NRRC Specific Regulations

Non-Medical Human Imaging for Security Purpose

NRRC-R-01-SR05

2023

هيئة الرقابة النووية والإشعاعية
Nuclear and Radiological Regulatory Commission

Specific Regulation

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Preamble

In accordance with the provisions of the Radiation Safety Regulation (NRRC-R-01), approved by the NRRC's Board of Directors in resolution No. (R/1/1/2022), dated 20 April 2022, in chapter (9), section (40), article (116), this specific regulation provides detailed requirements to support the authorization and safe performance of activities and facilities conducting non-medical human imaging for security purposes.

This specific regulation has been prepared on the basis of International Atomic Energy Agency (IAEA) stand-ards, as well as the and the international best practices and the experiences of similar international regula-tory bodies, and in accordance with the Kingdom's international commitments, and it has been approved by the NRRC's CEO resolution No. 1173, dated 04/05/2023.

Table of Contents

Table of References

Chapter 1: Objective, Scope, and Definitions

Section 1: Objective

1. This specific regulation specifies the requirements that shall be applied when inspection imaging devices are used for non-medical human imaging for security purposes.

Section 2: Scope

2. This specific regulation shall apply to all activities and facilities, involving non-medical imaging performed using general and limited inspection imaging devices for security purposes, that have been justified as specified the Regulation on Radiation Safety (NRRC-R-01).

3. This specific regulation does not cover the specific safety requirements for non-medical human imaging for security or other purposes that are performed using medical radiological equipment in a medical radiation facility.

Section 4: Definitions

Non-medical human imaging

The human imaging which is performed for legal purposes, including obtaining legal evidence, age determination, immigration or emigration purposes, and detection of drugs within a person.

Category 1 Non-medical human imaging

The non-medical human imaging which usually takes place in a medical

radiation facility that performs radiological procedures for the primary purpose of medical diagnosis, which is performed by medical personnel, and produces images that are assessed by a radiological medical practitioner.

Category 2 Non-medical human imaging

The non-medical human imaging which involves inspection imaging devices that are operated by personnel who are not specialists in radiology and produces images that are viewed by persons who are usually not medically qualified. This practice takes place in a non-medical facility, such as an airport, seaport, railway station or cross-border station, where imaging is used to detect concealed objects for anti-smuggling purposes and for the detection of concealed objects that could be used for criminal acts that pose a security threat.

General Use Systems

Inspection imaging devices that are characterized by a very low dose per exposure, typically an effective dose less than 0.1 μSv per scan. Such systems, based on backscatter technology, can, in principle, be used with little concern about the number of individuals scanned and the number of scans per individual in a given year.

Limited Use Systems

Inspection imaging devices that are characterized by delivering a higher dose per exposure, typically greater than 0.1 μSv effective dose per scan,

and up to 10 μSv per scan. Their operation may raise issues from the perspectives of cumulative individual dose and collective dose. Consequently, administrative, and operational constraints in terms of the number of individuals scanned and the number of scans per individual in a given year shall be considered.

Chapter 2: General Requirements

Section 4: Management System

4. The authorized person shall establish and implement an appropriate management system which, among others, addresses:

    a. The facility management structure;

    b. The designated responsibilities for radiation safety covering the entire lifetime of the facility;

    c. The provisions for the regular assessment of protection and safety;

    d. The implemented procedures and programs concerning:

        i. Training and competence of personnel;

        ii. Investigation of incidents and accidents;

        iii. testing, routine periodic examination, and maintenance and quality assurance; and

        iv. recordkeeping.

5. The authorized person shall appoint a Radiation Safety Officer in line with the requirements specified in the Regulation on Radiation Safety (NRRC-R-01).

Chapter 3: Technical Requirements

Section 5: Facility Design

6. When choosing a location to install an inspection imaging device, the authorized persons shall consider:

    a. Factors that may affect the safe management of and control over the radiation generator;

    b. Factors that may affect occupational and public exposure due to the radiation generator; and

    c. The feasibility of taking the foregoing factors into account in engineering design.

7. The authorized person shall ensure that the siting and layout of the facility considers the following:

    a. The occupancy of adjacent areas.

    b. The doses per scan.

    c. The expected workload.

    d. The system orientation (i.e., beam direction), and

    e. The flow of people.

8. The authorized person shall evaluate whether structural shielding is required for the facility based on:

    a. The safety assessment results, and

    b. The established dose constraints.

Section 6: Safety Characteristics of Inspection Imaging Devices

9. The authorized person shall ensure that the inspection imaging devices comply with the related national standards.

10. The authorized person shall ensure that the safety features of the inspection imaging devices include, among others:

    a. Appropriate radiation beam collimation;

    b. Beam on visual indication, clearly visible by the operator from all possible working positions;

    c. Safety systems to prevent inadvertent exposures;

    d. Adequate shielding incorporated into the inspection imaging device;

    e. Pre-set operating settings for each mode of operation;

    f. A key operated and/or password protected control panel;

    g. An accurately controlled and reproducible dose per exposure for each mode;

    h. Suitable warning labels or signs incorporating the basic ionizing radiation symbol; and

i. One or more emergency stop buttons, if applicable.

