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1. IDENTIFICATION

IAEA Safety Standards Series No. SSG-11 (Rev. 1), Radiation Safety in Industrial Radiography

Working ID: DS540

Proposed Title: Radiation Safety in Industrial Radiography

Proposed Action: Revision of Specific Safety Guide SSG-11

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

Technical Officer(s): Margaret CERVERA, NSRW/RITS

2. BACKGROUND

IAEA Safety Standards Series No. GSR Part 3, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, establishes requirements for the protection of people and the environment from the harmful effects of ionizing radiation and for the safety of radiation sources. The implementation of these requirements helps to ensure that the number of people exposed to radiation and their doses are kept as low as reasonably achievable and helps to prevent incidents or to mitigate their consequences.

IAEA Safety Standards Series No. SSG-11, Radiation Safety in Industrial Radiography, is intended to implement the requirements of GSR Part 3 in respect of the radiation sources used in industrial radiography. However, the publication, issued in 2011, predates GSR Part 3 and several other relevant safety standards.

As proposed during a consultancy meeting in March 2022, the revised publication will keep the same title, while the table of contents will be updated and the publication will include additional safety and security aspects.

3. JUSTIFICATION FOR THE PRODUCTION OF THE PUBLICATION

The revision of SSG-11 is necessary as it predates (2011) the current safety requirements established in GSR Part 2 (2016), GSR Part 3 (2014), GSR Part 4 (2016), and SSR-6 (Rev. 1, 2018). A revision is needed to ensure the consistency with the current safety requirements and with the terminology of the IAEA Safety Glossary (2018 Edition).

Since the development of SSG-11, more experience has been gained in the application of industrial radiography, new techniques have emerged, and new modes of application are becoming widespread. The lessons from these developments and recorded events will be addressed in the revised Safety Guide.

Increasingly, there is an emphasis on the safety and security aspects of a source from cradle to grave. This needs to be reflected in the revised publication through addressing a wider target

audience and management of sources in planned exposure situations and emergency exposure situations.

RASSC (eight term 2021–2023) has assigned the revision of SSG-11 as priority 2.

4. OBJECTIVE

This Safety Guide will provide recommendations on how industrial radiography work should be conducted and how radiation sources used for industrial radiography should be handled within the framework of GSR Part 3 and other relevant IAEA safety standards.

The recommendations in this publication will also address SSR-6 (Rev. 1) and other relevant IAEA safety standards, Nuclear Security Series publications, and the Code of Conduct on the Safety and Security of Radioactive Sources.

The recommendations in this publication will be aimed primarily at regulatory bodies, competent authorities, operating organizations that are authorized to conduct industrial radiography work, including their managers, radiographers, radiation protection officers, as well as qualified experts within the field of radiation protection, designers, manufacturers, suppliers, distributors and maintenance servicing organizations of industrial radiography sources, equipment and facilities. The guidance will also be of interest to those who need industrial radiography services (i.e. clients or customers).

5. SCOPE

This Safety Guide will offer recommendations and guidance for ensuring radiation safety and nuclear security in industrial radiography. This includes conventional industrial radiography using X ray generators and gamma sources, as well as use of hand-held X ray generators, pulsed radiography, computed tomography (CT) scanners and accelerators for industrial radiography.

This Safety Guide will cover safety and nuclear security measures to be applied throughout the lifetime of a source, i.e. from cradle to grave. Namely, it will address safety and nuclear security measures to be applied by a manufacturer of sources and equipment, import and export, maintenance, use of radiation sources in different configurations (on site, in shielded enclosures, and using cabinets), during transport of radioactive sources, and during the management of disused sources. Recommendations will be provided for planned exposure situations and emergency exposure situations related to industrial radiography.

The use of gamma radiography underwater and the use of neutron radiography are relatively rare. These techniques require specific safety assessments and procedures. These techniques will not be specifically addressed in this publication, although measures such as provision of adequate shielding and ensuring that radiation doses are kept as low as reasonably achievable are applicable.

