

## CERTIFICATION AND SHIPMENT OF TRANSURANIC WASTE

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### ABSTRACT

The certification process of transuranic (TRU) waste for transport to and disposal at the Waste Isolation Pilot Plant (WIPP) is a complicated process due the multitude and specificity of certification requirements imposed to ensure effective protection of human health and the environment. Additional complications arise from differences in RCRA requirements between the state from which the waste is being shipped (Colorado, in Rocky Flats' case) and the state of the receiving facility (New Mexico for WIPP). At Rocky Flats, the certification process consists of the following major elements:

- Waste Characterization data validation and verification
- Payload container staging, preparation and inspection
- Payload container certification
- Electronic transmission of payload container characterization/certification data to the WIPP Waste Information System (WWIS)
- WIPP approval authorization of payload container characterization/certification data
- Load management and TRUPACT-II payload assembly
- TRUPACT-II vessel loading and closure verification and inspection
- Shipment certification
- Electronic transmission of shipment data and WIPP approval authorization to ship
- Transportation enhanced Commercial Vehicle Safety Alliance (CVSA) inspections of outbound shipments

### INTRODUCTION

The entire process for a **single** TRUPACT-II vessel of 14 transuranic waste drums is estimated to take approximately 163 labor hours and cost \$6,800.00. The optimum shipping configuration would, however consist of **three** TRUPACT-II vessels in one shipment. Therefore, each shipment of three vessels would require 489 total labor hours (3 times 163). Cost of one shipment of three vessels will be approximately \$20,400.00 (3 times \$6,800). Currently, the drum verification through certification and loading process takes approximately 15 working days to complete. Rocky Flats Environmental Technology Site intends to eventually ship TRU waste to WIPP at a rate of 104 shipments per year.

Given these shipment rates, improvement in the efficiency of the waste certification process is a necessity. Improvements currently being pursued include:

- Limited electronic data management to maximize the efficiency of validation, verification and reporting process.
- Proposed construction of a dedicated characterization and shipping facility to allow for consolidation of characterization activities. The facility will also increase the storage space for pre-certified containers and will reduce the number of container movements now required between facilities

Improvements to the process recently implemented include:

- A dedicated staging area to provide for inspections, radiological surveys and payload assembly activities.
- Elimination of waste storage within the TRUPACT-II loading area to allow sufficient space for two or three pre-assembled payloads.

### **Waste Characterization Data Validation and Verification**

All data generated from the transuranic waste characterization processes (Radiography, Radioassay, Headspace Gas Sampling/Analysis, Solid Sampling/Analysis, Visual Examination) are verified and validated (V&V). V&V is completed at the data generation level as well as at the project level to ensure that 100% of all data generated during the characterization process meet mandated data quality objectives outlined in the Transuranic Waste Characterization Quality Assurance Program Plan (CAO-94-1010). All V&V is documented using checklists.

V&V at the data generation level consists of the performance of the following:

- An independent technical review and signature release to ensure that the data generated from the process is technically correct, calculations are verified, required review of the data have been performed and all quality records generated are correct and complete.
- A technical supervisory review and signature release to ensure that data are technically reasonable and that all quality assurance documentation is complete and includes raw data, calculation records, calibration records, and other documentation as necessary.
- A quality assurance officer review and signature release to ensure that quality control (QC) checks were properly performed and that any QC criteria that were not met are documented.

V&V at the project level involves review and signature release from both the site project manager and the site project quality assurance (QA) officer. The project level V&V includes preparation of a Site Project QA Officer Summary and a Data Validation Summary for each testing, sampling and analysis batch report. V&V at the project level involves review of data and quality control results for adequacy and reconciliation of data with the data quality objectives.

Once data have passed project level V&V, then one other data verification process, called WIPP verification, is performed. WIPP verification is the process used to verify that all data generated are correctly input in the Rocky Flats Waste and Environmental Management System (WEMS) computer database. WEMS is a secure computer system that is used throughout Rocky Flats to track and control the inventory, movement and various waste management activities (including characterization, certification and transportation) for containerized transuranic and other waste. WEMS provides cradle-to-grave tracking of containerized waste.