11. The authorized person shall ensure that the inspection imaging device's manuals, displays, symbols, and instructions are written in Arabic and English.

Section 7: Installation of Inspection Imaging Devices

12. The authorized person shall ensure that the inspection devices are installed in accordance with the manufacturer's instructions.

13. The authorized person shall request from the supplier of the inspection devices a formal handover, including:

    a. A verification that the inspection devices and associated software are performing to the required standards' and

    b. Provision of training on the use of the inspection devices and associated software to the personnel that will be involved in the related practices.

Section 8: Commissioning and Acceptance Testing of Inspection Imaging Devices

14. The authorized person shall ensure that the commissioning of inspection imaging devices:

    a. Includes measurements of all operational parameters and conditions, and a radiation survey of the inspection imaging device,

    b. Is carried out by, or under the supervision of, the Radiation Safety Officer or the Qualified Expert.

15. The authorized person shall ensure that acceptance testing is carried out to new, modified or repaired inspection imaging devices, or after the installation of new software or the modification of existing software that may affect protection and safety.

16. The authorized person shall provide the NRRC with a copy of the supplier's formal handover as well as the commissioning and the acceptance testing results for the newly installed inspection imaging devices.

Chapter 4: Radiation Protection Program

Section 9: General Requirements

17. The authorized person shall:

    a. Establish and implement an appropriate Radiation Protection Program (RPP) for the facility, based on a graded approach; and

    b. Ensure that the implemented RPP is reviewed and, if needed, appropriately revised on a regular basis.

Section 10: Safety Assessment

18. In addition to what is specified under section 35 of the in the Regulation on Radiation Safety (NRRC-R-01), the authorized person shall include in the regular safety assessment of the facility an estimation of:

    a. Expected doses per inspection or scan;

    b. Potential doses based on associated exposure scenarios; and

c. The cumulative dose to individuals who are likely to be exposed due to an inspection.

Section 11: Classification of Areas

19. The authorized person shall appropriately designate controlled and supervised areas in the facilities where Limited Use Systems operate, based on the safety assessment results.

Section 12: Training of Personnel

20. In addition to what is specified under section 57 of the Regulation on Radiation Safety (NRRC-R-01), the authorized person shall:

    a. Develop and implement an appropriate training program for the personnel involved in the use of inspection imaging devices covering technical, operational and radiation protection and safety aspects,

    b. Provide appropriate information and training to personnel involved in the use of new inspection imaging devices or associated equipment or software.

21. The authorized person shall ensure that only appropriately informed and trained personnel is allowed to operate the inspection imaging devices.

22. The authorized person shall ensure that the specific training of the personnel involved in the operation of inspection imaging devices covers, at least, the following topics:

    a. Devices' safety features.

b. Pre-operational checks.

c. Functional tests.

d. Operation of devices.

e. Object positioning.

f. Interpretation of images.

g. Actions in case a device is damaged or malfunctions.

h. Lessons learned.

23. The authorized person shall ensure that the training on radiation protection and safety of the personnel involved in the operation of inspection imaging devices covers, at least, the following topics:

    a. Typical radiation exposures from normal operation of inspection imaging devices and due to incidents;

    b. Radiation risks for the workers and the public;

    c. Facility design characteristics for the reduction of exposures;

    d. Radiation protection in practice;

    e. Lessons learned;

    f. Emergency preparedness and response procedures.

24. The authorized person shall designate only appropriately trained personnel to operate the inspection imaging devices.

Section 13: Local Rules and Procedures

25. The authorized person shall establish local rules and procedures that, at least, address the following:

    a. The safe operation of the inspection imaging devices;

    b. The maintenance of inspection imaging devices;

    c. The access to controlled and supervised areas;

    d. The minimization of occupational and public exposures; and

    e. Actions in case an inspection imaging device is damaged or malfunctions.

26. The authorized person shall ensure that all the personnel involved in the use of inspection imaging devices have read and understood the established local rules and procedures.

27. The authorized person shall ensure that in case an inspection imaging device is damaged or malfunctions it is removed from the use until it is properly repaired and tested.

Section 14: Protective Equipment

28. The authorized person based on the safety assessment results, shall:

    a. Provide the personnel involved in inspection practices with suitable and adequate personal protective equipment, is pertinent;

    b. Provides the personnel involved in inspection practices with adequate information on the proper use of personal protective equipment; and

c. The personal protective equipment is in a proper condition and tested on a regular basis.

Section 15: Individual and Workplace Monitoring

29. The authorized person shall establish and implement an appropriate individual dose monitoring program for personnel involved in Category 2 non-medical human imaging practices, addressing, among others:

    a. Arrangements for wearing, handling, and storing personal dosimeters;

    b. The establishment and implementation of dose constraints and investigation levels;

    c. A procedure and related criteria for the evaluation of individual monitoring results; and

    d. Record keeping and reporting procedures;

30. The authorized person shall establish and implement an appropriate workplace monitoring program defining, among others, the following:

    a. Measuring, recording, and reporting procedures and associated responsibilities;

    b. The frequency of radiation surveys;

    c. Testing, calibration, and maintenance procedures for measuring instruments; and

    d. Investigation levels.

