

# CONTACT-HANDLED (CH) MOCK WASTE RETRIEVAL DEMONSTRATION

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## ABSTRACT

This paper discusses the contact-handled (CH) mock waste retrieval demonstration which was conducted for the state of New Mexico on September 17, 1987. The demonstration met one of the design criterion for the WIPP project and one of the milestones spelled out in the Agreement for cooperation and consultation between the state of New Mexico and the Department of Energy (DOE). The demonstration documented the ability to safely retrieve CH waste from an in-situ condition approximately 11 years after the initial waste would be emplaced.

This paper presents operational aspects that were addressed during the actual conduct of the demonstration. Included are the methods and equipment that were used for the retrieval demonstration. Some of the specific points to be covered are contamination control, equipment operation under special underground conditions, phases of operator training, lighting, package wrapping techniques, and drum retrieval.

## INTRODUCTION

The Waste Isolation Pilot Plant (WIPP) is a research and development project of the Department of Energy (DOE) located approximately 26 miles southwest of Carlsbad, New Mexico, near the Eddy-Lea county line. WIPP is intended for the demonstration of safe storage and disposal of defense generated transuranic (TRU) radioactive waste materials in two forms: contact-handled (CH) and remote-handled (RH). Construction of the facility began in 1981; the receipt of the first shipment of contact handled waste is slated for October 1988. Packaged CH waste will be shipped to WIPP from various defense facilities in specially designed type B shipping containers called TRUPACTs. At WIPP, the CH packages will be off-loaded from the TRUPACTs, inspected for external contamination, verified as to the contents, and transported to the emplacement horizon in an ancient salt bed 2150 feet underground. Because WIPP is a demonstration plant, agreements have been made with the State of New Mexico that until the project is approved as a permanent repository, all waste forms must be demonstrated to be retrievable for a period of up to 15 years from initial mining and trimming. This paper discusses the results and lessons learned from one of those demonstrations.

The demonstration used non-radioactive mock-ups of representative CH TRU drums and boxes. The waste packages were installed in the WIPP TRU storage area in an in-situ underground environment representative of that to be encountered late in the retrieval period. The room in which the demonstration was conducted reflected projected salt

creep effects, including floor heave. The waste stack configuration and storage room geometry are such that creep closure of the salt neither contracts, nor loads the waste packages. However, to address a worst-case scenario for a demonstration of retrievability, the demonstration included: handling of simulated contaminated waste packages; handling a crushed drum; and As Low As Reasonably Achievable (ALARA) techniques to be used in WIPP operations should retrieval be required.

WIPP's CH retrieval demonstration was run in a way that would best simulate operations as envisioned during an actual retrieval period. The preliminary work of setting barriers, installing lights, and removing the south barricades had been completed prior to the planned date of the demonstration to expedite the process.

### Technician Briefing

The initial entry by Health Physics personnel was made to verify radiological conditions based on known data taken during the original emplacement operations. Based on the radiological survey and visual assessment of the area the Waste Handling Technicians were briefed on their assignments for the day. During this time the supervisor reemphasized actions for any hazards that might be encountered and repeated entrance and exit requirements. With radiological conditions set by the initial survey and recorded on the Radiation Work Permit, the Waste Handling Technicians donned protective clothing and performed the required Daily pre-operational checks on their equipment.

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### Waste Drum Removal

The seven-pack 55-gallon drums were handled first in the demonstration. The technician used a utility knife with retractable blade on an eight foot pole to cut the stretch wrap from the drums. The HPT took another broad area survey of the newly exposed surface area on the drums. The forklift operator approached the stack with a double drum handler attachment on the front of a 6,000 lb. electric forklift. The second technician also approached the waste stack face to act as spotter for the forklift operator. During later operations spotters are not needed because the tops of the drums are in view of the forklift operator. Two 55-gallon drums were removed from the stack and lowered to about one foot off of the floor. The forklift and the spotter moved back to an area approximately 30 feet south of the waste stack face.

The HPT took another survey of the drums, concentrating on the bottoms and the area around the seal rings. An absorbent swab on the end of a three-foot pole was used to make the survey under the drums so that the HPT's hands would not be under a hanging load on the forklift.

