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PART II

Statutory Notifications (S. R. O.)

GOVERNMENT OF PAKISTAN

PAKISTAN NUCLEAR REGULATORY AUTHORITY

NOTIFICATION

Islamabad, the 20th April, 2019

S. R. O. 806 (I)/2019.—In exercise of the powers conferred by Section 16(2)(a) read with Section 56 of the Pakistan Nuclear Regulatory Authority Ordinance, 2001 (III of 2001), Pakistan Nuclear Regulatory Authority is pleased to make and promulgate the following regulations:-

1. **Short Title, Extent and Commencement.**—(1) These regulations may be called the "Regulations on Physical Protection of Nuclear Material and Nuclear Installations — (PAK/925)".

(2) These regulations extend to the whole of Pakistan.

(3) These regulations shall come into force at once.

2. **Definitions.**—In these regulations, unless there is anything repugnant in the subject or context,

(a) “*adversary*” means an individual, group or organization that conducts or intends to conduct detrimental activities and against which physical protection system is designed. An adversary may be an insider, outsider or collusion of both;

(b) “*Authority*” means the Pakistan Nuclear Regulatory Authority established under Section 3 of Pakistan Nuclear Regulatory Authority Ordinance, 2001 (III of 2001);

(c) “*central alarm station*” means an installation which provides for the complete and continuous alarm monitoring, assessment and communication with guards, facility management and response forces;

(d) “*configuration management*” means the process of identifying and documenting the characteristics of a facility's physical protection system, including computer systems and software, and of ensuring that changes to these characteristics are properly developed, assessed, approved, issued, implemented, verified, recorded and incorporated into the facility documentation;

(e) “*contingency plan*” means predefined set of actions for responses to unauthorized acts indicative of attempted unauthorized removal or sabotage, including threats thereof, designed to effectively counter such acts;

- (f) “*conveyance*” means transport by:
 - (i) Road or rail: any vehicle used for carriage of nuclear material cargo;
 - (ii) Water: any seagoing vessel or inland waterway craft, or any hold, compartment, or defined deck area of a seagoing vessel or inland waterway craft used for carriage of nuclear material cargo; and
 - (iii) Air: any aircraft used for carriage of nuclear material cargo.
- (g) “*defense in depth*” means the combination of multiple layers of systems and measures that have to be overcome or circumvented before physical protection is compromised;
- (h) “*delay*” means the element of a physical protection system designed to increase adversary penetration time for entry into and exit from the nuclear installation or transport of nuclear material;
- (i) “*design basis threat*” means the attributes and characteristics of potential insider and external adversaries, who might attempt unauthorized removal of nuclear material or sabotage, against which a physical protection system is designed and evaluated;
- (j) “*detection*” means a process in a physical protection system that begins with sensing a potentially malicious or otherwise unauthorized act and that is completed with the assessment of the cause of the alarm;
- (k) “*exclusive use*” means the sole use, by a single consigner, of a conveyance or of a large freight container, in respect of which all initial, immediate and final loading and unloading is carried out in accordance with the directions of the consigner or consignee;
- (l) “*graded approach*” means the application of physical protection measures proportional to the potential consequences of a malicious act;
- (m) “*guard*” means a person who is entrusted with responsibility for patrolling, monitoring, assessing, escorting individuals or transport, controlling access and/or providing initial response;
- (n) “*inner area*” means an area with additional protection measures inside a protected area, where Category I nuclear material is used and stored;
- (o) “*insider*” means one or more individuals with authorized access to nuclear installations or nuclear material in transport who could attempt unauthorized removal or sabotage, or who could aid and abet an external adversary to do so;
- (p) “*isolation zone*” means an area around the facility and adjacent to physical barrier of protected area, clear of all objects that could conceal or shield an individual and be of sufficient size to allow detection, monitoring and assessment function;
- (q) “*licensee*” means the holder of a valid license issued by the Authority;
- (r) “*limited access area*” means designated area containing a nuclear installation and nuclear material to which access is limited and controlled for physical protection purposes;
- (s) “*malicious act*” means an act or attempt of unauthorized removal of nuclear material or sabotage;
- (t) “*nuclear installation*” means any:
 - (i) Nuclear reactor used as a source of power or for any other civilian purpose;

