NRRC Technical Regulations

Security of Radioactive Materials

NRRC-R-17 Rev. 0.1

2024

هيئة الرقابة النووية والإشعاعية
Nuclear and Radiological Regulatory Commission

Security of Radioactive Materials

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Regulation

Security of Radioactive Materials

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Preamble

In accordance with the provisions of the Law of Nuclear and Radiological Control issued by Royal Decree No. (M/82) dated 25/7/1439 AH, and NRRC's Statute issued by the Ministers' Cabinet Resolution No. (334) dated 25/6/1439 AH, the NRRC prepared regulations that ensure control over radiological activities and practices as well as nuclear and radiological facilities.

This regulation has been prepared on the basis of International Atomic Energy Agency (IAEA) standards, international best practices, and in accordance with the Kingdom's international commitments. This regulation has been presented in "the Public Consultation Platform" for the public review, comments, and feedback.

This regulation has been approved by the NRRC's Board of Directors Resolution No. (R/1/1/2022) dated 20/04/2022.

This edition, NRRC-R-17 Rev. 0.1 (2024), of the regulation is revised and takes precedence over the previous publication, NRRC-R-17 (2022). In addition, the changes within this revision are editorial.

Table of Contents

Related Regulations

Chapter 1: Objective, Scope, and Definitions

Section 1: Objective

1. The objective of this regulation is to establish the regulatory requirements for the security of radioactive materials throughout their lifetime against unauthorized removal of the radioactive material and sabotage.

Section 2: Scope

2. This regulation applies to the security of radioactive material, associated activity, and associated facility against unauthorized removal of radioactive material and sabotage performed with the intent to cause harmful radiological consequences.

3. This regulation applies to radioactive materials that include radioactive sources and unsealed radioactive material under regulatory control, as well as to radioactive material over which the regulatory control has been gained or regained.

4. The requirements defined in this regulation are in line with the Regulation on Notification on and Authorization of Facilities and Activities with Radiation Sources (NRRC-R-02 Rev. 0.1), Regulation on Radiation Safety (NRRC-R-01 Rev. 0.1), and the Regulation on the Safe Transport of Radioactive Materials (NRRC-R-15 Rev. 0.1).

Section 3: Definitions

Activity Ratios

The A/D ratio for a single radionuclide is the ratio of activity (A) of the source compared to the activity determined to define a threshold of danger (D) used to provide an initial ranking of relative risk for sources, which are then categorized after consideration of other factors such as the physical and chemical forms, the type of shielding or containment employed, the circumstances of use and accident case histories.

The D-value is the quantity of radioactive material that, if uncontrolled, could cause severe deterministic effects if not managed safely and securely.

Associated activity

The possession, production, processing, use, handling, storage, disposal, or transport of radioactive material.

Associated facility

A facility (including associated buildings and equipment) in which radioactive material is produced, processed, used, handled, stored, or disposed of and for which authorization is required.

Authorized person

Person granted authorization under this regulation and/or the relevant NRRC Laws.

Competent security agency

A governmental organization or institution that has been designated by the Kingdom to carry out one or more nuclear security functions.

Confidentiality

The property that information is not made available or disclosed to unauthorized individuals, entities, or processes.

Defense-in-depth

The combination of multiple layers of systems and measures that have to be overcome or circumvented before nuclear security is compromised.

Detection

A process that begins with sensing a potentially malicious or otherwise unauthorized act and that is completed with an assessment of the cause of the alarm/alert.

Deterrence

Occurs when an adversary, otherwise motivated to perform a malicious act, is dissuaded from undertaking the attempt.

Delay

To impede an adversary's attempt to gain unauthorized access or to remove or sabotage a radioactive source.

Graded Approach

The application of nuclear security measures proportionate to the potential consequences of criminal or intentional unauthorized acts involving or directed at radioactive material, associated facilities or associated activities or other acts determined by the Kingdom to have an adverse impact on nuclear security.

Information

Knowledge, irrespective of its form of existence or expression. It includes ideas, concepts, events, processes, thoughts, facts, and patterns. Information can be recorded on material such as paper, film, magnetic or optical media, or held in electronic systems. Information can be represented and communicated by almost any means.

Information security

The preservation of the confidentiality, integrity, and availability of information.

