



PH0500003

**STATUS OF PHILIPPINE REGULATORY
INFRASTRUCTURE FOR THE SAFE
TRANSPORT OF RADIOACTIVE
MATERIALS**

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Regional Training Course on Safe Transport of Radioactive Material
Singapore, April 5-16, 2004

Abstract. This paper presents some regulatory practices and experiences of the Philippine Nuclear Research Institute (PNRI) in ensuring safe transport of radioactive materials. The regulation and licensing the use of radioactive materials started in 1958. The number of packages containing radioactive materials transported into and within the country has increased with the increase number of licensees. During the period 2000-2002, the total number of licensees is 293, 311 and 311 respectively. The PNRI issues certificates of release and Certificate of Transport/Authority to Transport. Based on the data of certificates, the topmost sealed source shipments from abroad, mostly in Type A package, are ^{192}Ir and ^{125}I for brachytherapy. For unsealed sources, also mostly in Type A package, the topmost radioactive materials are $^{99\text{m}}\text{Tc}$ (generators), ^{131}I , ^{201}Tl mainly for medical diagnosis. From the data on certificates of transport, the total number of packages inspected for the period 2000-2002 is 464, 577 and 747 respectively. The experiences in the enforcement of the transport regulations and the implication of issuing certificates of release and transport are discussed and recommendations are presented.

1. History

In 1965, a National Committee created by Executive Order No. 139, approved "The Rules and Regulations on the Safe Transport of Radioactive Materials in the Philippines". The Committee was composed of representatives from government agencies such as the Civil Aeronautics, National Railway, Customs, Post, Land Transportation, the public service and then the Philippine Atomic Energy Commission. This was the first set of transport regulations that took effect in May 24, 1966. It was mainly based on the IAEA 1964 Revised Edition of the Regulations for the Safe Transport of Radioactive Materials.¹ In 1983, the PAEC adopted, by Administrative Order No. 01, Series of 1983, IAEA Transport Regulations Safety Series No. 6, 1973 Revised Edition, as amended. In March 2000, the Philippine Nuclear Research Institute (PNRI), formerly PAEC, also by Administrative Order No. 01, Series of 2000, adopted IAEA ST-1 (1996 Edition), "Regulations on the Safe Transport of Radioactive Material" to govern whenever practicable, the safe transport of radioactive materials in the Philippines by air, land or water.^{2, 3} The adoption of the two (2) IAEA revisions of the safe transport regulations has not resulted yet into a revision of the first Philippine transport regulations. The major changes on the IAEA 1996 Revised Edition of the Regulations for the Safe Transport of Radioactive Materials and the IAEA Transport Regulations Safety Series No. 6, 1973 Revised Editions were as follows: (a) Radiation Protection Programmes that applies to users, handlers and carriers; (b) UF_6 and Type C packages requirements; (c) Extension of deep immersion test; (d) Definition of radioactive material – Nuclide specific activity (Bq/g) for exempt material and addition of nuclide-specific activity limit (Bq) for exempt consignments.

2. Legislative basis

The Republic Act (RA) 2067, known as the Science Act of 1958 is the first governmental legislation that created the PAEC with functions, powers and duties that include regulation and licensing of various activities involving radioactive materials such as the following: manufacture, production, transfer, acquisition, ownership, possession, import, export, distribution, and use with the end objective of “protecting the health, minimizing the danger to life and property, and of promoting the national defense and security or otherwise protection of the general public.”⁴

RA 2067 further mandates PAEC to issue such rules and regulations establishing such standards and instructions to govern the shipments, possession, and use of radioactive materials.

Republic Act 5207, an Act for the Licensing and Regulation of Atomic Energy Facilities and Materials, Establishing the Rules on Liability for Nuclear Damage, and for Other Purposes, was promulgated in 1968. Section 18 of this Act provides that “any person who ships or transports atomic energy material shall comply with all such regulations and orders of the PAEC...”⁵

3. Regulatory activities

3.1 Regulatory requirements

All persons who intend to perform activities involving radioactive materials shall comply with the applicable provisions of the RAs and the Code of PNRI Regulations (CPR). The CPR is a codification of all rules and regulations issued by PAEC and PNRI. It includes Part 4 entitled “The Rules and Regulations on the Safe Transport of Radioactive Materials in the Philippines”. In order to implement and enforce Part 4, the following are required of applicants for a license:

- 3.1.1 All applicants/licensees are required to designate an individual as radiological health and safety officer. To qualify, the individual must have classroom and laboratory training on radioactivity, radiation safety, etc. that includes safe transport of radioactive materials.
- 3.1.2 All applicants/licensees who will be transporting radioactive materials are required to comply with Part 4. While Part 4 is being revised, the PNRI enforces the IAEA transport regulations as adopted according to administrative order.

3.2 Certificates of release and transport

- 3.2.1 Certificate of release is issued by PNRI for shipments of radioactive materials from abroad. This certification is issued in order that shipments will be released from the Bureau of Customs at international ports of entry. It contains the name and address of the licensee and the

list of radioactive materials authorized in the license. The Bureau of Customs will only release the shipment from their custody upon presentation of this certificate. The data contained in the certificate of release for the period 2000-2002 have been collected and analyzed. Tables 1 and 2 present the number of shipments, type and content of packages for the period 2000-2002. Most of the packages are Type A containing radioactive materials for medical use.