- (ii) Factory using nuclear fuel for the production of nuclear material, or any factory for the processing of nuclear material including any factory for the reprocessing of irradiated nuclear fuel;
 - (iii) Facility where nuclear material or spent fuel is stored other than storage incidental to the carriage of such material; or
 - (iv) Radioactive waste management facility.
- (u) “*nuclear material*” means the material as prescribed in Regulation 7 of these regulations;
 - (v) “*performance testing*” means testing of the physical protection measures and physical protection system to determine whether or not they are implemented as designed; adequate for the proposed natural, industrial and threat environments; and in compliance with established performance requirements;
 - (w) “*physical barrier*” means a fence, wall or similar impediment which provides access delay and complements access control;
 - (x) “*physical protection*” means measures (including structural, technical and administrative protective measures) taken to prevent an adversary from achieving undesirable consequences (such as sabotage, or the unauthorized removal of nuclear material in use, storage or transport) and to mitigate or minimize the consequences if the adversary initiates such a malicious act;
 - (y) “*physical protection event*” means an event that is assessed as having implications for physical protection operation of a nuclear installation or transport;
 - (z) “*physical protection measures*” means the personnel, procedures, and equipment that constitute a physical protection system;
 - (aa) “*physical protection system*” means an integrated set of physical protection measures intended to prevent the completion of a malicious act;
 - (bb) “*protected area*” means an area inside a limited access area containing Category I or II nuclear material and sabotage targets surrounded by a physical barrier with additional physical protection measures;
 - (cc) “*radiological consequences*” means consequences of a nuclear or radiological emergency causing exposures that have effects on human health and safety, quality of life, property or the environment;
 - (dd) “*response forces*” means persons, on-site or off-site, who are armed and appropriately equipped and trained to counter an attempted unauthorized removal of nuclear material or an act of sabotage;
 - (ee) “*sabotage*” means any deliberate act directed against a nuclear installation or nuclear material in use, storage or transport which 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;
 - (ff) “*security culture*” means the assembly of characteristics, attitudes and behaviors of individuals, organizations and institutions which serves as sustainable means to support and enhance physical protection measures;
 - (gg) “*shipper*” means any person, organization or government that prepares or offers a consignment of nuclear material for transport, and may also be called as the consignor;

- (hh) “*stand-off attack*” means an attack, executed at a distance from the target facility or transport, which does not require adversary hands-on access to the target, or require the adversary to overcome the physical protection system;
- (ii) “*threat*” means a person or group of persons with motivation, intention and capability to commit a malicious act;
- (jj) “*threat assessment*” means an evaluation of the threats - based on available intelligence, law enforcement, and open source information - that describes the motivations, intentions, and capabilities of these threats;
- (kk) “*transport*” means international or domestic carriage of nuclear material by any means of transportation, beginning with the departure from a facility of the shipper and ending with the arrival at a facility of the receiver;
- (ll) “*transport control centre*” means a facility which provides for the continuous monitoring of a transport conveyance location and security status for communication with the transport conveyance, shipper, receiver, carrier, and when appropriate, its guards and the response forces;
- (mm) “*two-person rule*” means procedure that requires at least two authorized and knowledgeable persons to be present to verify that activities involving nuclear material and nuclear installations are authorized in order to detect access or actions that are unauthorized;
- (nn) “*unauthorized removal*” means theft or other unlawful taking of nuclear material; and
- (oo) “*vital area*” means an area inside a protected area containing equipment, systems or devices, or nuclear material, the sabotage of which could directly or indirectly lead to high radiological consequences.

3. **Objective.**—(1) These regulations specify the requirements for licensees to establish physical protection measures and systems that:

- (a) Protect against unauthorized removal of nuclear material; and
- (b) Protect nuclear material and nuclear installations against sabotage.

4. **Scope.**—These regulations shall apply to all aspects of physical protection of nuclear installations and nuclear material in use, storage and during transport.

5. **Applicability.**—(1) A physical protection program approved by the Authority prior to promulgation of these regulations shall continue in legal effect by the terms of the license, unless the Authority requires earlier compliance with some or all of these regulations.

(2) Following the terms of the license applicable to an approved physical protection program, the licensee shall fulfill all requirements of these regulations within three (3) years from the date of promulgation of these regulations. Nuclear installations that have not filed an application for obtaining license from the Authority prior to promulgation of these regulations shall fully comply with the requirements of these regulations.

6. **Interpretation.**—The decision of Chairman PNRA regarding interpretation of any word or phrase of these regulations shall be final and binding.

7. **Categorization of Nuclear Material.**—(1) For the purpose of these regulations, un-irradiated¹ nuclear material shall be categorized as follows:

- (a) Category I material is:

¹ Material not irradiated in a reactor or material irradiated in a reactor but with a radiation level equal to or less than 1 Gy/h (100 rad/h) at 1 m unshielded.

- (i) Two (2) kg or more of plutonium² or uranium-233 (U-233); or
 - (ii) Five (5) kg or more of U-235 in uranium enriched to 20% or more U-235.
- (b) Category II material is:
- (i) More than 500 g but less than 2 kg of plutonium or uranium-233 (U-233); or
 - (ii) More than 1 kg but less than 5 kg of U-235 in uranium enriched to 20% or more U-235; or
 - (iii) Ten (10) kg or more of U-235 in uranium enriched to 10% but less than 20% U-235.
- (c) Category III material is:
- (i) More than 15 g but less than or equal to 500 g of plutonium or U-233; or
 - (ii) More than 15 g but less than or equal to 1 kg of U-235, in uranium enriched to 20% or more in U-235; or
 - (iii) More than 1 kg, but less than 10 kg of U-235, in uranium enriched to 10%, but less than 20% U-235; or
 - (iv) Ten (10) kg or more of U-235, in uranium enriched above natural but less than 10% U-235.
- (2) Irradiated, depleted or natural uranium, thorium or low enriched fuel (less than 10% fissile content)³ shall be treated as Category II nuclear material.
- (3) Nuclear material which is in a form that is no longer usable for any nuclear activity or, minimizes environmental dispersal and is practicably irrecoverable, shall be protected against unauthorized removal and/or access in accordance with prudent management practices.
- (4) Quantities of nuclear material below Category III shall be protected in accordance with prudent management practices.

