

NIGERIAN NUCLEAR REGULATORY AUTHORITY



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**NIGERIAN SAFETY AND SECURITY OF RADIOACTIVE MATERIAL IN USE
AND STORAGE REGULATIONS, 2021**

NUCLEAR SAFETY AND RADIATION PROTECTION ACT (No. 19, 1995)

**Nigerian Safety and Security of Radioactive Material Regulations, 2021
(Revision 1)**

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S. I.of 2021

NUCLEAR SAFETY AND RADIATION PROTECTION ACT (No. 19, 1995)

Nigerian Safety and Security of Radioactive Material in Use and Storage Regulations, 2021

Commencement :.....(Date)

In exercise of the powers conferred on it by section 47 of the Nuclear Safety and Radiation Protection Act 19 of 1995 and of all other powers enabling it in that behalf, **THE NIGERIAN NUCLEAR REGULATORY AUTHORITY**, with the approval of the President, hereby makes the following Regulations:

PART I – GENERAL

1. Objectives

(1) The objective of these Regulations is to achieve and maintain high level safety and security of radioactive material by preventing unauthorized access, damage, loss, theft, sabotage and or unauthorized transfer of radioactive material so as to reduce the likelihood of accidental harmful exposure or the malicious use or act to cause harm to individual, society or the environment and to prevent intentional or inadvertent recycling of radioactive metals for other uses.

(2) These Regulations establish requirements for the safety and security of radioactive material in use and storage.

2. Scope

These Regulations shall apply to all radioactive material that pose a significant risk to individuals, society and the environment, including the radioactive sources referred to in Schedule 1 and to any other potentially harmful radioactive material so determined by the Authority.

3. Exclusion

(1) These Regulations do not apply to nuclear material as defined in Schedule I of the Nigerian Physical Protection of Nuclear Material and Nuclear Facilities Regulations, 2021 except for radioactive sources incorporating plutonium-239.

(2) These Regulations do not apply to radioactive material within military or defense programmes.

(3) These Regulations also do not apply to transport safety and security of radioactive material.

4. Application

The application of these Regulations shall be in addition to the Nigerian Radiation Protection Regulations and any other existing ionizing radiation and nuclear regulations as well as any transport regulations in force at the commencement of these Regulations.

5. Relation to other Regulations and Resolution of Conflicting Provisions

1. The provision of these Regulations are in addition to, and not in place of, other applicable national laws and regulations and nothing in these regulations shall be construed as relieving a licensee from complying with other applicable laws and regulations.
2. Where a licensee identifies an apparent or actual conflict between the provisions of these Regulations and other laws or regulations, they shall notify the Authority in order to resolve the conflicting provisions.
3. Nothing in these regulations shall be construed as restricting any actions that may otherwise be necessary for safety and security of radioactive material.
4. A licensee shall comply with any additional requirement imposed by the Authority by any regulation, order or terms and conditions of a license, in addition to those established in these regulations, as deemed appropriate or necessary for the safety and security of radioactive material.

PART II - RESPONSIBILITIES OF THE AUTHORITY, LICENSEES AND RADIATION WORKERS

6. Responsibilities of the Authority

The Authority shall:

- (a) maintain records of licensees to possess or use radioactive material, with clear indication of the types of radioactive material and records for transfer and disposition of the radioactive material on termination of the license; These records shall be properly secured against unauthorised access, alterations and backup copies shall be made and kept;
- (b) implement an inspection programme to determine whether licensees are in compliance with these Regulations;
- (c) carry out safety and security inspections of facilities where radioactive material are present. These inspections may be announced or unannounced inspections at appropriate intervals taking into account past performance and the risks presented by the radioactive material;

- (d) verify that the licensee submits a detailed security plan, as required;
- (e) establish and maintain a National Radioactive Source Tracking System with database of registry of radioactive sources belonging to Category 1, 2 and 3 as described in Schedule 1;
- (f) have in place strategies including rapid response for gaining or regaining control over orphan and legacy sources, provide for measures to reduce likelihood of malicious acts, mitigate or minimize the radiological consequences of accidents or malicious acts involving radioactive material and provide for continuous improvement of the strategies;
- (g) ensure that radiation detection equipment are put in place at strategic entry and exit points for control of illicit trafficking of radioactive material;
- (h) ensure that inventory of radioactive material are conducted on a regular basis by licensees;
- (i) put in place a mechanism to ensure that licensees have a financial guarantee for the safe export, disposal or temporary storage of radioactive material under its control in case of bankruptcy, insolvency and winding up;
- (j) in coordination with security and intelligence Agencies develop national threat assessment for radioactive material;
- (k) establish appropriate security levels for radioactive sources taking the category of each source into cognizance as described in Schedule I;
- (l) ensure the confidentiality of any information that it receives in confidence from another State and provide such information to third parties only with the consent of the State concerned; and
- (m) ensure the consideration of cyber security in the objective of protection against theft of radioactive material and sabotage resulting in possible radiological release.

7. Responsibilities of the Licensee:

The Licensee shall:

- (a) provide the human and material resources necessary to ensure safe working conditions and compliance with Licence conditions prior to commencing any activity or practice;

- (b) bear the responsibility for establishing and implementing the measures that are required for ensuring security of radioactive material for which they are licenced and for compliance with all applicable requirements of these Regulations;
- (c) appoint and specifically identify to the Authority persons to carry out actions and tasks related to the safety and security of radioactive material, however, the licensees shall retain the primary responsibility for those actions and tasks ;
- (d) emplace and implement programs and procedures for security of radioactive material and for the administration of radiation safety,
- (e) ensure that any transfer of radioactive material is documented, authorized and received in accordance with regulatory requirements,
- (f) ensure that there is a procedure for communicating quarterly to the Authority on the status of radioactive material and reporting within prescribed interval unusual events that may affect safety or security of radioactive material;
- (g) implement measures for ensuring safety and security of disused sources including financial provisions where appropriate;
- (h) notify the Authority of intention to introduce any modification to facilities or activities affecting the safety and security of a radioactive material for which they are licenced, and shall not carry out any such modification unless specifically authorized by the Authority,
- (i) ensure that when radioactive sources are not in use they are promptly stored in accordance with the requirements for the security level to which the radioactive sources belong,
- (j) through the appropriate security agency, carryout background checks on all key personnel who use or have access to radioactive material to determine their trustworthiness prior to authorizing them for such access;
- (k) grant Inspectors appointed by the Authority unrestricted access to premises, facilities and activities in which radioactive sources are stored, used or to be transported in order to obtain information about the status of the safety, security and verify compliance with these Regulations. The licensee shall also make available to the Inspectors information and records regarding safety and security as required.
- (l) prepare and submit to the Authority a detailed site security plan as outlined in Schedule 3 for categories 1 – 3.

- (m) Take into account threat information from the Authority while designing the physical protection systems and regularly conduct vulnerability assessment of the physical protection systems and measures for the facility as outlined in Schedule 4.

