

THE ADDED LEVEL OF QUALITY ASSURANCE PROVIDED BY THE  
WIPP CONTACT-HANDLED AND REMOTE-HANDLED WASTE DEMONSTRATIONS

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ABSTRACT

This paper discusses the contact-handled (CH) and remote-handled (RH) mock waste emplacement and retrieval demonstrations which will be conducted at the Waste Isolation Pilot Plant (WIPP). The retrieval demonstrations are performed as a requirement that was established by the Consultation and Cooperation Agreement between the State of New Mexico and the Department of Energy. The demonstrations are used to document the retrievability of all waste forms from the WIPP should waste retrieval ever become necessary. This paper describes each of the mock waste demonstrations, including scope and magnitude, how and where demonstrations will be conducted, and what criteria will be evaluated to verify the success of the demonstrations.

INTRODUCTION

The Waste Isolation Pilot Plant (WIPP) is a research and development project of the Department of Energy (DOE) that is designed to demonstrate the safe disposal of defense transuranic radioactive waste materials. Transuranic (TRU) wastes from various defense facilities will be buried in salt formations at a depth of 2,150 feet below the surface. Agreements have been made with the State of New Mexico to ensure that emplaced nuclear waste will be retrieved, if the storage site is found to be unacceptable. The decision to make WIPP a permanent repository will be made approximately five years after receipt of first waste, based on site performance data and experience during that 5-year period. Additionally, WIPP will serve as a research facility to gather necessary information for future and permanent disposal of defense high-level radioactive wastes.

The WIPP site is located approximately 26 miles southeast of Carlsbad, New Mexico, close to the Eddy-Lea county line. The site consists of 10,240 acres, of which 8,960 acres are public domain administered by the Bureau of Land Management (BLM) and 1,280 acres are State land. Geological exploration at the site and conceptual design of the facilities began in 1975. Construction of the facility began in 1981, with major construction completion scheduled to be completed in 1988. The WIPP facility will receive its first radioactive waste in October 1988.

The facility has been designed to accept 168,000 m<sup>3</sup> of contact-handled (CH) waste and 700 m<sup>3</sup> of remote-handled (RH) waste. In addition, a limited amount of defense high-level waste may be received at WIPP for experimental purposes. When the experimental program is completed, all of the high-level waste must be removed from the site.

Mock Retrieval Demonstrations

The mission of WIPP, as a research and development facility, is to demonstrate the safe disposal of radioactive waste from the Department of Energy defense programs and related activities. A prerequisite to actual waste receipt is the completion of retrievability demonstrations for each of the

waste forms to be received. The demonstration of the retrieval of the waste is specified as a major project milestone in the Consultation and Cooperation Agreement between the State of New Mexico and the Department of Energy. The results of the mock demonstrations for both CH and RH waste are to be documented in a report which will be submitted to the State for review and comment. Mock demonstrations of RH and CH emplacements will also be conducted as part of the WIPP readiness reviews.

The WIPP project is currently preparing to conduct both the RH and CH retrieval demonstrations during 1987. Mock waste containers will be emplaced in underground storage rooms and then retrieved, with press and State officials invited to witness the demonstration.

Remote-Handled Demonstration

The first mock retrieval demonstrations to be performed will be the RH demonstrations. The demonstrations will consist of the in-room-in-situ emplacement and retrieval of actual size canisters (26" x 121"), and overpacked waste canisters (28" x 134") ballasted to the maximum canister weight that would be allowed with simulated non-radioactive material. The canisters will be emplaced in boreholes bored into the rib or room wall at mid-room height (67" from floor to borehole center), on 8' centers, just as would be done in a fully operational mode. The boreholes will be lined with a carbon steel liner (Fig. 1) capable of withstanding lithostatic pressures (2,150 psi) transmitted by the salt, again just as will be done during the demonstration period. Because the borehole liner is capable of withstanding lithostatic pressures, the possibility of canister capture, and therefore non-retrievability, is precluded.

The RH emplacement machine and facility cask (Fig. 2) have been designed not only for normal emplacement operations, but also are capable of canister retrieval. The retrieval process presents a mirror image of the emplacement process, and has been performed repeatedly during both the checkout of the equipment and the training and qualification of the waste handling personnel.