During WIPP verification, summary transuranic waste characterization data that is entered into WEMS (either hand entered or electronically transferred) is verified against the source characterization documents (i.e., the testing, sampling and analysis batch reports). Once data has been WIPP verified, security locks are activated in WEMS to prevent the data from being changed. WIPP verification consists of 7 categories as follows:

- Radioassay category – This category consists of verification and locking of radioassay batch report data.
- Physical Form and Packaging category – This category consist of verification and locking of information used for determining the physical form and packaging of each type of waste contained in a payload package. Radiography data, for retrievably stored waste, is verified and locked under this category.
- Visual Examination category – This category consists of verification and locking of applicable data associated with visual examination of randomly selected payload container contents.
- Headspace category – This category consists of verification and locking of headspace gas sampling and analysis information from the headspace gas sampling/analysis batch reports.
- Solid Sampling/Analysis category – As applicable, this category pertains to the verification and locking of solid sampling and analysis results for total metals, total volatile organic compounds, and total semi-volatile organic compounds for homogeneous solids.
- Venting and Aspiration category – This category pertains to determination, verification and locking of data associated with venting and aspiration requirements for shipment in TRUPACT-II.
- Miscellaneous category – This category captures any verification and locking of other data that may be required such as gas generation testing data.

Two additional activities are also performed as part of the WIPP verification process:

1. Confirmation of acceptable knowledge using headspace gas and solid sampling analysis results. This activity involves using headspace gas and solid sampling analysis results, as applicable, to confirm the assignment of Environmental

Protection Agency (EPA) hazardous waste numbers. If the confirmation process indicates the presence of constituents with EPA hazardous waste numbers in a waste stream or waste stream lot that can not be accounted for by acceptable knowledge, then, the appropriate EPA hazardous waste numbers must be added to the waste stream or waste stream lot.

2. Preparation and submittal of a waste stream profile form for new waste streams. A waste stream profile form must be prepared for every waste stream. A waste stream profile form is prepared using characterization data collected from the first lot that is WIPP verified for a given waste stream.

### **Payload Container Staging, Preparation and Inspection**

Once the WIPP verification activities have been completed the most labor-intensive part of the certification process begins. Due to the lack of dedicated storage and processing areas at Rocky Flats Environmental Technology Site waste containers must be transferred from storage facilities to other facilities for Real Time Radiography, Non Destructive Assay, Headspace Gas Sampling and/or Visual Examination. After the characterization activities have been completed containers are again transferred to a storage area prior to certification. In most storage areas containers are stacked in three or four high arrays in order to maximize the storage space availability. Containers selected for certification are again removed from the stacks in the storage areas and transferred to the shipping facility for certification.

After receipt at the shipping facility, each container is labeled and marked. Three bar code labels are applied approximately 120 degrees apart in the middle section of drums or on opposing sides of Standard Waste Boxes. Containers are also labeled to comply with the requirements of 49 CFR 173.411, Department of Energy requirements for DOT Specification 7A Type A packaging and the TRUPACT-II Vessel Certificate of Compliance.

Radiological contamination surveys for Alpha and Beta/Gamma contamination are performed and documented for each container. Radiation surveys for Beta/Gamma and Neutron dose rate radiation are performed and documented.

Each container is inspected by a trained and qualified inspector. The inspection is performed to ensure containers are in good physical condition and are marked and labeled correctly. The carbon composite filter torque specifications are verified for each container. Radiological contamination surveys and radiation surveys as well as associated container paperwork is reviewed and verified as complete and correct.

After physical inspection has been completed the radiological data collected is verified in WEMS in a process called radioactive verification. Contamination survey reports are used to enter container radiological Alpha and Beta/Gamma contamination information and radiation surveys are used to enter container Beta/Gamma and Neutron dose rate

information into WEMS. The DOT package type, Waste Stream Profile number, TRUPACT-II content code and container filter model type information is also verified and entered during radioactive verification.