GENERAL PROVISIONS

8. **General Responsibilities.**—(1) The licensee shall be primarily responsible for the physical protection of its nuclear material, nuclear installation and associated activities.
- (2) The licensee shall cooperate and coordinate with all organizations having physical protection responsibilities.
- (3) The licensee shall design, evaluate and maintain physical protection system for nuclear material, nuclear installation and associated activities in accordance with the requirements of these regulations. In addition, the licensee shall implement any additional physical protection measures as recommended by the Authority, from time to time, on the basis of Design Basis Threat or National Threat Assessment.
- (4) The licensee shall ensure that the physical protection system shall be integrated and effective against both sabotage and unauthorized removal.
- (5) The licensee shall ensure that the capabilities to detect, delay and respond to neutralize threats up to and including the design basis threat are maintained at all times.

² All plutonium except that with isotopic concentration exceeding 80% in plutonium-238.

³ Other fuel which by virtue of its original fissile material is classified as Category I or II before irradiation, may be reduced by one category level if the nuclear material has an external radiation dose rate in excess of 1 Gy/h (100 rad/h) at a distance of 1 m from any accessible surface without intervening shielding.

9. **Fundamental Principles of Physical Protection.**—In implementing the requirements of these regulations, the licensee shall apply, as is reasonable and practicable, the following fundamental principles of physical protection:

(1) **Security Culture:**

The licensee shall give due priority to the security culture, its development and maintenance necessary to ensure its effective implementation in the entire organization.

(2) **Threat:**

The physical protection shall be based on the current national threat assessment.

(3) **Graded Approach:**

Physical protection measures shall be based on a graded approach, taking into account the current assessment of the threat, the relative attractiveness, the nature of the material and potential consequences associated with the unauthorized removal of nuclear material and with the sabotage against nuclear material or nuclear installations.

(4) **Defense in Depth:**

The physical protection shall reflect a concept of several layers and measures of protection including structural or other technical, personnel and organizational measures that have to be overcome or circumvented by an adversary in order to achieve his objectives.

(5) **Quality Assurance:**

A quality assurance policy and quality assurance programme shall be established and implemented with a view to provide confidence that specified requirements for all activities important to physical protection are satisfied.

(6) **Contingency Plans:**

Contingency (emergency) plans to respond to unauthorized removal of nuclear material or sabotage of nuclear material or nuclear installations, or attempts thereof, shall be prepared and appropriately exercised periodically by the licensees and authorities concerned.

(7) **Confidentiality:**

The licensee shall implement requirements for protecting the confidentiality of information, the unauthorized disclosure of which could compromise the physical protection of nuclear material and nuclear installations.

10. **Safety and Physical Protection Interface.**—(1) The licensee shall assess and manage the physical protection interface with safety in a manner to ensure that they do not adversely affect each other and that, to the degree possible, they are mutually supportive.

(2) In case of a new facility, physical protection features shall be incorporated into the facility design in the initial design phase and also address interface issues with safety to avoid any conflicts and to be supportive of each other.

11. **Defense in Depth.**—The licensee shall ensure that the physical protection measures for detection, delay and response are based on the principle of defense in depth applied with a graded approach.

12. **Physical Protection Program.**—(1) The licensee shall develop and maintain a physical protection program according to the format and content specified by the Authority.

- (2) The licensee's physical protection program shall include:
 - (a) Physical Protection Plan;
 - (b) Contingency Plan;
 - (c) Information Security Plan;
 - (d) Transport Security Plan;
 - (e) Training and Re-training Plan; and
 - (f) Implementing Procedures.
- (3) The licensee shall ensure the implementation of approved physical protection program through drills and exercises before introducing nuclear material into the systems of the nuclear installation.
- (4) The licensee shall implement physical protection measures for storage of nuclear material based on its category, prior to arrival of the nuclear material on site.
- (5) The licensee shall submit an amendment to the physical protection program for prior approval by the Authority before making any significant modifications, including temporary changes, to the arrangements detailed in the approved physical protection program.
13. **Audit and Review.**—(1) The licensee shall review physical protection program on periodic basis by individuals independent of both physical protection program management and personnel who have direct responsibility for implementation.
 - (2) Review of the physical protection program shall include, but not be limited to, an audit of the effectiveness of the physical protection program, relevant plans, implementing procedures, safety and physical protection interface activities, the testing, maintenance, and calibration program.
 - (3) The outcome of the physical protection program review, and any actions taken as a result of prior reviews, shall be documented and reports shall be maintained in an auditable form.
14. **Maintenance, Testing and Sustainability Program.**—(1) The licensee shall develop, implement and maintain means and procedures for maintenance and testing of physical protection systems.
 - (2) Performance testing shall be carried out in accordance with the physical protection plans and implementing procedures.
 - (3) The licensee shall establish sustainability programs for its physical protection systems. The sustainability programs shall encompass:
 - (a) Operating procedures and instructions;
 - (b) Human resource management and training;
 - (c) Equipment updating, maintenance, repair and calibration;
 - (d) Performance testing and operational monitoring;
 - (e) Configuration management; and
 - (f) Resource allocation and operational cost analysis.
 - (4) Maintenance of physical protection equipment shall be performed according to approved procedures, vendor's recommendations, experience feedback, and system performance to ensure that design requirements are not compromised.