8. Responsibilities of Radiation workers

Radiation workers assigned responsibility by the licensee shall:

- a) ensure that the requirements for safety and security of radioactive material given in these Regulations are implemented and strictly adhered to.
- b) read and understand the licensee`s emergency, operating and radiation safety procedures

PART III – SAFETY REQUIREMENTS FOR RADIOACTIVE MATERIAL

9. Licence Applications

- (a) No person or organisation shall import, transport, use, store, transfer ownership, dispose or export radioactive material without an appropriate authorization from the Authority.
- (b) All proposals from applicants to import, transport, use, store, transfer ownership, dispose or export a radioactive material shall specify the following in a written application to the Authority:
 - i. the applicant`s name, email, physical address and telephone number;
 - ii. the description of the source or source containing equipment, including its quantity and unique identifiers, radionuclide and aggregate activity;
 - iii. the name and address of the supplier/manufacturer;
 - iv. the country of origin of the radioactive material or radioactive material containing equipment;
 - v. the name, address and telephone number of the consignee;
 - vi. a safety assessment;
 - vii. a site security plan for the radioactive material and/or the facility in which the source is to be managed, if required; and
 - viii. such other details as the Authority may consider necessary.
- (a) An applicant shall be prepared to pay the requisite authorization fee(s) prescribed by the Authority.

(b) The licensee shall comply with all the terms and conditions specified in the licence, including any specific radiation protection and security measures that maybe prescribed by the Authority from time to time.

(c) Any licence issued pursuant to paragraph (2) and (3) above shall be:

- i. valid for such a period as the Authority may determine;
- ii. renewable by the Authority if the licensee complies with the licence terms and conditions; and
- iii. subject to suspension or revocation as notified in writing, upon findings of the Authority, that the licensee has failed to comply with these regulations and the conditions of the licence.

10. Appointment, Duties and Responsibilities of Radiation Safety Officer

(a) A Licensee shall appoint at least one Radiation Safety Officer (RSO) with the authority to fulfil the duties and responsibilities listed in paragraph (3) below.

(b) The RSO shall have sufficient training and experience with radioactive material to be a user of the licenced radioactive material. Unless otherwise specified in the license, the training shall include practical experience in the safe and secure management of radioactive material and knowledge of the relevant principles, procedures, facilities and equipment.

(c) The duties and responsibilities of the RSO shall include the following:

- i. ensure that the Act, these Regulations and all terms and conditions of the licence are complied with;
- ii. ensure that the licensee's radioactive material are leak tested periodically and as prescribed by the manufacturer or by the licence;
- iii. ensure that radioactive material are used only by individuals who are authorized by the licensee and that all such individuals wear required personnel monitoring equipment;
- iv. maintain records of personnel monitoring , leak test , inventory , training, receipt, transfer, disposal, etc.
- v. ensure that radioactive material are properly secured against unauthorized access, removal, or sabotage as required by these Regulations and the licensee's site security plan;
- vi. serve as a contact to the Authority for events such as the loss, theft, sabotage or damage of radioactive material;

- vii. ensure that all users read and understand the licensee's emergency, operating and radiation safety procedures.
- viii. have authority to stop activities and practices which may be unsafe
- ix. any other duty or responsibilities that may be assigned by the licensee as deemed necessary

11. Establishment and Responsibilities of Radiation Safety and Security Committee

- (a) For Facilities using radioactive sources as in category 1 or 2 of Schedule 1, the licensees shall establish a Radiation Safety and Security Committee.
- (b) The Radiation Safety and Security Committee shall comprise of the following:
 - i. Representative of the Management which shall be the Chairman
 - ii. Radiation Safety Adviser,
 - iii. Site Chief Security Officer
 - iv. Radiation Safety Officers
 - v. And any other relevant personnel whose responsibilities have safety and security implications.
- (c) The Radiation Safety and Security Committee shall have the following responsibilities:
 - i. ensure the safe use and security of radioactive material;
 - ii. develop and recommend policies for the control and safe use of radioactive material;
 - iii. provide technical oversight, advice, and assistance on matters concerning security, safety and radiation protection;
 - iv. determine that all activities involving radioactive material are being conducted safely and in accordance with the provisions of the Act, Nigeria Basic Ionizing Radiation Regulations and these Regulations;
 - v. receive and review periodic reports from the RSO on incidents, personnel monitoring, inspections and other security, safety and radiation protection matters; and
 - vi. investigate all instances of alleged infractions of the Act, these Regulations, terms and conditions of license, safety rules, and any

other requirements prescribed by the Authority and decide the course of corrective action to be taken.

12. Personnel Monitoring

- (a) No licensee shall permit any individual to use or to assist in the use of radioactive material in portable devices unless such individual wears a personal dosimeter.
- (b) No licensee shall permit any individual to perform installations, maintenance or service, initial radiation surveys, relocations or removal from service of radioactive material in fixed devices unless such individual wears a personal dosimeter.
- (c) A personal dosimeter shall be worn by any individual using or assisting in the use of radioactive material of any gamma-emitting isotope with a gamma ray energy greater than 50KeV (kilo electron volts) or the use of any beta-emitting isotope with a maximum beta energy of 300KeV (kilo electron volts) or more.
- (d) A personal dosimeter shall be worn by any individual using or assisting in the use of radioactive material of 1,000 microcuries (37 MBq) or more of beta emitting isotopes with maximum beta energy of 1,000 KeV (kilo electron volts).
- (e) Each personal dosimeter shall be assigned to and worn by only one individual
- (f) Personal dosimeter shall be replaced at a specified interval and after replacement must be promptly processed..

13. Leak testing

- (a) A licensee in possession of a radioactive material shall ensure that:
 - i. the radioactive material is tested for leakage before its first use, unless the licensee has a certificate from the supplier indicating that the radioactive material was tested before transfer to the licensee; and
 - ii. the radioactive material is tested for leakage using a standard procedure and at intervals as approved by the Authority.
- (b) A licensee shall retain leak test records for three (3) years and the records shall contain the manufacturer's name, the model and serial numbers of each radioactive material tested, the identity of each radioactive material radionuclide and its estimated activity, the measured activity of each test sample expressed in microcuries (Becquerel), the date of the test, and the signature of the radiation safety officer or designee.

- (c) If the leak test reveals the presence of 0.005 micro curie (185 Bq) or more of removable contamination, the licensee shall:
- i. immediately withdraw the radioactive material from use and cause it to be decontaminated and repaired or to be disposed of in accordance with these Regulations; and
 - ii. file a report with the Authority within five (5) days of receiving the leak test results describing the equipment involved, the test results and the action taken.
- (d) The licensee shall not open radioactive sources or tamper with the encapsulation under any circumstances.

PART IV - SECURITY REQUIREMENTS FOR RADIOACTIVE MATERIAL

14. Security levels

The Licensee shall implement security protection measures commensurate with the security level(s) assigned to radioactive sources in Schedule 2.

15. Security Management

- (a) Security management shall include measures for access control, trustworthiness verification, information protection, preparation of a site security plan, training and qualification of personnel, accounting, inventory and response to and reporting of nuclear security events.
- (b) Licensees shall establish a security management system, commensurate with the size and nature of the authorized activity, which ensures that:
- i. Policies and procedures are established that identify security as being of the highest priority;
 - ii. Problems affecting security are promptly identified and corrected in a manner commensurate with their importance;
 - iii. The responsibilities of each individual for security are clearly identified and each individual is suitably trained and qualified;
 - iv. Clear lines of authority for decisions on security are defined;
 - v. Organizational arrangements and lines of communications that result in an appropriate flow of information on security at and between the various levels in the entire organization are established; and
 - vi. Strong security culture is instilled, practiced and promoted.