Malicious act

A wrongful act or activity intentionally done or engaged in without legal justification or excuse (e.g., smuggling) or an act or activity intended to cause death or physical injury to any person, material damage to any person (e.g., theft), or damage to property or the environment.

Mobile radioactive material

A radioactive source located in a device or container which, in its normal course of use, is intended to be capable of being moved in a limited way from place to place, for

example, a large machine on wheels designed to be able to be repositioned by a person within a room in a facility.

Need to know

Rule by which individuals, processes, and systems are granted access to only the information, capabilities, and assets which are necessary for execution of their authorized functions.

Nuclear Security

The prevention and detection of and response to theft, sabotage, unauthorized access, illegal transfer, or other illegal activities involving nuclear material, other radioactive substances, or their associated facilities.

Nuclear Security Event

An event that is assessed as having implications for nuclear security.

Portable radioactive source

A radioactive source located in a device or container which, in its normal course of use, is intended to be carried or moved with ease from place to place.

Response

Encompasses the actions undertaken following detection of a nuclear security event to prevent an adversary from successfully completing an act of unauthorized removal or sabotage response force.

Response Force

Persons, on-site or off-site, who are armed and appropriately equipped and trained to counter an attempted unauthorized removal or an act of sabotage.

Risk assessment

Assessment of the radiation risks and other risks associated with normal operation and possible accidents involving facilities and activities.

Sabotage

Any deliberate act directed against a radiological facility or radioactive material in use, storage, or transport that could directly or indirectly endanger the health and safety of personnel, the public, or the environment by exposure to radiation or release of radioactive substances.

Security culture

The characteristics and attitudes in organizations and of individuals which establish that security issues receive the attention warranted by their significance.

Security functions

A security system to protect radioactive sources from an adversary intent on committing a malicious act designed to perform basic security functions of deterrence, detection, delay, response, and security management.

Security management

The establishment and implementation of policies, plans and procedures for the security of radioactive material, associated facilities and associated activities as well as the deployment of the necessary resources.

Security measures

Measures intended to prevent a nuclear security threat from completing criminal or intentional unauthorized acts involving or directed at radioactive material, associated facilities, or associated activities or to detect or respond to nuclear security events.

Security personnel

An authorized and security cleared person who is responsible for security relating to patrolling, monitoring, assessing, or escorting any individuals or transport or controlling access and providing initial response.

Security plan

A document prepared by the Licensee that presents a detailed description of the security arrangements in place at a facility.

Security system

A security system is an integrated set of nuclear security measures intended to prevent the completion of a malicious act.

Sensitive information

Information, in whatever form, that unauthorized disclosure, modification, alteration, destruction, or denial of use of which could compromise nuclear security or otherwise assist in the carrying out of a malicious act against a nuclear and radiation facility, organization, or transport.

Storage

The holding of radioactive sources in a facility that provides for their containment with the intention of retrieval.

Threat assessment

An analysis that documents the credible motivations, intentions, and capabilities of potential adversaries that could cause undesirable consequences regarding radioactive material in use or storage and its associated facilities.

Unauthorized removal

The theft or other unlawful taking of radioactive sources/materials.

Vulnerability

Weakness of an asset or control that can be exploited by a threat.

Vulnerability assessment

A systematic appraisal of the effectiveness of a security system in protecting against a threat.

Chapter 2: Requirements for the Security of Radioactive Materials

Section 4: Responsibilities of Authorized Person

5. The authorized person shall ensure the security of the radioactive materials under their responsibility and maintain security measures for radioactive materials in accordance with the Regulation on Radiation Safety (NRRC-R-01 Rev. 0.1) and the Regulation on Safe Transport of Radioactive Materials (NRRC-R-15 Rev. 0.1) requirements.

6. The authorized person shall only deal with radioactive materials in accordance with the authorization issued by the NRRC.

7. The authorized person shall retain the prime responsibility for regulatory compliance with security as prescribed under this regulation.

8. The authorized person shall verify that the radioactive materials under their authorized possession are present at their secured and authorized location at all times.

9. The authorized person shall provide measures against unauthorized removal or sabotage of the radioactive materials at all times.

10. The authorized person shall develop and maintain a threat and risk assessment to determine vulnerabilities in the existing security system designed to protect against the loss, sabotage, illegal use, illegal possession, or illegal removal of radioactive material.

