



ISSUES AND TRENDS IN RADIOACTIVE WASTE MANAGEMENT IN THE PERSPECTIVES OF BANGLADESH

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Abstract.

Radioactive wastes arising in Bangladesh comes from the use of radionuclides in medicine, industry, research and agriculture. Regulatory arrangement to manage radioactive wastes in Bangladesh has been established through promulgation of nuclear safety and radiation control rules-1997, SRO No. 205-Law/1997. A national waste management strategy for waste classification, regulatory control would have been developed and implemented taking due account of the nature and magnitude of the waste in the country. An adequate training programme for the persons responsible for waste management and the staff of the regulatory body has been in place. Waste management facility and building construction for storage for decay and then clearance for disposal is in progress at the Atomic Energy Research Establishment, Bangladesh Atomic Energy Commission, Savar, Dhaka, Bangladesh, under the auspices and help of the International Atomic Energy Agency expertise.

1. Introduction

Radiation sources have been used in Bangladesh for many years in a wide range of applications in the fields of research, medicine, industry, and agriculture. Safe and permanent solutions to radioactive waste disposal reflect the political, economic, and environmental importance to public health and safety. Bangladesh is concerned with the management of nuclear wastes generated from medical centres, research institutions, industrial facilities, mining operations, and research reactors. Though at present Bangladesh has a regulatory infrastructure it gained very little experience in safe handling and management of radioactive waste. The Government of the People's Republic of Bangladesh has approved a project on Establishment of a Central Radioactive Waste Processing and Storage Facility (CWPSF) (April 1999) for implementation under Annual Development Programme (ADP) and is in progress. The Government has signed an agreement on "Convention on Safe Management of Radioactive Wastes" with the IAEA and the national commitment is to establish a waste management infrastructure in the country.

2. Trends in radioactive waste management in Bangladesh

In Bangladesh, Nuclear Safety and Radiation Control Rules (NSRC)-1997 (SRO No. 205-Law/97) was promulgated to regulate nuclear and radiological practices including waste management[1]. The law directed that the licensee of the radioactive waste management shall comply (a) with the requirements of the applicable safety series published under the IAEA RADWASS Programme, (b) activity and volume of any radioactive waste that results from the source for which they are responsible be kept to the minimum practicable, (c) the waste be collected, transported, stored and disposed of, in accordance with the requirements of the applicable standards, and (d) segregate, and treat separately if appropriate, different types of

radioactive waste where warranted by differences in factor, such as radionuclide content, half-life, concentration, volume and physical and chemical properties, taking into account the available options for waste disposal; and (e) the licensee shall not dispose of licensed material without the approval of the Bangladesh Atomic Energy Commission (BAEC).

2.1. Radioactive waste (RW) in different practices

2.1.1 Nuclear medicine practices

In Bangladesh, presently there are 15 Nuclear Medicine Centres (NMC) and one Nuclear Medicine Institute (NMI). Out of these 16 facilities 2 are private organization and rest belong to BAEC. A great majority of Nuclear Medicine facilities (NMF's) use I-131 and Tc-99m and some of the NMF's are Tl-201, P-32, Cr-51 and I-125. Most of the NMF's use Sr-90 for eye applicator. In the NMF's there are no proper inventory of radioactive materials and proper radioactive waste management programme[2]. On the basis of NSRC rules and survey findings, the NSRC authorities made some recommendation on waste management and instruction for removing the deficiencies of NMF's. The NMF's have been advised to maintain and develop appropriate radioactive waste disposal record, and waste management programme. Most of the NMF's especially the Government facilities do not yet fulfil the required standards. The task is difficult and poses many hurdles, yet have to be overcome. Nevertheless, with strong will and the required support and assistance from the Government, the concerned organization and the facilities believe that we should be able to achieve the goal of attaining the safety and protection standards compatible with the international standards within four to five years.

2.1.2 Industrial radiography practices

Gamma radiography uses gamma radiation. Iridium-192 is ideal for radiography but other radionuclides such as Co-60, Cs-137, Yb-169, Thulium-170 etc. is also used. In Bangladesh, there are total ten numbers of industrial radiography facilities. Most of the facilities don't have adequate records management system, lack of safety culture and waste disposal ideas[3].

2.1.3 Nucleonic gauge practices

In Bangladesh, there are total thirteen number of Nucleonic Gauge facilities, most of the facilities have serious lack of radiation protection and waste management tasks[3].

2.1.4 Gamma irradiators

In Bangladesh, there are three number of Gamma Irradiator facilities, they are used for variety of purposes in research, industry, and other fields. The facilities have lack of safety culture and waste disposal management[3].