16. Security culture

- (a) The licensee shall develop management structures, allocate sufficient resources and put in place appropriate management systems for motivating personnel to adopt strict and prudent approach to, and seeking continuous improvement in nuclear security, which ensures :
- i. Organizational arrangements and lines of communications that result in an appropriate flow of information on security at and between the various levels within the organization are established;
 - ii. Sensitive information related to the security of radioactive material are identified and protected;
 - iii. individual and collective commitments to security at all levels of the organization are promoted;
 - iv. common understanding of the key aspects of security culture within the organization;
 - v. organizational supports for individuals and teams with account taken of the interactions between individuals, technology and the organization;
 - vi. participation of workers, their representatives and other relevant persons in the development and implementation of policies, rules and procedures dealing with security are encouraged;
 - vii. accountability of the organization and of individuals at all levels for security;
 - viii. open communication with regard to security within the organization and with relevant parties, as appropriate;
 - ix. questioning and learning attitude and discourages complacency with regard to security; and
 - x. that the organization continually seeks to develop and strengthen its security culture.

17. Site Security Plan

- (a) Licensees of radioactive sources in security levels A and B shall have a site security plan which shall:
- i. describe how the security provisions in these Regulations are met for the licensee's radioactive material;
 - ii. be reviewed, tested, and evaluated at least annually to ensure that it is still current and applicable; and

- iii. conform with the structure, format and content as outlined in Schedule 3.
- (b) The Authority may request for site security plan for radioactive sources in security level C when necessary.

18. Emergency and Contingency Response

- (a) The licensee shall establish and document contingency plan to respond to unauthorized removal of radioactive material or sabotage, or attempts thereof.
- (b) The plan shall, as appropriate, give consideration to the following aspects:
 - i. Infrastructure for coordination and operational interfaces for emergency and contingency response between the licensee and local and/or state emergency authorities
 - ii. Organization and staffing;
 - iii. Clearly define responding organizations, assign positions with sufficient numbers of qualified and trained personnel, who shall be able to promptly respond to notifications, mitigation, protective actions and other response actions; and
 - iv. Establish and document the organizational relationship and interfaces between all major responding organizations.
- (c) The contingency plan shall be made available to the relevant organizations.
- (d) The contingency plan shall be tested every 12 months within the organization and every two years with relevant stakeholders

19. Information security

- (a) The licensee shall on a need-to-know basis, control and limit distribution of information and documents on radioactive sources in security levels A and B that can be used to identify specific locations, specific security measures or weaknesses in the licensee's system of management of radioactive material or otherwise compromise the licensee's security system
- (b) The information and documents shall include but not limited to information and documents pertaining to the following topics:
 - i. specific locations of radioactive material;
 - ii. the site security plan and security system associated with the radioactive material;
 - iii. temporary or permanent weaknesses in the security system;
 - iv. radioactive material utilization plans and records;
 - v. proposed date and time of radioactive material shipment or transfer;

- vi. emergency response plans and systems; and
- vii. personnel information .

20. Cyber Security

(a) The Licensee shall ensure that:

- i. cyber security policy which specifies the overall cyber security goals of the facility is established;
- ii. cyber security plan is an integral part of the Site Security Plan;
- iii. cyber Security Plan is regularly reviewed and updated;
- iv. cyber security procedures are developed;
- v. the various levels of management within the organization maintain appropriate level of cyber security within their areas of responsibility;
- vi. cyber security awareness is fully integrated into the overall site security culture;
- vii. graded approach is applied in the protection of computer and network based systems;
- viii. computer systems that can impact safety and security of activity or facility are adequately protected and
- ix. staff are sufficiently trained and briefed on cyber security issues relevant to their roles.

(b) For radioactive sources in security level A and facilities that use computer and network based systems, Licensee shall appoint a Cyber Security Officer (CSO) with the authority to fulfill the duties and responsibilities listed in 20(c)

(c) Duties and responsibilities of the CSO:

- i. Advise the facility's management on cyber security;
- ii. Coordinate and control the development of cyber security activities such as implementing the provisions of regulation 17, of these Regulations;
- iii. Coordinate with responsible security and safety officers to plan security measures and response to security incidents; Conduct periodic cyber security risk assessments;
- iv. Conduct periodic inspections, audits and reviews of the cyber security and provide status reports to management; and

- v. Investigate cyber security incidents and develop post-incident procedures and preventive actions for the facility.

21. Compensatory Security Measures for Mobile and Portable Sources

Where it is not feasible to fully meet the requirements of this Regulations for mobile or portable radioactive sources, licensees shall include in their application and the security plan a description of its compensatory security measures.

22. Inventory of Radioactive Material

- (a) A licensee shall conduct a physical inventory of all radioactive material during the month of January each year and send the inventory report to the Authority on or before 15th February each year.
- (b) The records of the inventory shall be kept appropriately secured and shall be retained for at least three (3) years.
- (c) The Inventory record shall contain the following:
 - i. the model and serial number of each radioactive material;
 - ii. the identity of each radioactive material;
 - iii. radionuclide and its activity on a specified date;
 - iv. the location of each radioactive material;
 - v. information on receipt, transfer or disposal of the radioactive material;
 - vi. Physical form of the radioactive material
 - vii. Radioactive material use history
 - viii. the date of the inventory; and
 - ix. the signature of the RSO or designee.

23. Transfer of Radioactive Material

A licensee shall not transfer a radioactive material to another party unless:

- (a) such licensee is authorized to do so by the Authority;
- (b) the recipient possesses a valid license for the radioactive material; and

- (c) the current licensee provides the recipient with all relevant technical information to permit the safe and secure management of the radioactive material.
- (d) In their applications, the current licensee and the proposed transferee provide to the Authority a description of the transaction, change of personnel, change of location, equipment, procedures, surveillance records, decommissioning processes and related records of transfer and transferee's commitment to abide by the current licensee's commitments.

24. Graded Approach for Protection against Unauthorized Removal and Sabotage

The Licensee shall:

- (a) categorize their radioactive material in accordance with Schedule 1 of this Regulation;
- (a) establish required level of protection taking into account the current evaluation of the threat, the relative attractiveness of a radioactive material, the nature of the source and potential consequences associated with its unauthorized removal or sabotage.
- (c) implement measures for protection against unauthorized removal and sabotage as required in these Regulations.

25. Measures to Locate and Recover Missing or Stolen Radioactive Material

(a) The Licensee shall:

- i. ensure that the system for the security of radioactive material system is designed to detect in a timely manner any radioactive material that are missing or stolen;
- ii. immediately notify the Authority, Nigerian Police Force and other relevant Security Agencies of missing or stolen radioactive material;
- iii. take all appropriate measures to locate, as soon as possible, any declared missing or stolen radioactive material on site, or collaborate with security agencies for off-site search and recovery of the missing or stolen radioactive material;

(b) The Licensee shall include in its contingency plan measures to implement the above requirements and shall test and evaluate it at least once in two years depending on the categorization of the radioactive sources as indicated in Schedule 1 of these Regulations.

PART VI - REPORTING REQUIREMENTS AND RESPONSE PLAN

26. Radioactive Source Tracking System

- (a) For the purposes of the National Radioactive Source Tracking System and Regulatory Authority Information System (RAIS), a licensee shall report to the Authority all information on transactions involving manufacture, transfer, receipt, export or disposal of radioactive material.
- (b) The information in 30 (1) shall include manufacturer's name and address, radioactive material activity and transaction dates.
- (c) The licensee shall provide also the facility name, licence number, address, name of individual that prepared the report and any other information the Authority may consider necessary.
- (d) As part of the annual inventory required by 22 (a), each licensee shall reconcile and verify the inventory of nationally tracked material possessed by the licensee against the licensee's data in the National Source Tracking System.
- (e) The reconciliation process must include resolving discrepancies in previously filed reports.

