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REPUBLIC OF THE PHILIPPINES

PHILIPPINE NUCLEAR RESEARCH INSTITUTE

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Quezon City

LICENSING REQUIREMENTS FOR LAND DISPOSAL OF RADIOACTIVE WASTE

CPR PART 23

I. GENERAL PROVISIONS

Section 1. Purpose.

a) The regulations in this Part establish procedures, criteria, terms and conditions upon which proponent/operator are issued a license by PNRI for the land disposal of radioactive waste if such disposal is away from point of generation or if such disposal is of waste which has been received from other persons.

b) This regulation is intended for use by those involved in site selection, design, safety assessment, operation, regulation and rehabilitation of a disposal facility. It is also relevant for use by those who generate radioactive waste for which disposal by near surface burial is appropriate.

c) The purpose of this regulation is to provide a basis for land disposal of solid radioactive waste in a way which ensures that there is no unacceptable risk or detriment to humans, other biota or the environment, at present, and that future risks or detriment will not exceed those currently accepted.

d) The requirements in this Part are in addition to, and not in substitution for, the requirements of Part 2 – "Licensing of Radioactive Materials", Part 3 – "Standards for Protection Against Radiation", and Part 4 – "Regulations for the Safe Transport of Radioactive Materials in the Philippines" of the Code of PNRI Regulations.

e) The regulations in this Part do not relieve the applicant or proponent/operator from complying with applicable regulations of other government agencies.

Section 2. Scope.

a) It deals with management aspects associated with radioactive waste disposal only and is not intended to cover issues related to the production and use of radionuclides such as waste minimization.

b) It applies to the following types of solid waste:
   1) waste arising from the medical, industrial, research and domestic use of radioisotopes;
   2) contaminated plant and equipment resulting from handling or processing of materials which contain naturally occurring radioactive material e.g. gypsum, phosphate, mineral sands, mineral waters, brown coal, natural gas, and crude oil;
   3) waste arising from processing of minerals remote from any mine site and where disposal at the mine site is inappropriate; and
   4) waste arising from the rehabilitation, decontamination or decommissioning of sites or facilities where radioactive materials have been produced, stored, used or dispersed.

Section 3. Definitions.

As used in this Part:

a) **"ALARA (As Low As Reasonably Achievable)"** means making every reasonable effort to maintain exposures to radiation as far as below the dose limits as is practicable:

   1) consistent with the purpose for which the licensed activity is undertaken; and

   2) taking into account the state of technology, the economics of improvement to benefit the health and safety of the public and the workers and other societal and socio-economic considerations.

b) **"Buffer zone"** means a zone of restricted access which is controlled by the proponent/operator between the operational site boundary and any structure within the facility to ensure that there is sufficient distance between the facility and any area accessible to members of the public.

c) **"Chelating agent"** means chemical compounds, such as amine poly-carboxylic acids, hydro-carboxylic acids, poly-carboxylic acids which are capable of forming soluble complexes with metal cations.

d) **"Commencement of construction"** means any clearing of land, excavation, or other substantial action that would adversely affect the environment of a land disposal facility. The term does not mean disposal site exploration, necessary roads for disposal site exploration, borings to determine foundation conditions, or other pre-construction monitoring or testing to establish background information related to the suitability of the disposal site or the protection of the environment.

e) **"Disposal"** means the emplacement of waste in an approved specified facilities, without the intention of retrieving it.

f) **"Disposal facility"** means the land, buildings and equipment which are intended to be used for the disposal of radioactive waste near the surface of the land and are enclosed within a fenced buffer zone.

g) **"Disposal site"** means that area of land which is used for the disposal of the waste and consists of a disposal facility and a surrounding buffer zone.

h) **"Disposal unit"** means a discrete portion of the disposal site into which waste is placed for disposal.

i) **"Engineered barrier"** means a feature made or altered by humans which delays or prevents radionuclide migration from the waste or the disposal structure into its surroundings.

j) **"Environmental management plan"** means a document which sets out a system of management based on social, economic and environmental aims within which the decision making process takes place.

k) **"Explosive material"** means any chemical compound, mixture, or device that produces a substantial instantaneous release of gas and heat spontaneously or by contact with sparks or flame.

l) **"Hazardous waste"** means those wastes defined and designated as hazardous wastes by Republic Act No. 6969.

m) **"Hydro-geologic unit"** means any soil or rock unit or zone which by virtue of its porosity or permeability, or lack thereof, has a distinct influence on the storage or movement of groundwater.

n) **"Inadvertent intruder"** means a person who might occupy the disposal site after closure and engage in normal activities, such as agriculture, dwelling construction, or other pursuits in which an individual might be unknowingly exposed to radiation from the waste.

o) **"Institutional control"** means the control of a waste disposal site by the appropriate authority (PNRI) in order to restrict access to and use of the site, and to ensure an on-going knowledge that the site has been used for the disposal of radioactive waste.

p) **"Intruder barrier"** means a sufficient depth of cover over the waste that inhibits contact with waste and helps to ensure that radiation exposures to an inadvertent intruder will meet the performance objectives set forth in this Part; or engineered structures that provide equivalent protection to the inadvertent intruder.

q) **"Land disposal"** means the placement of hazardous and radioactive wastes in the surface, near surface and geologic depths of the soil column.

r) **"Land disposal facility"** means the land, buildings and structures and equipment which are intended to be used for the disposal of radioactive wastes.

s) **"License"** means an authorization granted by PNRI for a specific practice or application described in the CPR.

t) **"Low and Intermediate Level Waste (LILW)"** means radioactive wastes in which the concentrations of or quantity of radionuclides is above clearance levels but with a radionuclide content and thermal power below about 2 KW/m^3.

u) **"Member of the public"** means a person who is exposed only incidentally to radiation as a consequence of the disposal of radioactive waste at a site or the operation of a disposal facility. Public exposure may occur through inadvertent intrusion or from dispersal of radioactive contaminants from the site.

v) **"Monitoring"** means observing and making measurements to provide data to evaluate the performance and characteristics of the disposal site.

w) **"Near surface disposal or shallow ground burial"** means the disposal of radioactive waste in structures located below and/or above the natural ground

surface (within approximately 30 meters of it) and covered by layer(s) of natural and/or manufactured materials.

x) **"PNRI"** means the Philippine Nuclear Research Institute and/or its duly authorized representatives.

y) **"Proponent/Operator"** means any person, company, government or other entity which conducts or carries out operations for the disposal of radioactive waste.

z) **"Pyrophoric liquid"** means any liquid that ignites spontaneously in dry or moist air at or below 54.5°C (130°F). A pyrophoric solid is any solid material, other than one classed as an explosive, which under normal conditions is liable to cause fires through friction, retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious transportation, handling, or disposal hazard. Included are spontaneously combustible and water-reactive materials.

aa) **"Radiation"** means ionizing radiation.

bb) **"Radiation management plan"** means a document which sets out a system of management of radiation protection aims within which the decision making process takes place.

cc) **"Site closure and stabilization"** means those actions that are taken upon completion of operations that prepare the disposal site for custodial care and that assure that the disposal site will remain stable and will not need ongoing active maintenance.

dd) **"Stability"** means the capability of a waste package or disposal structure to maintain its shape and properties under disposal conditions.

ee) **"Storage"** means the placement of waste in a facility where isolation, environmental protection and human control (e.g. monitoring) are provided and with the intent that the waste will be retrieved at a later time.

ff) **"Structural life"** means the period over which a structure is expected to continue to perform its basic functions, even at a reduced level, and is a measure of the useful life of a disposal structure.

gg) **"Surety"** means the amount or bond, pledged by the proponent/operator to assure that the activities of its contractor are in compliance with the regulations of this Part.

hh) **"Surveillance"** means monitoring and observation of the disposal site for purposes of visual detection of need for maintenance, custodial care, evidence of intrusion, and compliance with other license and regulatory requirements.

ii) **"Waste or Radioactive waste"** means any material that contains or is contaminated with radionuclides at concentrations or activities greater than the clearance levels as established by PNRI, and for which no use is foreseen.

jj) **"Waste conditioning"** means the process which converts the waste into an acceptable concentration and stable form for packaging, shipment and disposal. The process may involve solidification of the waste and/or encapsulation in a stable matrix such as concrete.

kk) **"Waste package"** means the product of conditioning that includes the waste form and any container(s) and internal barriers (e.g. absorbing materials and liner), as prepared in accordance with requirements for handling, transportation, storage and/or disposal.

ll) **"Waste treatment"** means the processes that are carried out to change the characteristics of the waste to produce a safe and convenient form of storage or disposal. This may involve operations such as solidification, incineration or compaction to minimize the waste volume.

mm) **"Waste minimization"** means the establishment of practices in all stages of the production, processing and use of radioactive materials to minimize the quantity of waste generated, including its radioactivity.

