

Mobile Loading Transuranic Waste at Small Quantity Sites in the Department of Energy Complex-10523

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ABSTRACT

Los Alamos National Laboratory Carlsbad Office (LANL-CO) conducts mobile loading operations for the Central Characterization Project (CCP) at all of the large and small quantity transuranic (TRU) waste sites in the Department of Energy (DOE) complex. The CCP LANL-CO mobile loading team performs loading and unloading evolutions for both contact handled (CH) and remote handled (RH) TRU waste. For small quantity sites, many of which have yet to remove their TRU waste, the CCP LANL-CO mobile loading team will load shipments bound for Idaho National Laboratory (INL), a centralization site, or headed directly to the Waste Isolation Pilot Plant (WIPP). For example, CCP has certified programs at Argonne National Laboratory and General Electric Vallecitos Nuclear Center for characterization, certification, loading and shipping of RH waste. They will ship their RH waste headed directly to WIPP. Many of the other smaller sites will ship their waste to Idaho for characterization and certification, then the waste will be shipped to the WIPP.

The mobile loading units (MLU) contain all of the necessary equipment needed to load CH and RH waste into the appropriate shipping vessels. Sites are required to provide some additional equipment, such as cranes, fork trucks, and office space. The sites are also required to provide personnel to assist in the shipping operations.

The CCP LANL-CO mobile loading team usually conducts a site visit to ensure that all of the necessary site equipment, site requirements and space for shipping can be provided. The team works with site representatives to ensure that all safety and regulatory requirements are met. Once the waste is ready and shipping needs have been met, the mobile loading personnel and equipment can be deployed to the site and begin loading waste for shipment.

The CH MLU is designed to support TRUPACT-II and HalfPACT loading activities wherever needed within the DOE complex. The CCP LANL-CO mobile loading team obtained DOE national certification for TRUPACT-II and HalfPACT loading and transportation certification.

The RH MLU is designed to support removable lid canister (RLC) and RH-72B cask loading activities wherever needed within the DOE complex. The CCP LANL-CO mobile loading operation has obtained DOE national certification for RLC and RH- 72B cask loading and transportation.

To date, the CCP LANL-CO mobile loading team has successfully made over 2,100 CH and RH TRU waste shipments. The mobile loading team continues to provide each site with safe, compliant, and efficient loading of TRU waste.

INTRODUCTION

The DOE manages TRU waste at DOE sites in the United States. There are 16 small quantity sites and 6 large quantity sites. DOE's mission includes an initiative to reduce the nuclear footprint at all of its TRU waste sites.

A large quantity site generally will have large volumes of TRU waste. All of the large quantity sites, with the exception of Rocky Flats Technology Site (which has emplaced all of its waste), have ongoing missions and will continue to generate TRU waste. Because of this, CCP has certified programs for characterization, certification, loading and shipping wastes from several of these locations, and the waste is shipped directly to WIPP. LANL-CO performs the mobile loading activities for CCP. The large quantity sites are certified sites and ship their waste directly to WIPP. All of the large quantity sites are certified under the Centralized Characterization Project (CCP). CCP operates under the National Certification at these sites.

DOE TRU waste sites must certify CH and RH TRU waste payload containers to the Transuranic Waste Acceptance Criteria (WAC) for the WIPP (DOE 2009). The WIPP WAC describes the controlling requirements to be used by the sites in preparing their waste for transportation to and disposal at the WIPP. The WAC includes WIPP operational safety, transportation, and hazardous waste requirements. Each site must go through rigorous audits and assessments to ensure that all of the waste is compliantly packaged and meets all of the WIPP WAC requirements.

Many of the small quantity sites only have enough TRU waste for one or two shipments and might not continue to generate TRU waste. Therefore, rather than certifying programs at each site the CCP LANL-CO mobile loading team ships their TRU waste to INL for certification. The waste at these small quantity sites must be packaged according to the packaging guidance issued from DOE Headquarters. This ensures acceptance by INL. Once the waste has arrived at Idaho, it will go through INL's certified program. Once the waste is characterized using WIPP-certified equipment, the waste can be certified for shipment to WIPP.