27. Reporting of Events

- (a) The licensee shall immediately inform the Authority and local and state emergency authorities in the case of the following nuclear security events:
 - i. Detection of an unauthorised removal or sabotage, or its attempt (promptly);
 - ii. Confirmed absence or accounting discrepancy in the amount of radioactive material (promptly);
 - iii. If storage containers or packages of radioactive material have been tampered with (within 24 hours);
 - iv. Any malfunctioning of the transport security system (within 24 hours);
 - v. Any breach of the security of sensitive information (within 24 hours).
- (b) The licensee shall investigate the nuclear security event and its causes, circumstances and consequences, take appropriate compensatory action to remedy the circumstances and to prevent a recurrence of similar situations and shall submit a report to the Authority about the results of the examination and the corrective actions within thirty (30) days, or as required. Failure to take corrective or preventive actions within a reasonable time in accordance with these Regulations shall be grounds for enforcement in accordance with Section 45 of the Act.

28. Response to an Increased Threat

(1) The licensee shall plan for response to an increased threat of malicious use in close cooperation with the Authority and the competent emergency response agencies. The licensee shall establish, to the extent practicable, pre-arranged procedures with law enforcement agencies regarding intelligence information and use of secure communications as well as the reactions to an increased threat.

(2) Where a licensee with responsibility for Security Levels A, B or C radioactive material becomes aware, or suspects that there is a specific threat targeting a radioactive material or radioactive material storage location, the licensee shall increase his security arrangements and measures in accordance with the threat. The increased security measures shall be continued until such time as the Authority determines that the specific threat is no longer present. The following measures shall be considered:

- a) if the radioactive material is in use, return the radioactive material to its secure storage location;
- b) provide a 24-hour guard and implement appropriate physical protection measures in accordance with the threat;
- c) ensure that the law enforcement agencies and the Authority are made aware of the suspected threat;
- d) review the security procedures, facility layout, and radiation safety practices with the law enforcement and emergency response personnel;
- e) make sure those emergency response procedures are current; and
- f) ensure that local medical facilities with trained personnel and appropriate equipment are available.

PART VI – TRAINING REQUIREMENTS

29. Training Requirements for Authorized Users

(1) Licensees shall allow radioactive material to be used only by individuals who are qualified by training and experience to protect public, health, property and the environment.

(2) Licensees shall ensure that all personnel on whom safety or security depends are appropriately trained and qualified. They shall be periodically retrained or re-qualified as may be appropriate

(3) Licensees shall submit for approval by the Authority a radiation safety and security training program for workers including its contents and resource person(s)/organization. Licensees shall routinely evaluate and update the training program as necessary.

(4) Licensees shall maintain records of training during the period of employment of the individual and for 3 years thereafter.

PART VII - REQUIREMENTS FOR IMPORT AND EXPORT OF RADIOACTIVE MATERIAL

30. Requisite Authorization

(1). The Authority shall:

- (a) ensure that for every import of a radioactive material, the recipient has the requisite Authority license (s) to receive and possess the radioactive material;
- (b) ensure that for every export of a radioactive material, the recipient has the requisite authorization from the importing State to receive and possess the radioactive material.

(2) All licensees proposing to import or export a radioactive material shall in addition to other requirements for the appropriate licenses in cases of Categories 1 and 2 of Schedule 1 of these Regulations provide to the Authority:

- (a) For an application for a license to import a radioactive material, an export authorization from the regulatory body of the exporting state and
- (b) a written agreement from the radioactive material manufacturer or an authorized handler that the radioactive material shall be accepted back when disused or spent;
- (c) For an application for a license to export a radioactive material, an import license from the regulatory body of the importing state
- (d) if the conditions in (a) and (c) with respect to particular import or export cannot be satisfied, that import and export can be authorized in exceptional circumstances with the consent of the importing country if an alternative arrangement has been made to ensure the radioactive material will be managed in a safe and secure manner.

(2) Licensee shall ensure that in addition to the provisions of these Regulations, the import and export of radioactive material is consistent with the provisions of relevant international standards.

PART VIII – ADDITIONAL REQUIREMENTS

31. Safety and Security Interface

The Licensee shall assess and manage the safety and security interface to ensure that they do not adversely affect each other and that they are mutually supportive.

32. Quality Assurance

Licensees shall establish quality assurance programmes that provide:

- (1) Adequate assurance that the specific applicable requirements relating to safety and security are satisfied;
- (2) Assurance that the components of the safety and security systems are of good quality and sufficient for their tasks; and
- (3) Quality control mechanisms and procedures for reviewing and assessing the overall effectiveness of safety and security measures.

33. Operating and Emergency Procedures

(1) The licensee's operating and emergency procedures shall be posted accordingly within the area of operations and shall accompany portable devices at all times.

(2) The procedures shall include instructions in the following as applicable to the type of use:

- (a) the uses of radioactive material so that exposures are maintained as low as reasonably achievable and no individual is likely to be exposed to radiation doses in excess of the standards in Nigeria Basic Ionizing Radiation Regulations;
- (b) methods and occasions for conducting radiation surveys;
- (c) methods and occasions for locking and securing radioactive material;
- (d) personnel monitoring and the use of personnel monitoring equipment;
- (e) minimizing exposure of individuals in the event of an accident or emergency;
- (f) notifying proper personnel in the event of damage, loss, theft, or accident involving radioactive material; specific emergency procedures should be developed at least for the security levels A,B and C which are appropriate to the magnitude and number of sources
- (g) annually exercising and evaluating emergency response procedures and sending reports to the Authority
- (h) maintenance of records;

- (i) procedures for picking up, receiving and opening packages containing radioactive material; and
- (j) the transportation of radioactive material to temporary job sites, including the packaging, marking, labeling and placing of such radioactive material in vehicles, placarding of vehicles, securing the radioactive material during transportation and possessing proper shipping papers and emergency response information

34. Abandonment of Radioactive Material

(1) For a radioactive material that has become lodged in a well and determined to be irretrievable by the licensee after reasonable efforts at recovery have been expended, the licensee shall:

- a. immediately notify the Authority giving details of the incident and detailed information on the radioactive material identification including licence and serial numbers,
- b. Indicate circumstances that resulted in the inability to retrieve the source and obtain approval from the Authority to implement abandonment procedures.

(2) With the approval of abandonment from the Authority, the licensee shall within 30 days immobilize the material and seal in place with a cement plug, provide means to prevent inadvertent intrusion on the source, install a permanent identification plaque at the surface of the well and submit details of the abandonment procedures to the Authority.

35. Additional Requirements for Radioactive Material in Fixed Devices

(1) A licensee authorized to perform installations, maintenance or service, initial radiation surveys, relocations or removal from service of radioactive material in fixed devices shall possess portable radiation survey instruments. The instruments shall be operable and calibrated by a standards dosimetry laboratory.

(2) A licensee shall post and provide to personnel lock-out procedures that will prevent employees from entering the radiation beam during maintenance, repairs, or other work in, on, or around a bin, tank, hopper or pipe on which a device using a radioactive material is mounted.