Once the HPT was satisfied that there was no loose surface contamination on the drums, the forklift operator was released to move the drums to the south end of controlled area. The forklift operator set the drums just north of the access door and returned to the waste stack face. A second forklift with a double drum handler reached through the access door and picked up the drums. The second forklift moved back about six feet and stopped so that the Bar Codes on the drums could be read and recorded. The drums were then placed in the S-1950 access drift. This process simulated the loading of a transporter which was not part of the demonstration. After the drums were picked up from the controlled area the floor surface where the drums were sitting was surveyed to re-verify that no loose surface contamination was present. This operation was continued until all of the 55-gallon drums were removed. During the day of the actual demonstration, the drums were removed in two parts. Only the top seven drums were removed while the state of New Mexico witnesses were in attendance so that they could view each of the operations in a short period. The remainder of the drums was removed later in the day, with the only difference being that the 6,000 lb. forklift operator did not require a spotter at the waste stack. During this time the technician acting as a spotter moved to an area south of the control area in order to be up wind and in a minimal radiation exposure field.

### Waste Box Removal

The next operation was to remove waste boxes. The 6,000 lb. forklift was again used but with the drum handler removed. In this instance, a forklift spotter was not necessary because operator was able to see the ends of the forklift forks. Two boxes were removed in this fashion.

While removing the third box from the waste stack, the HPT discovered mock loose surface contamination on the back side of the box. Mock contamination was illustrated using a florescent powder that could be detected with a black light. In this case, the powder was intentionally placed on the back side of the box so that the initial surveys would not be able to detect the contamination until the box had been moved back to the thirty foot line.

Once the contamination was discovered, the HPT directed all operations to stop and everyone to leave the controlled area. The gloves and outer shoe covers were removed first and everyone proceeded to the exit portal. Here all personnel removed their protective equipment such as hard hats, and miners lamps. These were hung on a rack so they could be used again later. Each operator was surveyed prior to entering the portal by the HPT inside the control area and again as they exited by a second HPT outside the control area.

The operations procedures now required the technicians to don Anti-Contamination clothing for operations. The contamination scenario assumed that the airborne contamination potential had risen from low level to medium level as defined in the WIPP Radiation Safety Manual. Thus, it was required that all personnel working in the area wear at least one pair of Anti-C coveralls and positive pressure respirators. The technicians were suited up under the supervision of the Waste Handling Supervisor and checked by the HPT prior to entering the controlled area.

### Decontamination/Overpack Process

Once back in the controlled area the first task was for the HPT to determine the spread of the contamination. It was found that in addition to the contamination on the box, there were small amounts on the floor north of the box and back at the waste stack. The box was stabilized by removing the loose contamination using damp rags. The Waste Handling Technician completed the decontamination work, and the HPT continued to survey the area. Once the box was completely wiped down, the entire floor area (from the waste stack out) was cleaned with a HEPA filtered vacuum cleaner. The forklift operator then moved the second box (floor level) back approximately eight feet from the waste stack face. This gave the HPT and waste handling technician sufficient room to survey the back of this box and the front of the newly exposed waste stack. The back of the box was dealt with first, after the survey showed more contamination. Again, the loose surface contamination was removed using damp rags. Once the box was wiped down it was moved back to the 30-foot line and placed beside the first box. The floor was now cleaned in front of the waste stack working north from where the box had been to the contaminated 55-gallon drums. The accessible areas on the drums were wiped down just as the boxes had been.

When it was determined that most of contamination had been controlled, the technicians returned to the 30-foot line where they disposed of contaminated rags and bags in a special receptacle.

The two contaminated boxes were now readied for overpacking operations. A second boundary line about ten feet south of the 30-foot line was established to provide personnel with a visual indication of the contamination control demarcation line. Each time someone proceeded south across this line, he or she removed the outer layer of shoe covers and gloves.

At this point, a second forklift was brought into operation. It was configured with inverted forks and special rigging attachment so that it could make higher lifts without hitting the back (or ceiling) of the storage room. Its operating boundary was south of the contamination control line to the control barrier. The 6,000 lb. forklift was now restricted to operations north of the 30-foot line. This ten-foot buffer zone greatly reduced the possibility of contamination being transported south through the controlled area on the forklift tires.

Nylon slings were slipped under the boxes. The second forklift reached over the 40-foot line and picked up the first box with slings. The box was transported south to a waiting overpack box that had been placed in the overpack fixture. (Overpack boxes have liners with large flaps which are opened out over the overpack fixture to prevent any loose surface contamination that might have been missed earlier from contaminating the overpack fixture.) The Bar code information was taken from the waste box and written on marker board. This board was taken to a viewing window where the code information was copied to the data sheets by a technician on the outside of the control barrier. This eliminated the possibility of transporting contamination out of the controlled area on the data sheets.

The waste box was raised, moved over the overpack box, and was then lowered into the box. The slings were removed from the forklift forks and left with the waste box. When the forklift had cleared the area of the overpack fixture, the top of the waste box was sprayed with a thin film of liquid fixant to help control any contamination that might blow off of the box as the overpack liner was pulled back over the box. The liner was pulled over and into the overpack box and sealed with tape.