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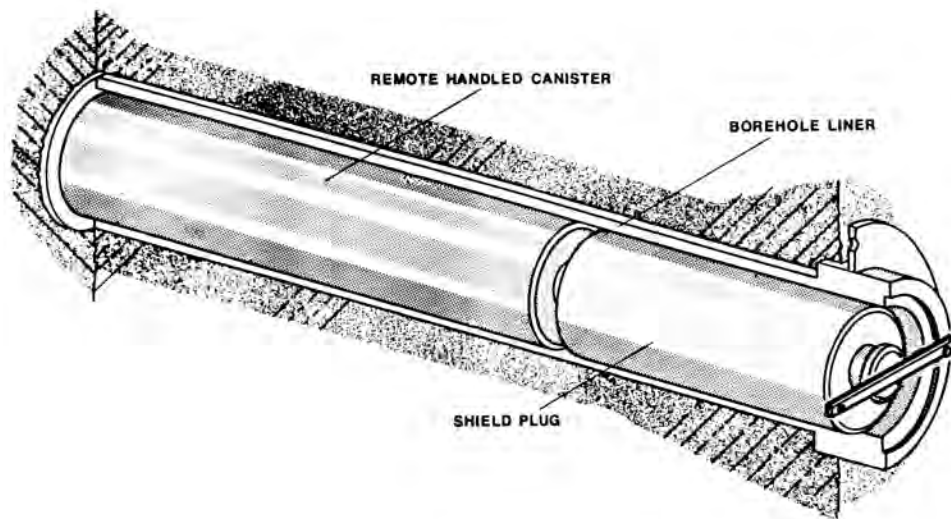


Fig. 1. Typical Remote-Handled Emplacement Configuration.

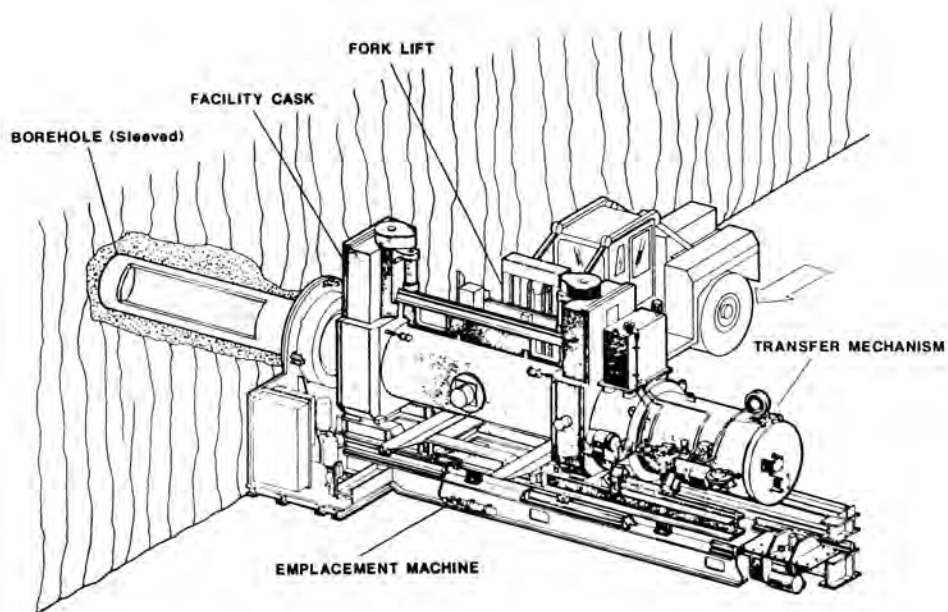


Fig. 2. WIPP Remote-Handled Emplacement Machine.

