WIPP Remote Handled Waste Facility: Performance Dry Run Operations

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ABSTRACT

The Remote Handled (RH) TRU Waste Handling Facility at the Waste Isolation Pilot Plant (WIPP) was recently upgraded and modified in preparation for handling and disposal of RH Transuranic (TRU) waste. This modification will allow processing of RH-TRU waste arriving at the WIPP site in two different types of shielded road casks, the RH-TRU 72B and the CNS 10-160B. Washington TRU Solutions (WTS), the WIPP Management and Operation Contractor (MOC), conducted a performance dry run (PDR), beginning August 19, 2002 and successfully completed it on August 24, 2002. The PDR demonstrated that the RH-TRU waste handling system works as designed and demonstrated the handling process for each cask, including underground disposal. The purpose of the PDR was to develop and implement a plan that would define in general terms how the WIPP RH-TRU waste handling process would be conducted and evaluated. The PDR demonstrated WIPP operations and support activities required to dispose of RH-TRU waste in the WIPP underground.

A joint team of six qualified experts was assembled from Washington TRU Solutions (WTS), Carlsbad Field Office (CBFO), and the CBFO Technical Assistance Contractor (CTAC). Using criteria established in the PDR plan the team evaluated both the RH RH-TRU 72B cask process and the CNS 10-160B cask process. Both processes were evaluated from beginning (cask installed on transport trailer in the RH bay), to end (cask contents processed and cask returned to transport trailer ready for empty shipment).

To aid in the evaluation, each process was subdivided into discreet modules. The module approach allowed members of the team to focus on critical elements within the overall process. This approach in turn allowed grading at discreet levels that were more reflective of actual performance. Each module of each process was assigned a grade of "satisfactory" or "unsatisfactory", based upon scoring criteria established within the evaluation plan. In establishing the modules of the plan, the team recognized that some steps within the processes required special attention during the evaluation. These elements were listed in the PDR plan and were given a higher order of attention during the performance dry run.

In addition to the module grading approach, the team elected to evaluate six technical disciplines across each process. These disciplines were considered essential elements necessary to demonstrate required operations. The evaluation team concluded that all modules of both processes were completed appropriately and were assigned a score of "satisfactory". In turn, each process was assigned a score of "satisfactory". At the conclusion of the dry run the six disciplines were scored and assigned a grade of "satisfactory". The team found several positive areas and practices that were considered note worthy. There were also several suggestions for continuing improvement as the program matures.

Three members of the Defense Nuclear Facilities Safety board, representatives of Environmental Evaluation Group (EEG) and two members of ANDRA (the French equivalent to the US department of Energy) additionally observed the Performance Dry Run. These individuals provided no formal comments, however it should be noted that they shared several positive impressions of the WIPP operations.

PURPOSE

The purpose of this paper is to discuss the approach that was utilized at the Waste Isolation Pilot Plant (WIPP) to prepare for and complete the operational portion of the Remote Handled Performance Dry Run.

INTRODUCTION

The Waste Isolation Pilot Plant Land Withdrawal Act (1992) (1) authorizes the US Department of Energy to dispose of 7,080 m^3 of Remote-Handled (RH) Transuranic (TRU) waste in 250 million-year old salt beds 650 meters below the surface.

RH-TRU Waste is radioactive waste that requires shielding in addition to that provided by the container to protect people nearby from radiation exposure. By definition, the radiation dose rate at the outer surface of the container is greater than 200 millirem per hour and less than 1,000 rem per hour.

WIPP has just completed modifications to the RH-TRU facility to include new systems and equipment to better and more safely handle of RH-TRU waste containers. These modifications include the ability to handle two types of NRC certified shipping casks that optimize RH-TRU waste throughput. The casks are the RH-TRU 72B and the CNS 10-160B transportation casks.

This paper is intended to describe the necessary activities for Washington TRU Solutions (WTS) to prepare for and successfully complete one full waste disposal cycle (using simulated waste) by September 30, 2002 for the Remote Handled Performance Dry Run. The process approach will promote and encourage safe, efficient, and incident free operations of the Remote Handled Waste Handling RH-TRU 72B Cask-To-Cask Transfer and the CNS 10-160B Canisterization processes.

SCOPE

This paper will encompass necessary aspects needed to achieve readiness, and to successfully complete the Remote Handled Performance Dry Run. The paper will describe the activities performed to prepare for operational readiness and equipment/system needs to perform RH-TRU 72B Cask-to-Cask operation activities and CNS 10-160B Canisterization. This will include trailer and cask unloading, transfer of waste to the U/G via the waste hoist, and emplacement of waste via the U/G Horizontal Emplacement and Retrieval Equipment (HERE) at the WIPP facility.

OPERATIONAL PREPRATION FOR THE PERFORMANCE DRY RUN

Initial start-up of the Remote Handled equipment and operating processes required several key activities to be performed simultaneously. Initial evaluation of the current in-activated equipment was required for equipment status, equipment modifications required, new equipment needed, new operating processes developed, new operating procedures required, a new qualification program needed and an in-depth completion schedule developed.

Initially RH Engineering developed a comprehensive schedule covering all aspects of the Remote Handled program. Lead personnel were assigned the task of ensuring that all required elements of the schedule and process were updated biweekly and that the overall tasks/areas were completed on time to support the Remote Handled Performance Dry Run.

RH Engineering and Operations completed an evaluation for equipment up-grades, modifications and maintenance activities. From this evaluation it was determined that numerous modifications were needed. These consisted of modifications to the underground Horizontal Emplacement and Retrieval Equipment (HERE), the RH Bay 140/25-Ton Crane, and Heating Ventilation and Air Conditioning Systems (HVAC). In addition, the following Hot Cell related equipment required refurbishment; the Crane, PAR Manipulator, Master Slave Manipulators, Transfer Drawer, Transfer Cell shuttle Car, Closed Circuit Television System. Other equipment including the Facility Cask and Facility Cask Transfer Car required additional rework.

