

DEPARTMENT OF ATOMIC
ENERGY MALAYSIA

Assessment and Licensing Point of View Toward Borehole Disposal Facility in Malaysia

HASIM Muhammad Hasyakirin, KOSTOR Monalija, RAMLI Mohd Zulfadli, RAZALI Noraini,
Teng Iyu Lin & JALIL Suhana

Email: kirinhasim@aelb.gov.my

Department of Atomic Energy (Atom Malaysia),

Ministry of Science, Technology, and Innovation (MOSTI), Batu 24, Jalan Dengkil, 43800 Dengkil, Selangor, MALAYSIA



1. Introduction

Malaysia is one of the rapidly developing countries using ionizing radiation from radioactive material, especially in research, industrial and medical applications. The use of these radioactive materials in various applications over time has led to the accumulation of radioactive waste called Disused Sealed Radioactive Sources (DSRS). These DSRS started to accumulate from the 70s until today, and up to date approximately more than 12,000 units of DSRS belong to Category 1 to Category 5 was generated and stored in the national storage facility located at Nuclear Malaysia Agency. Since 2011, the government of Malaysia approved the construction of a Borehole Disposal Facility proposed by the Nuclear Malaysia Agency as the ultimate solution to the large amount of DSRS. In the evaluation process of the Borehole Disposal Facility construction, the Department of Atomic Energy (Atom Malaysia) as an atomic energy regulatory body had made several assessment before issuance of the license to the project under the provision of the Atomic Energy Licensing Act 1984 (Act 304) which provides the requirements and control of the atomic energy activities in Malaysia. The Borehole Disposal Facility in Malaysia is actively under development and is the pioneer, therefore it will gain attention from all over the world in the perspective of assessment and licensing procedures and also the operation of this facility.

2. Legal Requirements

The Atomic Energy Licensing Act 1984 (Act 304) is the main Act in Malaysia that provides the regulation and control of atomic energy, and also for the establishment of standards on assessment and licensing toward Borehole Disposal Facility. Atom Malaysia play the main role as the regulatory body responsible to conduct the assessment and issuance of the license under the provision of the Act 304 and the Regulations made thereunder, such as;

- Radiation Protection (Licensing) Regulations 1986;
- Radiation Protection (Transport) Regulations 1989;
- Atomic Energy Licensing (Basic Safety Radiation Protection) Regulations 2010;
- Atomic Energy Licensing (Radioactive Waste Management) Regulations 2011; and
- Radiation Protection (Low Activity Radioactive Sources) (Exemption) Order 2020.

3. Phase of Assessment and Licensing

The assessment conducted by Atom Malaysia includes the following phases as shown in the following Fig. 1:

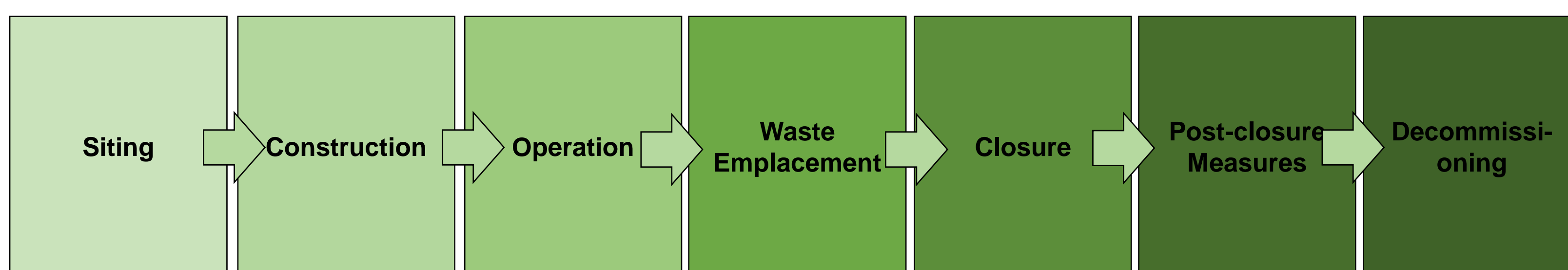


Fig. 1: Implementation Phases of Borehole Disposal Facility

Each of these phases need to be approved by the regulator prior to the next phase. In addition, the assessment also take into consideration the environmental and technical data documented such as Radiological Impact Assessment (RIA), Safety Case, etc. and submit to the regulator for assessment and verification. These data/document are subjected to review and update for each phase. The description of the main documents is shown in Table 1 below:

Table 1: Description each of the technical documents

Technical Document	Description
Safety Case	Details collection of scientific, technical, administrative and managerial arguments and evidence in support of the safety of the Borehole Disposal Facility covering the suitability of the site and design, construction and operation of the facility, the assessment of radiation risk and assurance of the adequacy and quality of all the safety related work associated with the facility
Radiological Impact Assessment (RIA)	Assessment of the radiological impact and risk caused by operation of the Borehole Disposal Facility to the member to the public, workers and the environment as to ensure that the resulting risk to these groups of population and the environment are within the permissible limits
Radioactive Waste Management Plan	Explanation on DSRS generated from the licensee on what it plans or proposes to do with the DSRS and how operator is going to deal with and manage the DSRS during operation of the Borehole Disposal Facility and post-operational period. This document may include details of waste collection, storage, handling, transport, treatment, conditioning, packaging and finally disposal