Recommendations relating to techniques of industrial radiography, such as techniques for producing a quality radiograph, are provided in IAEA-TECDOC-628/Rev. 3, Training Guidelines in Non-destructive Testing Techniques, 2013 Edition.

This Safety Guide will not cover X ray generators and other radiation sources used for security inspection purposes and for non-medical human imaging. Recommendations on these are provided in IAEA Safety Standards Series No. SSG-55, Radiation Safety of X Ray Generators

and Other Radiation Sources Used for Inspection Purposes and for Non-medical Human Imaging.

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

This Safety Guide will interface with at least the following IAEA Safety Standards Series and other publications (the list is not intended to be final or exhaustive):

- GSR Part 2, Leadership and Management for Safety
- GSR Part 3, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards
- GSR Part 4 (Rev. 1), Safety Assessment for Facilities and Activities
- GSR Part 5, Predisposal Management of Radioactive Waste
- GSR Part 6, Decommissioning of Facilities
- GSR Part 7, Preparedness and Response for a Nuclear or Radiological Emergency
- SSR-6 (Rev. 1), Regulations for the Safe Transport of Radioactive Material
- NSS No. 11-G (Rev. 1), Security of Radioactive Material in Use and Storage and of Associated Facilities
- NSS No. 9 (Rev. 1), Security of Radioactive Material in Transport
- RS-G-1.9, Categorization of Radioactive Sources
- Code of Conduct on the Safety and Security of Radioactive Sources and supplementary guidance

All relevant sections in the IAEA's Department of Nuclear Safety and Security will be consulted, as appropriate, throughout the drafting and review process.

7. OVERVIEW

A consultancy meeting in March 2022 reviewed the current structure and content of SSG-11 and concluded that some changes in a revised version will be needed, though the majority of the current structure will be retained.

The current table of contents will be extended to cover the responsibilities of designers, manufacturers, suppliers, service and maintenance providers of the sources and radiography equipment.

A new Section 2 will be introduced to give a brief overview of industrial radiography sources and their categorization.

Section 3 in the revised Safety Guide will be extended, compared to the current Section 2, to cover roles and responsibilities of parties that have a role in safety assurance.

Sections 4, 5 and 6 will be updated to comply with the current safety requirements on the respective content of the sections: safety assessment, radiation protection programme and training.

A new Section 7 on occupational exposure control will address all aspects of occupational radiation protection management by combining Sections 6 and 7 of the current Safety Guide and harmonizing it with the current requirements of the safety standards.

Sections 9, 10 and 11 of the current Safety Guide will be re-worked to differentiate between the safety of industrial radiography sources (new Section 8) and safety related to performing industrial radiography on site, in shielded enclosure and in cabinets (new Section 9).

The current Section 8 (new Section 10) will be extended to cover nuclear security and control of the industrial radiography sources, import and export issues, and references to the Code of Conduct on the Safety and Security of Radioactive Sources.

The current Section 13 on emergency preparedness and response will be moved to be the new Section 12.

A new Section 13 on disused industrial radiography sources will be introduced to ensure the safety of sources from cradle to grave. This section will cover storage, disposal, and handling of disused sources, including those containing depleted uranium, and the decommissioning of industrial radiography facilities.

The Appendix and the Annexes will be updated, respectively.