This evaluation also determined that some new equipment would also be required. This included a Road Cask Transfer Car, Cask Proportion Station, 2.5-Ton Jib Crane, 25-Ton Cask Unloading Room Crane, Floor Shield Valve, Cask De-tensioning Robot, Swipe Robot, Vision System, Swipe Delivery System, Facility Cask Rotating Device, and miscellaneous handling fixtures.

Upon completing the equipment evaluation, maintenance requirements were also evaluated. New Preventive Maintenance Instructions were developed, reviewed and validated as the equipment was returned to service or as the new equipment was constructed, installed and turned over to operations.

Concurrent to the above-mentioned evaluations, Operations personnel began developing pre-operational and operating procedures for the equipment and processes. Also, Operations personnel, in conjunction with the Technical Training Department, began development of a new qualification program. This was achieved by adhering to the Systematic Approach to Training (SAT) as required by DOE Order 5480.20 A.

A Subject Matter Expert (SME) was designated to be responsible for assisting in the development the SAT program for each qualification card, generating the technical portion of the operating procedure and conducting operator training and qualification on the equipment and processes.

As operating procedures and qualifications completed, operator proficiency training began. Each process was completed using simulated waste drums and/or canisters. An additional piece of the readiness activities aside from the proficiency training being performed by operations personnel was to ensure that the RH-TRU 72B Cask units that were available were operationally functional. This consisted of loading the RH-TRU 72B Cask with a training canister and performing an operation fit-up with all of the equipment throughout the cask handling process.

REMOTE HANDLED PERFORMANCE DRY RUN OPERATIONS

Exemptions

The receipt of RH-TRU waste at the WIPP is basically identical to the current CH waste receipt process, including examination of the Uniform Hazardous Waste Manifest and WIPP Waste Information System (WWIS) receipt/acceptance. Therefore, the operational portion of the Performance Dry Run process will begin in the RH Bay with the RH-TRU 72B (figure 1) and CNS 10-160B (figure 2) Casks being prepared for unloading and will not duplicate the current receipt process.

From a radiological control standpoint, radiological control procedures relating to access control, Radiological Work Permits (RWP) and postings have all been verified to be operationally safe and efficient in the current CH waste handling process. Therefore, this plan will not re-verify these procedures and processes in the Remote Handled Performance Dry Run. However, radiological control procedures, which specifically support the Remote Handled waste handling process, including new equipment operation will be in place and performed as part of the Remote Handled Performance Dry Run.

Canisterization of the 55-gallon drums, which are shipped in the CNS 10-160B Cask, will occur in the Hot Cell. The processing of a WIPP facility canister once in the Facility Cask through disposal in the underground is identical to the process for disposal of a RH-TRU 72B canister. RH-TRU 72B Cask handling through waste disposal in the underground will occur first, therefore, the CNS 10-160B Canisterization process will be complete after a single facility canister has been loaded in the Hot Cell, and processed into the Facility Cask.

The RH Preliminary Safety Analysis Report (PSAR) (2) requires that room exit CAM's be placed at the end of an active room and be operational during waste disposal activities. Currently the Eberline CAM's for Panel 2 are placed at the end of Room 7 in S-2180 Drift. For the purpose of performing the Remote Handled Performance Dry Run, the CAM's will be left in place and the test package will be offered as objective evidence that the CAM's have been calibrated, functional operability checks completed, and are fully functional as required.