Section 4. Interpretation.

Except as specifically authorized in writing by the PNRI Director, no interpretation of the meaning of the regulations in this Part by any officer or representative of PNRI will be recognized to be binding upon PNRI.

Section 5. Communication.

All communication and reports concerning the license and the regulations in the CPR should be addressed to the PNRI Director, Philippine Nuclear Research Institute, Commonwealth Avenue, Diliman, Quezon City 1101.

Section 6. License Required.

a) No person may receive, possess, and dispose of waste received from other persons at a land disposal facility unless authorized by a license issued by PNRI pursuant to this Part.

b) Each person shall file an application and obtain a license from PNRI pursuant to this Part before commencing construction of a land disposal facility. Failure to comply with this requirement shall be ground for denial of a license.

Section 7. Requirements for Issuance of a License.

A license for the receipt, possession, and disposal of waste containing or contaminated with radioactive material will be issued by PNRI upon finding that:

a) The issuance of the license will not constitute an unreasonable risk to the health and safety of the public;

b) The applicant is qualified by reason of training and experience to carry out the disposal operations requested in a manner that protects health and minimizes danger to life or property;

c) The applicant's proposed disposal site, disposal design, land disposal facility operations, including equipment, facilities, and procedures, disposal site closure, and

post-closure institutional care will protect the public health and safety and that they provide assurance that the general population will be protected from releases of radioactivity;

d) The applicant will maintain ecosystems and ecological processes that are essential for the functioning of the biosphere;

e) The applicant's proposed disposal site, disposal site design, land disposal facility operations, including equipment, facilities, and procedures, disposal site closure, and post-closure institutional control will protect the public health and safety and that they will provide assurance that inadvertent intruders are protected;

f) The applicant's proposed land disposal facility operations, including equipment, facilities, and procedures, will protect the public health and safety and that they will provide assurance that the standards for radiation protection set out in CPR Part 3 will be met;

g) The applicant's proposed disposal site, disposal site design, land disposal facility operations, disposal site closure, and post-closure institutional control will protect the public health and safety and that they will provide assurance that long-term stability of the disposed waste and the disposal site will be achieved and will eliminate to the extent practicable the need for ongoing active maintenance of the disposal site following closure;

h) The applicant's demonstration provides assurance that the applicable technical requirements of this Part will be met;

i) The applicant's proposal for institutional control shall assure that such control will be provided for the length of time found necessary to ensure the findings in Section 21.6.2 of this Part; and

j) The information on financial assurances meets the requirements of Sections 22.10.3 and 22.10.4 of this Part.

Section 8. Conditions of License.

a) A license issued under this Part, or any right thereunder, may not be transferred, assigned, or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of the license to any person, unless PNRI finds, after securing full information, that the transfer is in accordance with the provisions of the CPR Part 2 and this Part and gives its consent in writing in the form of a license amendment.

b) PNRI shall have the authority to suspend or revoke a license at any time before the termination of a license. Such action shall only be taken after written notice has been given to the proponent/operator and a hearing has been held except that, in the event of an immediate threat to health or safety, PNRI may take immediate action pending a final determination in a hearing.

c) No license may be terminated unless the final closure plan is fully implemented as approved by PNRI.

d) The terms and conditions of the license are subject to amendment, revision, or modification, by reason of amendments to, or by reason of rules, regulations, and orders issued in accordance with the terms of CPR Part 2.

e) Each person licensed by PNRI pursuant to the regulations in this Part shall confine possession and use of radioactive materials to the locations and purposes authorized in the license.

f) The proponent/operator shall not dispose of waste until the proponent/operator has received written notification from PNRI that PNRI has inspected the land disposal facility and has found it to be in conformance with the description, design, and construction described in the application for a license.

g) PNRI may incorporate in any license at the time of issuance, or thereafter, by appropriate rule, regulation or order, additional requirements and conditions with respect to the proponent/operator's receipt, possession, and disposal of waste as it deems appropriate or necessary in order to:

   1) Protect health or to minimize danger to life or property;

   2) Require reports and the keeping of records, and to provide for inspection of activities under the license that may be necessary or appropriate to effectuate the purposes of Act and regulations issued thereunder.

h) The authority to dispose of waste expires on the date stated in the license. Any expiration date on a license applies only to the site operations activities and to the authority to dispose of waste. Failure to renew the license shall not relieve the proponent/operator of responsibility for carrying out site closure and post-closure observation and transfer of the license to the site owner.

Section 9. Application for Renewal or Closure.

a) An application for renewal or an application for closure under Section 10 of this Part must be filed at least 90 days prior to license expiration.

b) Applications for renewal of a license must be filed in accordance with Section 9 of this Part. Applications for closure must be filed in accordance with Section 10 of this Part. Information contained in previous applications, statements or reports filed with PNRI under the license may be incorporated by reference if the references are clear and specific.

c) In any case in which a proponent/operator has filed an application in proper form for renewal of a license, the license does not expire until PNRI has taken final action on the application for renewal.

d) In determining whether a license will be renewed, PNRI shall apply the criteria set forth in Section 7 of this Part.

Section 10. Contents of Application for Closure.

a) Prior to final closure of the disposal site, the applicant shall submit an application to amend the license for final closure. This final closure application shall include a final

revision and specific details of the disposal site final closure plan included as part of the license application that includes each of the following:

1) Any additional geologic, hydrologic, or other data pertinent to the long-term containment of emplaced waste obtained during the operational period.

2) The results of tests, experiments, or any other analyses relating to filling material or excavated areas, final closure and sealing, waste migration and interaction with emplacement media, or any other tests, experiments, or analysis pertinent to the long-term containment of emplaced waste within the disposal site.

3) Any proposed revision of plans for:

   i) Decontamination and/or dismantlement of surface facilities;

   ii) Backfilling of excavated areas; or

   iii) Stabilization of the disposal site for post-closure care.

4) Any new information regarding the environmental impact of final closure activities and long-term performance of the disposal site.

b) Upon review and consideration of an application to amend the license for final closure submitted, PNRI shall issue an amendment authorizing final closure if the proponent/operator provides assurance that the performance requirement and safety assessment of Section 21.3 of this Part will be met.

Section 11. Termination of License.

a) Following the period of institutional control required in accordance with Section 22.9 of this Part and upon establishing that the requirements of Section 7 of this Part have been met, the proponent/operator may apply for an amendment to terminate the license.

b) This application will be reviewed in accordance with the provisions of this Part and the appropriate sections of CPR Part 2.

c) A license will be terminated only if PNRI finds:

1) That the requirements of this Part have been met;

2) That the institutional control requirements under Section 7(h) of this Part have been met; and

3) That any additional requirements resulting from new information developed during the institutional control period have been met and that permanent monuments or markers warning against intrusion have been installed.

Section 12. Resolution of Conflict.

The requirements of this Part are in addition to, and not in substitution for, other requirements of applicable Parts of the CPR. In any conflict between the specific requirements in this Part and a requirement in another Part of the CPR, the specific requirement shall govern.

II. TECHNICAL REQUIREMENTS

Section 21. Criteria for Waste Management.

21.1. Waste Disposal Objective.

The objective in establishing a waste disposal facility is to isolate radioactive waste in a way which ensures that there is no unacceptable health risk to human, and no long-term unacceptable detriment to other biota and the environment from the operation of the facility or following its closure. The principle that the burden placed upon future generations for the surveillance and control of waste produced by the present generation should be minimized. It shall be achieved by the use of the annual radiation dose limits as specified in CPR Part 3 for the following individuals:

a) personnel employed at the disposal facility or personnel involved with operations for the treatment, packaging or conditioning of waste or in the transport of waste to the facility; and

b) any member of the public who might be exposed as a result of inadvertent intrusion or environmental dispersal of radioactivity from the site during operations, or during or after the institutional control period.

21.2. Radiation Protection Considerations.

The characteristics of the site chosen for the disposal facility and the design of the facilities for waste treatment, packaging, or conditioning for disposal shall ensure that the following system of radiation protection is adhered to.