36. Screening of Scrap Metal

(1) The export of scrap metal shall only be done through designated ports where radiation portal monitors are provided.

(2) A certified document indicating that the consignment does not contain high level of radioactivity arising from incorporation of radioactive material shall be part of the documents to be provided to the customs services before export.

(3) For industries that are using scrap metal as raw materials for products to be used in the country, provision of radiation monitors for screening of radioactivity shall be provided and with approved procedures from the Authority.

PART IX – OFFENCES, PENALTIES AND APPEAL

37. Offences and Penalties

(1) A person who contravenes any of the provisions of these Regulations commits an offence and is liable on conviction to the penalties stipulated under the Act and any other extant Laws.

(2) Notwithstanding the provisions of paragraph (1) above, the Authority may impose penalties such as administrative fine, suspension, revocation of authorization, sealing of facility or any combination of these.

38. Appeal

Any person or body corporate may appeal to the Board of the Authority against any decision made by the Authority pursuant to these Regulations.

39. Interpretation

In these Regulations, unless the context otherwise requires –

“**the Act**” means the Nuclear Safety and Radiation Protection Act 19 of 1995 including any amendment thereto;

“**the Authority**” means the Nigerian Nuclear Regulatory Authority established under Section 1 of the Act;

“**authorization**” means a permission granted in a document by the Authority to a legal person who has submitted an application to carry out a practice or any other action described in the Act or regulations there under. The Authorization can take the form of a registration or a license.

“**associated activity**” means the possession, production, processing, use, handling, storage, disposal or transport of nuclear material or other radioactive material.

“**associated facility**” means a facility (including associated buildings and equipment) in which nuclear material or other radioactive material is produced, processed, used, handled, stored or disposed of and for which an authorization is required.

“contamination” Means radioactive substances on surfaces, or within solids, liquid or gases (including the human body), where their presence is unintended or undesirable, or the process giving rise to their presence in such places.

“contingency plan means a predefined sets of actions for response to unauthorized acts indicative of attempted unauthorized removal or sabotage, including threats thereof, designed to effectively counter such acts.

“cyber security means a particular aspect of information security that is connected with computer based systems, networks and digital systems.

“cyber security policy means aggregate of directives, Regulations, rules and practices that prescribes how an organization manages and protects computers and computer systems.

“design basis threat” means the attributes and characteristics of potential insider and/or external adversaries, who might attempt unauthorized removal and/or sabotage, against which a physical protection system is designed and evaluated.

“delay” means the element of a physical protection system designed to increase the time required for an adversary to gain unauthorized access to or to remove or sabotage a radioactive source, generally through barriers or other physical means.

“detection” means a process in a physical protection system that begins with sensing a potentially malicious or other unauthorized act and that is completed with the assessment of the cause of the alarm.

“disposal” means the emplacement of spent fuel or radioactive waste in an appropriate facility without the intention of retrieval.

“disused source” means radioactive source no longer intended to be used, and is not intended to be used for the practice of which an authorization has been granted;

“dose rate” means, in relation to a place, the rate at which a person or part of a person would receive a dose of ionizing radiation from external radiation if he were at that place being a dose rate at that place averaged over one minute;

“effective dose” means the quantity E, defined as a summation of the tissue equivalent doses, each multiplied by the appropriate tissue weighting factor:

$$E = \sum_T W_T H_T$$

where H_T is the equivalent dose in tissue T and W_T is the tissue weighting factor for tissue T. From the definition of equivalent dose, it follows that:

$$E = \sum_T W_T \cdot \sum_R W_R \cdot D_{T,R}$$

where W_R is the radiation weighting factor for radiation R and $D_{T,R}$ the average absorbed dose in the organ or tissue T.

“export” means the physical transfer, originating from an exporting state, into an importing state or to a recipient in an importing state, of one or more radioactive source(s) covered by these Regulations;

“exporting facility” means the natural or legal person in an exporting state, from which one or more radioactive source(s) are exported to an importing state or to a recipient in an importing state;

“exporting state” means the state of origin of an export of one or more radioactive source(s) to an importing state or a recipient in an importing state;

“graded approach” means the application of nuclear security measures proportional to the consequences of a malicious act.

“guard” means a person who is entrusted with responsibility for patrolling, monitoring, assessing, escorting individuals or transports, controlling access and or providing initial response.

“import” means the physical transfer into an importing state or to a recipient in an importing state, originating from an exporting state, of one or more radioactive source(s) covered by these Regulations;

“importing state” means the state of final destination for a physical transfer of one or more radioactive source(s) from an exporting state or an exporting facility;

“industrial gamma radiography” is a non-destructive method of inspecting materials for hidden flaws by utilising the ability of gamma radiation to penetrate various materials;

“ionizing radiation” means energy in the form of particles or electromagnetic waves of a wavelength of 100 nanometers or less or a frequency of 3×10^{15} hertz or more capable of producing ions directly or indirectly;

“legal person” means any organisation, corporation, partnerships, firm, association, trust, estate, public or private institution, group, political or administrative entity or other persons designated in accordance with national legislation, who or which has responsibility and authority for actions taken under these Regulations;

“licence” means an authorization granted by the Authority on the basis of a safety assessment and accompanied by specific requirements and conditions to be complied with by the licensee;

“licensee” means the holder of a current licence granted by the Authority for a practice or source who has recognized rights and duties for the practice or source, particularly in relation to radiation protection, safety and security;

“management” means the administrative and operational activities that are involved in practices entailing radioactive sources;

“malicious act” means a criminal or intentional unauthorized act involving or directed at radioactive material, an associated facility and/or an associated activity;

“monitoring” means the measurement of radiation or radionuclides for reasons related to the assessment or control of exposure and the interpretation of such measurements. Monitoring can be continuous and non-continuous;

“nationally tracked source” means a radioactive source containing a quantity equal or greater than Category 1 or 2 levels of any radioactive material listed in Schedule I of these Regulations;

“NiBIRR” means the Nigeria Basic Ionizing Radiation Regulations 2003;

“nuclear material” means Plutonium except that with isotopic concentration exceeding 80% in plutonium-238; uranium-233; uranium enriched in the isotope 235 or 233; uranium containing the mixture of isotope 235 or 233; uranium containing the mixture of isotopes as occurring in nature other than in the form of ore or ore-residue; any material containing one or more of the foregoing.

“nuclear security” means the prevention of, detection of, and response to, criminal or intentional unauthorized acts involving or directed at nuclear material, other radioactive material, associated facilities, or associated activities.

“nuclear security event” means an event that has potential or actual implications for nuclear security that must be addressed.

“operators” means an entity (person or organization) authorized to operate a nuclear or radiological facility or authorized to use, store or transport nuclear material and/or radioactive material. Such an entity would normally hold a licence or other document of authorization from a competent authority or be contractors of a holder of such an authorization.