11. The authorized person shall review and update the threat and risk assessment annually as required by the NRRC and/or based on changes that affect the threat level.

12. The authorized person shall provide personnel with the competence necessary to effectively maintain security compliance with all security requirements at all times.

13. The authorized person shall develop a security plan that incorporates the necessary security functions and measures as specified in Appendix 1.

14. In the event of the absence or missing of radioactive materials, the authorized person shall immediately investigate and report to the NRRC within the time period specified in Section 25 of this regulation.

Section 5: Graded Approach

15. The authorized person shall apply a graded approach when designing security systems and measures, taking into account the current threat evaluation, the relative attractiveness of a radioactive source/material, the nature of the source, and potential consequences associated with its unauthorized removal or sabotage.

16. A graded approach application shall ensure that the highest consequence sources receive the greatest degree of security.

Section 6: Defense-in-Depth Principle

17. The authorized person shall apply the defense-in-depth principle in designing security systems that provide security functions for the protection of radioactive material.

18. The system design shall include independent measures that ensure that the failure of one capability does not mean a loss of function.

Section 7: Security Interface with Safety

19. Security measures shall be integrated with safety measures, including industrial safety arrangements, radiation protection measures, and appropriate design in order to provide adequate protection against unauthorized removal or sabotage of radioactive material.

20. The authorized person shall ensure that a balance between safety and security is maintained during the implementation of security measures.

21. The authorized person shall ensure security and safety measures will not contradict each function both during normal and emergency situations.

22. Any change in the safety or security system or in the design or characteristics of the facility shall be analyzed from both a safety and a security point of view before being implemented and approved by the NRRC.

Chapter 3: Determination of Security Measures

Section 8: Categorization of Sources

23. The authorized person shall ensure that each radioactive source/material or aggregation of radioactive sources shall be categorized based on activity ratios specified in the Regulation on Radiation Safety (NRRC-R-01 Rev. 0.1).

24. In the context of this regulation, the radioactive material shall be categorized based on activity ratios derived from the (A/D) value in which (D) is specified in the Regulation on Radiation Safety (NRRC-R-01 Rev. 0.1).

25. In the event that a practice involves the accumulation of several sources into a single storage or use location, where these sources are in close proximity or collocated, such as in storage facilities, manufacturing processes, or transport conveyance, the total activity shall be treated as a single source for the purpose of assigning a category.

26. Radioactive materials that are stored or used in separate controlled locations shall have independent security measures commensurate with the activity level of the material. In such a situation, the aggregation considerations shall not be applicable.

27. The authorized person shall develop and maintain security measures that are commensurate with the categorization, threat level and level of risk to be approved by the NRRC.

Section 9: Security Levels

28. The authorized person shall establish a security system that is based primarily on the harmful radiological consequences that could result from a successful malicious act involving the particular radioactive material to be protected.

29. The authorized person shall determine the security level in accordance with the criteria set forth in Appendix 2 of this regulation.

30. In providing protection to the radioactive material, the following goals shall be achieved:

    a. Security level A: Provide a high level of protection of radioactive material against unauthorized removal;

    b. Security level B: Provide an intermediate level of protection of radioactive material against unauthorized removal;

    c. Security level C: Provide a baseline level of protection of radioactive material against unauthorized removal.

31. The security system shall display a performance level for each of the security functions in accordance with the radioactive sources category specified in Appendix 1.

32. The safety measures required by the Regulation on Radiation Safety (NRRC-R-01 Rev. 0.1) for materials of Categories 4 and 5 (Security level D) shall provide the security functions for the radioactive material.

33. The authorized person shall ensure that the applicable security measures required for ensuring security, functions as specified in Appendix 1, are implemented at all times.

Section 10: Mobile and Portable Radioactive Material

34. The authorized person shall ensure the availability of the following additional security measures for mobile and portable radioactive sources when used in the field:

    a. Immediate detection, effective delay, and timely response by operating or security personnel in case of unauthorized access to or removal of the radioactive sources;

    b. Availability of two persons, each equipped with an independent communication device, to communicate with the response security personnel;

    c. Presence of radioactive sources through physical check(s) after every use in the field.

Section 11: Measures Against Increased Security Threat

35. The authorized person shall ensure that security measures are maintained, including in situations where security threat is increased.