Proposed table of contents:

1. INTRODUCTION

Background
Objective
Scope
Structure

2. OVERVIEW OF INDUSTRIAL RADIOGRAPHY SOURCES

Definitions
Categorization of sources

3. ROLES AND RESPONSIBILITIES IN INDUSTRIAL RADIOGRAPHY

General radiation protection principles
Government and regulatory body
Operating organization
Qualified experts
Radiation protection officers
Workers
Suppliers
Service provider
Client

4. SAFETY ASSESSMENT IN INDUSTRIAL RADIOGRAPHY

General
Methodology for the safety assessment
Outcomes of the safety assessment
Documentation and record keeping of the safety assessment
Reviews of the safety assessment

5. RADIATION PROTECTION PROGRAMME IN INDUSTRIAL RADIOGRAPHY

Objectives and scope
Structure and content

6. TRAINING AND QUALIFICATION IN INDUSTRIAL RADIOGRAPHY

General

Objective of a training programme

Structure and content of the training course

Refresher training

7. OCCUPATION EXPOSURE CONTROL IN INDUSTRIAL RADIOGRAPHY

General

Assessment and control of occupational exposure

Individual dose assessment and record keeping

Review of exposures

Selection, maintenance, and calibration of survey meters

8. SAFETY OF INDUSTRIAL RADIOGRAPHY SOURCES AND EQUIPMENT

General

Gamma radiography sources and exposure devices

X ray generators and accelerators

9. SAFETY WHEN PERFORMING INDUSTRIAL RADIOGRAPHY

General

Site radiography

Radiography in shielded enclosures

Industrial radiography using cabinet enclosure

10. SECURITY AND CONTROL OF RADIATION SOURCES IN INDUSTRIAL RADIOGRAPHY

General

Security measures

Accounting and control

Import and export

IAEA Safeguards

11. SAFETY AND SECURITY FOR TRANSPORT OF INDUSTRIAL RADIOGRAPHY SOURCES

General

Movement of sources within the site

Transport outside the site

Record keeping

12. EMERGENCY PREPAREDNESS AND RESPONSE IN INDUSTRIAL RADIOGRAPHY

General

Emergency plan

Specific emergency procedures

Emergency equipment

Training and exercises

Periodic reviews of plans and equipment

Investigation of events and reporting

13. DISUSED INDUSTRIAL RADIOGRAPHY SOURCES

Management of disused sources
Decommissioning of the industrial radiography facility

APPENDIX: IAEA CATEGORIZATION OF RADIOACTIVE SOURCES

ANNEX I: EXAMPLE OF A SAFETY ASSESSMENT IN INDUSTRIAL RADIOGRAPHY

ANNEX II: OVERVIEW OF INDUSTRIAL RADIOGRAPHY SOURCES AND EQUIPMENT

ANNEX III: EXAMPLES OF ACCIDENTS IN INDUSTRIAL RADIOGRAPHY (update)

8. PRODUCTION SCHEDULE: Provisional schedule for preparation of the publication, outlining realistic expected dates for each step

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STEP 1: Preparing a DPP	March 2022
STEP 2: Internal review of the DPP (Approval by the Coordination Committee)	April 2022 - approved
STEP 3: Review of the DPP by the review Committee(s) (Approval by review Committee(s))	June 2022 - approved
STEP 4: Review of the DPP by the CSS (approval by CSS) or information of the CSS on the DPP	October 2022 - approved
STEP 5: Preparing the draft publication	Start November 2022
STEP 6: First internal review of the draft publication (Approval by the Coordination Committee)	2023
STEP 7: First review of the draft publication by the review Committee(s) (Approval for submission to Member States for comments)	2023
STEP 8: Soliciting comments by Member States	180 days
STEP 9: Addressing comments by Member States	
STEP 10: Second internal review of the draft publication (Approval by the Coordination Committee)	2024
STEP 11: Second review of the draft publication by the review Committee(s) (Approval of the draft)	2024
STEP 12: (For Safety Standards) Editing of the draft publication in MTCO and endorsement of the draft publication by the CSS (For nuclear security guidance) DDG's decision on whether additional consultation is needed, establishment by the Publications Committee and editing	2024-2025

STEP 13: Approval by the Board of Governors (for SF and SR only)	NA
STEP 14: Target publication date	2025 - 2026

9. RESOURCES

Estimated resources involved:

Secretariat (person-weeks) 14 weeks

Member States (number and type of meetings) 4-5 Consultant's Meetings, HBAs as needed.