- 3.2.2 Certificate of transport is issued by PNRI after inspection or verification of packages intended for transport. This certificate covers packages for shipment abroad, packages arriving at the ports from abroad, and packages to be transported within the country. The inspection includes verification of packaging that includes the type of package, contents, entries on package label i.e. name of radionuclide, activity, transport index, T. I. and category of package. T. I. is verified by actual measurement of radiation levels at the surface and 1 meter away from the package.

3.3 Compliance monitoring

All licensees are inspected almost annually to verify compliance with the applicable provisions of the Code of PNRI Regulations, license conditions and commitments in license applications. To ensure that all pertinent provisions of Part 4 are complied with, the modal agencies have to perform their respective roles and responsibilities.

3.4 Training

Training on safe transport is required of license applicants/licensee personnel. Cargo handlers, especially of international airline companies are also required to undergo periodic training e.g. safe air transport of dangerous goods inclusive of radioactive material. Training of Customs personnel is also provided by the PNRI on per request basis.

With respect to skills and knowledge gained at international and regional levels, these have been utilized in the revision of Part 4 and in national training courses on radioisotopes techniques and radiation safety. These national training courses include two (2) hours lecture and demonstration on safe transport, the main reference of which is the IAEA safety transport regulations.

Separate training course on safe transport of radioactive material is conducted by PNRI on per request basis and not regularly offered.

3.5 Regulatory conference

The PNRI recently conducted a regulatory conference on draft Part 4 which is primarily based on IAEA TS-R-1 (2000). The purpose of this conference was to review, comment and recommend for approval the draft Part 4. Representatives of shipping companies, modal agencies (Philippine Port Authority, Philippine Coast Guard, Maritime Industry Authority, Air Transport

Office, Philippine National Railways, Manila International Airport Authority), licensees who are frequently transporting radioactive materials, Bureau of Customs, and PNRI regulatory staff participated in the conference.

Most participants of the regulatory conference have no objections on the contents of draft Part 4 except on the inclusion of the traditional practice by PNRI of requiring Certificates of Transport. There was extensive discussion on its definition and the manner of implementation. This issue needs to be resolved.

4. Discussion and recommendations

While arrangements for regulation, control, compliance monitoring and training exist to ensure safety in transporting radioactive material, there are some practices that should be corrected and improved. The National Committee has never been reconvened with the adoption of IAEA safe transport regulations. Thus, provisions in the regulations addressed to modal agencies i.e. air, water and land, may not be adequately enforced and implemented. There is a need to re-establish closer coordination with the modal agencies in order to effectively implement the provisions of the transport regulations.

In the case of the issuance of certificate of release, this covers only international ports located in Metro Manila. With the international concern on illicit trafficking of radioactive material, there is urgent need to expand the practice to include all international ports in the country. This will also require expansion of training of Customs personnel as well as modal agency personnel responsible for dangerous goods.

The issuance of certificate of transport by the PNRI is now under review and changes have been made. It has been recognized that more attention should be given to consignors' compliance with the requirements on packages, limits on contents, labeling, marking, placarding, and proper declaration and documentation of shipments of radioactive material.

CPR Part 4, "Regulations for the Safe Transport of Radioactive Material in the Philippines", which is being drafted to specify transport practices as applied to Philippine conditions, essentially complies with IAEA ST-1 (now TS-R-1). The effective implementation of the current rules in the issuance of Certificates of Release and the Authority to Transport by PNRI dictates the initial measures that will ensure the safe transport of radioactive materials. Domestic transport of radioactive materials, particular for portable nuclear devices such as radiographic cameras and moisture/density gauges, are adequately addressed in specific regulations such as CPR Part 11 "Licenses for Industrial Radiography and Radiation Safety Requirements for Radiographic Operations" and CPR Part 16 "Licenses for the Use of Sealed Sources Contained in Industrial Devices" respectively.

Most of the packages transported are Type A packages containing radioactive material for medical use. For unsealed sources, frequently transported are technetium-99 generators and technetium-99 pertechnetate, iodine-131, and thallium-201. For sealed

sources, these are iridium-192 for brachytherapy and for industrial radiography. Since most of the medical licensees are located in the National Capital Region, and these include Metro Manila, it follows then that the transportation of radioactive materials especially by land, occur mainly in Metro Manila. So far, there has been no report of accident or incident during transport of packages of radioactive material. If emergency should occur during transport, it is more likely that it will involve Type A packages containing radioactive material for medical use. With this knowledge, preparedness and response could be appropriately planned. Accordingly, the RADPLAN includes transport accidents involving radioactive material in the design basis assumptions. Specific procedures in accordance with written PNRI directives describe the delegation of responsibilities between the emergency organization and the regulatory group.