21.2.1. Justification.

No practice involving exposures to radiation should be adopted unless it produces sufficient benefit to the exposed individuals or to society to offset the radiological detriment it causes.

21.2.2. Optimization.

The magnitude of individual radiation exposures, the number of people exposed and the likelihood of incurring the exposures where these are not certain to be received shall be kept as low as reasonably achievable (ALARA), economic and social factors being taken into account.

21.2.3. Individual Dose and Risk Limits.

The exposure of individuals resulting from the combination of all the relevant practices should be subjected to an annual 1 mSv dose limit or its risk equivalent of 5×10^{-5} per year in the case of potential exposures.

21.2.4. Dose Constraint.

It shall be applied to the waste disposal system to ensure that individual dose limits are not exceeded. Such constraints shall apply where individuals may be exposed to other potential, or actual, sources of radiation, excluding natural background or medical sources.

21.3. Performance Requirement and Safety Assessment.

a) The proponent/operator shall submit to PNRI a detailed analysis of the design and operation of the facility, and an assessment of the projected long-term integrity of the site after closure. The structural requirements of Section 21.6.5 should be addressed in this assessment.

b) A safety assessment shall also be undertaken by the proponent and be subject to independent technical audit. This assessment shall identify those pathways through which radionuclides could be released to the general environment during the operation of the facility or after its closure.

c) The assessment shall also include a quantitative treatment of realistic scenarios which could lead to exposure through inadvertent intrusion at the site after institutional control has ceased. It should be clearly demonstrated that the degree of protection to humans is optimized, and that potential radiation exposure of an individual member of the public in the event of off-site releases of radioactivity or inadvertent intrusion will not lead to a radiation dose in excess of the limits prescribed in Section 21.6.1.

21.4. Site Requirements and Selection Criteria.

21.4.1. Generic Site Characteristics.

a) The waste disposal system shall provide for the isolation of waste and the limitation of releases of radionuclides needed to ensure that the potential effects of waste disposal on humans and the environment are within acceptable limits and that the waste disposal objective is met, with account taken of the waste characteristics, institutional

controls, engineered barriers and natural barriers associated with the site.

b) The site shall be located in an area with favorable meteorological, geological and geographical characteristics so that the radioactive waste, once in place, will be adequately isolated from the biosphere for the time that the radionuclides originally present, or their progeny, constitute a radiation hazard.

c) The best practicable technology consistent with ALARA shall be incorporated into the design of structures to enhance the confinement of waste.

21.4.2. Site Selection Criteria.

a) The facility site shall be located in an area free from flooding and have good surface drainage features, and generally be stable with respect to its geomorphology.

b) The water table in the area shall be at a sufficient depth below the planned disposal structures and the hydrogeological setting shall be such that large fluctuations in the water table are unlikely.

c) The geological structure and hydrogeological conditions shall permit modeling of groundwater gradients and movement, and enable prediction of radionuclide migration times and patterns.

d) The disposal site shall be located away from any known or anticipated seismic, tectonic or volcanic activity which could compromise the stability of the disposal structures and the integrity of the waste.

e) The site shall be in an area of low population density and in which the projected population growth or the prospects for future development are also very low.

f) The groundwater in the region of the site which may be affected by the presence of a facility shall ideally not be suitable for human consumption, pastoral or agriculture use.

g) The site shall have suitable geochemical and geotechnical properties to inhibit migration of radionuclides and to facilitate repository operations.

h) The site of the facility shall be located in a region which has no known significant natural resources, including potentially valuable mineral deposits, and which little or no potential for agriculture or outdoor recreational use.

i) The site shall have reasonable access for the transport of materials and equipment during construction and operation, and for the transport of waste into the site.

j) The site shall not be in an area which has special environmental attraction or appeal, which is of notable ecological significance, or which is the known habitat of rare fauna or flora.

k) The site shall not be located in an area which is of special cultural or historical significance.

l) The site shall not be located in reserves containing regional services such as electricity, gas, oil or water mains.

m) The site shall not be located in an area where land ownership rights or control could compromise retention of long-term control over the facility.

21.4.3. Public Consultation.

Site selection shall include a suitable consultative process to establish public consent to the location of a disposal facility at the particular site.

21.5. Waste Classification.

Radioactive waste suitable for near-surface land disposal shall be separated into three categories:

a) **Category A** – covers solid waste with radioactive constituents, mainly beta or gamma emitting radionuclides, whose half-lives are considerably shorter than the institutional control period. The radioactivity will decay substantially during this period. Long-lived alpha-emitting radionuclides should only be present at very low concentrations. This category of waste will comprise, predominantly, lightly contaminated or activated item such as paper, cardboard, plastics, rags, protective clothing, glassware, laboratory trash or equipment, certain consumer products and industrial tools or equipment. It may also comprise lightly contaminated bulk waste from mineral processing or lightly contaminated soils.

b) **Category B** – covers solid waste and shielded sources with considerably higher activities of beta or gamma – emitting radionuclides than Category A waste. Long lived alpha-emitting radionuclides should be at relatively low levels. This category of waste will comprise, typically, gauges and sealed sources used in industry, medical diagnostic and therapeutic sources or devices, and small items of contaminated equipment.

c) **Category C** – covers solid waste containing alpha-, beta- or gamma-emitting radionuclides with activity concentrations similar to those for Category B. However, this waste typically will comprise bulk materials, such as those arising from downstream processing of radioactive minerals, significantly contaminated soils, or large individual items for contaminated plant or equipment for which conditioning would prove to be impractical.

Radioactive waste which does not meet quantitative and qualitative criteria shall not be approved by PNRI as suitable for near-surface disposal.

d) **Category D** – covers waste that does not meet the specifications of Categories A, B, or C. This will comprise sealed sources, gauges or bulk waste which contains radionuclides at higher concentrations than are allowable under Categories A, B or C.

Waste within Category D shall be unacceptable for near-surface disposal and shall be retained in storage until an alternative disposal method is available.

21.6. Specific Criteria and Requirements for Waste Acceptance and Disposal.

Exposure of individuals resulting from waste acceptance and disposal shall be subject to dose limits specified in CPR Part 3. If other potential sources of exposure exist, dose constraints shall be established to ensure that the dose to a member of the public from all sources, excluding natural background radiation and medical exposure, does not exceed the specified limit.

21.6.1. Radiation Protection Criteria.

a) During the operational period, the annual effective dose for exposure of members of the public shall not exceed the value specified in **Section 15.3 of CPR Part 3 which is 1 mSv**. This limit shall be the basis for the development of quantitative criteria for the acceptance of waste for disposal. If a dose constraint is established to take into account other potential exposures, the lower value shall be used to calculate activity concentration limits for each category of waste.

b) Radiation protection standards for those personnel who work at the disposal facility shall be in accord with the values specified in **Section 13 of CPR Part 3 (occupational exposure); an effective dose of 20 mSv per year averaged over five (5) consecutive years with no more than 50 mSv in any single year.**

21.6.2. Institutional Control Period.

Following closure of the disposal facility, public access to, or alternative use of, the site shall be restricted for a predetermined period of time. This will be termed the institutional control period.

The institutional control period shall be established before commencement of disposal operations and should not be less than 100 years. The PNRI may vary the institutional control period according to the usage of the facility. However, the period shall not be reduced without a full safety assessment of the site. This assessment shall take into account the nature of the radionuclides, their total activity and activity concentrations in waste already disposed of, and the intended future use of the facility.

The proponent/operator of the disposal facility during the institutional control period has the ultimate responsibility for ensuring safety and environmental protection. This on-going responsibility of the proponent/operator will include:

a) implementation of the monitoring programme;

b) control of access to the facility; and

c) implementation of corrective actions, if needed.