The listed technical documents in Table 1 must be sent to the regulator for further assessment and review. Any additional supporting documents may also developed and submitted in order to support arguments and evidence needed towards the Borehole Disposal Project. In order to conduct assessment and review of these documents, there are several methodology that have been implemented as listed below and shown in Fig. 2 and Fig. 3:

- Peer review mission by international experts;
- Findings and inputs from the technical meeting between operator;
- Calculation and verification of data via modelling software;
- Technical and scientific visits to the project site;
- External advices on specific subject areas; and
- Comparison between national and international guideline.



Fig. 2: Peer review mission by international experts



Fig. 3: Technical visits to the project site

4. Evaluation of Essential Components

Site investigation and characterization of the Borehole Disposal Project were also conducted by Nuclear Malaysia Agency where environmental components involved in the studies are geological, hydrogeological, geotechnical properties, hydrochemistry, meteorological and seismicity. Thus, assessor from various expertise appointed will taking part to review these components. Other than that, social studies were also taken account including the demography studies and public engagement of the local population. The aim of these studies is to evaluate public values and concerns into decision making build trust, in both the process and the organizations involved. In addition, technical components were also evaluated which comprise design and safety function of the engineered part (as shown in Fig.4 and Fig.5), safety procedure of DSRS handling and operation of this project. Safety and operational assessment aspects also conducted for each of the phase started from siting, construction, operation, waste emplacement, closure, post-closure and decommissioning.