### **Payload Container Certification**

The RFETS Waste Certification process is independent of waste generating organizations. This process is performed to certify that transuranic wastes shipped from RFETS comply with all applicable WIPP disposal, transportation requirements, DOE requirements and associated state and federal regulations. Certification criteria are specified by requirements documents and are reflected in waste generator implementing procedures. Certification is performed after the successful completion of the radioactive verification function. Final certification of transuranic waste containers is based on, but not limited to, verification of the following:

- Overall waste generation/packaging system
- Wastes are properly packaged and identified according to applicable procedures
- Proper identification and characterization activities have been performed
- Verification that an auditable system exists to ensure proper characterization of the waste
- Physical condition of the waste package
- Radiography dispositions and technician certification status
- Nondestructive Assay or radiochemical analysis for determination of waste type as transuranic waste dependent on point of origin of the waste
- Determining adequacy of documentation and ensuring traceability through the process (cradle to grave)
- Compliance to weight and radiological limits

The required information on transuranic containers is collected using a combination of container documentation and the WEMS. The Waste Certification Official (WCO) affirms compliance with WIPP waste acceptance criteria for each container. Interim and final certification activities are performed during the staging and loading activities. The status of a container's certification is captured and tracked in WEMS.

### **Electronic Transmission of Payload Container Characterization/Certification Data to the WIPP Waste Information System (WWIS)**

Relevant characterization and certification data for each payload container must be received and approved by a WIPP Data Administrator before the payload container can be assigned to a TRUPACT-II shipment. All relevant characterization and certification information associated with a payload container is entered in to WEMS. Once a payload container is certified all associated characterization and certification information in

WEMS has been verified, certified and secured and is ready for electronic data transmission in to the WWIS. Data is transferred by extracting the necessary data from WEMS into extract files that are stored in WEMS extract tables. Once extracted, the data are electronically transmitted into WIPP extract tables (extract tables that reside at WIPP). Finally, the data are electronically transmitted from the WIPP extract tables in to the WWIS database. Extract files may consist of one or more payload containers and so data associated with multiple payload packages can be electronically transmitted in one extract file.

### **WIPP Approval Authorization of Payload Container Characterization/Certification Data**

Once data are transmitted into the WWIS, a WIPP Data Administrator reviews the data on a payload container basis. If the data is acceptable, then the WIPP Data Administrator approves the data for each applicable payload container. The approval status of payload containers is captured in the WWIS. Periodically, or on demand, WEMS downloads updated payload container status from the WWIS. Once a payload container has been approved in the WWIS and this approval has been downloaded into WEMS, then the payload container is eligible for assembly and loading into a TRUPACT-II shipping vessel for subsequent transportation to WIPP.

### **Load Management and TRUPACT-II Payload Assembly**

Each TRUPACT-II vehicle receives a Commercial Vehicle Safety Alliance (CVSA) inspection by Transportation Security Officers (TSO) upon receipt at RFETS. After radiological contamination surveys are performed on the incoming empty vessel/s and trailer they are moved to the TRUPACT-II loading facility. The trailer is disconnected from the tractor and moved into a loading dock enclosure. A loading platform is lowered around the vessel/s. Appropriate guardrails and chains are installed in the loading platform. The vessel identification numbers are verified as appropriate. Tie down bolts are loosened on the TRUPACT-II trailer. In this condition the TRUPACT-II vehicle (vessel and vehicle) is ready for payload assembly loading.

Payload assemblies may be prepared independently from, or prior to, TRUPACT-II receipt. Individual containers are ready for staging into payload assemblies after final authorization and approval has been given by WIPP. The WEMS Offsite Shipping Module has been developed to assist with the identification and selection of containers that will be assembled for loading into the TRUPACT-II vessels. Certified waste container numbers are entered into the package/shipment assignment screen in groups of fourteen drums or two Standard Waste Boxes per TRUPACT-II vessel. The shipping module function verifies that containers selected for WIPP shipments meet transportation requirements as well as TRUPACT-II load restrictions.

The load management function verifies that containers have been certified and the container type and waste type is allowed for shipment. The gross weight of the shipment is automatically calculated based on the tractor, trailer weights, vessel weight and tare weights of the payload assembly hardware (pallets, guide tubes, plastic wrap and slip-sheets). A payload assembly can not exceed 7,265 lbs. and will vary depending on the as-built weight of the TRUPACT-II vessel. The maximum gross weight of a loaded TRUPACT-II vessel can not exceed 19,250 lbs. When three vessels are loaded, the maximum Gross Vehicle Weight Rating of 80,000lbs. cannot be exceeded.

