

Radioactive Material Accidents in the Transport

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Abstract. Transport is an important part of the worldwide nuclear industry and the safety record for nuclear transport across the world is excellent. The increase in the use of radioactive materials in our country requires that these materials be moved from production sites to the end user. Despite the number of packages transported, the number of incidents and accidents in which they are involved is low. In Brazil, do not be records of victims of the radiation as a result of the transport of radioactive materials and either due to the accidents happened during the transports. The absence of victims of the radiation as result of accidents during the transports is a highly significant fact, mainly to consider that annually approximately two hundred a thousand packages containing radioactive material are consigned for transport throughout the country, of which eighty a thousand are for a medical use. This is due to well-founded regulations developed by governmental and intergovernmental organizations and to the professionalism of those in the industry. In this paper, an overview is presented of the activities related to the transport of radioactive material in the state of São Paulo. The applicable legislation, the responsibilities and tasks of the competent authorities are discussed. The categories of radioactive materials transported and the packaging requirements for the safe transport of these radioactive materials are also described. It also presents the packages amounts of carried and the accidents occurred during the transport of radioactive materials, in the last five years. The main occurred events are argued, demonstrating that the demanded requirements of security for any transport of radioactive material are enough to guarantee the necessary control of ionizing radiation expositions to transport workers, members of general public and the environment.

KEYWORDS: *transport; radioactive material; packages; accidents; regulations.*

1 Introduction

Transport is an important part of the worldwide nuclear industry and the safety record for nuclear transport across the world is excellent. The increase in the use of radioactive materials in our country requires that these materials be moved from production sites to the end user. Despite the number of packages transported, the number of incidents and accidents in which they are involved is low. In Brazil, do not be records of victims of the radiation as a result of the transport of radioactive materials and either due to the accidents happened during the transports. The absence of victims of the radiation as result of accidents during the transports is a highly significant fact, mainly to consider that annually approximately two hundred a thousand packages containing radioactive material are consigned for transport throughout the country, of which eighty a thousand are for a medical use. This is due to well-founded regulations developed by governmental and intergovernmental organizations and to the professionalism of those in the industry. In this paper, is presented an overview of the activities related to the transport of radioactive material in the state of São Paulo. The applicable legislation, the responsibilities and tasks of the competent authorities are discussed. The categories of radioactive materials transported and the packaging requirements for the safe transport of these radioactive materials are also described. It also presents the packages amounts of carried and the accidents occurred during the transport of radioactive materials, in the last five years. The main occurred events are argued, demonstrating that the demanded requirements of security for any transport of radioactive material are enough to guarantee the necessary control of ionizing radiation expositions to transport workers, members of general public and the environment.

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The transport of radioactive materials involves a risk to the team staff, members of the public and the environment. While transport safety is based on the designs of packages, programs of radiation protection are important to ensure radiological control the workers, the public and the environment during transportation of these materials.

Although the increased interest in the transport of radioactive material tends to focus on the nuclear industry, transport largely true for materials for medical use. These are predominantly transported in packages of Type A and excepted packages.

It is estimated that are transported in the state of São Paulo, approximately 200 thousand packages per year. Usually, the package is transported by road in vehicles exclusive to this end. For medical purposes, in some cases, are transported by modes: land-air-land, since the delivery may be required as soon as possible, due to the fact that some radionuclides have short half-life. The requirements of security required for any transportation involving radioactive materials are effective in providing the necessary control of exposure of people, goods and environment to radiation. The safety project depends primarily on the packaging used for transport, whose design takes into account four key parameters: the radiotoxicity of radionuclide, the total amount of activity in the packed, the physical form of radionuclides and the potential levels of external radiation. The regulations and standards [1,2,3] specify stringent tests for each type of packaging to ensure an acceptable standard of safety during transport, including the way that are independent even as the form of operational procedures are conducted.

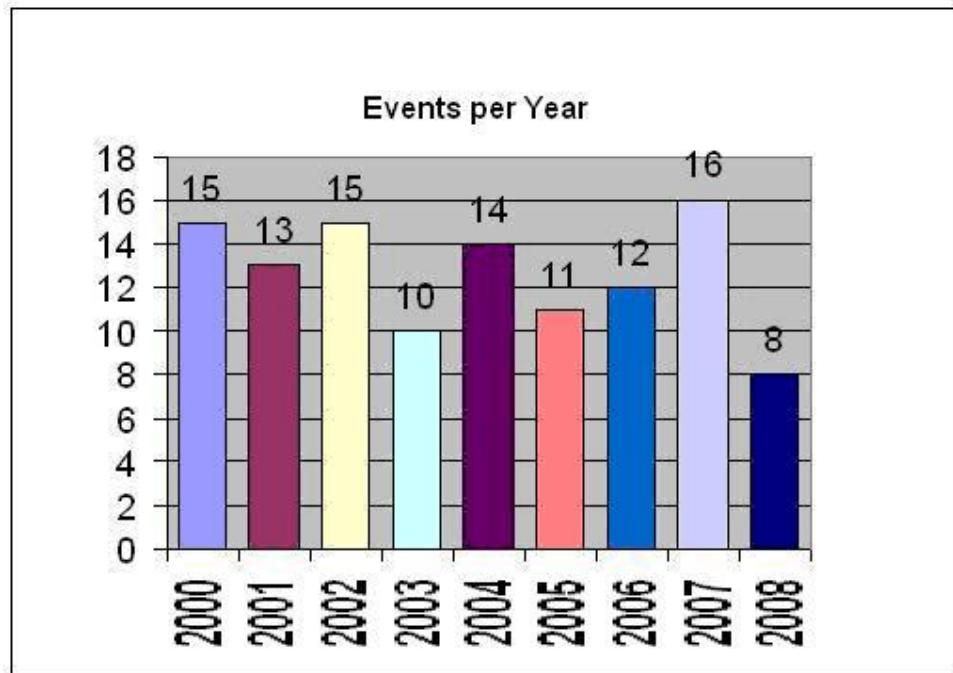
2. Emergency response in Brazil

Until the moment, in Brazil, there have been no reported transport accidents with serious radiological consequences. However, in spite of all the measures taken to ensure the safe transport of radioactive material, there is still a possibility that such accidents may take place. An accident resulting in a significant release of radioactive material or loss of shielding could have considerable consequences. These consequences can be controlled or mitigated by proper emergency response actions.