“practice” means work involving:

(a) the production, processing, handling, use, holding, storage, transport or disposal of radioactive material; or

(b) the operation of any electrical equipment emitting ionizing radiation and containing components operating at a potential difference of more than 5kV;

which can increase the exposure of individuals to radiation from an artificial source, or from a radioactive substance containing naturally occurring

radionuclides, which are processed for their radioactive, fissile or fertile properties;

“quality assurance” means all those planned and systematic actions necessary to provide adequate confidence that an item, process or service will satisfy given requirements for quality, for example, those specified in the licence;

“radioactive source” means radioactive material that is permanently sealed in a capsule or closely bonded, in a solid form and which is not exempt from regulatory control. It also means any radioactive material released if the radioactive source is leaking or broken, but does not mean material encapsulated for disposal, or nuclear material within the nuclear fuel cycles of research and power reactors;

“radioactive material” means any material designated in national law or regulations as being subject to regulatory control because of its radioactivity;

“radioactive waste” means material, whatever its physical form, remaining from practices or interventions and for which no further use is foreseen,

(a) that contains or is contaminated with radioactive substances and has an activity or activity concentration higher than the level for exemption or clearance from regulatory requirements, and

(b) exposure to which is not excluded from these Regulations;

“radionuclide” means a nucleus (of an atom) that possesses properties of spontaneous disintegration (radioactivity). Nucleus is distinguished by their mass and atomic number;

“recipient” means the natural or legal person in an importing state that receives one or more radioactive source(s) exported by an exporting state or a facility in the exporting state;

“regulatory control” means any form of control applied to radioactive material, associated facilities or associated activities by the Authority for reasons related to radiation protection or the safety or security of radioactive sources;

“response” means the actions undertaken following detection to prevent an adversary from succeeding or to mitigate potentially severe consequences.

“sabotage” means any deliberate act directed against a radioactive source or associated facility or activity 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.

“safety” means measures intended to minimize the likelihood of accidents with radioactive sources and, should such an accident occur, to mitigate its consequences;

“safety assessment” means a review of the aspects of design and operation of a source that are relevant to the protection of persons or the safety of the source,

including the analysis of the provisions for safety and protection established in the design and operation of the source and the analysis of risks associated with normal conditions and accident situations;

“safety culture” means the assembly of characteristics and attitudes in organizations and individuals, which establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance;

“security agencies/law enforcement agencies” means those agencies of the Federal Government of Nigeria so designated by law to handle and/or deal with defence and security matters. They include Nigeria Police Force, Nigeria Military, Department of State Services, National Intelligence Agency, Nigeria Security and Civil Defense Corps, Nigeria Customs Service, Nigeria Immigration Service, Federal Road Safety Commission as appropriate and Office of National Security Adviser

“security culture” means characteristics and attitudes in organizations and of individuals, which establish that security issues receive the attention warranted by their significance;

“security level A” means radioactive sources in Category 1 as explained in Schedule 1

“security level B” means radioactive sources in Category 2 explained in Schedule 1

“security level C” means radioactive sources in Category 3 explained in Schedule 1

“security management” means the establishment and implementation of policies, plans, and procedures and the deployment of the necessary resources, for the security of radioactive material and associated facilities.

“transport” means international or domestic carriage of radioactive material by any means of transport, beginning with the departure from a nuclear facility of the shipper and ending with the arrival at a facility of the receiver.

“threat” means a person or group of persons with motivation, intention and capability to commit a malicious act.

“trustworthiness determination” means assessment of an individual’s integrity, honesty and reliability in pre-employment checks and checks during employment that are intended to identify the motivation or behaviour of persons who could become insiders.

“unauthorized removal” means the theft or other unlawful taking of radioactive sources.

“unusual events” means loss of control over a radioactive source, unplanned exposures, unauthorized access or use of a radioactive source, failure of

equipment containing radioactive sources and discovery of an unaccounted radioactive source.

“vulnerability assessment” means a process which evaluates and documents the features and effectiveness of the overall security system at a particular target.

“worker” means any person who works, whether full time or temporarily, for an employer and who has recognized rights and duties in relation to occupational radiation protection (a self employed person is regarded as having the duties of both an employer and a worker);

40. Citation

These Regulations may be cited as the Nigerian Safety and Security of Radioactive Material in Use and Storage Regulations, 2021.

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SCHEDULE 1: CATEGORY OF RADIOACTIVE SOURCES

This Schedule describes the system of categorization to be used in categorizing radioactive sources subject to these Regulations as Category 1, 2, or 3. All other radioactive sources shall be protected as assets, but are not otherwise subject to these Regulations.

In recognition of the fact that human health is of paramount importance, the categorization system is based primarily on the potential for radioactive sources to cause deterministic health effects. The D-value is the radionuclide-specific activity of a radioactive sources which, if not under control, could cause severe deterministic effects for a range of scenarios that include both external exposure from unshielded radioactive sources and inadvertent internal exposure following dispersal (e.g.: by fire or explosion) of the radioactive sources.

A radioactive source is assigned to a category based on the activity of the radioactive source (A) divided by the danger value (D-value or D) for the particular radionuclide. If this activity ratio is greater than or equal to 1000, the radioactive source is assigned to Category 1. If the ratio is less than 1000 but greater than or equal to 10, the radioactive source is assigned to Category 2. If the ratio is less than 10 but greater than or equal to 1, the radioactive source is assigned to Category 3. This assignment is shown in Table 1. Categorization thresholds of A/D ratios for commonly used radionuclides are shown in Table 2.

TABLE 1. CATGORIZATION BASED ON A/D RATIO

Category	A/D Ratio
1	$A/D \geq 1000$
2	$1000 > A/D \geq 10$
3	$10 > A/D \geq 1$

The following text describes the risk of being close to an individual radioactive source in Category 1, 2, and 3 and the typical practices in which such sources are used.

Category 1 Radioactive Sources

If not safely managed or securely protected, a Category 1 radioactive source would be likely to cause permanent injury to a person who handled them, or were otherwise in contact with them, for more than a few minutes. It would probably be fatal to be close to this amount of unshielded radioactive source for a period of a few minutes to an hour. These radioactive sources are typically used in practices such as radioisotope thermoelectric generators, irradiators and teletherapy.

Category 2 Radioactive Sources

If not safely managed or securely protected, a Category 2 radioactive source could cause permanent injury to a person who handled it, or who was otherwise in contact with it for a short time (minutes to hours). It could possibly be fatal to be close to this amount of unshielded radioactive material for a period of hours to days. These radioactive sources are typically used in practices such as industrial gamma radiography, high dose rate brachytherapy and medium dose rate brachytherapy.

Category 3 Radioactive Sources

If not safely managed or securely protected, a Category 3 radioactive source could cause permanent injury to a person who handled it, or was otherwise in contact with it for some hours. It could possibly — although this is unlikely — be fatal to be close to this amount of unshielded radioactive material for a period of days to weeks. These radioactive sources are typically used in practices such as fixed industrial gauges involving high activity sources including level gauges, dredger gauges, conveyor gauges and spinning pipe gauges) and well logging.

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TABLE 2

The table provides a categorization by activity levels for radionuclides that are commonly used. These are based on D-values, which define a dangerous radioactive source i.e.: a radioactive source that could, if not under control, gives rise to exposure sufficient to cause severe deterministic effects. A more complete listing of radionuclides and associated activity levels corresponding to each category, and a full explanation of the derivation of the D-values, may be found in eight schedule of Nigeria Basic Ionizing Radiation Regulations, which also provides the underlying methodology that could be applied to radionuclides not listed. Typical source uses are noted above for illustrative purposes only.