(5) In all cases of modifications and replacement of physical protection equipment, it shall be ensured that the intended function of the system is not compromised.

15. **Compensatory Measures.**—(1) The licensee shall identify and immediately implement measures to compensate for degraded or inoperable equipment, systems and components, and in case the physical protection equipment is taken out of service.

(2) Compensatory measures shall provide a level of protection that is equivalent to the protection that was provided by the equipment, system or components before degradation or inoperability.

(3) Compensatory measures shall be implemented as identified in physical protection program. However, any design change in physical protection system that affects system performance shall require approval from the Authority before implementation.

16. **Security Culture.**—The licensee shall be responsible to establish and maintain a dynamic and effective security culture where there is recognition that credible threat exist and every individual has a role in physical protection.

17. **Protection of Sensitive Information.**—The licensee shall identify and classify sensitive information which can add to adversary's capability to perform sabotage or unauthorized removal of nuclear material and protect such information against unauthorized disclosure.

18. **Insider Mitigation.**—The licensee shall establish, maintain and implement insider mitigation measures to monitor the initial and continual trustworthiness and reliability of individuals granted or retaining unescorted access authorization to a protected or vital area or sensitive information and implement defense-in-depth methodologies to minimize the potential for an insider to adversely affect, either directly or indirectly, the licensee's capability to prevent sabotage and unauthorized removal of nuclear material.

19. **Protection of Computers, Communication Systems and Networks.**—(1) The licensee shall protect the computers, communication systems and networks associated with functions important-to-safety and physical protection from cyber attacks that would:

- (a) Adversely impact the integrity or confidentiality of data and software;
- (b) Deny unauthorized access to systems, services, and data;
- (c) Adversely impact the operation of systems, networks and associated equipment; and
- (d) Contribute to physical damage of equipment or aid in the unauthorized removal of nuclear material.

20. **Evaluations.**—(1) Evaluations, including performance testing of physical protection measures and of the integrated physical protection system, including timely response of the guards and response forces shall be conducted regularly to determine the reliability and effectiveness against the threat.

(2) Performance testing of physical protection system shall include appropriate exercises to determine if the response forces can provide an effective and timely response to prevent malicious act.

21. **Reportable Physical Protection Events.**—(1) The licensee shall report the following physical protection events in accordance with Regulation 22 of these regulations:

- (a) Actual or attempted intrusion into the facility or into a limited access area, protected area, inner area, or vital area.

- (b) Attempted or actual unauthorized removal, loss or unauthorized movement of nuclear material, whether involving external adversaries or insiders.
- (c) Attempted or actual acts of sabotage, including tampering or interference with vital area equipment, systems or devices.
- (d) Loss or unauthorized disclosure of sensitive information.
- (e) Failure of any physical protection equipment and system leading to loss of physical protection system's function.
- (f) Compromise or attempted compromise of digital computers, communication systems and networks used for physical protection and safety.

22. **Event Reporting.**—(1) Whenever an event specified in Regulation 21(a), (b), (d) and (f) occurs, the licensee shall:

- (a) Take immediate remedial action;
 - (b) Within twenty four (24) hours, notify the Authority;
 - (c) Within seven (7) days, submit a preliminary report to the Authority; and
 - (d) Within sixty (60) days, submit a detailed report to the Authority on the causes of the event, its circumstances and consequences, and on the compensatory measures or corrective actions taken.
- (2) Whenever an event specified in Regulation 21(c) occurs, the licensee shall:
- (a) Take immediate remedial action;
 - (b) Within one hour, notify the Authority;
 - (c) Within twenty four (24) hours, submit a preliminary report to the Authority; and
 - (d) Within fifteen (15) days, submit a detailed report to the Authority on the causes of the event, its circumstances and consequences, and on the compensatory measures or corrective actions taken.
- (3) Whenever an event specified in Regulation 21(e) occurs, the licensee shall:
- (a) Immediately take prompt actions to minimize the consequences of failure;
 - (b) Immediately investigate the failure and its causes, circumstances, and consequences;
 - (c) Immediately undertake review and evaluation of the event and notify the Authority in accordance with the established event reporting system; and
 - (d) Within sixty (60) days, submit a detailed report to the Authority on the causes of the event, its circumstances and consequences, and on the compensatory measures or corrective actions taken.

PROTECTION AGAINST UNAUTHORIZED REMOVAL OF NUCLEAR MATERIAL IN USE AND STORAGE

23. **Category III Nuclear Material.**—(1) The licensee shall use or store Category III nuclear material within limited access area.