The technicians inside the equipment enclosure were signaled to move the box back into the enclosure. The lid for the overpack box was lifted using a half-ton monorail hoist and vacuum lifter attachment, and placed on the overpack box. The overpack box was checked by an HPT; special attention was paid to the top of the sides just under the lid and on the bottom of the box. Once the survey was completed, the lid was secured using steel clips supplied by the

box manufacturer. Next, the outside door was opened to the enclosure and a six-ton forklift entered and removed the box to the S-1950 drift. After the box was removed a new overpack box was brought into the enclosure and set on the transfer car. The lid was removed and the liner inspected. The box was then moved through the inner door into the overpack fixture on the transport cart. The second box was overpacked in the same manner as the first.

The contaminated drums were handled much the same way as the contaminated boxes. For the witnessed portion of the demonstration, only the upper right hand six-pack of drums was removed. In this way, the state witnesses were able to view the most difficult drum retrieval in a short amount of time. The operations proceeded as before with some minor variations. When the drums were removed from the waste stack they were placed on a steel plate referred to as an overpack plate. This plate provides a flat surface with which to align the drums for later operations. The HPT did not do any further surveys of the drums, and instead continually monitored the retrieval area for signs of spreading contamination. When six drums had been removed from the waste stack and placed on the overpack plate they were rotated and lined up in a six pack configuration. The Bar Code data was recorded on a marker board as before. The six-ton forklift, equipped with an overhead six-pack handler attachment, approached the drums from the south and picked them up. It moved the six-pack west and south just clear of the overpack plate. A large pre-cut plastic bag was slipped over the six-pack. The six-pack was then transported south to the overpack fixture just as the boxes were. The overpack operations for the drums were much like those of the boxes except that there were no slings required to hoist the drums. The remaining contaminated drums were removed later in the day.

#### BREACHED DRUM RETRIEVAL

The final operation was to remove a damaged/breached drum. To simulate what could be construed as a breached drum, a 55-gallon drum weighing about 650 lbs was hoisted 11 feet into the air and dropped to the salt floor. The drop was done in such a way to cause the drum to land on the seal ring. The drum was laid in front of the waste stack by the west rib (wall), and was positioned on its side on the curve of the simulated floor surface.

The drum was uprighted using a standard drum sling device on the 6,000 lb. forklift. It was then hoisted approximately two feet off of the floor. A bag made for 55-gallon drums was slipped around it and taped. The drum was transported to the control point where it was set down. The six-ton forklift then picked it up from the south side of the control line and transported it to the overpack fixture. The overpack operation was the same as before except only the single drum was placed in the box.

At this point the state-witnessed portion of the demonstration ended and the technicians exited the control area to remove their Anti-C's and respirators inside the exit Portal. After a lunch break the technicians again donned Anti-C's and reentered the control area. The remaining drums were removed using the same techniques.

### CONCLUSION

The CH TRU Waste Mock Retrieval Demonstration, completed at WIPP in September 1987, was successful in that retrievability of the CH TRU waste packages from an in-room, in-situ environment representative of that to be encountered during the retrieval period, was satisfactorily demonstrated while maintaining control of potential contamination. The demonstration verified the acceptability of the operating procedures, operating techniques, personnel and equipment. The analysis of the time line and dose assessment data generated supports two facts: (1) if required, the retrieval of up to 930,000 ft<sup>3</sup> of CH TRU waste can be accomplished while satisfying the radiological requirements of DOE Order 5480.1; and (2) this retrieval, if required, can be completed within 11 years of the decision to effect retrieval.

While successful in terms of pre-defined objectives and acceptance criteria, this CH TRU Waste Mock Retrieval Demonstration has identified a number of 'lessons learned' which would be applicable to future retrieval operations, as required. Such lessons, which will further improve operational and radiological impacts, include the following:

- (1) Clearly, the ability to handle full waste package assemblies, i.e., six-packs or seven-packs, as opposed to single or double drums, will reduce time lines and operator doses.
- (2) Use the smallest forklift practical for each operation. Large equipment requires more time and room for

precision handling, thus operators are exposed to increased radiation levels.

- (3) Equipment should be as lightweight and mobile as possible since the entire control area must be shifted forward frequently as the waste stack is relocated.
- (4) The overhead florescent lights are much more effective than the portable flood lights used for the demonstration, because they do not interfere with the forklift operator's vision.
- (5) Operators should wear anti-contamination clothing for no more than two hours at a time to avoid becoming tired out too quickly.
- (6) Operator task assignments should be varied throughout the shift to prevent tedium- or fatigue-related mistakes.

### REFERENCES

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