2.1.5 Radiotherapy practices

In Bangladesh, there are ten Radiotherapy installations, they have ten Co-60 teletherapy units, 1 linear accelerator, 3 HDR brachytherapy units, 2 LDR brachytherapy units, 7 deep therapy X-ray machines and 5 simulators. From overall assessments, only one installation out of 10 may be considered satisfactory from radiological point of view[4].

2.2. Radioactive waste management (RWM) programme in Bangladesh

The objective of the programme is to provide adequate protection of man and the environment against undue exposure to the ionising radiations from the radioactive wastes (RWs) including the spent/used/unused (old) radiation sources that are being generated presently and also expected to be generated in the future. The following RWM works are being conducted by the Radiation Monitoring and Waste Management Laboratory (RMWML) of Atomic Energy Research Establishment (AERE), BAEC, Savar, Dhaka:

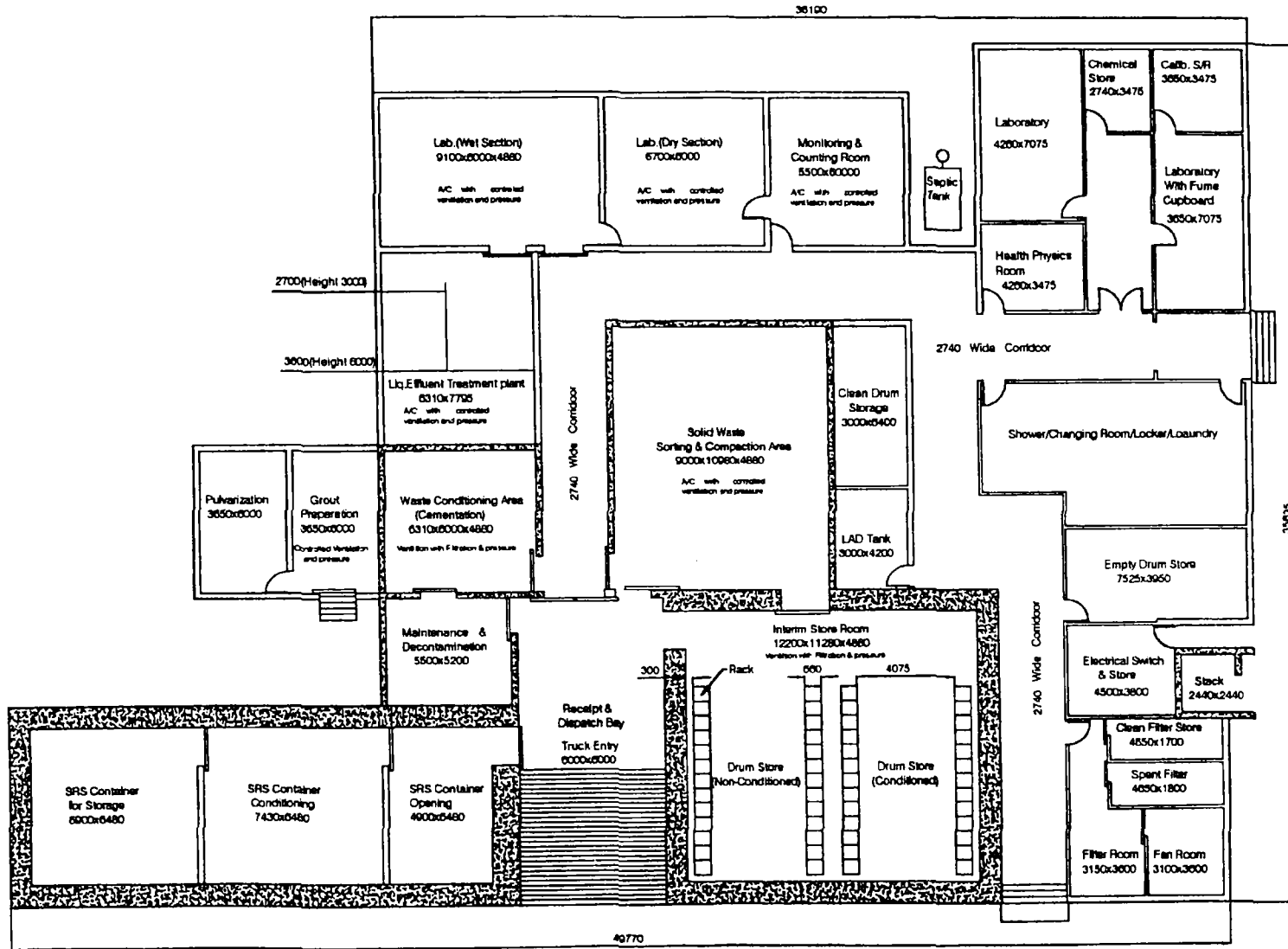


Figure 1. Layout of the Central Radioactive Waste Processing and Storage Facility (CWPSF)