(2) Provision shall be made for detecting unauthorized intrusion into the limited access area.

(3) Provision shall be made for appropriate actions by guards or response forces, in case of unauthorized intrusion into the limited access area.

- (4) Procedures for transferring custody of nuclear material shall be established.
 - (5) Technical means and procedures for access control shall be established and protected against compromise such as manipulation and falsification.
 - (6) Contingency plans shall be prepared to counter malicious acts effectively and to provide for appropriate response by guards or response forces.
24. **Category II Nuclear Material.**—(1) The licensee shall use or store Category II nuclear material within a protected area located inside a limited access area.
- (2) The licensee shall meet the requirements of Regulation 23 of these regulations along with following additional requirements:
 - (a) The protected area perimeter shall consist of a physical barrier and an isolation zone.
 - (b) The isolation zone shall be:
 - (i) Designated and of sufficient size to permit detection and assessment of activities on either side of protected area barrier;
 - (ii) Monitored with intrusion detection equipment capable of detecting both attempted and actual penetration of protected area perimeter barrier; and
 - (iii) Monitored with assessment equipment capable to provide real-time and play-back/recorded video images of detected activities before and after each alarm annunciation.
 - (c) The intrusion detection and assessment systems shall:
 - (i) Ensure that alarm devices to include transmission lines to annunciators are tamper indicating and self-checking; and
 - (ii) Ensure intrusion detection and assessment equipment at the protected area perimeter remains operable from an uninterruptible power supply in the event of the loss of normal power.
 - (d) The licensee shall provide isolation zones and appropriate exterior areas within the protected area with illumination level sufficient to perform proper assessment of alarms and meet the illumination requirements of physical protection system.
 - (e) The licensee shall identify and analyze site-specific conditions to determine the specific use, type, function, and placement of physical barriers as necessary to control access into installation areas. The barriers shall be designed and constructed to provide deterrence, delay, or support access control, support effective implementation of the licensee's protective strategy.
 - (f) The number of access points into the protected area shall be kept to the minimum necessary. All points of potential access shall be appropriately secured and alarmed.
 - (g) The licensee shall take following measures for authorized access to protected area:
 - (i) Establish effective access control measures under which only authorized persons have access to the protected area. The number of authorized persons entering the protected area shall be kept to the minimum necessary. Persons authorized for unescorted access to the protected area shall be limited to persons whose trustworthiness has been determined. Persons whose trustworthiness has not been determined such as temporary repair, service or construction workers and visitors shall be escorted by authorized personnel.

- (ii) The identity of authorized persons entering the protected area shall be verified.
 - (iii) A record shall be kept of all persons having access to or possession of keys, key cards and other systems, including computer systems that control access to protected area.
 - (iv) Licensee shall protect technical means and procedures for access control, including keys and computerized access lists against manipulation, falsification, or other form of compromise.
- (h) The licensee shall search all personnel, vehicles, packages and materials entering and leaving the protected areas for contraband or other prohibited items which could be used to commit radiological sabotage or removal of nuclear material.
- (i) All emergency exits in the protected area must be alarmed and secured by locking devices while allowing prompt egress during emergency.
- (j) Central Alarm Station:
- (i) The licensee shall establish a permanently and adequately staffed central alarm station for monitoring and assessment of alarms, initiation of response, and communication with the guards, response forces, and facility management. Information acquired at the central alarm station shall be stored in a secure manner. The central alarm station shall be protected so that its functions can continue in the presence of threat, e.g. hardened. Access to the central alarm station shall be strictly minimized and controlled.
 - (ii) Alarm equipment, alarm communication paths, and the central alarm station shall be provided with an uninterruptible power supply and be tamper-protected against unauthorized monitoring, manipulation and falsification.
 - (iii) Dedicated, redundant, secure and diverse transmission systems for two-way voice communication between the central alarm station and the response forces shall be provided for activities involving detection, assessment and response. Dedicated two-way secure voice communication shall be provided between guards and the central alarm station.
 - (iv) The licensee shall establish secondary alarm station to ensure that the functions of central alarm station in monitoring and assessment of alarms, initiation of response and communication shall continue during emergency.
- (k) Guards and Response Forces:
- (i) The licensee shall establish and maintain, at all times, properly trained and equipped guards and response force to interdict and neutralize threats.
 - (ii) The licensee shall ensure that firearms, ammunition, and equipment necessary to implement the physical protection program are in sufficient supply, in working condition, and readily available for use.
 - (iii) Sufficient number of response force personnel shall remain available at all times inside the protected area.
- (3) On-Site Movements of Nuclear Material between Protected Areas:
- The licensee shall establish measures under which on-site movements of nuclear material between two protected areas are treated in compliance with the requirements for nuclear material during transport, taking into account existing physical protection measures at the installation.

25. **Category I Nuclear Material.**—(1) The licensee shall use or store Category I nuclear material within an inner area located within a protected area.