RH-TRU Waste Receiving

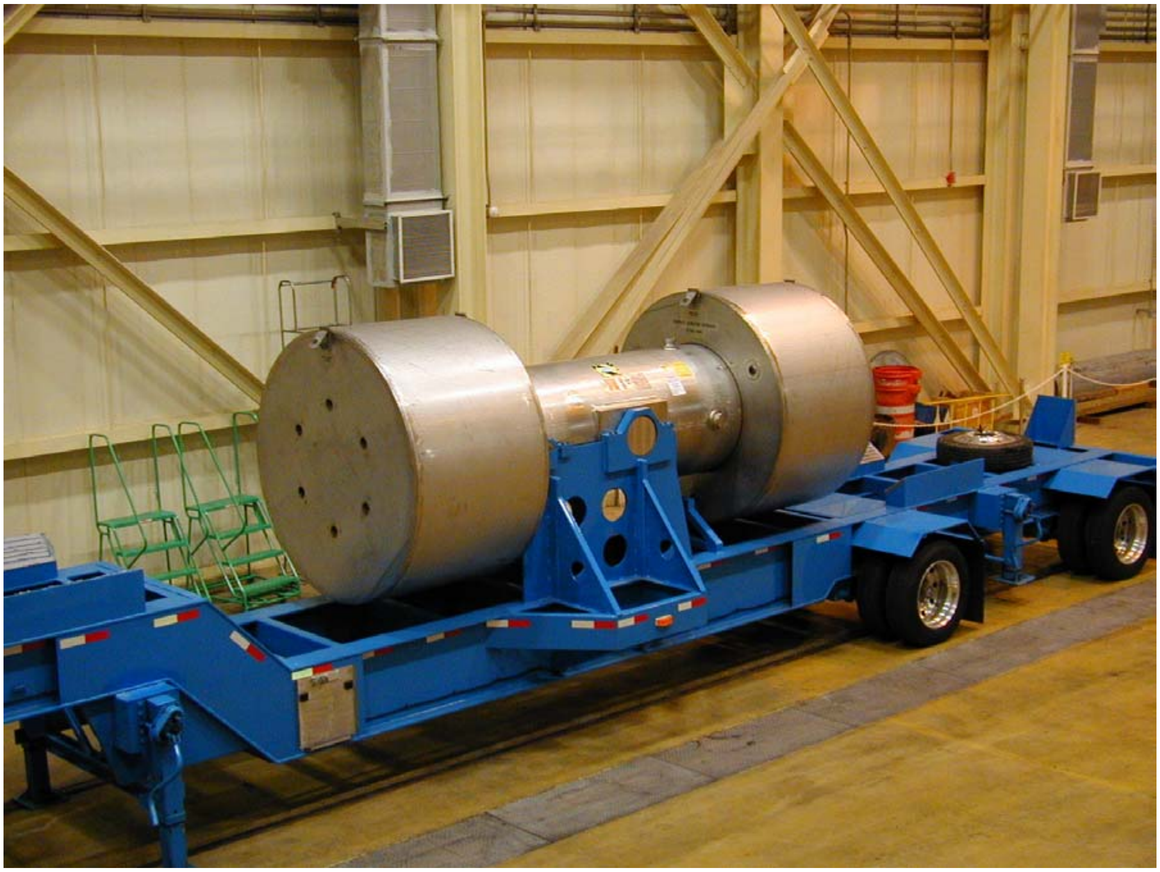

Figure 1. RH-TRU 72B Cask

Upon arrival, each incoming RH-TRU 72B Cask shipment is inspected. These inspections include verifying the shipment documentation, performing a security check, and conducting an initial exterior radiological contamination and dose rate survey of the shipment. If any levels of radiation, contamination, or significant damage in excess of acceptance criteria are found, actions will be taken in accordance with approved procedures.

Following turnover of the shipping documentation, the driver transports and parks the trailer, unhooks the transporter in the parking area south of the Waste Handling Building (WHB). The tractor and trailer are surveyed and subsequently released. The disconnected loaded trailer is attached to a trailer jockey and brought into the RH Bay by operations personnel (as stated earlier, the above portion of the receipt process will not be duplicated during the Remote Handled Performance Dry Run).

RH-TRU 72B Road Cask Preparation

After the trailer is spotted, the two impact limiters are removed from the RH-TRU 72B Cask while still on the trailer. The 140/25-ton overhead crane is used to lift the impact limiters and place them on separate support stands. The newly exposed areas of the RH-TRU 72B Cask will be surveyed for external contamination and radiation dose rates. The cask lifting yoke is connected to the 140/25-ton overhead crane. The lifting yoke engages the handling trunnions of the RH-TRU 72B Cask and the transport trunnion tiedowns are removed. The shielded RH-TRU 72B Cask is lifted and rotated to the vertical position, the lower trunnion tiedowns are removed, and the RH-TRU 72B Cask removed from the trailer and placed on the road cask transfer car. The A-frame of the road cask transfer car supports the RH-TRU 72B Cask at the transport trunnions as it is placed into the road cask transfer car. The RH-TRU 72B Cask lifting yoke is then removed from the cask. The RH-TRU 72B Cask is then moved to the cask prep station (an elevated work platform) in the RH Bay. The work platform, which straddles the road cask transfer car rails, allows personnel to have access to the entire head area of the RH-TRU 72B Cask for conducting lid preparation, radiological surveys, performing physical inspections or minor maintenance, and decontamination, if necessary.

The outer lid lift fixture is attached to the cask prep station 2.5-ton jib crane. After radiological surveys for surface contamination and radiation dose rates are performed, the space between the inner and outer lid is vented through a HEPA filter via the outer lid vent port, test port tool and vent adapter. The operators then remove the Outer Container (OC) lid bolts, and the outer lid lift fixture is attached to the OC lid. The OC lid is lifted by the jib crane from the RH-TRU 72B Cask and placed on its storage stand. The inner lid vent is opened using the test port tool and vent adapter venting through a HEPA filter to equalize the pressure between the RH-TRU 72B Cask inner cavity and atmospheric pressure. The inner lid lift fixture (pintle) is attached to the inner lid.

RH-TRU 72B Road Cask Unloading

The RH-TRU 72B Cask is moved from the cask prep station into the Cask Unloading Room. A 25-ton crane with an RH-TRU 72B Cask lift fixture is located in the Cask Unloading Room. After the Cask Unloading Room lift fixture has engaged two opposing lifting trunnions of the RH-TRU 72B Cask, the 25-ton crane lifts the RH-TRU 72B Cask from the road cask transfer car and positions the cask over the Cask Unloading Room Shield Valve. Interlocks require the 25-ton crane to be positioned over the floor valve, the shuttle car cask receiver in the Transfer Cell to be positioned under the floor valve. In addition, the Transfer Cell ceiling shield valve and the Hot Cell Shield Valves must be closed before the Cask Unloading Room floor shield valve can be opened. When all of the interlocks are satisfied, then the floor shield valve in the Cask Unloading Room is opened.

Transfer Cell

The loaded RH-TRU 72B Cask is lowered through the opening in the Cask Unloading Room floor port into the Transfer Cell, then into the shuttle car cask receiver. The height of the cask receiver and the size of the shuttle car prevent any road cask movement once it is inside the receiver. The cask lift fixture is disengaged from the lifting trunnions (closed circuit television (CCTV) cameras and load cells on the lift fixture are used to verify lift fixture disengagement). The 25-ton crane lift fixture is lifted back inside the Cask Unloading Room. When the open port of the floor shield valve is clear, the floor shield valve is closed.

The transfer cell shuttle car is designed to transfer one cask at a time from below the Cask Unloading Room floor shield valve to the various robotic workstations in the Transfer Cell. Remote-controlled CCTV cameras are used to monitor waste handling operations in the Transfer Cell.

The shuttle car positions the RH-TRU 72B Cask under the robotic inner lid-detensioning device. The detensioning device loosens the lid retaining bolts, which are spring loaded captured bolts so that they remain in the inner lid. The detensioning robot is retracted, and the shuttle car then positions the road cask directly below the Transfer Cell ceiling shield valve.