36. In the event of increased security threats targeting a radioactive material as notified by the NRRC, competent security agencies, or through reliable sources, the authorized person shall take the following additional security measures:

    a. Returning the radioactive material to its secured storage location if it is in use;

    b. Ensure 24-hour surveillance through security personnel;

    c. Review the security plan and corresponding procedures to ensure the security system's credibility to be approved by the NRRC;

    d. Additional security measures shall be continued until it is determined that the increased security threat no longer exists.

Chapter 4: Management System

Section 12: Security Plan

37. The authorized person for radioactive material of categories 1, 2, and 3 shall submit a security plan for approval by the NRRC as part of the authorization requirements.

38. The security plan shall describe the security arrangements that are in place to protect radioactive material at all times in accordance with appropriate security functions and measures specified in Appendix 1.

39. The authorized person shall ensure compliance with the security plan as approved by the NRRC.

Section 13: Vulnerability Assessment

40. The authorized person shall conduct a vulnerability assessment annually and ensure that the identified additional security measures requirements are implemented.

Section 14: Training and Qualification

41. The authorized person shall ensure the competency and assignment of security related responsibilities, including the clear roles for each individual.

Section 15: Maintenance and Testing

42. The authorized person shall ensure security systems and components are maintained in an operability condition.

43. In a situation when the security system(s) is not in an operability condition, the authorized person shall provide an equivalent level of compensatory measures throughout the inoperability duration.

44. The authorized person shall develop and implement plans and procedures for the maintenance and testing of the security systems.

45. The authorized person shall establish and maintain all records related to the maintenance and testing of installed security systems and components.

Section 16: Information Security

46. The authorized person shall provide protection measures to control access to sensitive information to prevent loss, illegal use, illegal possession, or illegal removal of such information, including the relevant computer-based system as prescribed by the Regulation on Information Protection and Cybersecurity (NRRC-R-20).

47. At a minimum, the authorized person shall have the measures for protecting the confidentiality of the following sensitive information that could compromise the security of radioactive material:

    a. Details of physical protection system and any other security measures in place for radioactive material, associated facilities, and activities, including information on security personnel and response forces;

    b. Information related to the quantity and form of radioactive material in use or storage;

    c. Information related to the quantity and form of radioactive material in transport;

    d. Contingency and response plans to respond to nuclear security events;

    e. Personal information about employees, vendors, and contractors;

    f. Threat assessments and security alerting information;

    g. Details of sensitive technology;

    h. Technical specification;

    i. Historical information related to classified information.

Section 17: Personal Trustworthiness and Reliability

48. The authorized person shall verify the trustworthiness and reliability of all persons who require access to radioactive materials at the location or to sensitive information, including servicing companies, contractors, and building maintenance staff who require access without escort.

49. Personnel who require access to radioactive materials or sensitive information without prior trustworthiness and reliability verification shall be escorted at all times by an individual with access granted under Article 48.

50. The nature and depth of personnel screening practices shall be in accordance with the radioactive material's categorization.

51. The authorized person shall, at a minimum, verify the following information for Categories 1, 2, and 3 sources:

    a. Confirm the identity of personnel from the competent security agency;

    b. A record from the relevant competent security agencies showing the result of the person's criminal record;

    c. The person's employment history, including their qualifications, unless the person has been employed for more than five (5) years at the facility;

    d. If a history cannot be established for at least the last five (5) years, information relating to the trustworthiness of the person, including, where available, from each country in which the person has resided for one (1) or more years in the last five (5) years.

52. The authorized person shall conduct a periodic review of trustworthiness and reliability verification as specified by the NRRC.

53. The authorized person shall be responsible for retaining documentation regarding trustworthiness and reliability for the period of 20 years minimum or as specified by the NRRC.

54. The authorized person shall verify the authenticity of the documents provided by the employee and maintain copies of all documents.

55. The authorized person shall provide the trustworthiness and reliability records or any related information required by the NRRC for the purpose of this regulation.

Section 18: Inventory Control

56. The authorized person shall develop, maintain, and update the register of their radioactive sources and submit the inventory to the NRRC on a quarterly basis for Categories 1 and 2 radioactive sources and semi-annually for the remaining categories of sources or at any specific timeframe determined by the NRRC.