The Brazilian Nuclear Energy Commission (CNEN) program to attend the nuclear emergencies in the Brazilian territory. The main emergency co-ordinator group is centralized at Rio de Janeiro city and is supported by others groups distributed in the Brazilian territory in charged to investigate the events. The support groups maintain trained professionals to attend any event with radiological risk on duty 24 hours per day. The IPEN takes part of the program with almost 30 experts and is responsible by all the events in São Paulo state, which this means to attend 40 million persons and 60% of the country radiation sources.

The events are reported, most of them, situations involving radioactive lightning eliminator, accidents during the transport of radioactive material and lack of adulteration of containers or equipment. In Fig. 1 are shown the emergency responses in the last 08 years in São Paulo State and the participation of emergencies involving the transport of radioactive materials.

Figure 1: Emergency response during the years 2000 to 2008.



In Fig. 2 and Table 1 are shown the types of events related to the responses of emergency.

Figure 2: Types of events related to the responses of emergency.

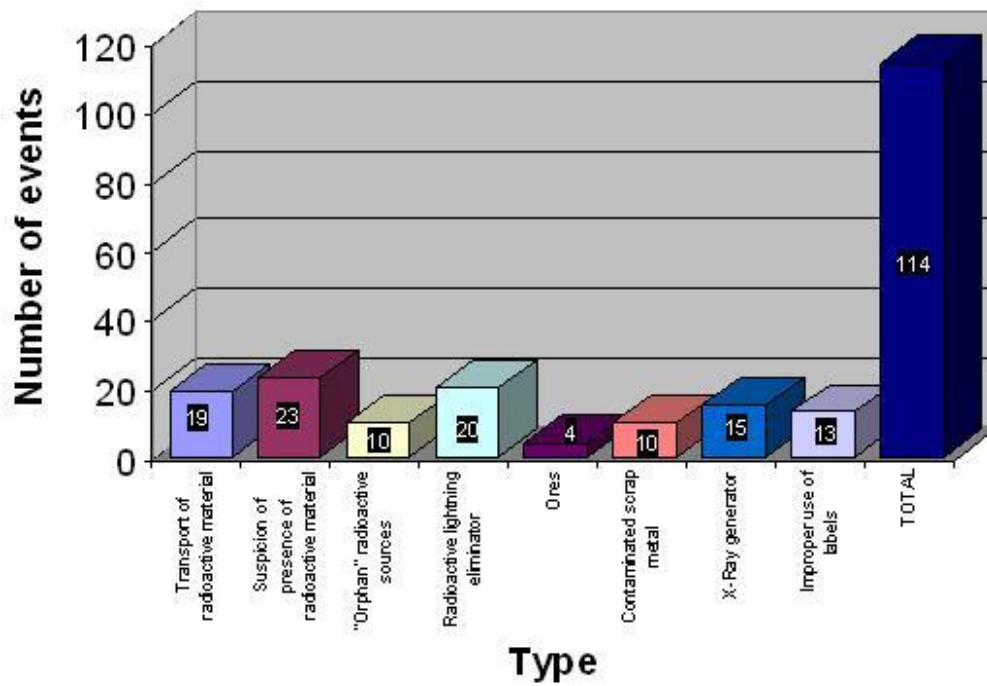


Table 1: Types of events related to the responses of emergency.

Type	Number of Events
Transport of radioactive material	19
Suspicion of presence of radioactive material	23
Orphan radioactive sources	10
Radioactive lightning eliminator	20
Ores	04
Contaminated scrap metal	10
X-Ray generator	15
Improper use of labels	13
TOTAL	114

In Fig. 3, are shown the set of referring photographs to the accident in the transport of radioactive materials of big impact occurred in São Paulo State. In this event, the vehicle that carried one Type B(U) packed, Gammamat NS-1407, with Ir-192 source (IRS-3682) of 1.6 TBq, found to a distance of 50 m of the Presidente Dutra highway, main road linking at São Paulo and Rio de Janeiro city, in the direction of Rio de Janeiro. The metal box remained fixed into vehicle interior. As the dose rate values measured in the external surface of the packed do not presented changes in relation to measures carried out before the transport operation and the packed physical appearance did not present damages in its structure, was decided to liberate de place, the vehicle and the packed to be carried in another vehicle.

Figure 3: Set of photographs to the accident in the transport of radioactive material.



3. Conclusion

The radioactive materials transport is carried out in Brazil and the world with unquestionable level of security. The demanded requirements of security for any radioactive material transport, in such way, are efficient in assuring the necessary people exposure, materials and environmental ionizing radiation controls. In our Country, does not have registers of victims of the ionizing radiation as consequence of the radioactive material transport. The absence of victims of the ionizing radiation during accidents in transport is highly expressive if considered the fact that São Paulo State annually transport approximately 200 a thousand packages containing radioactive material.

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