Table 1. Shipments of Sealed Sources Covered with Certificate of Release

Type A Package	Number of Shipments (Units)			Range of Activity
	FY 2000	FY 2001	FY 2002	
Medical				
Cesium-137	-	1 (2)	-	1.94 GBq
Iridium-192	11 (11)	8 (8)	10 (10)	370.00 – 472.00 GBq
Iodine-125 (seeds)	-	-	42 (3718)	10.36 – 23.46 MBq
Strontium-90	1(2)	2(2)	-	33.30 MBq
Reference/Calibration sources: Co-57/Cs-137/Ba-133	5(5)/ 4(4)/ -(-)	-(-)/ 1(1)/ 1(1)	4 (4)/ 2(2)/ 1(1)	185.00–740.00 MBq 0.37 – 9.25 MBq 9.25 MBq
Industrial Radiography				
Selenium-75	1(1)	2(2)	-	0.59 – 1.29 TBq
Cesium-137	1(1)	2(2)	-	335.00- 616.00 GBq
Industry				
Cs-137; Am-241:Be	3(3)	7(7)	-	0.37 – 1.48 GBq
Krypton-85	4(4)	1(1)	1(1)	444.00 – 555.00 GBq
Californium-252	1(1)	-	-	0.40 GBq
Strontium-90	2(2)	-	2(13)	0.7 – 1.85 GBq
Cobalt-60	-	-	2(2)	73.00 – 307.00 MBq
Promethium-147	1(1)	-	1(2)	25.90 GBq
Nickel-63	1	-	-	555.00 MBq
Cesium-137	-	1(1)	2(3)	0.37 GBq

Type B Package	Number of Shipments (Units)			Range of Activity
	FY 2000	FY 2001	FY 2002	
Medical				
Cobalt-60 teletherapy source	1(1)	2(2)	-	222.00 – 370.00 TBq
Industrial Radiography				
Iridium-192	11(34)	20(48)	13(24)	1.85 – 7.40 TBq
Cobalt-60	-	5(5)	-	250.00 GBq

Table 2. Shipments of Unsealed Sources Covered with Certificate of Release

Type A Package				
Year	FY 2000	FY 2001	FY 2002	
No. of shipment	314	364	349	
Radionuclides	Medical	Total Activity		
	Molybdenum-99/ Tc-99m Generator	9.76 TBq	10.76 TBq	12.78 TBq
	Iodine-131 (sol'n and capsule)	3.55 TBq	5.10 TBq	6.10 TBq
	Iodine-131 (MIBG)	-	100.00 MBq	354.50 MBq
	Thallium-201	151.40 GBq	154.00 GBq	250.00 GBq
	Gallium-67	1.90 GBq	212.00 GBq	4.14 GBq
	Indium-111	2.45 GBq	1.26 GBq	1.27 GBq
	Samarium-153	322.00 MBq	-	-
	Iodine-125 (RIA)	2.45 GBq	1.26 GBq	1.27 GBq
	Carbon-14 (RIA)	177.60 MBq	962.00 MBq	710.40 MBq
	Research			
	Phosphorus-32	2.40 GBq	1.314 GBq	1.10 GBq
	Phosphorus-33	92.50 MBq	-	-
	Tritium (H-3)	186.85 MBq	148.00 GBq	222.00 MBq
	Sulfur-35	9.25 MBq	37.00 MBq	37.00 MBq
	Carbon-14	75.85 MBq	38.55 MBq	74.00 MBq
	Iodine-125	37.00 MBq	-	-
	Iron-55	-	37.00 MBq	-
	Iron-59	-	-	10.40 MBq

Excepted Packages are radioactive materials other than articles manufactured or natural uranium, depleted uranium or natural thorium that shall not contain activities greater than the following:

- a. where the radioactive material is enclosed in or is included as a component part of an instrument or other manufactured article, such as a clock or electronic apparatus;
- b. where the radioactive material is not so enclosed in or is not included as a component of an instrument or other manufactured article.

Type A Packages shall not contain activities greater than the following:

- a. for specific form radioactive material – A₁; or
- b. for all other radioactive material – A₂.

Type B(U) and Type B(M) Packages shall not contain:

- a. activities greater than those authorized for the package design;
- b. radionuclides different from those authorized for the package design; or
- c. contents in a form, or a physical or chemical state different from those authorized for the package design as specified in their certificates of approval.

References

- [1] PHILIPPINE ATOMIC ENERGY COMMISSION, Rules and Regulations on the Safe Transport of Radioactive Materials in the Philippines, Official Gazette, Manila (1966).
- [2] Administrative Order No.01, Series of 1983, PAEC Adoption of IAEA Safety Series Nos. 6 and 9, Official Gazette, Manila (1983).
- [3] Administrative Order No.1, Series of 2000, Adoption of ST-1 1996 Edition of the IAEA Regulations for the Safe Transport of Radioactive Material, Official Gazette, Manila (2000).
- [4] Republic Act 2067, known as the Science Act of 1958. Philippine Congress, 1958.
- [5] Republic Act 5207, an Act for the Licensing and Regulation of Atomic Energy Facilities and Materials, Establishing the Rules on Liability for Nuclear Damage, Philippine Congress, 1968.