21.6.3. Activity Concentration Limits.

a) Activity concentration limits for a specific disposal facility shall be calculated to cover radionuclides in each category of waste. These shall be derived from detailed assessment of the radiological impact of the facility and the possible pathways for the radiation exposure of members of the public during the operation of the facility and following its closure. Exposure scenarios appropriate to possible future uses of the site and its environs shall be included in the safety assessment. It should be assumed that inadvertent or intentional intrusion by humans does not occur during the institutional control period specified in 21.6.2 and that, after this period, the probability of any exposure within each scenario is unity, unless it can be shown to be otherwise.

b) Limiting Operational and Post-Closure Period Concentrations for the Vault Disposal Facility with a Clay Geosphere under Temperate Conditions for Categories A, B, and C are presented in Tables 1 and 2 respectively. In practice, values should be derived for a specific disposal site using data for environmental parameters and exposure scenarios appropriate to that site.

c) For radioactive waste in Category A or B which has been packaged, treated or conditioned the activity concentration shall be calculated by averaging the activity of the waste over the whole conditioned package or container.

d) For Category C bulk waste, radionuclide activities may be averaged over the volume of the disposal structure into which the Category C waste has been placed. In exceptional circumstances the PNRI may permit the proponent/operator to accept some individual waste packages as Category C, provided that the activity concentrations of radionuclides do not exceed the limit by more than a factor of 10. If this provision is used the operator shall ensure that the concentration of each radionuclide when averaged over the volume of the disposal structure does not exceed the limit applicable to that radionuclide.

e) For waste containing a mixture of radionuclides, the activity concentration of radionuclides in the waste package should satisfy the following summation rule:

$$\sum_i = \frac{Q_i}{Q_{i,l}} \leq 1$$

where: **Qi** is the actual activity of radionuclide **i** to be disposed (Bq or $Bq.kg^{-1}$; and

Qi,l is the activity limit for radionuclide **i** to be disposed ((Bq or $Bq.kg^{-1}$).

The appropriate limits shall be taken from the relevant tables (Tables 1 or 2)

21.6.4. Derivation of Total Site Activity.

A quantitative evaluation of exposures that might result from the release and dispersal of radioactive contaminants by air and water, including inadvertent human intrusion shall be carried out by the proponent/operator using appropriate mathematical models which incorporate site specific data. Based on this evaluation, and prior to commencement of disposal operations, the PNRI shall establish a limit on the total radionuclide activity for the proposed disposal facility.

21.6.5. Structural Stability and Waste Conditioning.

a) The waste shall be required to meet certain criteria with respect to structural stability, firstly, to ensure the overall long- term integrity of the disposal site and, secondly, in the case of waste in Categories B and C, to ensure that it remains in recognizable and non-dispersable form for a longer period, thereby limiting exposures in the event of inadvertent intrusion when there is unrestricted access to the site.

b) Generally the requirements for stability will be achieved through appropriate waste treatment, packaging and/or conditioning prior to disposal. The extent and nature of the treatment or conditioning required depends upon the physical properties and concentrations of radionuclides in the waste, and therefore varies for each of the three categories of waste as outlined below.

   i) Treatment of Category A waste shall be carried out to reduce the waste volume and to minimize voids. The minimum requirement shall be consolidation and compaction of the waste. Bulk waste in which the levels of radioactive contamination are low may meet the criteria for Category A, in which case the waste shall be required to meet the stability requirements of Category C bulk waste.

   ii) For disposal of Category B or Category C waste, the waste shall be in a form which will maintain its physical dimensions and properties under the anticipated conditions of disposal. Factors requiring consideration may include the compressive load of overburden or compaction equipment, and possible structural changes caused by chemical reaction or biodegradation. Waste in either of these two categories shall be structurally stable for a design period of at least 300 years.

c) Stability may be provided by the waste form itself, by processing the waste to a stable form, by placing the waste into a disposal container, or by placing it into a structure such as lined trench or a bore hole. The method of conditioning the waste to give the required stability after disposal will generally depend upon the volume of the waste and its ease of handling.

d) Category B waste will comprise relatively small items (i.e. less than about $0.1m^3$ prior to conditioning), and the individual waste package, after conditioning, should meet the long term stability requirements and provide additional protection against inadvertent intrusion. This stability and protection should be achieved by embedding the radioactive waste in a solid matrix such as concrete, bitumen or polymeric material.

e) Category C waste will comprise bulk waste and the required stability may be provided by the properties of the bulk waste itself. Otherwise, Category C waste shall be disposed of in a container or structure which is designed to provide stability.

f) For all categories, void spaces within the waste packages or containers shall be minimized to avoid subsidence.

21.6.6. Qualitative Physical, Biological and Chemical Requirements.

For waste to be acceptable for disposal, the following physical and chemical characteristics shall apply to all categories of waste. These requirements are specified to minimize the potential hazard to personnel at the disposal site, and to facilitate handling during disposal operations. The intention is to ensure the long term stability of the waste and reduce the potential for dispersal of radionuclides from the site.

a) For disposal, radioactive waste shall not contain corrosive materials; waste containing inorganics acids, alkalis and corrosive salts shall be treated to neutralize them and thereby to nullify the chemical effect of these materials.

b) Where practicable, flammable or combustible materials, such as paper, plastics, cloth or resins, shall be separated from non-flammable solids and packaged, contained and labeled in a proper manner.

c) Waste shall not contain or be capable of generating gaseous materials in quantities which might lead to the release of harmful vapors or fumes, or compromise the integrity of the facility.

d) Waste shall not contain material which will readily detonate upon impact, decompose explosively, react violently with water or undergo vigorous exothermic reaction at normal temperatures and pressures.

e) Waste containing pyrophoric material shall be treated, conditioned or packaged to render it non-flammable.

f) Liquid waste shall be solidified to be acceptable for disposal. The final package for disposal shall comply with the stability requirements for the particular category of waste.

g) As far as practicable, waste materials being disposed of should be free of biological materials.

h) Radioactive waste contaminated with toxic, pathogenic or infectious material shall be treated or conditioned to minimize both the potential hazard to disposal site personnel and the long-term health risks to members of the public. Any treatment should be carried out in accordance with relevant Parts or guidelines such as CPR Part 3.

i) Waste which contains chelating agents shall be treated or conditioned to reduce the possible long-term effects of leaching by water.

Section 22. Facility Design and Operational Requirements.

22.1. Facility Design.

a) Waste shall be disposed of in a manner which ensures the integrity of the package. Void spaces between packages should be minimized and such spaces filled to prevent subsidence or settlements.

b) The base of a disposal structure shall be constructed in accordance with best engineering practice, and shall be capable of bearing the weight of the whole system.

c) Suitable engineering barriers of natural or manufactured materials shall be incorporated in the design of the facility. The purpose is to guarantee the integrity of waste under all foreseeable circumstances, to minimize the possibility of waste infiltrating the disposal structure, and to delay or prevent radionuclide migration, both during operations and after closure of the facility. In addition, the engineered barriers should be designed to provide protection in the event of inadvertent intrusion into the disposal structure. For Category B and C waste the design of life of the barriers shall not be less than 300 years with a structural life of 1000 years. For Category B waste the conditioned waste package may provide one such barrier.

d) The design shall include a suitably engineered cover for the disposal structure following a consideration of site specific parameters. The cover may require several layers of material to be incorporated into the design, each layer having a specific function to estabilize the structure, prevent ingress of water, discourage entry of animals and people and inhibit erosion.

e) Backfill material shall be used to prevent subsidence and to minimize settlements within the disposal structure.

f) Each disposal structure shall be accurately located and surveyed. Appropriate permanent surface and below-ground markers shall be put in place to define the boundaries and locations of disposal structures.

g) A surface water management system shall be incorporated to control water erosion of the cover and to divert waste away from any partially filled disposal structure, but shall not allow water to drain off-site.

h) Drainage shall be provided so that any water, which might enter the disposal structure during operations or following the closure of the site, does not accumulate within the structure.

i) Category A waste shall not be placed in the same structure as Category B or C waste, except if Category A waste is conditioned or packaged to meet the same criteria as Category B or C. Suitable Category A waste may be considered to form part of the cover requirements for Category B or C as in 22.1(d) above.

j) A buffer zone shall be maintained between buried waste and the boundary of the disposal site. This zone shall be of sufficient area surrounding the facility operations to allow environmental monitoring to be carried out, to allow contingency measures to be carried out in an emergency, and to ensure that during site operations there is an adequate distance between the facility and any area used by, or accessible to, members of the public.

k) Consideration should be given to the inclusion of a zone of restricted occupancy outside the site perimeter as a region in which there is public access, but in which permanent occupancy is prohibited for the institutional control period.

22.2. Environmental Management Plan.

a) An environmental management plan, approved by the PNRI, shall be established by the proponent/operator for the disposal site prior to the commencement of its construction and operations. The purpose of the plan is to set out management objectives and practices which will provide for the safe and environmentally sound management of the facility during its construction, operational and post-operational stage.