Facility Cask Loading Room

The Facility Cask Loading Room shield door will remain closed during cask loading operations. In the Facility Cask Loading Room, the facility cask, on the facility cask transfer car is positioned and moved into the Facility Cask Rotating Device. Hydraulic cylinder locks are engaged on the rotating trunnions of the Facility Cask. The Facility Cask is rotated to the vertical position by the facility cask-rotating device and is in alignment with the opening of the Transfer Cell ceiling shield valve and the telescoping port shield.

When the facility cask has been rotated to the vertical position, electrical and pneumatic connections are the made to the Facility Cask, the telescoping port shield, mounted in the floor of the Facility Cask Loading Room, is raised to mate with the facility cask bottom shield valve body. The facility Cask Loading Room 6.25-ton grapple hoist is lowered so that the shield bell is in contact with the facility cask top shield valve body. With the shield bell and telescoping port shield in contact with the facility cask, a totally shielded volume is formed to allow the safe transfer of an RH-TRU waste canister from the canister shuttle car into the facility cask.

The facility cask top shield valve is opened and the facility grapple lowered into the facility cask. The Transfer Cell ceiling shield valve is opened, and then facility cask bottom shield valve is opened. The facility grapple, attached to the 6.25-ton grapple hoist, is lowered into the Transfer Cell. The facility cask grapple engages the inner lid lift fixture, and lifts the inner lid clear of the RH-TRU 72B Cask. When the lid is clear of the cask, radiological contamination swipes are taken by robotic means of the underneath side of the inner lid and top of the canister pintle. The swipes are transferred from the Transfer Cell to the Service Room for analysis. The shuttle car is then repositioned so that the inner lid storage platform is aligned under the Transfer Cell ceiling shield valve. After verifying that the radiological surveys are clean, the facility grapple positions the inner lid on its storage platform and releases the lift fixture. The facility grapple is lifted so that it clears the RH-TRU 72B Cask and the shuttle car then positions the canister in alignment with the Transfer Cell ceiling shield valve. The facility grapple is lowered until it engages the pintle of the RH waste canister.

As the waste canister is lifted from the RH-TRU 72B Cask and before it passes through the Transfer Cell ceiling shield valve, radiological contamination swipes on the waste canister are taken by robotic means. The swipe surveys are transferred from the Transfer Cell to the Service Room for analysis. During this time the waste canister identification number is compared against the Shipment Summary Report to verify that the canister corresponds with the WWIS information. During the lift, the CCTV cameras provide a visual inspection to verify the mechanical integrity of the waste canister and verify that it is suitable for disposal.

When the waste canister has cleared the Transfer Cell ceiling shield valve, the shield valve is closed and the waste canister is held in position until the results of the contamination surveys, waste canister identification number verification, and integrity inspections are reviewed and permission given to proceed with emplacement. When permission to proceed is received, the waste canister is lifted inside the facility cask. The bottom shield valve of the facility cask is closed and the facility grapple lowers the waste canister so that it is resting on the bottom shield valve. The facility grapple disengages from the waste canister lifting pintle and is lifted into the shield bell. The facility cask top shield valve is closed. The shield bell is then lifted away from the facility cask and the telescoping port shield is lowered. The electrical and pneumatic connections are disengaged from the facility cask, and the facility cask is rotated to the horizontal position. The hydraulic cylinder locks are disengaged from the Facility Cask rotating trunnions and the Facility Cask Transfer Car moves the Facility Cask out of the Facility Cask Rotating Device. Radiological dose rate surveys are performed on the loaded Facility Cask. The Facility Cask Loading Room shield door is opened.

Waste Shaft Entry Room

In the waste shaft entry room where the waste hoist cage will have been properly positioned, the shaft gates are opened, the pivot rails are lowered, and the Facility Cask Transfer Car transports the Facility Cask onto the waste hoist conveyance. Once the Facility Cask Transfer Car is positioned on the waste hoist conveyance, it is pinned in place, the power disconnected, pivot rails raised and the shaft gates closed. The waste hoist conveyance and Facility Cask are lowered to the disposal horizon.

Transfer Area

When the waste shaft conveyance has stopped at the disposal horizon, the shaft gates are opened, the pivot rails are lowered, power cable connected, and the Facility Cask Transfer Car moves from the conveyance into the cask transfer area (E-140/Waste Station area in the mine). The 41-ton forklift lifts the Facility Cask from the Facility Cask Transfer Car and starts the trip to the RH waste disposal location.

RH-TRU Waste Disposal

Prior to beginning waste emplacement, the HERE will have to be assembled on a borehole. The 20-ton forklift is used to stage the Alignment Fixture at the face of the borehole. The operating console for the HERE is connected to the Alignment Fixture and positioned approximately 20 feet from the borehole. Placement of the operating console is to maintain exposures As Low As Reasonable Achievable (ALARA). The 20-ton forklift is removed from the Alignment Fixture and the hydraulic jacks on the fixture are used to align the Alignment Fixture with the borehole. This ensures that the shield collar on the Alignment Fixture is recessed into the borehole and that the Alignment Fixture is level. Next, the 41-ton forklift places the Leveling Platform and Staging Platform (secured to the Leveling Platform) on the Alignment Fixture. The 41-ton forklift is removed from the Leveling Platform. The hydraulic jack on the Leveling Platform is then used to level the Waste Transfer Machine Assembly to the borehole. After completing all leveling activities, waste emplacement can begin.