After the transportation information has been entered into the WEMS, reports are generated to facilitate assembly of the payload and certification of the shipment. A Payload Package Transportation Certification Document (PPTCD) is generated and distributed to Waste Certification and Transportation personnel for review. Each container has an individual PPTCD that must be signed by the Waste Certification Official stating the container meets all requirements for shipment as stated in the Safety Analysis Report for the TRUPACT-II shipping package.

A Payload Assembly Transportation Certification Document (PATCD) is generated and distributed to Waste Operations personnel. The report identifies individual containers to be used in the top and bottom assembly. Solid Waste Operations personnel move selected containers from the staging area to the payload assembly area. Prior to assembly, the containers are again physically inspected and verified by Transportation and Waste Certification personnel. Radiological contamination surveys are again performed to ensure compliance with RFETS radiological procedures.

Seven of the heaviest containers (drums) or the heavier of two Standard Waste Boxes comprise the bottom assembly as identified by the PATCD. When drums are used, they are placed on a payload pallet and slip-sheet that has been aligned to ensure the guide tube holes are unobstructed. A reinforcing plate is aligned with guide tube holes and placed on the top of the bottom assembly. Plastic stretch wrap is drawn securely around the bottom assembly of seven drums. Another slip-sheet is placed on top of the reinforcing plate. Two aluminum guide tubes are inserted in the guide tube holes. The remaining seven containers are placed on top of the bottom assembly. The third guide tube is inserted and the final assembly is secured with stretch wrap. Standard Waste Boxes are secured by a specially designed tie-down strap assembly and lifting adapter.

Actuating ring bolts, vent port thermal and access plugs are removed from the TRUPACT-II Outer Containment Vessel (OCV) lid and surveyed for radiological contamination. The test port thermal plug is also removed and surveyed. A vent port plug removal tool is installed into the vent port, the vent port plug is removed and sufficient vacuum applied to the OCV until the actuating ring can be easily rotated. An overhead bridge crane is attached to a load cell and Automatic Center of Gravity Lifting Fixture (ACGLF). This assembly is attached and locked into the lid. The OCV lid is carefully lifted from the Outer Containment Assembly (OCA) body just high enough to

perform radiological surveys of the underside of the lid and exterior of the Inner Containment Assembly (ICV) lid. The OCV lid is then placed on a lid stand. The ACGLF assembly is then disconnected from the OCV lid. Minor maintenance is performed and documented for both upper and lower main "O"-ring seals.

The process for removing the Inner Containment Vessel (ICV) lid and performing minor maintenance on the O-rings is essentially the same as described above utilizing tools and a lid stand designed for the ICV.

A thorough inspection of the visible portions of both lids and sealing surfaces is performed. The interior of the ICV is visually inspected to verify there is no standing water in the vessel. Locking ring bolts for both the OCV and ICV are inspected. After inspection, sealing surfaces are cleaned using denatured alcohol. The "O" rings are cleaned, lubricated and replaced.

The overhead bridge crane is again utilized for loading the payload into the vessel. The three short legs are removed from the ACGLF and replaced with long legs (when loading drums). The ACGLF is maneuvered into place over the payload assembly. The long legs are carefully guided into the guide tubes in the payload assembly. When Standard Waste Boxes are being loaded, the short legs remain on the ACGLF and attach to the Standard Waste Box adapter. The legs are locked into place and the payload assembly is lifted approximately 1-2 inches from the floor. The counterweight balancing system controls are operated to obtain a balanced alignment. The payload assembly is moved and centered over the open ICV. The payload is then lowered until it rests on the floor of the ICV. The ACGLF is disengaged from the payload assembly and raised to clear the payload and vessel.

The three long legs are removed from the ACGLF and replaced with short legs (when loading drums). The ACGLF is attached to the ICV lid and locked into place. The ICV lid is moved and centered over the ICV. The lid is carefully lowered and positioned into place. Vacuum is again applied to the ICV sufficient to draw the lid down and secure the locking ring.