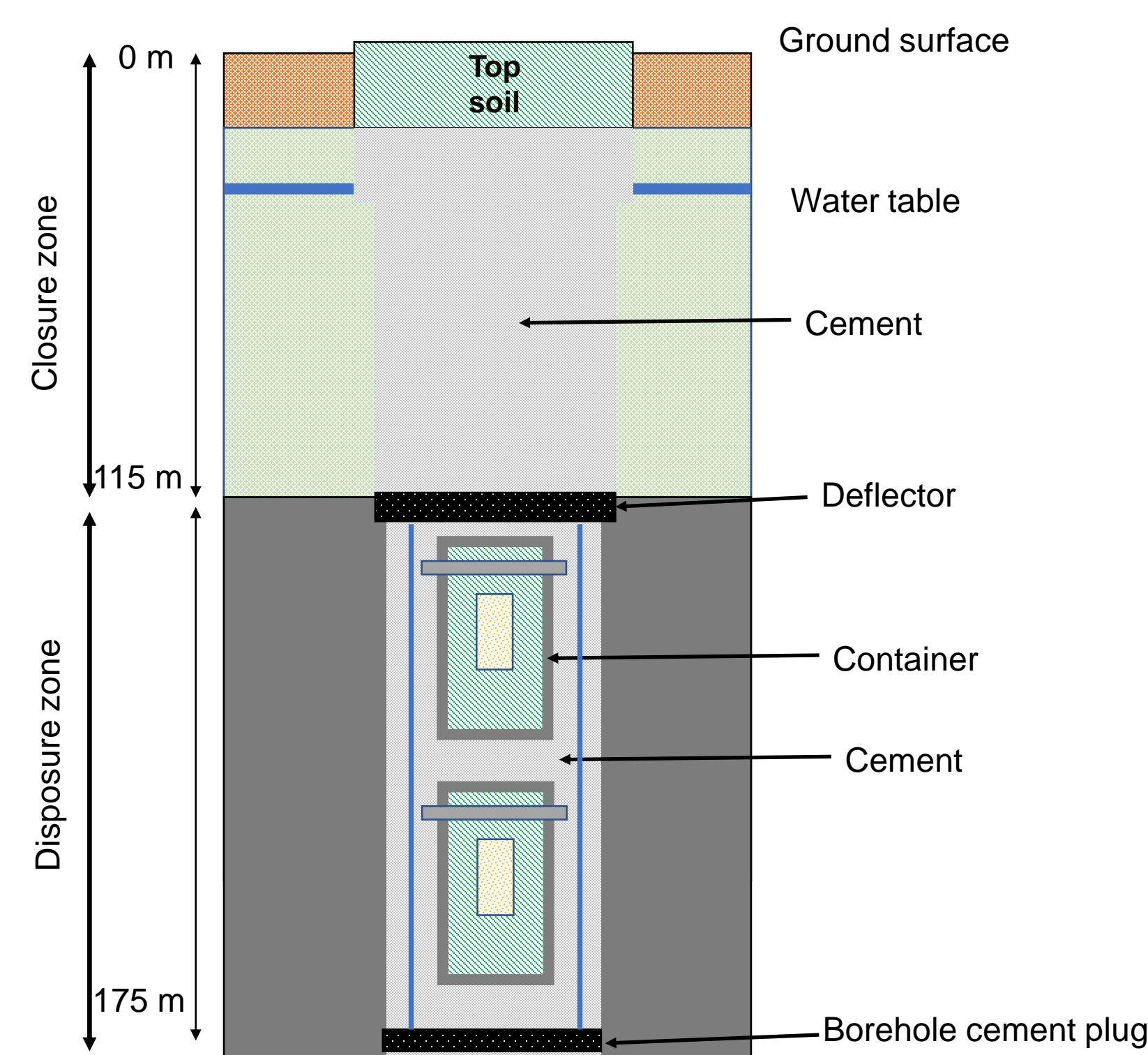


Fig. 4: Schematic diagram design of Borehole Disposal Facility



Fig. 5: Photo of Container body

5. Assessment of Operational Safety

Operational Safety Assessment document developed by Nuclear Malaysia Agency are part of the safety case for the Borehole Disposal Facility that support arguments in safety for the whole operation. It provides confidence and demonstrates the operational safety during the predisposal and disposal operations. The summary of the assessment and review of this document are as follows:

- Safety procedures for recovering, conditioning, containerization and disposal of low activity DSRS in the Borehole Disposal Facility using Mobile Tool Kit Facility (as shown in Fig. 6 and Fig.7); and
- Safety features and consideration of the entire project operation from handling of the DSRS, preparation and transport of waste package to the disposal in the Borehole Disposal Facility.

A more detailed assessment has been made onto the operational safety where the following components were also taken into considerations:

- Working procedure during pre-disposal and disposal operations;
- Operational dose assessment during normal operations and accidental scenarios; and
- Risk and hazard for each of the phases and whole operations.

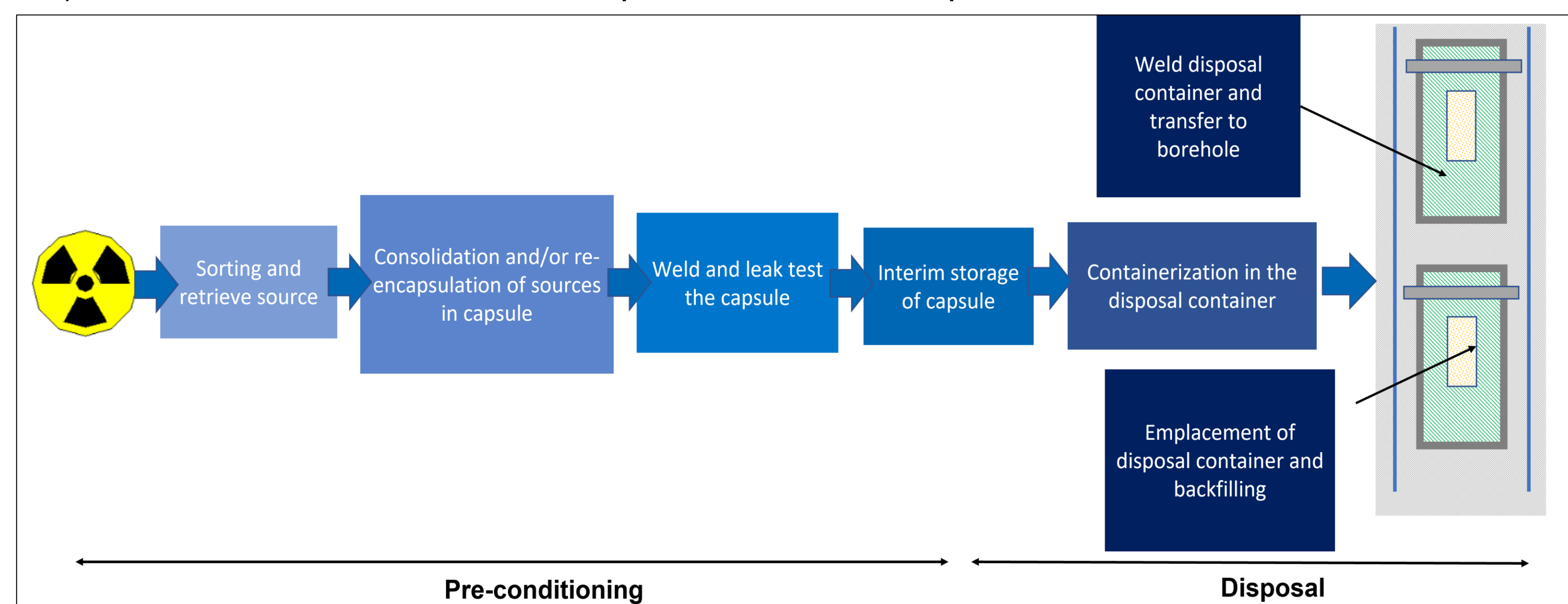


Fig.6: DSRS Flow in Pre-Disposal and Disposal Phase



Fig. 7: Inner photo of Mobile Tool Kit Facility

6. Conclusion

The assessment of Borehole Disposal Facility includes reviewing and endorsement of the technical and non-technical documents and appropriate activities. Such project involved various expertise and relevant stakeholders for comprehensive assessments in order to gain confidence and trustworthy for the project to be approved accordingly.