Table 2: ACTIVITIES CORRESPONDING TO THRESHOLDS OF CATEGORIES

Radionuclide	Category 1		Category 2		Category 3	
	1000 x D		10 x D		D	
	(TBq)	(Ci) ^a	(TBq)	(Ci) ^a	(TBq)	(Ci) ^a
Am-241	6.E+01	2.E+03	6.E-01	2.E+01	6.E-02	2.E+00
Am-241/Be	6.E+01	2.E+03	6.E-01	2.E+01	6.E-02	2.E+00
Cf-252	2.E+01	5.E+02	2.E-01	5.E-00	2.E-02	5.E-01
Cm-244	5.E+01	1.E+03	5.E-01	1.E+01	5.E-02	1.E+00
Co-60	3.E+01	8.E+02	3.E-01	8.E+00	3.E-02	8.E-01
Cs-137	1.E+02	3.E+03	1.E+00	3.E+01	1.E-01	3.E+00
Gd-153	1.E+03	3.E+04	1.E+01	3.E+02	1.E+00	3.E+01
Ir-192	8.E+01	2.E+03	8.E-01	2.E+01	8.E-02	2.E+00
Pm-147	4.E+04	1.E+06	4.E+02	1.E+04	4.E+01	1.E+03
Pu-238	6.E+01	2.E+03	6.E-01	2.E+01	6.E-02	2.E+00
Pu-239/Be	6.E+01	2.E+03	6.E-01	2.E+01	6.E-02	2.E+00
Ra-226	4.E+01	1.E+03	4.E-01	1.E+01	4.E-02	1.E+00
Se-75	2.E+02	5.E+03	2.E+00	5.E+01	2.E-01	5.E+00
Sr-90 (Y-90)	1.E+03	3.E+04	1.E+01	3.E+02	1.E+00	3.E+01
Tm-170	2.E+04	5.E+05	2.E+02	5.E+03	2.E+01	5.E+02
Yb-169	3.E+02	8.E+03	3.E+00	8.E+01	3.E-01	8.E+00
Au-198*	2.E+02	5.E+03	2.E+00	5.E+01	2.E-01	5.E+00
Cd-109*	2.E+04	5.E+05	2.E+02	5.E+03	2.E+01	5.E+02
Co-57*	7.E+02	2.E+04	7.E+00	2.E+02	7.E-01	2.E+01
Fe-55*	8.E+05	2.E+07	8.E+03	2.E+05	8.E+02	2.E+04
Ge-68*	7.E+02	2.E+04	7.E+00	2.E+02	7.E-01	2.E+01
Ni-63*	6.E+04	2.E+06	6.E+02	2.E+04	6.E+01	2.E+03
Pd-103*	9.E+04	2.E+06	9.E+02	2.E+04	9.E+01	2.E+03
Po-210*	6.E+01	2.E+03	6.E-01	2.E+01	6.E-02	2.E+00
Ru-106 (Rh-106)*	3.E+02	8.E+03	3.E+00	8.E+01	3.E-01	8.E+00
Tl-204*	2.E+04	5.E+05	2.E+02	5.E+03	2.E+01	5.E+02

These radionuclides are very unlikely to be used in individual radioactive sources with activity levels that would place them within Categories 1, 2 or 3 and would therefore not be subject to the paragraph relating to national registries (11) or the paragraphs relating to import and export control (23 to 26)

- a The primary values to be used are given in TBq. Curie values are provided for practical usefulness and are rounded after conversion.
- b Criticality and safeguard issues will need to be considered for multiples of D.

Aggregation of radioactive sources

When radioactive sources are in close proximity, such as in a single room or other enclosure), the license shall aggregate the activity of the radioactive sources and assign a category to the group. In situations of this type, the summed activity of the radionuclide should be divided by the appropriate D value and the calculated ratio A/D compared with the ratios A/D given in Table 1, thus allowing the set of different radionuclides to be categorized on the basis of activity. If radioactive sources of various radionuclides are aggregated, then the sum of the ratios A/D should be used in determining the category, in accordance with the formula:

Aggregate A/D =

$$\sum_n \frac{\sum_i A_{i,n}}{D_n}$$

where:

radioactive

source

i

$A_{i,n}$ = activity of each individual
of radionuclide n .

D_n = D value for radionuclide n .

SCHEDULE 2: PHYSICAL PROTECTION MEASURES

Security objectives and measures for radioactive sources in Security Level A

The wide range of characteristic exhibited by radioactive sources makes them tools for adversaries in carrying out malicious act. It is therefore imperative that a wide range of effective security measures is adopted to ensure the security of radioactive sources. Graded approach should therefore be applied for effective security of radioactive sources by using the concept of security levels.

Three security levels namely Security Level A, B and C have been developed to allow specification of security system performance in a graded manner. The security level that should be applied on a source depends on the source category”

In order to achieve the goal of Security Level A, which is **to prevent the unauthorized removal of radioactive sources**, licensees shall:

1. Detection

- (a) Provide immediate detection of any unauthorized access to the secured area/source location by the use of an electronic intrusion detection system and/or continuous surveillance by operator personnel.
- (b) Provide immediate detection of any attempted unauthorized removal of the source (e.g. an insider) by the use of electronic tamper detection equipment and/or continuous surveillance by operator personnel.
- (c) Provide immediate assessment of detection by the use of remote monitoring of Closed Circuit Television (CCTV) or assessment by operator/response personnel.
- (d) Provide immediate communication to response personnel through rapid, dependable, diverse means of communication such as phones, cell phones, pagers, radios.
- (e) Provide a means to detect loss through verification by daily checking through physical checks, CCTV, tamper indicating devices, etc.

2. Delay

Provide delay after detection sufficient for response personnel to interrupt the unauthorized removal through a system of at least two layers of barriers (e.g. walls, cages) which together provide delay sufficient to enable response personnel to interdict.

3. Response

Provide immediate response to assessed alarm with sufficient resources to interrupt and prevent the unauthorized removal through the capability for immediate response with size, equipment, and training to interdict.

Security objectives and measures for radioactive sources in Security Level B

In order to achieve the goal of Security Level B, which is **to minimize the likelihood of unauthorized removal of radioactive sources**, licensees shall:

1. Detection

- (a) Provide immediate detection of any unauthorized access to the secured area/source location by the use of electronic intrusion detection equipment and/or continuous surveillance by operator personnel.
- (b) Provide detection of any attempted unauthorized removal of the source through the use of tamper detection equipment and/or periodic checks by operator personnel.
- (c) Provide immediate assessment of detection through remote monitoring of CCTV or assessment by operator/response personnel.
- (d) Provide immediate communication to response personnel through rapid, dependable means of communication such as phones, cell phones, pagers, radios.
- (e) Provide a means to detect loss through verification by weekly checking through physical checks, tamper detection equipment, etc.

2. Delay

Provide delay to minimize the likelihood of unauthorized removal through a system of two layers of barriers (e.g. walls, cages).

3. Response

Provide immediate initiation of response to interrupt unauthorized removal through the use of equipment and procedures to immediately initiate response.

Security objectives and measures for radioactive sources in Security Level C

In order to achieve the goal of Security Level C, which is **to reduce the likelihood of unauthorized removal of radioactive sources**, licensees shall:

1. Detection

- (a) Provide detection of unauthorized removal of the source through the use of tamper detection equipment and/or periodic checks by operator personnel.
- (b) Provide immediate assessment of detection through an assessment by operator or response personnel.
- (c) Provide a means to detect loss through verification by monthly checking through physical checks, tamper indicating devices, etc.

2. Delay

Provide delay to reduce the likelihood of unauthorized removal by the use of one barrier (e.g. cage, source housing) or through observation by operator personnel.