(2) The licensee shall meet the requirements of Regulation 24 of these regulations along with following additional requirements:

- (a) Inner areas shall be appropriately secured and alarmed when unattended.
- (b) Inner areas shall provide delay against unauthorized access to allow for a timely and appropriate response to a malicious act. Delay measures shall be designed considering both insider's and external adversary's capabilities, and be balanced for all potential points of intrusion.
- (c) Vehicle barriers shall be installed at an appropriate distance from the inner area to prevent the penetration of unauthorized land or waterborne vehicles that could be used by an adversary for committing a malicious act. Attention shall also be given to providing protection measures against any airborne threat.
- (d) Authorized Access to Inner Areas:

The licensee shall allow only authorized persons to have access to an inner area. Effective access control measures shall be taken to ensure the detection and prevention of unauthorized access. The number of authorized persons entering an inner area shall be kept to the minimum necessary. Persons with authorized access to an inner area shall be limited to those whose trustworthiness has been determined. In exceptional circumstances and for a limited period, persons whose trustworthiness has not been determined shall be provided access only when escorted by persons authorized unescorted access.

- (e) Detection and Prevention of Unauthorized Access:

The licensee shall establish measures under which vehicles, persons and packages are subject to search on entering and leaving inner areas to detect and prevent unauthorized access and the introduction of prohibited items. Vehicles, persons and packages leaving the inner area shall be subject to search to detect and prevent removal of nuclear material. Access of private vehicles shall be prohibited to inner areas.

- (f) Continuous Surveillance of Activity in Inner Area:

To counter the insider threat, the licensee shall ensure detection of unauthorized action by continuous surveillance, through the two-person rule or other equivalent means, whenever an inner area is occupied.

- (g) Storage Area:

The licensee shall store nuclear material in a hardened or strong room or hardened enclosure inside the inner area that provides an additional layer of detection and delay against removing the material. This storage area shall be locked and alarms activated except during authorized access to the material. When nuclear material is kept in an unoccupied work area outside this storage area, equivalent compensatory physical protection measures shall be established.

- (h) The number of access points into the inner area shall be kept to the minimum necessary. All points of potential access shall be appropriately secured and alarmed.

26. **Measures to Locate and Recover Missing or Stolen Nuclear Material.**—(1) The licensee shall ensure that any missing or unauthorizedly removed nuclear material is detected in a timely manner and the responsible person for physical protection is informed.

(2) The measures to locate and recover missing or stolen nuclear material shall be included in the contingency plan and shall be tested and evaluated regularly.

(3) The licensee shall secure the nuclear material in situ as soon the missing or unauthorizedly removed nuclear material has been located and identified in accordance with the contingency plan.

(4) The licensee shall assist/coordinate with the response organizations to locate and recover the missing or unauthorizedly removed nuclear material.

27. Prudent Management Practices.—(1) For nuclear material below Category III, prudent management practices for physical protection shall include the following:

- (a) Access to the nuclear material shall be restricted to authorized persons only;
- (b) When not under the operating control of authorized persons, the nuclear material shall be physically secured; and
- (c) Measures to detect unauthorized removal shall be implemented.

MEASURES AGAINST SABOTAGE OF NUCLEAR INSTALLATIONS AND NUCLEAR MATERIAL IN USE AND STORAGE

28. Process for Design of Physical Protection Systems against Sabotage.—

(1) Sabotage Scenarios:

The licensee shall define and submit to the Authority, credible scenarios by which adversaries could carry out sabotage of nuclear material or nuclear installation.

(2) Physical Protection System Design:

- (a) The licensee shall identify equipment, structure, system or components, and nuclear material, the sabotage of which could directly or indirectly lead to events with high radiological consequences as prescribed in Regulations on Management of a Nuclear or Radiological Emergency - (PAK/914) and Regulations on Radiation Protection - (PAK/904).
- (b) The licensee shall design a physical protection system that is effective against the defined sabotage scenarios and complies with the required level of protection for its nuclear installation and nuclear material.
- (c) The physical protection system against sabotage shall be designed as an element of an integrated system to prevent the potential consequences of sabotage by taking into account the robustness of the engineered safety and operational features, and the fire protection, radiation protection and emergency preparedness measures.
- (d) The physical protection system shall be designed to deny unauthorized access of persons or equipment to the targets, to minimize the opportunity of insiders, and to protect the targets against possible stand-off attacks consistent with design basis threat. The response strategy shall be based on denial of adversary access to the sabotage targets or denial of adversary task completion at the sabotage targets.

29. Specific Measures for Nuclear Power Plants (NPPs) and Research Reactors (RRs).—(1) All equipments, systems or devices, or nuclear material, the sabotage of which could directly or indirectly lead to high radiological consequences shall be located inside one or more vital areas.

(2) The licensee shall meet the requirements of Regulation 25 of these regulations along with following additional requirements:

- (a) Timely detection of tampering or interference with vital area equipment, systems or devices shall be provided.
- (b) During a shutdown and maintenance period, strict access control to vital areas shall be maintained. Searches and testing shall be conducted to detect any tampering that may have been committed during shutdown and maintenance.
- (c) The reactor control room, the central alarm station, and the location within which the last access control function for access to the protected area is performed, shall be bullet-resisting.