57. The authorized person shall establish, maintain, and update records of receipt, transfer, transportation, disposal, and physical verification of radioactive sources as well as any other information as required by the NRRC.

58. The authorized person shall establish, maintain, and update the inventory of all the components of the installed security system, where applicable.

Section 19: Operating Procedures

59. At a minimum, the authorized person shall develop and maintain written operating procedures and instructions pertaining to:

    a. Measurements for controlling access to the authorized area;

    b. Surveillance by foot and vehicle patrols;

    c. Assessment and response to alarms;

    d. Apprehension and detainment of unarmed intruders;

e. Reporting on suspicious activities, including armed intruders, to the NRRC and competent security agencies;

f. Security equipment operation;

g. Security training relating to assigned duties.

Section 20: Security Culture

60. The authorized person shall ensure that a dynamic and effective security culture is embedded in the overall management system at all operational and management levels.

Chapter 5: Security of Radioactive Material in Transport

Section 21: General Requirements for Radioactive Sources for Categories 1, 2, and 3

61. The authorized person shall ensure that the responsibilities of all persons involved in the transport of radioactive sources are clearly defined.

62. The authorized person shall request a permit from the NRRC prior to the transportation of radioactive sources for which the transportation is not specified in the approved License Conditions.

63. The authorized person shall ensure that radioactive sources are handled only by the authorized persons during transport.

64. The authorized person shall ensure that the radioactive sources are secured during transport.

65. The authorized person shall ensure the integrity of the lock and seal during transportation.

66. The authorized person shall designate a contact person traveling with the vehicle carrying radioactive sources equipped with diverse communication means.

67. In case of any adverse conditions during transportation, the authorized person shall restrict the movement of the vehicle carrying radioactive sources and immediately inform the NRRC and competent security agencies.

68. The authorized person shall ensure that the vehicle carrying the radioactive source is never left unattended during transport.

69. The authorized person shall ensure that security procedures are available and necessary instructions are communicated to the assigned personnel involved in the transport.

70. The authorized person shall protect sensitive information related to the transport of radioactive sources and shall disseminate such information only on a need to know basis.

Section 22: Additional Requirements for Category 2 Radioactive Sources

71. In addition to the requirements in Section 21 of this regulation, the following requirements apply to the transportation of Category 2 radioactive sources:

    a. The authorized person shall submit a transport security plan of radioactive sources to the NRRC for its approval in accordance with the requirements specified by the NRRC;

    b. For frequently transported radioactive sources, the authorized person shall submit the transport security plan for radioactive sources once and shall apply permit to the NRRC prior to each transportation of radioactive source;

    c. The authorized person shall establish credible liaison with the competent security agencies, in coordination with the security elements, during transportation.

Section 23: Additional Requirements for Category 1 Radioactive Sources

72. In addition to the requirements in Section 21 of this regulation, the following requirements apply to the transportation of Category 1 radioactive sources:

    a. The authorized person shall submit the transport security plan for radioactive sources once and shall prepare a specific transport security plan for each transportation of radioactive source in accordance with the requirements specified by the NRRC;

    b. The transport security plan shall be tested and evaluated before the transportation of radioactive sources and shall be reviewed and revised if required by the NRRC. Any change(s) in the transport security plan shall be submitted to the NRRC for prior approval;

    c. The authorized person shall ensure that the vehicle carrying radioactive sources is escorted by security personnel;

    d. The authorized person shall ensure tracking of the vehicle carrying radioactive sources to confirm its location;

    e. The authorized person shall ensure that all persons engaged in the transportation of radioactive sources are trustworthy.

Chapter 6: Reporting Nuclear Security Event

Section 24: Alarm Response Protocol

73. The authorized person shall establish a capability to manage and report security events.

74. The authorized person shall develop and maintain a documented alarm response protocol to record the cause and dispensation of alarms.

75. The protocol shall include the role and responsibilities of the security response staff and offsite response force and shall be documented in a response plan.

76. The authorized person shall develop and maintain a documented alarm response protocol that includes:

    a. Response plan in case of unauthorized removal, loss, or sabotage of a radioactive source;

    b. The role and responsibilities of the staff;

    c. Communication arrangements with the NRRC and competent security agencies;

    d. Incident reporting/notification;

    e. Immediate reporting of any recovered materials.

