

# Development of the 435-B Type B(U) Package for International Disused Sealed Radioactive Source Recoveries

Without proper end of life management, disused sealed radioactive sources (DSRSs) become increasingly vulnerable to loss, theft, and sabotage that can result in accidents and incidents, including loss of life. Type B quantities of radioactive material can be particularly hard to manage due to complexity and costs associated with their compliant shipment from user's facilities to sites for final disposition or secure long-term storage. Historically, a major part of this issue stems from the lack of certified Type B packaging for safe, secure, and legally compliant shipments.

To help address this issue, in 2009 the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) Office of Radiological Security (ORS) directed Los Alamos National Laboratory (LANL) to design, test, certify, and fabricate Type B packages for domestic and international use. Through these efforts, the NNSA Model 435-B Type B (USA/9355/B(U)-96) was developed. The package was certified by the U.S. Nuclear Regulatory Commission (NRC) in 2014. Since then, three 435-B packages have been fabricated. Two are currently in use by ORS's Off-Site Source Recovery Program (OSRP) for DSRS recovery and disposal operations. In 2019, the third unit was donated to the International Atomic Energy Agency (IAEA) by the U.S. DOE/NNSA for international source recovery missions.

The 435-B package can be shipped by ground, air, or water. The relatively compact and light design (2245kg empty weight) allow it to be used in locations with less developed infrastructure, such as unpaved roads. This was achieved by relying on payload shielding rather than adding significant shielding to the package itself, which would result in a very heavy, cumbersome Type B container. Shielded Type B containers can weigh upwards of 30,000 kg. Because the 435-B is unshielded, proposed payloads are thoroughly evaluated for their shielding properties and intrinsic safety prior to NRC certification as approved content. The list of approved 435-B payload content continues to grow as needs are identified.

As a part of the original conceptual design of the 435-B package, ORS and LANL anticipated that some international DSRS recoveries would be coordinated with the IAEA. To facilitate this, final design requirements included certification of the long-term storage shield (LTSS) as authorized content in the 435-B package. The LTSS is a lead-shielded container in which high activity DSRSs can be loaded using the IAEA mobile hot cell.

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