30. **Measures for Protection against Sabotage of Nuclear Material and Installations other than NPPs and RRs.**—For nuclear material and installations other than NPPs and RRs sabotage of which can result in radiological consequences to the public shall also be protected depending on the degree of consequences. Measures specified in Regulation 29 of these regulations shall be applied by using graded approach.

31. **Measures to Mitigate or Minimize the Radiological Consequences of Sabotage.**—(1) The licensee shall assess, on detection of a malicious act, whether this act could lead to radiological consequences and notify the Authority.

(2) Immediately following an act of sabotage, the licensee shall take measures specified in the contingency plan to prevent further damage, secure the nuclear installation and protect emergency equipment and personnel.

PROTECTION OF NUCLEAR MATERIAL DURING TRANSPORT

32. **General Requirements.**—

(1) Aggregation:

The licensee shall use the total amount of nuclear material on or in a single conveyance to determine an aggregate categorization for both unauthorized removal and potential radiological consequences associated with sabotage and identify the appropriate protection measures for the conveyance. When different types of nuclear materials are transported on the same conveyance, the aggregation formula established by the Authority shall be used to determine the category of the consignment in accordance with the requirements of Regulations for the Safe Transport of Radioactive Material - (PAK/916).

(2) Common Requirements:

The licensee shall implement the following measures in accordance with the graded approach:

- (a) Minimize the number of transfers and duration of transport of nuclear material;
- (b) When the conveyance makes a planned stop, protect nuclear material in designated storage facility incidental to transport in a manner consistent with the protection required for the applicable category of that nuclear material;
- (c) If the conveyance makes an unplanned extended stop, apply the physical protection measures appropriate for that category of material in storage to the fullest extent possible;
- (d) Avoid the use of predictable movement schedules by varying times and routes;
- (e) Predetermine the trustworthiness of individuals involved during transport of nuclear material;

- (f) Limit advance knowledge of transport information to the minimum number of persons necessary;
- (g) Use a material transport system with passive and/or active physical protection measures appropriate for the threat assessment or design basis threat; and
- (h) Use routes which avoid areas of natural disaster, civil disorder or known threat.

(3) Information Protection:

The licensee shall protect sensitive information relating to transport operations, including detailed information on the schedule and route, and shall disseminate such information based on the need to know. The licensee shall not use unnecessary markings on conveyances, and shall avoid the use of open channels for transmission of messages concerning shipments of nuclear material. When a security related message is transmitted, such information shall be protected in accordance with applicable information protection requirements.

(4) Key Control:

The licensee shall ensure the security of keys for conveyance and security locks.

33. Protection of Category III Nuclear Material against Unauthorized Removal.—In addition to the general requirements given in Regulation 32 of these regulations, the following requirements also apply to Category III nuclear material:

(1) Arrangements Prior to Shipment:

The licensee shall ensure that prior agreements among, receiver, and carrier specify the time, place and procedures for transferring physical protection responsibilities; and adequate physical protection arrangements are in place.

(2) Locks and Seals:

Packages containing nuclear material shall be carried in a closed, locked and sealed conveyance, compartment or freight container.

(3) Search Prior to Shipment:

There should be a detailed search of conveyance to ensure that nothing has been tampered with and that nothing has been affixed to the package or conveyance that might compromise the security of the consignment.

(4) Communications:

The licensee shall ensure the availability of a communication system for the conveyance to communicate with response forces.

(5) Checks upon Receipt:

The licensee shall ensure that the receiver checks the integrity of the packages and locks and seals to verify that the security of the consignment has not been compromised and accepts the shipment and notifies in writing immediately upon arrival.

34. Protection of Category II Nuclear Material against Unauthorized Removal.—In addition to the general requirements prescribed in Regulation 32 and specific requirements in Regulation 33 of these regulations, the following requirements also apply to Category II nuclear material:

(1) Arrangements Prior to Shipment:

- (a) Prior to shipment, the licensee shall submit a transport security plan to the Authority for approval. This plan shall include the route, with alternative routing in case of any emergency, stopping places, destination hand-over arrangements, identification of persons authorized to receive delivery, emergency procedures and reporting procedures. In choosing the route, the capabilities of the response forces shall be taken into account.
- (b) Prior to commencing transport, the licensee shall ensure that all measures necessary to implement the approved transport security plan are in place.
- (2) Search Prior to Shipment and Surveillance:

The conveyance shall be searched immediately prior to loading and shipment. Immediately following completion of the search, the conveyance shall be placed in a secure area or kept under guard surveillance until its loading and shipment for transport and unloading.
- (3) Delay Measures:

Physical protection measures shall provide sufficient delay in the conveyance, freight container and package so that guards and response forces have reasonable time to intervene the removal of the material.
- (4) Guards:

The licensee shall ensure that appropriately equipped and trained guards shall accompany each shipment, including before and during loading and unloading operations. Surveillance of the route shall be conducted for any threat indicators and necessary response shall be initiated. Continuous, effective surveillance of the packages or locked cargo hold, or compartment holding the packages, shall be maintained at all times, especially when the conveyance is not on move.
- (5) Communications:

Physical protection measures shall include provision of continuous two-way voice communication systems between the conveyance, any guards accompanying the shipment, the designated response forces, and where appropriate, the shipper and receiver. Such systems shall be redundant, diverse and secure. The guard or conveyance crew shall report by secure two-way voice communication system to the transport control centre after the interval of one hour. In addition, guard or conveyance crew shall report to the transport control centre at each overnight stopping place, at the place of handover of the shipment, and upon arrival at the final destination.
- (6) Response Forces:

The licensee shall make arrangements for the availability of response forces proportional to the prevailing threat to deal with physical protection events in time to prevent the unauthorized removal of nuclear material.
- (7) Modal Requirements:
 - (a) For shipments by road, the consignment shall be shipped in a conveyance under exclusive use conditions i.e. in a conveyance used exclusively for that shipment.
 - (b) For shipments by rail, the consignment shall be shipped in a freight train in an exclusive use condition. Unless operationally impracticable, the consignment shall be shipped in a fully enclosed and locked conveyance. If not shipped in a fully enclosed and locked conveyance, additional approval by the Authority is required.

- (c) For shipments by water, the consignment shall be shipped on a vessel in a secure compartment or container which is locked and sealed.
- (d) For shipments by air, the consignment shall be shipped in an aircraft designated for cargo only and in a secure compartment or container which is locked and sealed.

35. **Protection of Category I Nuclear Material against Unauthorized Removal.**—In addition to the general requirements prescribed in Regulation 32 and specific requirements in Regulation 33 and 34 of these regulations, the following requirements also apply to Category I nuclear material:

(1) **Prior Shipment Requirements:**

- (a) The Authority shall be intimated about exact date and time of shipment prior to the commencement of each shipment.
- (b) A detailed route surveillance shall be conducted based on the threat assessment or intelligence information.

(2) **Transport Control Centre:**

The licensee shall establish a transport control centre for the purpose of keeping track of the current position and physical protection measures status of the shipment of nuclear material, alerting response forces in case of an attack and maintaining continuous secure two-way voice communication with the shipment and the response forces. The transport control centre shall be protected so that its function can continue in the presence of the threat. While the shipment is in process, the transport control centre shall be staffed by appropriate personnel whose trustworthiness has been predetermined.

(3) **Communication:**

The licensee shall maintain continuous two-way communication between the conveyance, transport control centre, guards accompanying the shipment, the response forces, and the receiver.

(4) **Modal Requirements:**

- (a) For shipments by water, the consignment shall be transported in a dedicated transport vessel.
- (b) For shipments by air, the consignment shall be transported in an aircraft designated for cargo only and for which the nuclear material is its sole cargo.

36. **Prudent Management Practices.**—(1) For nuclear material below Category III, prudent management practices of physical protection shall include the following:

- (a) Basic security awareness training for all personnel involved;
- (b) Verification of the identity of all personnel involved;
- (c) Verification of security of conveyances used;
- (d) Availability of written instructions;
- (e) Exchange of information on security measures between operators, shippers or carriers and with competent authorities ensuring the need for confidentiality; and
- (f) Determining the trustworthiness of the personnel involved.

37. **Measures to Locate and Recover Missing or Stolen Nuclear Material during Transport.**—(1) The licensee shall immediately notify the Authority if nuclear material packages are determined to be missing or have been tampered with.

(2) The measures to locate and recover missing or stolen nuclear material shall be included in the contingency plan and shall be tested and evaluated regularly.

(3) The licensee shall secure the nuclear material in situ as soon the missing or unauthorizedly removed nuclear material has been located and identified in accordance with the contingency plan.

(4) The licensee shall assist and coordinate with the response organizations to locate and recover its missing or unauthorizedly removed nuclear material.

38. **Measures for Protection against Sabotage.**—

(1) **Integration of Safety and Physical Protection:**

The safety features of the design of transport package, container and conveyance should be taken into account while deciding additional physical protection measures for protection of the material against sabotage.

(2) **Additional Measures for Protection against Sabotage:**

Based on threat assessment or design basis threat and potential radiological consequences, licensee shall identify and implement additional physical protection measures to prevent sabotage of nuclear material during transport.

39. **Measures to Mitigate or Minimize the Radiological Consequences of Sabotage.**—(1) The licensee shall assess, on detection of a malicious act, whether this act could lead to radiological consequences and notify the Authority.

(2) Immediately following an act of sabotage, the licensee shall take measures specified in the contingency plan to prevent further damage.

40. **Enforcement.**—In case of any non compliance of these regulations, enforcement action will be initiated by the Authority.

41. **Records and Reports.**—The licensee shall maintain all records and reports required under these regulations and license conditions for at least three (3) years after the record or report is superseded, unless specified otherwise by the Authority.

42. **Repeal.**—Regulation No. 70 of Pakistan Nuclear Safety and Radiation Protection Regulations, 1990 issued *vide* S.R.O 1406 (I)/98 dated 31st December, 1998 is hereby repealed.

MOHAMMAD SALEEM ZAFAR,

Member (Corporate).