Section 25: Event Reporting

77. The authorized person shall respond immediately to the loss of control of, damage to, unauthorized transfer or access to, actual or attempted theft or sabotage of radioactive material.

78. Whenever an event involving the loss of control of, damage to, unauthorized transfer/access to, actual or attempted theft or sabotage of radioactive material has occurred, the authorized person shall:

    a. Take immediate remedial actions;

    b. Notify the NRRC and the competent security agencies within twenty-four (24) hours;

    c. Submit a preliminary report to the NRRC within seventy-two (72) hours;

    d. Submit a detailed report to the NRRC within thirty (30) days on the causes of the event, its circumstances and consequences, and the corrective actions taken or to be taken.

Appendix 1: Security Functions and Measures

Security Nuclear Functions	Nuclear Security Measures
Security Measures for Category 1 Radioactive Sources (Security Level A)	
Detection	▶ Immediate detection of any unauthorized access to the secured area by the use of an electronic intrusion detection system. In case the intrusion detection system is intentionally bypassed by the operating personnel, continuous surveillance shall be ensured; ▶ Immediate detection of any attempted unauthorized removal of the sources by the use of an electronic tamper detection device; ▶ Immediate assessment of detection by the use of CCTV or by operating and/or security personnel, as applicable; ▶ Immediate communication to response personnel through rapid, dependable, and diverse means of communication; ▶ Presence of radioactive sources through physical verification by fortnightly check(s).
Delay	▶ Sufficient delay for response personnel to interrupt the unauthorized removal through a system of at least two layers of barriers.
Response	▶ Immediate response to the assessed alarm with sufficient resources and capabilities to interrupt and neutralize the adversary in accordance with the approved security plan.
Access Control	▶ Provision of access control to the radioactive source location through identification and verification that effectively restricts access to authorized persons only.

Security Nuclear Functions	Nuclear Security Measures
Security Measures for Category 2 Radioactive Sources (Security Level B)	
Detection	▶ Immediate detection of any unauthorized access to the secured area by the use of an electronic intrusion detection system or by operating personnel. In case the intrusion detection system is intentionally bypassed by the operating personnel, continuous surveillance shall be ensured; ▶ Detection of any attempted unauthorized removal of radioactive sources through tamper detection or periodic checks by operating and/or security personnel, as applicable; ▶ Immediate assessment of detection of unauthorized access/attempted unauthorized removal by the use of CCTV or by operating and/or security personnel, as applicable; ▶ Immediate communication to response personnel through rapid and reliable means of communication; ▶ Presence of radioactive sources through physical verification by fortnightly check(s).
Delay	▶ Sufficient delay for response personnel to interrupt the unauthorized removal through a system of two layers of barriers.
Response	▶ Initiation of immediate response action(s) to interrupt the adversary in accordance with the approved physical protection plan.
Access Control	▶ Provision of access control to the radioactive source location through identification that effectively restricts access to authorized persons only.

Security Nuclear Functions	Nuclear Security Measures
Security Measures for Category 3 Radioactive Sources (Security Level C)	
Detection	▶ Detection of unauthorized removal of the sources through tamper detection device or daily check(s) by operating and/or security personnel, as applicable; ▶ Immediate assessment of detection by operating and/or security personnel, as applicable; ▶ Presence of radioactive sources through physical verification on a monthly basis.
Delay	▶ Delay through a single barrier or surveillance by security personnel.
Response	▶ Implementation of appropriate response action(s) in accordance with the approved security plan.
Access Control	▶ Provision of access control to the radioactive source location through identification that effectively restricts access to authorized persons only.
Security Measures for Categories 4 and 5 Radioactive Sources (Security Level D)	
Detection	Apply the relevant safety requirements provided in (NRRC-R-01 Rev. 0.1)
Delay	
Response	
Access Control	

Appendix 2: Security Level by Category

Category	Activity Ratio (A/D)	Security Level
1	$A/D \geq 1000$	A
2	$1000 > A/D \geq 10$	B
3	$10 > A/D \geq 1$	C
4	$1 > A/D \geq 0.01$	Apply the relevant safety requirements provided in NRRC-R-01 Rev. 0.1
5	$0.01 > A/D$ and $A >$ level for exemption[(a)]	Apply the relevant safety requirements provided in NRRC-R-01 Rev. 0.1

[(a)] Levels for exemption are specified by the NRRC.

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