeks) and the Member States (number and type of meetings)

2 Consultant meetings in 2013

1 Consultant meeting in 2014.

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