At the RH waste disposal location, the 41-ton forklift places the facility cask on the Waste Transfer Machine Assembly. The Staging Platform is moved forward until the Facility Cask has mated with the shield collar on the Alignment Fixture and is then locked in place. The Transfer Carriage is advanced to mate with the Facility Cask rear shield valve and is locked in place. The Facility Cask rear shield valve is opened and the transfer mechanism extends until the grapple makes contact with the canister pintle. The front shield valve of the Facility Cask is opened and the transfer mechanism pushes the waste canister into the borehole. The transfer mechanism is retracted into the Facility Cask and the front shield valve is closed. The transfer mechanism is further retracted until it is in the Transfer Carriage and the rear shield valve on the facility cask is closed. 6-ton forklifts using the strong-back lift fixture positions a shield plug on the shield plug carriage. The Transfer Carriage is moved to the rear about 6.5 ft on the Staging Platform and the 6-ton forklift places the shield plug carriage on the Staging Platform. The Transfer Carriage is moved forward to mate with the shield plug carriage. The Transfer Carriage, shield plug carriage and the Facility Cask are all mated together in place. The rear shield valve on the facility cask is opened and the transfer mechanism pushes the shield plug into the Facility Cask. The front shield valve of the Facility Cask is opened and the shield plug is pushed into the borehole.

The transfer mechanism is retracted into the Facility Cask and the front shield valve is closed. The transfer mechanism is further retracted until it is in the Transfer Carriage and the rear Facility Cask shield valve is closed. The Transfer Carriage is moved to the rear about 6.5 ft on the Staging Platform. The 6-ton forklift is used to remove the empty shield plug carriage from the Staging Platform. The Facility Cask is unlocked from the shield collar on the Alignment Fixture. The Staging Platform is moved to the rear of the Leveling Platform and simultaneously moves the Facility Cask away from the shield collar on the Alignment Fixture. Using the 41-ton forklift, the Facility Cask is removed from the emplacement machine and the empty Facility Cask returned to the surface. After removal of the Facility Cask, radiological dose rate surveys are performed around the shield plug area. The emplacement machine is now available for disassembly and transfer to another location. Completion of the disposal process occurs with the administrative closeout of procedural paperwork and entry of disposal data in the WWIS.

CNS 10-160B WASTE HANDLING PROCESS

Figure 2. CNS 10-160B Cask

RH-TRU Waste Receiving

Upon arrival, each incoming CNS 10-160B Cask shipment is inspected. These inspections include verifying the shipment documentation, performing a security check, and conducting an initial exterior radiological contamination and dose rate survey of the shipment. If any levels of radiation, contamination, or significant damage in excess of acceptance criteria are found, actions will be taken in accordance with approved procedures.

Following turnover of the shipping documentation, the driver transports and parks the trailer in the RH Bay and unhooks the transporter. The tractor and trailer are surveyed and subsequently released (As stated earlier, the above portion of the receipt process will not be duplicated).

CNS 10-160B Road Cask Preparation

After the trailer is spotted, the top impact limiter is removed from the CNS 10-160B Cask while still on the trailer. The 140/25-ton overhead crane is used to lift the impact limiter and place it on supports on the RH Bay floor. The newly exposed area of the CNS 10-160B Cask will be surveyed for external contamination and radiation dose rates. The cask lifting attachments are connected to the cask using the 140/25-ton overhead crane. The appropriate rigging is attached to the lifting attachments of the CNS 10-160B Cask, and the transport ratchet tie downs are removed. The shielded CNS 10-160B Cask is lifted out of the lower impact limiter and placed on the road cask transfer car. The newly exposed area of the CNS 10-160B Cask is surveyed for external contamination and radiation dose rates. The rigging is then removed from the cask. The use of two mobile man lifts are used to access the lid area of the CNS 10-160B Cask. They allow personnel to have access to the entire head area of the CNS 10-160B Cask for conducting lid preparation, radiological surveys, performing physical inspections, and decontamination, if necessary.

After radiological surveys for surface contamination and radiation dose rates are performed, the inner cavity is vented via the lid vent fixture. The operators then remove the primary lid bolts and install the cask lid lift fixture.

CNS 10-160B Road Cask Unloading

The 25-ton crane located in the Cask Unloading Room is centered underneath the Hot Cell floor plugs. The CNS 10-160B Cask is moved from the RH Bay into the Cask Unloading Room. After the CNS 10-160B Cask has been properly positioned in the Cask Unloading Room, the 140-ton shield door is closed.

The 25-ton Cask Unloading Room crane is also used to install the shielded insert into the Transfer Cell Shuttle Car. After canisterization in the Hot Cell, and prior to transferring a canister from the Hot Cell to the Transfer Cell the Shielded Insert will be placed in the Transfer Cell Shuttle Car. The road cask transfer car will move the shielded insert into the Cask Unloading Room and position it underneath the 25-ton crane. The 25-ton crane will lift the shielded insert from the road cask transfer car and position it over the floor shield valve. Interlocks require the 25-ton crane to be positioned over the shield valve. In addition, the shuttle car cask receiver in the Transfer Cell to be positioned under the floor valve, the Transfer Cell Ceiling Shield Valve and the Hot Cell Shield Valve to be closed before the Cask Unloading Room Shield Valve can be opened. When all of the interlocks are satisfied, then the floor shield valve in the Cask Unloading Room is opened. The shielded insert is lowered into the Transfer Cell shuttle car and the lifting yoke disengaged. The 25-ton crane is raised to clear the floor shield valve and the shield valve closed.

Hot Cell

In the Hot Cell, the 15-ton Hot Cell Crane is connected to the lid pintle of an empty facility canister and placed at the inspection station. Using the Hot Cell Crane and/or the PAR Manipulator the empty facility canister lid is removed.

The 15-ton Hot Cell Crane is then connected to the large floor shield plug lift fixture. The floor shield plugs are removed and staged on the Hot Cell floor. The Hot Cell crane is disconnected from the large floor shield plug lift fixture.

The Hot Cell crane is lowered through the floor port down to the Cask Unloading Room and connected to the CNS 10-160B Cask lid lift fixture. The cask lid is lifted into the Hot Cell and positioned in front of the inspection station. Using the manipulators, contamination swipe surveys are taken of the underneath side of the cask lid. The surveys are transferred from the Hot Cell to the Hot Cell Gallery via the Transfer Drawer for counting. Once the surveys are verified clean, permission is given to disconnect from the cask lid. The lid is staged on the Hot Cell floor and the 15-ton Hot Cell Crane disconnected from the lid lift fixture.