A nondestructive leak test is performed on the ICV main "O"-ring and vent port seal. Leak testing is a method of determining leakage of containers or systems. The leak test is completed to meet requirements for shipping radioactive waste to verify that the vessel has been assembled correctly. The test is performed by first injecting helium into ICV. Exterior ports are then monitored to determine how much, if any helium leaks past the vessel "O"-rings. The OCV lid is replaced after successful leak testing has been performed. Leak testing is repeated for the OCV.

### **TRUPACT-II Vessel Loading and Closure Verification and Inspection**

The TRUPACT-II vessel is sealed with a security seal, the seal number and closure date is recorded on the PATCD report. Applicable DOT markings are applied to the vessel. The Waste Certification Official and transportation personnel observe and verify the closure and sealing of the TRUPACT-II vessel. Radiological surveys are completed of the exterior of the vessel and trailer per the RFETS radiological operating instructions and as required by the Department of Transportation. Documentation of the surveys is recorded on the shipping papers. The information is also entered into the WEMS.

### **Shipment Certification**

An additional PATCD report is generated by WEMS including the closure date information. The report is submitted to the Transportation Certification Official and the Waste Certification Official for approval. When the TCO and WCO have granted approval, all shipment information is electronically transmitted to WIPP for approval of the shipment utilizing the WIPP Waste Information System.

### **Electronic Transmission of Shipment Data and WIPP Approval Authorization to Ship**

Before a shipment can be transported to WIPP, shipment data must be reviewed and approved by a WIPP Data Administrator. The required data may be transmitted to WIPP either at one time or in two phases. The advantage of transmitting shipment data in two phases is that the majority of the shipment data can be transmitted to the WWIS when it is available. Then a WIPP Data Administrator can review and approve that data. The remaining five data fields (ICV Closure Data, TRUPACT-II Dose Rate at Surface, TRUPACT-II Dose Rate at 1 Meter, TRUPACT-II Dose Rate at 2 Meters, and Ship Date) may be transmitted just prior to when a shipment leaves the site. The turnaround time for a WIPP Data Administrator to review and approve the remaining five fields should be minimal. A shipment can leave the site once the final approval of the shipment is received from WIPP.

The electronic transmission of shipment data in to the WWIS, and the associated WIPP approval, is accomplished in the same manner as that described in the previous sections entitled Electronic Transmission of Payload Container Characterization/Certification Data to the WIPP Waste Information System (WWIS) and WIPP Approval Authorization of Payload Container Characterization/Certification Data. The only significant difference is that in the previous sections WIPP was reviewing and approving data associated with individual payload containers while here they are reviewing and approving data associated with individual shipments.

### **Transportation Enhanced Commercial Vehicle Safety Alliance inspections of Outbound Shipments**

Once WIPP approval is received the Transportation Certification Official arranges a shipment date with the TRUPACT-II carrier and notifies the Colorado State Patrol/Department of Public Safety (CSP/DPS) of the shipment date. A Bill of Lading/Uniform Hazardous Waste Manifest is prepared by the transportation department. This information is entered into the Transportation Tracking and Communication System (TRANSCOM) tracking system. TRANSCOM tracks the shipment from the point of origin to the final destination at WIPP.

On the shipment date Transportation Security Officers perform an Enhanced Commercial Vehicle Safety Alliance vehicle inspection. The TSO's then release the shipment to the CSP/DPS and the TRUPACT-II carrier who perform an additional transportation inspection. The shipment is dispatched only on approved routes and in good weather conditions. The shipment may not enter a city with a population of 50,000 or greater during rush hour (6:00 - 9:00a.m. and 3:00 - 6:00 p.m.).

### **Conclusion**

Certification and shipment of transuranic waste to WIPP for disposal is a complicated and involved process. The process consists of the performance of a variety of sequential operations needed to ensure that compliance with all requirements is achieved. Correct sequencing of operations/activities is vital. Because of the importance of shipment and disposal of transuranic waste at WIPP in achieving closure performance measures and milestones at Rocky Flats Environmental Technology Site, it is critical that the efficiency of the certification and shipment process be maximized.