The objectives of this plan will be:

1) To outline management strategies and practices which will prevent unacceptable dispersal of radioactive contaminants through the various environmental pathways, from the commencement of operations at the facility until institutional control ceases, and which will minimize such release thereafter;

2) To establish performance indicators and outline monitoring procedures necessary to acquire the data needed:

i) to assess any impact of site operations on members of the public and on the environment;

ii) to enable early detection of any inadvertent releases of radioactivity, and thus allow corrective action to be taken to limit the impact upon site personnel, the public and the environment;

iii) to predict the long-term behavior of the waste in the site following closure of the facility; and

3) To ensure that disposal operations comply with regulatory requirements.

b) The environmental management plan shall include an assessment of possible exposure pathways. A program of routine on-site and off-site monitoring shall also be required within the plan and shall include appropriate measurements of radionuclides at various locations and in various environmental media such as surface run-off and groundwater, surface soil, local plants and animals, airborne dust, together with external radiation measurements on the site perimeter and off-site. The location and frequency of sampling, sampling procedures and analytical methods shall be examined and approved by the PNRI.

c) In the absence of adequate existing data, pre-operational measurements shall be carried out for at least 12 months prior to the commencement of operations to establish baseline data for each aspect of the proposed monitoring program. The adequacy of the baseline data for the assessment of the potential environmental and radiological impact of the facility shall be confirmed by the technical auditor.

d) A review of the environmental management plan shall be carried out by the proponent/operator at intervals at approximately three years during the period of operation. A publicly available report detailing this review shall be provided to the PNRI.

22.3. Radiation Management Plan.

a) Before the commencement of disposal operations, the proponent/operator shall establish a radiation management plan for operation at the facility which meets the requirements of, and is approved by, the PNRI. The purpose of this plan is to establish management practices and procedures to ensure that when the waste handling, packaging, and disposal operations are carried out there will be no unacceptable risk to workers or members of the public.

b) The radiation management plan shall address the operational aspect of radiation safety. The plan shall include personnel training, personnel monitoring, maintaining records, monitoring within the operational area of the facility, designation of areas of potential radiation exposure, emergency preparedness and response, contamination control and protective clothing and apparatus.

c) The radiation management plan shall be reviewed by the proponent/operator at approximately three yearly intervals during the period of operation and the proponent/operator shall submit a publicly available report detailing this review to the PNRI.

22.4. Contingency Plans/Emergency Response Procedures.

Contingency plans shall be prepared by the proponent/operator of the facility and be approved by the PNRI. The operator shall prepare appropriate on-site and, if necessary, off-site emergency plans. Such emergency plans shall be tested at appropriate intervals in accordance with national regulations.

22.5. Security Arrangements.

The operator/proponent must ensure that all reasonable precautions shall be taken to prevent persons from carrying out unauthorized actions that jeopardize the safety of the disposal facility. Arrangements shall be made to ensure that only designated persons have access to the site. Provision shall be made to detect and prevent any unauthorized entry into the security sensitive areas. The level of security arrangements shall reflect the potential for damage to the disposal facility or to the waste.

22.6. Operational Practices/Procedures.

22.6.1. Treatment, Packaging and Conditioning of Waste.

a) Before disposal, the radioactive waste shall be treated, packaged and/or conditioned (where necessary) to ensure that it meets the criteria in Section 21 for the appropriate category. The waste shall also comply with any additional specifications of the PNRI.

b) The proponent/operator shall submit a detailed specification of the proposed treatment, packaging and conditioning for approval by PNRI. Facilities may be provided at the disposal site by the proponent/operator for conditioning of waste to ensure that it conforms to the disposal criteria for the particular category of waste.

c) Waste producers, or their agents, shall be provided with the necessary specifications for conditioning particular shipments of their waste to ensure that they will be acceptable for disposal at the facility.

d) The packaging of waste for shipment to the disposal site, whether in a conditioned form or not, shall be done in compliance with CPR Part 4 and other relevant transport regulations.

e) The proponent/operator shall institute a quality assurance program to verify that all packaging, labeling and accompanying documentation accurately reflects the contents of conditioned waste packages received for disposal. This program shall meet the requirements of the PNRI.

22.6.2. Transport.

Transportation of waste to the facility shall comply with **CPR Part 4, "Regulations for the Safe Transport of Radioactive Materials in the Philippines".**

22.6.3. Disposal Operations.

Waste shall be disposed of in accordance with the criteria and requirements of this Part and following procedures which have the prior approval of the PNRI. Only waste containing or contaminated with radioactive materials should be accepted for disposal at the facility.

22.7. Records and Inventory Keeping.

a) Detailed records shall be kept by the proponent/operator and the PNRI of all waste consigned to, and received at, the facility. For each shipment the waste generator, the type of waste, its volume and weight, and the nature and concentration of radionuclides in the waste shall be recorded. Any conditioning of the waste shall also be recorded.

b) Details of any accidents and incidents at the facility shall be kept together with information on the impact on personnel, the public and the environment.

c) The occupational exposure records of all workers exposed to radiation in the course of their work shall be retained in a form specified by PNRI. All data from environmental and area monitoring at and around the facility shall also be retained.

d) Site records shall be kept at least until the end of the institutional control period in two widely separated locations, one of which shall be PNRI or a government archives and shall include:

   1) the location of any disposal structures;

   2) the location of the waste packages or containers within the structures and the date of their placement;

   3) details of the contents of waste packages or containers; and

   4) details of the backfilling and cover materials.

22.8. Disposal Facility Closure.

a) Operations shall cease at the disposal facility when the authorized disposal space is filled or the limit on total site radioactivity is reached. Unrestricted public access to the site or alternative use of the site shall not be permitted for the duration of the established period of institutional control. At the end of the institutional control period, the status of the site shall be reviewed to determine whether any further management or control should be instituted.

b) Prior to the commencement of operations the proponent/operator shall prepare draft or conceptual plans for decommissioning the facility and rehabilitating the site, and submit them to PNRI for approval. These plans shall be reviewed every five years and resubmitted for approval. The proponent/operator shall apply to PNRI to cease operations at the facility at least three years prior to the proposed date of closure. At this time detailed plans for the decommissioning of the facility and for the site rehabilitation shall be submitted to PNRI for approval.

c) Site rehabilitation plans should include the proper provision of site markers and exclusion barriers to remain for the duration of the institutional control period, and the removal of all superfluous surface structures which may encourage occupation of the site and buildings.

d) The operator shall remain responsible for the site and all necessary site rehabilitation work until the work is formally accepted to be satisfactory to PNRI. After this time, responsibility for measures in the case of an accident should be assumed by the PNRI.

e) The PNRI shall ensure that a program of surveillance involving site inspections and environmental monitoring is carried out during the institutional control period, and that historical records of waste disposed at the site are preserved. The perimeter fence and site markers shall be maintained during this period. The location and purpose of the disposal site shall be marked on land titles as caveats or mentions for the institutional control period.

22.9. Post-Institutional Control Land Use.

a) At the end of the institutional control period, the site shall be cleared of any remaining fences, site markers, etc.

b) The institutional control period and disposal limits must be chosen so that any doses or risks do not exceed corresponding limits or constraints. Appropriate caveats or mentions indicating the former use of the site for the disposal of radioactive waste should be retained on relevant land titles.

22.10. Financial Indemnities.

PNRI may consider the imposition of a levy, a surcharge on the proponent's/operator's charges or some other means to ensure that the decommissioning can be completed if the proponent/operator experiences financial difficulties during the operation of the facility or at its closure.

22.10.1. Financial Information.

The financial information shall demonstrate that the financial qualifications of the applicant are adequate to carry out the activities for which the license is sought and meet all other financial requirements of this Part.

22.10.2. Applicant Qualifications and Assurances.

The applicant shall show that it either possesses the necessary funds and/or has reasonable assurance of obtaining the necessary funds, to cover the estimated costs of conducting all licensed activities over the planned operating life of the project, including costs of construction and disposal.