31. The authorized person shall ensure that a radiation survey is carried out:

    a. After the installation of the inspection device has been completed and before its first use;

    b. After the installation of new software or a significant modification or maintenance to the hardware or software of the inspection device;

    c. After servicing to the inspection device that might have an impact on protection and safety; and

    d. If working patterns or other factors change from assumed values.

32. When the implementation of an individual dose monitoring program is not feasible, the authorized person shall use workplace monitoring results for the assessment of the doses received by the personnel involved in Category 2 Non-medical human imaging practices.

Section 16: Protection of Persons Undergoing Inspection

33. The authorized person may conduct non-medical human imaging procedures for security proposes without previous individual justification and approval form NRRC, only when the procedures are performed by General Use Systems.

34. Exposures which are planned to be performed with Limited Use Systems require prior individual justification.

35. The authorized person shall develop specific criteria for justifying in

terms of individual justification the exposures performed with Limited Use Systems considering, among others, the associated benefits and detriments and the availability of alternative inspection techniques.

36. The justification criteria under article 35 of this regulation and the procedure of their implementation shall be approved by the NRRC.

37. The authorized person shall ensure that, for an individual undergoing a justified Category 2 Non-medical human imaging procedure, the dose limits for public exposure as specified in section 10 of Regulation on Radiation Safety (NRRC-R-01) shall apply.

38. The authorized person shall develop and implement appropriate procedures to ensure that the performance of the General and Limited Use systems is optimized in terms of image quality and exposure parameters.

39. The authorized person shall develop and implement appropriate procedures to:

    a. Avoid any unintended and unnecessary exposures; and

    b. Ensure that the exposures are performed appropriately.

40. The authorized person shall establish appropriate dose constraints for the exposures performed with inspection imaging devices.

41. The authorized person shall:

    a. Assess the doses received by inspected individuals; and

    b. Keep appropriate records of the doses received by individuals due to exposures performed with Limited Use Systems.

42. The authorized person shall ensure that individuals inspected with Limited Use systems are provided with appropriate information about the imaging process.

43. If it is considered necessary a Category 1 to follow a Category 2 Non-medical human imaging procedure, the authorized person shall ensure that:

    a. The justification process for the Category 1 Non-medical human imaging procedure will specify the type of radiological medical equipment intended to be used;

    b. The performance of the Category 1 Non-medical human imaging procedure will take place in an authorized medical radiation facility; and

    c. The individual to undergo the Category 1 Non-medical human imaging procedure will be afforded at least the same level of protection and safety as a patient undergoing a similar radiological procedure.

Section 17: Protection of the Public

44. The authorized person shall establish and implement appropriate procedures to regularly assess the likely exposure of the members of the public due to the operation of inspection imaging devices.

45. The authorized person shall ensure that the access of the members of the public to the controlled areas where Limited Use Systems are operating is restricted.

Section 18: Quality Assurance Program

46. The authorized person shall establish and implement an appropriate Quality Assurance (QA) program for ensuring the optimized performance of inspection imaging and safety devices.

47. The authorized person shall ensure that:

    a. Appropriate preventive and corrective maintenance are performed, as necessary, to the inspection imaging devices; and

    b. Preventive maintenance procedures are carried out at the frequency recommended by the manufacturer of the inspection imaging device.

Section 19: Records

48. The authorized person shall maintain and make available to the NRRC, upon request, records for:

    a. The use of inspection imaging devices (logbook);

    b. The implemented training program;

    c. The results of the individual and workplace monitoring;

    d. The assessment results of public exposure, as applicable; and

    e. The maintenance of inspection imaging devices, including:

        i. information on any device defect (a fault log);

        ii. remedial actions taken; and

        iii. the results of testing before a device is reintroduced into use.

Chapter 5: Emergency Arrangements

Section 20: Emergency Preparedness and Response Plan

49. The authorized person shall:

    a. Establish an appropriate emergency preparedness and response plan, based on a graded approach, that covers all reasonably foreseeable emergency scenarios associated with the operation of the inspection devices.

    b. Ensure that all workers involved in inspection practices are aware of the established emergency preparedness and response plan and adequately trained to take appropriate actions in the event of an emergency.

50. After an emergency has ended, the authorized person shall investigate the causes of the emergency and evaluate the emergency response. In particular, this evaluation shall be conducted with the aim of the following:

    a. Determining the root cause(s) of the emergency;

    b. Estimating the doses received by the exposed individuals, as applicable;

    c. Identifying and implement any corrective actions necessary to prevent the recurrence of such an emergency;

    d. Assessing the efficiency of the emergency response actions; and

    e. Identifying necessary improvements to the emergency arrangements.

51. The authorized person shall:

    a. Keep appropriate records with the results of the investigations under article 50 of this regulation,

    b. Report the information under article 50 of this regulation to the NRRC in due time.

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