The Hot Cell Crane is now connected to the 5-drum carriage lift fixture. Using the Hot Cell Crane, the carriage lift fixture is lowered through the Hot Cell floor port to the Cask Unloading Room and connected to the top 5-drum carriage. The drum carriage is raised into the Hot Cell, and positioned at the inspection station. Using the manipulators, contamination surveys are taken on the carriage and waste drums. The surveys are transferred from the Hot Cell to the Hot Cell Gallery via the Transfer Drawer for counting. Simultaneously the drum identification numbers are verified against the WWIS Shipment Summary Report. After the surveys are verified clean and the drum identification numbers verified the carriage is staged on the Hot Cell floor. The 5-drum carriage lift fixture is disconnected from the carriage and the process is repeated for the lower carriage in the CNS 10-160B Cask.

If empty drum carriages are available in the Hot Cell, they are placed into the CNS 10-160B Cask using the 15-ton Hot Cell Crane and carriage lift fixture. The carriage lift fixture is then disconnected from the Hot Cell crane. The 15-ton Hot Cell Crane is then re-attached to the large floor shield plug lift fixture, and the floor shield plugs are installed into the floor port. The lift fixture is disconnected from the large shield plug and positioned in the Hot Cell and disconnected from the Hot Cell Crane. The Cask Unloading Room 140-ton shield door is opened and the empty CNS 10-160B Cask moved from the Cask Unloading Room to the RH Bay.

Using the 15-ton Hot Cell Crane and/or the PAR Manipulator, individual 55-gallon drums are removed (one at a time) and positioned over the facility canister. The drum identification number is recorded, a visual inspection performed of the drum and the drum lowered into the facility canister. This process is repeated until three (3) drums have been placed into the facility canister.

The Hot Cell Crane is then connected to the facility canister lid pintle and positioned onto the facility canister. Using the 15-ton Hot Cell Crane and/or the PAR Manipulator the facility canister lid is rotated and mechanically locked into place. The canisterization process is repeated until all drums from the CNS 10-160B Cask shipment have been placed into facility canisters.

Transfer Cell

The Transfer Cell shuttle car is positioned below the Hot Cell shield valve, the Cask Unloading Room shield valve and the Transfer Cell ceiling shield valves are verified closed. The 15-ton Hot Cell crane is attached to a loaded facility canister and positioned above the Hot Cell shield valve. The Hot Cell shield valve is opened and the facility canister is loaded into the shielded insert in the shuttle car. The Hot Cell Crane is disconnected from the facility canister and raised into the Hot Cell. The Hot Cell Shield Valve is then closed. The shuttle car is moved to position the facility canister directly under the Transfer Cell Ceiling Shield Valve.

Facility Cask Loading Room

The Facility Cask Loading Room shield door will remain closed during cask loading operations. In the Facility Cask Loading Room, the facility cask, on the facility cask transfer car is positioned and moved into the Facility Cask Rotating Device. Hydraulic cylinder locks are engaged on the rotating trunnions of the Facility Cask. The Facility Cask is rotated to the vertical position by the facility cask-rotating device and is in alignment with the opening of the Transfer Cell ceiling shield valve and the telescoping port shield. Electrical and pneumatic connections are the made to the Facility Cask.

When the facility cask has been rotated to the vertical position, the telescoping port shield, mounted in the floor of the Facility Cask Loading Room, is raised to mate with the facility cask bottom shield valve body. The facility Cask Loading Room 6.25-ton grapple hoist is lowered so that the shield bell is in contact with the facility cask top shield valve body. With the shield bell and telescoping port shield in contact with the facility cask, a totally shielded volume is formed to allow the safe transfer of a WIPP facility canister from the canister shuttle car into the facility cask. The facility cask top shield valve is opened and the facility grapple lowered into the facility cask. The Transfer Cell ceiling shield valve is opened and then facility cask bottom shield valve is opened. The facility grapple, attached to the 6.25-ton grapple hoist, is lowered into the Transfer Cell. The facility grapple is lowered until it engages the pintle of the facility canister.

When the facility canister has cleared the Transfer Cell ceiling shield valve, the shield valve is closed and the facility canister is lifted inside the facility cask. The bottom shield valve of the facility cask is closed and the facility grapple lowers the facility canister so that it is resting on the bottom shield valve. The facility grapple disengages from the facility canister lifting pintle and is lifted into the shield bell. The facility cask top shield valve is closed. The shield bell is then lifted away from the facility cask and the telescoping port shield is lowered. The electrical and pneumatic connections are disengaged from the facility cask, and the facility cask is rotated to the horizontal position. The hydraulic cylinder locks are disengaged from the Facility Cask rotating trunnions and the Facility Cask Transfer Car moves the Facility Cask out of the Facility Cask Rotating Device. Radiological dose rate surveys are performed on the loaded Facility Cask.

Transfer Area

The waste transfer operation has been previously demonstrated in the RH-TRU 72B Cask-to-Cask Transfer process. Therefore, this process will not be duplicated since this operation is identical for both waste canisters.

RH-TRU Waste Disposal

RH-TRU waste disposal in the underground has been previously demonstrated in the RH-TRU 72B Cask-to-Cask Transfer process Therefore, this process will not be duplicated since this operation is identical for both waste canisters.

PREFORMANCE DRY RUN

WIPP Remote Handled Waste Facility Performance Dry Run Operations: Evaluation

With the onset of the 1998 fiscal year, the Remote-Handled Waste Facility, at WIPP, stood on the verge of several significant challenges. The process and equipment required upgrading and modification to provide a viable solution to the handling and processing of RH-TRU waste within the DOE complex. With the resolution of the process design a workforce would require new training and familiarization with that equipment to fulfill the scope of handling the waste stream. By August of 2001, it was apparent that those challenges were being met.