22.10.3. Funding for Disposal Site Closure and Stabilization.

a) The applicant shall provide assurances prior to the commencement of operations that sufficient funds will be available to carry out disposal site closure and stabilization. These assurances shall be based on PNRI-approved cost estimates reflecting the PNRI approved plan for disposal site closure and stabilization. The applicant's cost estimates must take into account total costs that would be incurred if an independent contractor were hired to perform the closure and stabilization work. The assurances shall establish that there will be sufficient funds for:

   1) decontamination or dismantlement of land disposal facility structures; and

   2) closure and stabilization of the disposal site so that following transfer of custody of the disposal site to the appropriate government agency, the need for ongoing active maintenance is eliminated to the extent practicable and only minor custodial care, surveillance, and monitoring are required.

b) The proponent/operator's surety mechanism will be submitted annually for review by PNRI to assure that sufficient funds are available for completion of the closure plan, assuming that the work has to be performed by an independent contractor.

c) The amount of surety liability will be considered in accordance with the projected cost of future closure and stabilization. Factors affecting closure and stabilization cost estimates include: inflation; increases in the amount of disturbed land; changes in engineering plans; closure and stabilization that has already been accomplished; and any other conditions affecting costs. This will yield a surety that is at least sufficient at all times to cover the costs of closure of the disposal units that are expected to be used before the next license renewal.

d) The term of the surety mechanism shall be open-ended unless it can be demonstrated that another arrangement would provide an equivalent level of assurance. This assurance could be provided with a surety mechanism which is written for a specified period of time [e.g., five (5) years] yet which shall be automatically renewed unless the party who issues the surety notifies PNRI and the beneficiary (the government) and the principal (the proponent/operator) not less than 90 days prior to the renewal date of its intention not to renew. In such a situation the proponent/operator must submit a replacement surety within 30 days after notification of cancellation. If the proponent/operator fails to provide a replacement surety acceptable to PNRI, the government may collect on the original surety.

e) Proof of forfeiture shall not be necessary to collect the surety so that in the event the proponent/operator cannot provide an acceptable replacement surety within the required time, the surety shall be automatically collected prior to its expiration. The conditions described above would have to be clearly stated on any surety instrument which is not open ended, and shall be agreed to by all parties. Liability under the surety mechanism shall remain in effect until the closure and stabilization program has been completed and approved by PNRI and the license has been transferred to the site owner.

f) Financial surety arrangements generally acceptable to PNRI include: surety bonds, cash deposits, certificates of deposit, deposits of government securities, escrow accounts, irrevocable letters or lines of credit, trust funds, and combinations of the above or such other types of arrangements as may be approved by PNRI. However, self-insurance, or any arrangement which essentially constitutes pledging the assets of the proponent/operator, will not satisfy the surety requirement for private sector applicants since this provides no additional assurance other than that which already exists through license requirements in accordance with Sections 22.10.2 and 22.10.3 of this Part.

22.10.4. Financial Assurances for Institutional Controls.

a) Prior to the issuance of the license, the applicant shall provide for PNRI review and approval a copy of a binding arrangement, such as a lease, between the applicant and the disposal site owner that ensures that sufficient funds will be available to cover the costs of monitoring and any required maintenance during the institutional control period. The binding arrangement will be reviewed periodically by PNRI to ensure that changes in inflation, technology, and disposal facility operations are reflected in the arrangements.

b) Subsequent changes to the binding arrangement specified in Section 22.10.4 (a) above of this Part relevant to institutional control shall be submitted to PNRI for approval.

III. ADMINISTRATIVE REQUIREMENTS

Section 31. Duties and Responsibilities.

31.1. Appropriate Authority (PNRI).

PNRI is responsible for enforcing compliance with the provisions of this Part. In carrying out this function it is expected that PNRI shall:

a) At each stage of the approval process for a new waste disposal facility, consider in detail all relevant submission and proposals;

b) Analyze all information supplied by the proponent in respect of the location, design, operation and closure of the facility to ensure compliance with criteria specified in this Part, any imposed constraints applied below occupational or public dose limits, or any legislation embodying this Part;

c) Examine, and if satisfied, approve the quantitative and qualitative criteria for each of the categories of waste, including waste activity concentration limits and total site activity based upon a safety assessment of the proposed facility undertaken by the proponents;

d) Examine, and if satisfied, approve proposals by the proponent/operator for site radiation and environmental monitoring programs to be carried out prior to, and during, operations at the facility;

e) Establish or approve procedures and requirements for the treatment, packaging and conditioning of waste for disposal, and ensure that these are carried out in compliance with radiation protection criteria specified in this Part and any legislation embodying this Part, as amended from time to time;

f) Communicate any concerns and requirements in relation to the facility to the proponents;

g) Require modification to plans, criteria, standards and characteristics as deemed necessary;

h) Determine the extent of the buffer zone, allowable nearby land uses, and the duration of the institutional control period;

i) Determine all reporting procedures to be followed in accordance with this Part;

j) Determine the means of indemnifying the PNRI against cost of surveillance, monitoring, premature closure and any rectification work which may become necessary during the post-operational institutional control period.

k) In accordance with Section 31.6, determine the contents of the annual reports required to be provided by the facility operator and assess such reports;

l) Establish and be responsible for post rehabilitation surveillance, monitoring and maintenance programs;

m) Establish or approve a program, which includes the performance of random tests, to ensure agreement between labeling and documentation, and the contents of waste packages. This program should ensure that waste for disposal complies with the acceptance criteria required in this Part;

n) Approve the appointment of an independent technical auditor to perform duties in accordance with the requirements of Section 31.5 of this Part.

o) Communicate and liaise with the general public and provide information to members of the public as required;

p) In the event of becoming aware of any non-compliance with this Part, take appropriate action to return the operation to compliance as expeditiously as possible; and

q) Consider and, if appropriate, approve applications from the operator for variation of this Part provided that any modification does not diminish the standard of safety required by this Part.

31.2. Approvals and Authorizations.

The following actions shall be required to proceed to the construction and continued operation of a disposal facility and its subsequent closure.

a) The proponent/operator shall submit a preliminary disposal facility design and an analysis of potential sites for the facility to PNRI. These shall be based upon the criteria contained within this Part. Reference should be made to any guidelines to this Part. Approval to proceed to the development of a detailed design and to carry out an

environmental and radiation assessment of the preferred site shall be obtained from the PNRI.

b) The proponent/operator shall prepare an environmental and a radiation assessment, including a safety analysis of the proposed facility design and operation addressing the criteria detailed in Sections 21 and 22 of this Part. In assessing the environmental impact of the proposed facility the approach to environmental assessment under the Philippines should be adopted to ensure thorough investigation of potential issues. Relevant Phil. legislation shall be adhered.

c) The public acceptability of the site and the design of the facility should be evaluated by the appropriate public consultative process.

d) Construction of a facility shall commence at the chosen site only with approval of PNRI.

e) Following construction of the facility in accordance with the approvals given in 31.2. (d) and, upon approval of detailed operational, public reporting, emergency, transport and monitoring procedures, the PNRI would be expected to issue an authorization to operate the facility. This would be expected to be reviewed after one year and thereafter at regular intervals (not exceeding three years) by PNRI.

f) The proponent/operator should submit an application for approval by the PNRI to cease operations and proceed to decommissioning three years before the proposed closure of the site.

g) The proponent/operator shall submit plans for decommissioning the facility to PNRI prior to commencement of operations. These plans shall be reviewed and resubmitted for approval every five years.

31.3. Proponent/Operator.

During the planning, operation and closure of the waste disposal facility the proponent/operator shall:

a) Prepare and submit all the necessary documentation for approvals and all authorizations required by PNRI at each stage of the development, operation and closure of the disposal facility;

b) Operate the facility in accordance with written procedures that meet the requirements of this Part and those of PNRI;

c) Provide the necessary specifications for the treatment and/or conditioning of particular shipments of waste to waste producers or their agents; alternatively, comply with these specifications for conditioning which may be carried out at the facility under exceptional circumstances;

d) Instruct all workers in safe working practices as approved by PNRI, provide adequate protective and monitoring equipment, and ensure that the precautions, necessary to limit radiation exposure are followed;

e) Ensure that, when averaged over the whole disposal structure, the concentrations of radionuclides in the waste do not exceed the limits on activity concentration and total site activity that have been approved, or specified by PNRI;

f) Establish environmental and radiation management plans with the approval of PNRI and perform any monitoring that is required within these plans, including the assessment and recording of radiation doses received by the workers and others;

g) Prepare detailed procedures to be implemented in the event of an accident, incident, or emergency at the facility. Submit these contingency plans to PNRI for approval prior to the commencement of operations, and then ensure that the workers are familiar with these plans;

h) Maintain all records related to the disposal of radioactive waste at the facility, including radiation and environmental monitoring and as required by PNRI;

i) Submit regular reports to PNRI;

j) Provide a plan for the rehabilitation of the site and decommissioning of the facility to PNRI for approval prior to the commencement of operations, and subsequently revise and resubmit these plans for re-approval of five yearly intervals;

k) Apply to PNRI for approval to decommission the waste facility not less than three years prior to the proposed closure date;

l) Decommission the facility and rehabilitate the site in accordance with previously approved plans and any additional requirements of the PNRI;

m) Provide any medical examinations for the workers which are required by PNRI;

n) Report in detail to PNRI all incidents, and action taken to prevent such occurrences as required by PNRI;

o) Establish a comprehensive quality assurance program applicable to all safety related activities, structures, systems and components of disposal system; and

p) Recommend to PNRI a technical auditor as required in this Part.