For the mock demonstrations, the emplacement machine will be positioned in front of the emplacement location and leveled in both the horizontal and vertical direction. The shield plug will be removed from the liner. The transfer carriage will then be extended forward into the liner where the pintle of the canister will be grappled. The transfer mechanism is then retracted, pulling the canister from the liner into the WIPP facility cask. The front and rear shield valves of the facility cask are closed, and the cask lifted from the emplacement machine using a 41-ton forklift. The facility cask, complete with the retrieved canister, will then be transferred to the waste hoist by the forklift. The facility cask is then placed on the hoist for transfer to the surface, where it is loaded into a transport cask in the WIPP hot cell and removed from WIPP, if required.

#### Contact-Handled Demonstration

The CH demonstrations, like the RH demonstrations, involve an in-room demonstration of WIPP capability to safely emplace and retrieve the in-situ CH waste, should the need for retrievability ever become necessary. The demonstration will be conducted using both boxes and drums placed in a waste storage room that approximates the room dimensions which would be present at the end of the five-year demonstration period. The waste stack will be backfilled with crushed salt.

The drums will be arranged in six-pack configurations that are secured by either plastic stretch wrapping or metal banding, just as will be done in a fully operational WIPP mode. The drums and boxes are stacked in a configuration of three high drums and two high boxes identical to the configuration used during operations (Fig. 3). A representative sample of drums and boxes will be crushed and breached, to demonstrate how such containers would be retrieved and overpacked, as well as how the area will be decontaminated.

Contamination will be simulated using a fluorescent powder that is visible under black light. Using such a material, observers can be shown how contamination may affect the waste packages, floors, and backfill material. The simulated contamination can then be decontaminated using fixatives, HEPA-filtered vacuums, and other proven techniques. The area can then be black lighted again, to illustrate the effectiveness of the decontamination effort.

The drums will be removed from the stack using single or double drum handling equipment; moving entire six-packs is also possible, using forklifts. All containers will be overpacked to ensure contamination-free packages for transport to the waste hoist and the surface.

All retrieval will be conducted using continuous health physics coverage. Contamination control barriers will be maintained, including air flows of at least 150 linear feet per minute that are directed away from personnel. The air flows will be routed over the waste stack, bag-out facilities (for all material), and contamination barrier walls—as shown in Fig. 4.

#### Measurables and Evaluation Criteria

There are numerous benefits to be gained by performing the mock emplacement and retrieval demonstrations. The most obvious is to verify that retrieval of in-situ waste from WIPP is possible, and that the retrievals can be done in a safe and efficient manner—if such action were ever required. In addition, both the emplacement and retrieval demonstrations will be used to verify the adequacy of operator training and qualification. Field verification that operating retrieval procedures have sufficient detail, and that all necessary data can be collected to satisfy WIPP reporting requirements, will also be obtained. The retrieval demonstrations will be used to verify timelines and, therefore, anticipated emplacement, retrieval, and facility throughput rates. Finally, the demonstration will verify that operator radiation dose commitments are within Department of Energy published order limits, and that operator staff levels are adequate to handle the anticipated waste volumes which will be received through the life of the WIPP facility. All of these actions must be demonstrated to the State of New Mexico, as well as to major WIPP project participants, so as to validate the WIPP design basis.

#### SUMMARY

The WIPP project will verify that in-situ retrieval of both CH and RH waste can be done in a safe, efficient manner—if retrieval is ever necessary. This proof will occur in the form of separate mock waste retrieval demonstrations, using the actual waste configurations and equipment and simulated waste packages. Additionally, emplacement demonstrations to verify equipment and operator readiness will be conducted.

These demonstrations will not only document retrievability to the State of New Mexico, as required by the Consultation and Cooperation Agreement, but also to Department of Energy officials and peers. These demonstrations are extremely beneficial, in that they will be used to assure the adequacy (and content) of operating procedures, while verifying personnel training and qualification. The demonstrations will also verify WIPP timelines, operator dose assessments, and the adequacy of safety and quality considerations—all of which are necessary to successfully operate the WIPP in a fully operational mode.