Safe collection and interim-storage:

Solid and liquid RWs are being collected and segregated at the point of generation in GI (for solids) and plastic containers (for liquids and also solids), labelled and safely stored in active interim-storage rooms located at NMCs, NMI, etc. Some RWs mostly short-lived, are safely stored in interim storage rooms of the waste producers (where available) for delay and decay, while some others are stored for further management (as applicable) and final disposal. Some of the spent/used/unused (old) sealed radiation sources (SRS) for hospitals, industrial organizations, etc. are stored in shielded rooms at the users sites and some are being safely transported and stored enclosures within AERE campus (Savar). The gaseous wastes from research reactor are properly monitored and safely discharged through the stack to the environment following ICRP discharge limit (for Ar-41).

Processing and disposal (research and development):

Liquid RWs (containing Cs-137, Co-60, Sr-90, etc.) are studied by chemical precipitation for their decontamination, immobilization and disposal. Ion-exchange method for treatment of liquid waste has been initiated. Immobilization (by concentration) of caesium pptn sludge has been initiated and will be continued. Geo-scientific investigation in connection with site selection for a near-surface waste repository of low-and intermediate-level wastes (LILW) within AERE campus is in progress. An experimental-cum-demonstration shallow-land disposal trench (6m × 4m × 1.3 m) has been dug within AERE campus (1989), and 129 bags of Cs-137 contaminated imported skimmed milk powder have been buried.

2.3. Development of a waste processing and storage facility (CWPSF) at AERE, Savar:

A project proforma (PP) on Establishment of a Central Radioactive Waste Processing and Storage Facility (CWPSF) has been approved (April 1999) by The Government of the People's Republic of Bangladesh for implementation under Annual Development Programme (ADP) at a total cost of US\$ 1.38 million including Foreign Exchange equiv. of US\$ 0.162 million and is in progress. In future, all RWs including SRS, Ra-226 sources would be collected, processed and safely stored within the CWPSF.

The Government has signed an agreement on "Convention on Safe Management of Radioactive Wastes" with the IAEA and the national commitment is to establish a waste management infrastructure in the country. On behalf of the Government, BAEC is to implement and follow-up the programmes of Joint Convention on the Spent Fuel Management and on the Safety of Radioactive Waste Management agreement. A potential TC project "Strengthening Radioactive Waste Management Infra-structure in Bangladesh" (The proposed TC project BGD/2001/010L, 2001-2002 Cycle) which addresses the establishment of the CWPSF at AERE, Savar. A layout with dimension and description of the waste management facility (CWPSF) building at AERE, Savar, Bangladesh is shown in Figure-1.

2.4. LILW repository plan:

BAEC has a very long-term programme to develop a pilot-scale near-surface waste repository at AERE for short-lived LILW from non-power sources by the year 2010. The ultimate selection of the repository type/concept depends on geo-hydrology, climatic conditions, migration extent, etc. and specific disposal requirements & regulatory approach, which is under study.

3. Conclusion

Bangladesh being a developing country with 120 million populations, more and more radioactive wastes would be generated due to increasing application of radioisotopes in medicine, research and industry. The People's Republic of Bangladesh has given a high

priority to establishing a national regulatory framework for radioactive waste management. NSRC authority has been empowered to authorize and inspect regulated radioactive waste management activities and enforce the legislation and regulations. Nuclear Safety and Radiation Control rules of 1997 have been enforced to provide effective empowerment to the regulatory authority to implement BSS, to establish radiation source inventory through notification and to identify radiation sources subject to regulatory control and their locations. Functional inspection programme has been undertaken employing adequate number of appropriately qualified staff. Training programme for staff with adequate resources is being conducted. A nation-wide inventory of all radiation sources (SR) and radioactive wastes (RWs) has already been started. Construction work of Central Radioactive Waste Processing and Storage Facility (CWPSF) Building at AERE, Savar has been moving fast and will be completed by 2003. Once the CWPSF is complete, all RWs including SRS, Ra-226 Sources would be collected, processed and safely stored within the CWPSF. BAEC has a long term programme to develop a pilot-scale near-surface waste repository at AERE for short lived LILW from non-power sources by the year 2010. However, on-going IAEA projects should continue to achieve the objectives of developing sustainable technologies for managing radioactive wastes and establishing a waste management system in the country.

References

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