In late July of 2002 focuses shifted to demonstrating the operations and support activities necessary and required to dispose of RH-TRU Waste. A practical end to end performance demonstration was planned. This demonstration was recognized as being the first of several activities that would eventually culminate in a declaration of readiness for the RH Facility and process.

It was determined that the Performance Dry Run (PDR) (as the practical demonstration was to be called), would be evaluated by a joint team of experts from the management and operating (M. & O.) contractor, the DOE, and the Carlsbad Field Office technical assistance contractor. Washington TRU Solutions (WTS), the M. & O. contractor, provided an evaluation team leader in late July while the Carlsbad Field Office assigned a dedicated counterpart.

These two team members then set to the task of defining the scope of the PDR, the evaluation team makeup, and the grading criteria that would be used to determine the success or failure of the activity.

PDR Scope

The PDR was intended to be one of several stepping-stones to the declaration of WIPP's readiness to handle RH waste. Because of this it was essential that this demonstration practically illustrate the ability of the equipment, process, and workforce to handle and emplace RH waste. The process must fully support handling and disposal of waste from either of two different types of road casks, which will be used in shipping the RH waste. These casks are the RH-RH-TRU 72B cask and the CNS 10-160B cask.

After extensive discussion, the determination was made by the team leader and the DOE counterpart to focus scope on the anticipated normal operations, no drills demonstrating abnormal events would be initiated or evaluated as part of the dry run. The PDR would separately demonstrate each handling process for each type of road cask. Hazards anticipated to occur in the process would be simulated. Operations would be conducted using qualified personnel, and approved and controlled procedures.

Limited exceptions to these conditions were allowed after extensive review. Exceptions typically were granted only when conditions required for actual emplacement could be established only through accelerated cost expenditure or extensive labor commitment that yielded no true value to the demonstration (example: repainting the Waste Handling Bay floor-covering several years early for the purposes of the PDR only).

While it was true that the PDR focus would concentrate on normal operations, and not drills or abnormal events, a determination was made early on that if actual events occurred they could be, and would be evaluated as part of the process. If equipment malfunctioned or failed entirely, the process to recover and continue the dry run would be evaluated. This approach would be true in the case of procedure failures as well. The initial evaluation team viewed this approach, as the only truly representative way to demonstrate the process was ready for operation.

The last element that was considered in setting the scope was determining what elements or activities that would not be evaluated due to redundancy between the CH and RH processes. As the initial activity reviews were conducted it became obvious that shipment, transportation and WIPP site receipt tasks were essentially identical in nature between the CH handling process and the RH handling process. These activities were conducted routinely on a daily basis. Evaluation of these activities in support of the RH PDR would yield no useful or productive insights. With this in mind the team leader and DOE counterpart excluded these elements from evaluation.

Team Makeup

The question of team makeup and size became a major topic early in the planning cycle for the PDR. Both DOE and WTS agreed that some level of independence was important to validate the program performance. In simpler terms, it would not be left purely to the M. & O. contractor to declare the program a success, but that declaration would come from a team of project participants with sufficient independence, to allow for unbiased appraisals.

Because the PDR scope was focused and limited it was determined that team size should be small. A small team would allow for more team interaction, and limit the total impact to the process resulting from observers. The later point was important because of the limited work areas and space associated with many of the evaluated steps. Limiting the team size meant, however, that each selected member would need a broader skill base, being capable of evaluating more than one activity or area. This decision to use a small team with broad skills now raised the question of what skill set should the team as a whole possess? The team leader and DOE counter part reviewed the projected dry run, and debated this topic for several days. The final conclusion reached was that the team needed expertise and background in six "Technical Disciplines". These disciplines were - Safety, Training / Qualification, Radiological Control, Conduct of Operations, Maintenance, and Operations.

With this in mind a joint team of qualified experts from WTS, the DOE Carlsbad Field Office (CBFO), and the CBFO technical assistance contractor (CTAC) were assembled. During the evaluation process each member would be assigned full-time to support the performance evaluation. In this way no external commitments or schedules would interfere with their evaluation duties.

Each team member was picked based on the skill and experience level they possessed. Each member was acknowledged to have a primary area of expertise, and at least two secondary areas of knowledge. Members were picked to ensure that the six critical technical disciplines could be evaluated during all elements of the PDR. No activity would be observed for the purpose of grading by a single evaluator. Each critical activity would be observed by no less than two people, at least one of which would be the recognized lead in that technical discipline being observed. In this way no single person could pass or fail an activity based on their observations or conclusions. In practice, all most all elements were reviewed by greater than two grading observers.

With the team size determined, the skill base defined, and the technical disciplines set; the team lead and DOE counterpart began the actual assignment of names to roles. This step proved the most difficult. Not only did the team require a broad skills mix, but a certain level of chemistry must also exist between the individual members to allow them to work closely together. It was recognized that in the planning stage that a debate would arise over some elements of performance during the PDR. When this occurred, it would be critical that the team as a whole would be able to discuss the issue and come to consensus on the final grading conclusion. After extensive discussion the team size of six was set, and the names of candidates finalized. With the support of project participants the team was staffed.

Grading Criteria

The PDR was defined at the on-set as a practical demonstration of WIPP's ability to demonstrate operations and support activities necessary and required to dispose of RH-TRU waste in the WIPP underground.

How would the WIPP evaluation team grade this practical demonstration? Should a sliding scale be used? Would some elements be weighted? Would each step or element be required to pass? How would we apply the disciplines? In the beginning more questions than answers were apparent to the team. The team turned their attention to the process overviews and to understanding the tasks, and their complexity. It was clear first that two distinct processes must be evaluated in order to declare that RH-TRU waste could be handled. Additionally, each process was composed of modules that must be satisfactorily performed. Lastly, each step of each module of each process had to be performed satisfactorily in light of the six disciplines.

