

The Eldorado-8 Re-Source: Mastering Safety, Security, and Logistics in the Transport and Installation of a High Activity Cobalt-60 Source

1. Introduction

The safe and secure transport of high-activity Category I radioactive sources presents complex challenges requiring meticulous planning and rigorous adherence to safety protocols. This paper details the comprehensive safety and security framework implemented for the replacement of a Co-60 source in the Eldorado-8 teletherapy calibration machine at the Secondary Standard Dosimetry Laboratory (SSDL) of Malaysian Nuclear Agency (NUKLEAR Malaysia). The operation involved the transport and installation of a new 2,188 Ci source, transported using a Type B(U) package over a 50 km inland distance from Kuala Lumpur International Airport (KLIA) Cargo Hub.

2. Objective

The primary objective is to share a successful, real-world case study, highlighting integrated protocols developed to meet both IAEA Regulations (SSR-6) and national regulatory requirements by Malaysian Department of Atomic Energy (ATOM Malaysia) for the safe and secure transport of radioactive material.

3. Integrated Safety and Security Methodology

The entire operation from import approval to final source installation was meticulously segmented into three critical phases, designed and executed under the supervision of the Radiation Protection Supervisor (RPS) of NUKLEAR Malaysia.

3.1 Pre-Transport Planning and Licensing

This phase ensured comprehensive regulatory compliance and risk mitigation:

- **Regulatory Compliance:** Approvals for the import, ownership, and transport of the Category I source were secured from the ATOM Malaysia. The source was procured from the Institute of Isotopes Co. Ltd., Hungary.
- **Transport Risk Assessment:** The detailed Work Implementation Plan defined the preferred 50 km transport route and meticulously documented height limitations to prevent vehicular accident.
- **Physical Security Plan:** Due to the Category I nature of the source, enhanced security was mandated, detailing the use of Armed Guard to provide armed escort. All transport and installation personnel were vetted for reliability.

3.2 Transportation Phase: Safety and Security in Transit

The road transport phase was executed under strict physical security and radiation protection controls.

Key Implementation Details (December 2022):

- **Armed Escort:** Transport occurred at night and was protected by a convoy including the Armed Guards, RPS, and the contractor. The transport vehicle maintained a minimum of two personnel and was continuously guarded.
- **Package Verification & Control:** Upon arrival at KLIA Cargo Hub, the Type B(U) flask was verified for document conformity, integrity, and labelling (UN 2916). Mandatory Leak Testing was performed, and RPS continuously monitored dose rates to ensure ALARA compliance.

3.3 On-Site Movement and Installation Phase (Delayed Execution, January 2023)

The source replacement, initially planned for 16 January 2023, was completed on 18 January 2023 due to a critical technical delay.

- **Logistical Challenges (Bunker & Technical Delay):** Initial site constraints (narrow corridors, ramps, and a raised threshold) necessitated specialized lifting equipment. However, the primary delay was a technical challenge: the holes on the Eldorado-8 machine head did not align correctly with the transfer tool required to safely move the old source (81 Ci) into a temporary storage head, requiring specialized effort and time to resolve while maintaining strict radiation protection.

- **Radiological Safety and Accountability:** The source exchange utilized remote operation by specialized engineers. Continuous radiation monitoring by Health Physics Group personnel ensured ALARA was upheld. Post-installation, the depleted source was safely repackaged and transferred to NUKLEAR Malaysia's waste storage, ensuring full chain of custody and accountability.

4. Conclusion

The successful transport and installation, despite confronting significant technical challenges, confirmed the effective integration of IAEA transport regulations (SSR-6) with stringent national security protocols. This experience underscores the critical role of the RPS in managing complex, multi-agency operations and executing flexible solutions for both predictable logistics and unexpected technical failures, thereby guaranteeing the safety and security of Category I radioactive material.

Country or International Organization

Instructions

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