31.4. Workers Responsibilities.

Workers at the waste disposal facility shall:

a) Prior to commencement of their employment, notify the employer of all previous work involving radiation and subsequently attend such familiarization courses and re-training as required;

b) Use protective equipment and radiation monitors as directed;

c) Report any defects in plant or equipment to the proponent/operator as soon as they become aware of them;

d) Modify equipment or plant only with the approval of the operator;

e) Undergo all relevant medical examinations requested by the operator or by PNRI;

f) Follow work practices necessary for compliance with Section 31.3 of this Part; and

g) Report all incidents and accidents to their supervisor.

31.5. Technical Auditor.

The independent technical auditor, appointed under Sections 31.1and 31.3 shall have expertise in radioactive waste management. The technical auditor shall review all the actions of the proponent/operator required by this Part and provide publicly available reports to PNRI:

a) Prior to commencement of actual burial operations; and

b) Annually thereafter, within one month following the presentation of the proponent/operator's public annual report required under Section 31.6 of this Part.

31.6. Reporting Procedures.

Proponent/Operator.

The proponent/operator shall consult with PNRI regarding the information to be supplied and the manner in which the facility operations will be reported. Reporting shall include a public annual report which details at least the following information:

a) A list of all waste received, buried or in storage;

b) The state and condition of equipment and plant, necessary maintenance or major modifications foreseen as necessary;

c) Details of all accidents and incidents at the facility together with information on the potential or actual impact on the site personnel, members of the public and the general environment as reported to PNRI (for the public report personal details shall remain confidential).

d) A summary and interpretation of results from the radiation and environmental management programs; and

e) A summary of the current rehabilitation and decommissioning plan and an indication of the expected date of closure of the facility.

IV. RECORDS, REPORTS, AND TESTS

Section 41. Maintenance of Records, Reports, and Transfers.

a) The proponent/operator shall maintain any records and make any reports in connection with the licensed activities as are required by the conditions of the license or by regulations of PNRI.

b) The proponent/operator shall keep records showing the receipt, transfer and disposal of radioactive materials in his possession and shall be retained until PNRI authorizes their disposition.

c) Records which shall be maintained pursuant to this Part may be the original or a reproduced copy or microfilm if this reproduced copy or microfilm is capable of producing a copy that is clear and legible at the end of the required retention period.

d) If there is a conflict between PNRI regulations in this Part, other Parts of the Code, and a license condition pertaining to the retention period for the same type of record, the longest retention period specified takes precedence.

e) Notwithstanding subsections (a) through (d), copies of records of the location and the quantity of radioactive wastes contained in the disposal site must be transferred upon license termination to appropriate governmental agencies as designated by PNRI at the time of license termination.

f) Following receipt and acceptance of a shipment of radioactive waste, the proponent/operator shall record the date of disposal of the waste, the location in the disposal site, the condition of the waste packages as received, any discrepancies between materials listed on the manifest and those received, and any evidence of leaking or damaged packages or radiation or contamination levels in excess of limits specified in the regulations for safe transport of radioactive materials of PNRI. The proponent/operator shall briefly describe any repackaging operations of any of the waste packages included in the shipment, plus any other information required by PNRI as a license condition.

g) Each proponent/operator authorized to dispose of radioactive waste received from other persons shall file a copy of its financial report or a certified financial statement annually with PNRI in order to update the information base for determining financial qualifications.

h) Each proponent/operator shall keep records showing the total exposures of each worker under his employ and shall be maintained and preserved until PNRI authorizes their disposition.

i) Each proponent/operator shall maintain records showing the results of test performed in compliance with Section 42 of this Part and shall be retained until PNRI authorizes their disposition.

j) Annual Reports:

1) Each proponent/operator authorized to dispose of waste materials received from other persons, pursuant to this Part, shall submit annual reports to PNRI. Reports shall be submitted by the end of the first calendar quarter of each year for the preceding year.

2) The reports shall include:

i) specification of the quantity of each of the principal radionuclides released to unrestricted areas in liquid and in airborne effluents during the preceding year;

ii) the results of the environmental monitoring program;

iii) a summary of proponent/operator disposal unit survey and maintenance activities;

iv) a summary, by waste class, of activities and quantities of radionuclides disposed of; and

v) any instances in which observed site characteristics were significantly different from those described in the application for a license.

3) If the quantities of radioactive materials released during the reporting period, monitoring results, or maintenance performed are different from those expected in the materials previously reviewed as part of the licensing action, the report must cover this specifically.

Section 42. Tests at Land Disposal Facilities.

Each proponent/operator shall perform, or permit PNRI to perform, any tests PNRI deems appropriate or necessary for the administration of the regulations in this Part, including, but not limited to, tests of:

a) Radioactive wastes and facilities used for the receipt, storage, treatment, handling and disposal of radioactive wastes;

b) Radiation detection and monitoring instruments; and

c) Other equipment and devices used in connection with the receipt, possession, handling, treatment, storage, or disposal of radioactive waste.

Section 43. Reporting Requirements.

a) The proponent/operator shall notify PNRI immediately by any fast means of communication after the discovery of an event that could lead to exposures to radiation or radioactive material that could result in regulatory limits or releases of radioactive material that exceed regulatory limits. Such events may include fires, explosions, toxic gas releases, transport accidents, etc.

b) Each proponent/operator shall notify PNRI immediately by any fast means of communication after the discovery of any of the following events involving licensed material:

1) An unplanned contamination event wherein access into the contaminated area by workers or the public is restricted or prohibited for more than 24 hours by imposing additional radiological controls;
2) An unplanned contamination event wherein access into the contaminated area is restricted for a reason other than to allow isotopes with a half-life of less than 24 hours to decay prior to decontamination;

c) The information required for notification in paragraphs (a) and (b) of this section must include, to the extent available;

1) The caller's name, company or institution and callback number;
2) A description of the event, including date and time of occurrence;
3) The exact location of the event;
4) The isotopes, quantities, and chemical and physical form of the licensed material involved; and

5) Any personnel radiation exposure data available.

d) Each proponent/operator who makes a report required by paragraph (a) and (b) of this section shall submit written follow-up report of the event within thirty (30) days of the initial report. The report must include the following:

1) A description of the event, including the probable cause, and the specifications of the any equipment involved that failed or malfunctioned;
2) The exact location, date and time of the event;
3) The isotopes, quantities, and chemical and physical form of the licensed material involved;
4) Corrective actions taken or planned and the results of any evaluations or assessments; and
5) The extent of exposure of individuals to radiation or to radioactive material.

e) Written reports required pursuant to other Parts of the CPR may be submitted to fulfill this requirement if the reports contain all of the necessary information.

V. ENFORCEMENT

Section 51. Inspections of Land Disposal Facilities.

a) Each proponent/operator shall afford PNRI at all reasonable times, the opportunity to inspect radioactive waste not yet disposed of, and the premises, equipment, operations, and facilities in which radioactive wastes are received, possessed, handled, treated, stored, or disposed.

b) Each proponent/operator shall make available to PNRI for inspection, records kept by it pursuant to the regulations in this Part. Authorized representatives of PNRI may make and keep copies, of any record that is required to be kept and maintained pursuant to this Part.