3. Response

Implement appropriate action in the event of unauthorized removal of a source by the use of procedures for identifying necessary actions in accordance with contingency plans.

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SCHEDULE 3: OUTLINE OF A SITE SECURITY PLAN

A security plan as required by Regulations 17 shall include all information necessary to describe the security approach and system being used for protection of the radioactive source(s). The level of details and depth of content shall be commensurate with the security level of the source(s) covered by the plan. The following topics shall be included:

- (a) description of the process for developing, approving and updating the facility security plan,
- (b) objectives of the security plan for the specific building or facility should include,
 - i. specific concern to be addressed: unauthorized removal, destruction or malicious use,
 - ii. kind of control needed to prevent undesired consequences including the auxiliary equipment that might be needed,
 - iii. equipment or premises that will be secured.
- (c) description of the source, its uses and associated equipment, its categorization and security level,
- (d) description of the environment, building and /or facility where the source is used or stored and if appropriate a diagram of the facility layout and security system,
- (e) the location of the building or facility relative to areas accessible to the public,
- (f) development of procedures for operating and maintaining the security measures,
- (g) development of the security measures to be used and this should include,
 - i. the measures to secure, provide surveillance, detect, delay, respond and communicate,
 - ii. the design features to evaluate the quality of the measures against the assumed threat,
 - iii. administrative measures.
- (h) development of training and qualification program which should include,
 - i. security related trainings /qualifications and frequency of the trainings,
 - ii. provision of training records and information on the provider of the trainings
- (i) description of the facility operations which should involve,
 - i. description of the security management measures in place,
 - ii. identification of the positions required for the facilities' operations,
 - iii. provision of an organizational chart, schematic or tables showing the staffing structure with lines of authority and supervision to demonstrate how the security organization and responsibilities fit within the overall facility organization.

- (j) description of the process to evaluate the trustworthiness and reliability of personnel. The process should also indicate requirements for periodic review,
- (k) description of the facility's performance testing arrangements to determine whether the security system (people, procedures and equipment) performs as required and achieves the desired results,
- (l) description of the maintenance program for the security system's equipment so as to ensure their continuous and reliable operation,
- (m) resource planning for security should be viewed and implemented at the system level and reported at the facility level,
- (n) describe what information requires protection, as defined by the regulatory body or facility management including: **security system, threat information,**
- (o) describe the process or methodology used to evaluate the security system of the facility and assess its vulnerabilities taking into account the threat information provided,
- (p) describe the security layers and how each secured area and the associated radioactive source is protected by detection, delay and response measures,
- (q) describe how assigned personnel should operate security systems and discharge their other security-related responsibilities during periods of:
 - i. routine operations;
 - ii. off-shift or after-hours operations when staff are not ordinarily present, generally at nights, on weekends and during holidays;
 - iii. emergency operations.
- (j) description of how periodic accounting for radioactive source, as prescribed by the regulatory body is performed,
- (k) description of how the facility's inventory of all radioactive source is established and maintained,
- (l) description of the response arrangements for security events including their relationship with emergency situations and other contingency situations,
- (m) describe the arrangements among organizational, local and national response forces and their deployment, including target familiarization, response times, capabilities, strategy and tactics,
- (n) description of the communication methods (radio, land lines, etc.) to be used by response forces in communicating with the alarm monitoring station and in establishing command and control during security events,
- (o) description of how security events are reported to the facility security organization and how events are documented; who is responsible to document the event and subsequent external reporting requirements (e.g. reporting to the regulatory body),
- (p) summarize the arrangements and actions to be taken during non-security emergencies or other contingency situations to ensure the protection of the radioactive and nuclear materials at the facility,
- (q) description of how notifications of an increased threat level are addressed by the facility. The procedures to address increased threat level should include the process for periodically evaluating the effectiveness of the plan and updating it accordingly,
- (r) list any reference documents such as specific Regulations, regulatory licence, operating manuals, organizational policies and manuals etc that are referred to in the Security plan or are needed to explain or expand on any details in the Plan,

- (s) access control program should be developed,
- (t) Access control measures and this should:
 - i. describe the physical measures for controlling access, in particular indicating:
 - (1) how personnel are physically controlled at each access control point to limit access only to authorized persons according to the access authorization procedure and to prevent unauthorized access;
 - (2) the specific means used to authenticate the identity of authorized persons such as key card, personal identification number, biometric device, or a combination; and
 - (3) the procedures to be followed by authorized persons to access a secured area including, where relevant, application of the two-person rule.
 - ii. Describe the procedures for opening and closing each secured area within the facility, particularly activities such as the unlocking and locking of doors and other barriers, as well as communications with the alarm station to deactivate and activate detection systems. The procedures should identify who within the organization is responsible for opening and closing these areas and should also include actions to validate that other delay mechanisms (e.g. cages) have been appropriately secured.
 - iii. Describe the procedures used for control of all keys, locks, combinations, passwords, and related measures used to control access to secured areas and security systems. The procedures should identify who is responsible for changing these access control measures and the specific conditions which require them to be changed, such as the compromise of a combination or password, loss of a security key or termination of a staff member's access.

SCHEDULE 4: DESCRIPTION OF A VULNERABILITY ASSESSMENT

1. There are a number of methods that can be used to verify that facilities are in compliance with all applicable security requirements and to assess the effectiveness of their security systems. One such method is a vulnerability assessment, a method of evaluating the effectiveness of a facility's security system.

2. Examples of vulnerabilities within a facility include:

- Ineffective or absent security measures;
- Inappropriate administrative controls;
- Inadequate communication;
- Poor security culture;
- Incompatibility of security measures with safety measures.

3. Vulnerability should be assessed against the basic functions of security (detection, delay and response) and security management to ensure that the risks associated with malicious acts against radioactive material and associated facilities, as defined by the State, are managed to an acceptable level.

4. A vulnerability assessment is a systematic appraisal of the effectiveness of a security system in protecting against a threat. The vulnerability assessment can be specific or general in nature. It can be conducted locally by the operator to demonstrate system effectiveness against the requirements specified by the regulatory body, or to design or make modifications to the existing design of the security system. The vulnerability assessment can also be conducted and used by the regulatory body in developing or evaluating either its regulations or the operator's security system.

5. Those conducting the vulnerability assessment should be technical experts familiar with the facility in question, particularly its technical and commercial operations, with the appropriate knowledge and skills related to the design and evaluation of security systems.

6. The VA process comprises three major phases:

— Planning the vulnerability assessment includes determining the scope and objectives of the VA; selecting a methodology; evaluating potential threats and their capabilities; understanding the nature of the facility, including the attractiveness of the material and the threat environment; defining the roles and responsibilities of the vulnerability assessment team; determining the resources and time frame required to complete the assessment; confirming the radioactive material inventory and associated information; and taking note of the categorization, form and location of the radioactive material and the physical environment in which it is located.

— Conducting the vulnerability assessment includes defining the requirements of the security system; gathering the data needed to characterize the security system and its components; analysing the ability of the system to meet the requirements; identifying existing security measures; assessing the expected effectiveness of the security system in protecting against attacks by the

assessed threats; and determining what, if any, additional security measures are necessary to meet the required level of protection.

— Completing the vulnerability assessment includes the provision of reports outlining the methodology used, the assumptions made, the data collected, the effectiveness of the security system and recommendations for upgrades, if required.

DRAFT

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