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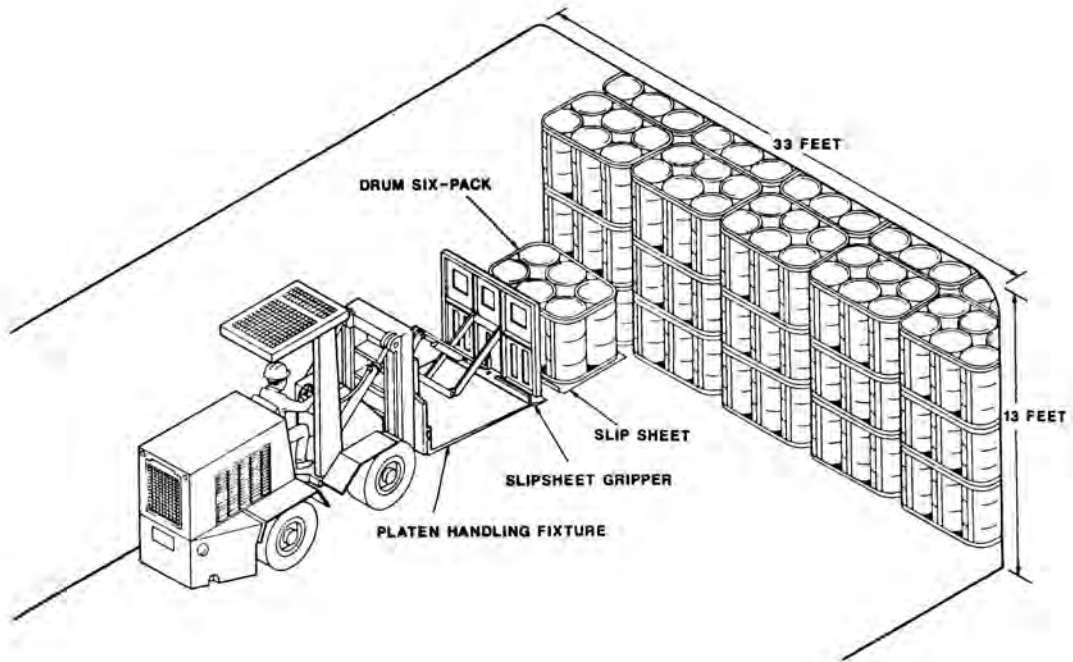


Fig. 3. WIPP Drum Handling.

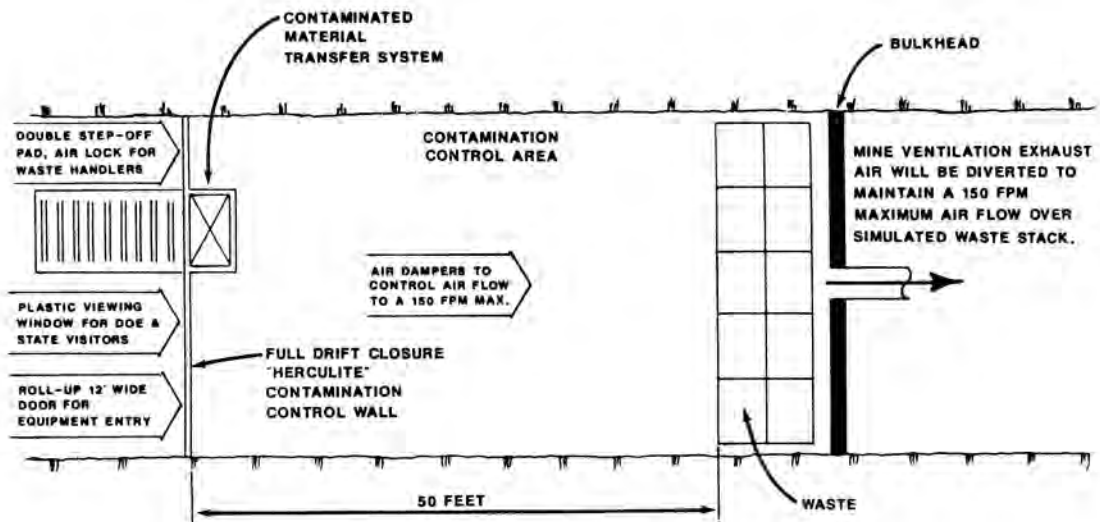


Fig. 4. CH Mock Demo.