Section 52. Modification, Suspension and Revocation of Licenses.

a) The terms and conditions of each license issued pursuant to the regulations in this Part and any other Part of the CPR shall be subject to amendment, revision or modification by reason of amendments to the Act, or by reason of rules, regulations and orders issued in accordance with the terms of the Act.

b) Any license may be revoked, suspended, or modified, in whole or in part, for any material false statement in the application or any statement of fact required under Section 20 of R.A. No. 5207, or because of conditions revealed by such application or statement of fact, or any report, record or inspection or other means which would warrant PNRI to deny a license on an original application, or for violation of, or failure to observe any of the provisions of the Act or any rule, regulation or order issued by PNRI, any of the terms and conditions of the license.

c) Except in cases of willfulness or those in which the public health, interest or safety requires otherwise, no license shall be modified, suspended or revoked unless, prior to the institution of proceedings therefore, adequate facts which may warrant such action shall have been brought to the attention of the proponent/operator in writing and the proponent/operator shall have been accorded the opportunity to be heard and to demonstrate or achieve compliance with all lawful requirements.

Section 53. Violations.

a) A proponent/operator shall be issued a notice of violation if found to have violated any rule, regulation or order issued by PNRI; or any term, condition or limitation of his license.

b) The notice of violation shall require the proponent/operator to submit a written explanation in reply and shall include:

1) The corrective steps which have been taken and the results obtained;
2) The corrective steps which will be taken; and
3) The date when full compliance will be achieved.

Section 54. Criminal Penalties.

Section 64 and Section 65 of Republic Act No. 5207, as amended, provides for criminal sanctions for willful violation of, attempted violation of, or conspiracy to violate, any provision of Section 16 of the Act, or of any regulation or order of the PNRI, or license issued under the authority of the Act.

Section 55. Effectivity.

The regulations in this Part shall take effect fifteen (15) days following the publication in the Official Gazette or in a newspaper of general circulation.

Approved:

ALUMANDA M. DELA ROSA, Ph.D.

Director, PNRI

Date: February 16, 2005

Table 1

Limiting Operational Concentrations for the Vault Disposal Facility with a Clay Geosphere under Temperate Conditions

Radionuclide	Operational Period	
	Limiting Concentration ($Bq\text{-}kg^{-1}$ of waste)	Associated Scenario
^{3}H	1.E+12	Gas release (public)
^{10}Be	**1.E+20**	Drop and crush
^{14}C	8.E+09	Gas release (public)
^{22}Na	**4.E+11**	Drop and crush (worker)
^{41}Ca	3.E+14	Drop and crush (worker)
^{54}Mn	**1.E+12**	Drop and crush (worker)
^{55}Fe	**1.E+12**	Drop and crush (worker)
^{59}Ni	9.E+13	Drop and crush (worker)
^{63}Ni	1.E+20	Drop and crush
^{60}Co	4.E+11	Drop and crush (worker)
^{65}Zn	**2.E+12**	Drop and crush (worker)
^{90}Sr	1.E+20	Drop and crush
^{93}Zr	1.E+20	Drop and crush
^{94}Nb	5.E+11	Drop and crush (worker)
^{99}Tc	1.E+20	Drop and crush
^{106}Ru	**4.E+12**	Drop and crush (worker)
^{110m}Ag	**3.E+11**	Drop and crush (worker)
^{121m}Sn	**1.E+14**	Drop and crush (worker)
^{125}Sb	**2.E+12**	Drop and crush (worker)
^{126}Sn	**5.E+11**	Drop and crush (worker)
^{129}I	2.E+13	Drop and crush (worker)
^{134}Cs	**6.E+11**	Drop and crush (worker)
^{137}Cs	2.E+12	Drop and crush (worker)

Limiting Operational Concentrations for the Vault Disposal Facility with a Clay Geosphere under Temperate Conditions

Radionuclide	Operational Period	
	Limiting Concentration (Bq-kg^{-1} of waste)	**Associated Scenario**
^{144}Ce	**8.E+10**	Drop and crush (crane operator)
^{147}Pm	**2.E+17**	Drop and crush (worker)
^{151}Sm	2.E+16	Drop and crush (worker)
^{152}Eu	**8.E+11**	Drop and crush (worker)
^{154}Eu	**7.E+11**	Drop and crush (worker)
^{204}Tl	**6.E+14**	Drop and crush (worker)
^{210}Pb	**9.E+13**	Drop and crush (worker)
^{226}Ra	4.E+05	Gas release (public)
^{227}Ac	**2.E+12**	Drop and crush (worker)
^{228}Ra	1.E+20	Drop and crush
^{232}Th	3.E+14	Drop and crush (worker)
^{234}U	3.E+14	Drop and crush (worker)
^{235}U	4.E+12	Drop and crush (worker)
^{238}U	3.E+13	Drop and crush (worker)
^{237}Np	3.E+12	Drop and crush (worker)
^{238}Pu	3.E+14	Drop and crush (worker)
^{239}Pu	7.E+14	Drop and crush (worker)
^{240}Pu	3.E+14	Drop and crush (worker)
^{241}Pu	1.E+20	Drop and crush
^{241}Am	2.E+13	Drop and crush (worker)

Reference: IAEA-TECDOC 1380

Notes: (1) Activity limits calculated using a dose limit of 1 mSv.y^{-1} for the public and 20 mSv.y^{-1} for workers for each radionuclide.

(2) Activity limits calculated assuming a probability of unity for each scenario.

(3) The most restrictive limit for each radionuclide is emboldened.

(4) Various sources of uncertainty have been considered in the derivation of the above values. Hence, these values should not be seen as recommended limits to be used to assess site specific disposal systems. It is more appropriate to regard them as order of magnitude estimates.

Table 2

Post-Closure Period Concentrations for the Vault Disposal Facility with a Clay Geosphere under Temperate Conditions

Radionuclide	Operational Period	
	Limiting Concentration ($Bq\text{-}kg^{-1}$ of waste)	Associated Scenario
^{3}H	**3.E+06**	Bathtubbing
^{10}Be	N/A	N/A
^{14}C	**1.E+09**	Road construction
^{22}Na	N/A	N/A
^{41}Ca	**1.E+09**	Bathtubbing
^{54}Mn	N/A	N/A
^{55}Fe	2.E+17	Bathtubbing
^{59}Ni	**2.E+09**	Bathtubbing
^{63}Ni	**2.E+09**	Bathtubbing
^{60}Co	**1.E+09**	Bathtubbing
^{65}Zn	N/A	N/A
^{90}Sr	**5.E+04**	Bathtubbing
^{93}Zr	**4.E+08**	Road construction
^{94}Nb	**9.E+04**	Road construction
^{99}Tc	**1.E+07**	Bathtubbing
^{106}Ru	N/A	N/A
^{110m}Ag	N/A	N/A
^{121m}Sn	N/A	N/A
^{125}Sb	N/A	N/A
^{126}Sn	N/A	N/A
^{129}I	**5.E+03**	Bathtubbing
^{134}Cs	6.E+12	Bathtubbing
^{137}Cs	**8.E+04**	Bathtubbing

Post-Closure Period Concentrations for the Vault Disposal Facility with a Clay Geosphere under Temperate Conditions

Radionuclide	Operational Period	
	Limiting Concentration ($Bq\text{-}kg^{-1}$ of waste)	Associated Scenario
^{144}Ce	N/A	N/A
^{147}Pm	N/A	N/A
^{151}Sm	**2.E+11**	Road construction
^{152}Eu	N/A	N/A
^{154}Eu	N/A	N/A
^{204}Tl	N/A	N/A
^{210}Pb	N/A	N/A
^{226}Ra	**5.E+04**	Road construction
^{227}Ac	N/A	N/A
^{228}Ra	**5.E+08**	Bathtubbing
^{232}Th	**4.E+04**	Road construction
^{234}U	**2.E+06**	Road construction
^{235}U	**7.E+05**	Road construction
^{238}U	**2.E+06**	Road construction
^{237}Np	**3.E+05**	Road construction
^{238}Pu	**1.E+07**	Road construction
^{239}Pu	**2.E+05**	Road construction
^{240}Pu	**2.E+05**	Road construction
^{241}Pu	**2.E+07**	Road construction
^{241}Am	**5.E+05**	Road construction

Reference: IAEA-TECDOC 1380

Notes: (1) Activity limits calculated using a dose limit of 1 $mSv.y^{-1}$ for the public and 20 $mSv.y^{-1}$ for workers for each radionuclide.

(2) Activity limits calculated assuming a probability of unity for each scenario.

(3) The most restrictive limit for each radionuclide is emboldened.

(4) Various sources of uncertainty have been considered in the derivation of the above values. Hence, these values should not be seen as recommended limits to be used to assess site specific disposal systems. It is more appropriate to regard them as order of magnitude estimates.