Would performance at this level then equal success? Team members quickly came to the conclusion that this alone would not spell success. Some reasonable time for demonstrating the handling process was needed as well as requiring safety throughout the entire evolution.

At this point the question arose, are there certain actions or events that would immediately spell failure. This question now became a topic of debate. The debate however was short lived. The answer reached by the team was – yes; there was an immediate failure criteria. That criteria was "during the PDR if employees perform, or fail to prevent an act, that results in a lost-time injury, or that results in an injury or equipment damage that are reportable under DOE Order 232.1A (Occurrence Reporting and Processing of Operations Information)", the PDR would be declared unsatisfactory and terminated.

With this conclusion reached it became easier to identify success. First it was determined that all grading would be on a "satisfactory or unsatisfactory" level. No points, special weighting, or sliding scale would be considered. For an overall technical evaluation of "satisfactory", each of the two cask processes must be scored as "satisfactory". For a cask process to be satisfactory each of its modules must be scored "satisfactory". In addition each of the disciplines must be scored "satisfactory". A set of general criteria governing operation under normal conditions must be met as well. And lastly no failure criteria could be met. In the end this meant no unsafe acts as defined above and the process would have to be completed within a specified time frame once it began. With the criteria for success established the team finalized the evaluation plan, a related guide and the projected schedule for beginning the PDR.

THE PDR

On Monday August 18, 2002 WIPP began the PDR to demonstrate satisfactory operation of the RH-TRU Waste Facility. The six evaluation team members were joined by representatives of the Defense Nuclear Facilities Safety Board, representatives of the Environmental Evaluation Group (a WIPP stakeholder) and visiting dignitaries from the French organization of ANDRE.

Normal shift operations were conducted during the week to accomplish the PDR. The PDR team met each morning prior to the start to review the previous day's activities and observations and establish the plan for that day's assignment. Closeout meetings were held with WIPP site personal at the end of each day to ask questions about the operation. Upon completion of the waste handling operation for the receipt and disposal of the simulated RH-TRU 72B and CNS 10-160B waste containers, the demonstration was concluded on Saturday August 24, 2002. The PDR review team convened the following week to prepare the completion documentation and provide feedback to the RH Project staff and participants.

The final conclusions of the evaluation team were that - "the two road cask processes, the support processes and the technical disciplines were judged to be satisfactory." The PDR was completed successfully with a "satisfactory" rating being earned.

Like all such activities, several noteworthy practices were identified.

- Excellent rigging practices.

  Rigging is an important operation for the waste handling process. The team witnessed excellent rigging practices by the operator staff during the demonstration.

- Excellent pre-job detailed ground control inspections.

  Excellent underground ground control inspections were observed exemplifying the safety culture in operations.

- Waste handlers and Health Physics technicians worked as a cohesive unit.

  Excellent teamwork between the different technical disciplines was observed resulting in a well-run operation.

- Good use of inspection mirror during placement of the HERE to confirm lockup mechanism operation.

  The lockup mechanisms on the HERE are difficult for an observer to safely witness the positive lock-up between the facility cask and the shield collar. The waste handling staff incorporated the use of a mirror normally used for security observations allowing the PDR observers to safely confirm the correct operation of the locking mechanism. This is an innovative solution to the situation.

- Rapid response to a non-related medical emergency during the PDR.

  During the PDR, a non-related medical emergency occurred requiring the activation of the emergency medical staff at WIPP. The PDR team was very impressed with the rapid response witness in handling the medical emergency thus inspiring confidence with our emergency medical response program.

In addition, several areas in which improvement could be made were noted.

- Procedure improvement.

  As the program matures, procedures need to incorporate lessons learned.

- Increase Tenelec read time (30 seconds to 60 seconds)

  It is recommended that the read time for the Tenelec swipe counter be increased from 30 seconds to 60 seconds to increase the accuracy of the count.

- RH-TRU 72B impact limiter bolts appear to be binding and gauling.

  During removal and installation of the impact limiter bolts it was noted that the bolts might be binding and gauling. Investigation into the use of bolt lubricant is being conducted.

- Cask trunnion wear limiter replacement.

  It was observed that the cask trunnion wear limiter material was not securely attached. The material has since been modified.

- CNS 10-160B venting system redesign.

  The cask venting system was observed to be of a temporary nature and recommend that more substantial equipment be obtained.

- Limit duties of crane operator.

  The crane operators were observed doing multiple tasks and suggest limiting the duties only to crane operations at the time of operation.

- Replace RH bay firewater drainage ditch covers.

  The firewater drainage ditch covers are in need of replacement.

- Reposition a RADOS CAM alarm closer to the operator.

  A RADOS CAM alarm was observed to be out of optimum operator position. Recommended moving the alarm to a more convenient location.

- RADCON Improvements: Substitute for use of leather gloves, use shoe booties, opportunities to improve ALARA, consider more rigor in the transportation of swipes.

  All of the mentioned RADCON improvements are being assessed. ALARA practices can always be improved.

For the evaluation team, the effort expended in establishing a good plan for evaluation, picking the right evaluators, and establishing strong and straightforward criteria, paid off in the final result. For WIPP and those generator sites dealing with the legacy of RH-TRU waste, the success of the PDR should be apparent. A critical first step toward declaring readiness to accept and emplace this Legacy of the Cold War had been achieved. Progress toward a final solution to Americas waste problem was made.

Reference:

1) "The Waste Isolation Pilot Plant Land Withdrawal Act of 1992", U.S. Congress. Senate, 102nd Congress, 1st sess., 1992. S. Rept. 1671

2) "Preliminary Safety Analysis Report for RH-TRU Waste", DOE-CAO, WIPP, U. S. Department of Energy (2002)