The Idaho Settlement Agreement, which settled a lawsuit filed by the state of Idaho, states all TRU wastes will be removed from Idaho by a target date of December 31, 2015, and no later than December 31, 2018 (U.S. 1995). An Amendment to the Record of Decision (ROD) published in the Federal Register on March 7, 2008, (for the DOE's TRU waste program) allowed TRU waste to be accepted for treatment and characterization at INL in accordance with the provisions of the Idaho Settlement Agreement, the Idaho Waste Acceptance Criteria and the Site Treatment Plan. The amended ROD allows TRU waste from other DOE sites to be shipped to Idaho if it is treated within 6 months of receipt and shipped out of Idaho within 6 months of treatment (DOE 2008). This timeframe is too restrictive for RH waste, as it does not allow enough time for all of the necessary approvals required prior to shipment to the WIPP site. For this reason, the CCP LANL-CO mobile loading team is used to ship RH waste directly to the WIPP.

PURPOSE

The CCP LANL-CO mobile loading function was originally intended solely to service the small quantity sites. The reasons for this were based on economics. Because of the rigorous training and qualifications program for personnel needed to meet the WIPP transportation requirements, it made little sense for the smaller sites to train and staff their own shipments. It also made little economic sense to purchase the equipment needed. In addition there is the cost and time required for audits, assessments and regulatory approvals. Since the mobile loading function began in 2001, several things have driven the evolution to where it is today, such as American Recovery and Reinvestment Act (ARRA) funding and additional TRU waste sites identified. In addition to providing services to all the small quantity sites, the mobile loading function now conducts operations at all of the large quantity sites currently shipping waste to the WIPP and has made every RH waste shipment to the WIPP to date. The large quantity sites currently shipping waste to the WIPP include Los Alamos National Laboratory, Oak Ridge National Laboratory, Idaho National Laboratory, and Savannah River Site. Hanford in Richland, Washington, is not currently shipping waste, but shipments are tentatively scheduled to begin in 2010. Since 2001, the CCP LANL-CO mobile loading team has grown from a staff of 4 to 23 members and has made over 2,100 CH and RH TRU waste shipments.

At the beginning of 2009, President Obama awarded funding for accelerated projects around the nation under the ARRA. DOE received funding to accelerate clean up of legacy TRU waste at DOE sites around the complex by September 31, 2011. Eight small quantity sites were chosen to de-inventory legacy TRU waste. DOE, CCP and LANL worked together to come up with project plans and schedules. The mobile loading function was augmented to support this acceleration. The CCP LANL-CO mobile loading team has been tasked with shipping waste from the 8 small quantity sites during a campaign that ends in September 2011 in addition to its regular shipment schedule. During this campaign, the small quantity sites will package all of their legacy TRU waste. The CCP LANL-CO mobile loading team will ship the waste either to Idaho for characterization or directly to the WIPP. The eight small quantity sites are Bettis Atomic Power Laboratory, General Electric Vallecitos Nuclear Center, Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory (Area 300), Nevada Test Site, Nuclear Radiation Development, Sandia National Laboratory, and the Separations Process Research Unit.

CH Waste

The CH MLU is designed to support TRUPACT-II and HalfPACT loading activities wherever needed within the DOE complex. The CCP LANL-CO mobile loading team has obtained DOE national certification for TRUPACT-II and HalfPACT loading and transportation operations. Using the MLU, the team can make shipments directly to the WIPP, or intersite shipments to other sites around the complex such as INL. For example, when a drum is sent to INL for core sampling, the team will unload the drum of waste for sampling and re-load the drum of waste and ship the waste back to the site for certification.

RH Waste

The RH MLU is designed to support RLC and RH-72B cask loading activities wherever needed within the DOE complex. The CCP LANL-CO mobile loading team that performs the mobile loading operation has obtained DOE national certification for RLC and RH-72B cask loading and transportation operations. Using the MLU, the team can make shipments to the WIPP.

SHIPMENTS

The CCP LANL-CO mobile loading team has extensive experience performing TRUPACT-II, HalfPACT and RH-72B shipment. As of November 2009, the mobile loading team has made CH and RH shipments from the sites listed in Table 1.

Table I: Sites from which mobile loading shipments have been made.

Site	Waste Type
Argonne National Laboratory-East	CH/RH
Battelle Columbus Laboratory	CH/RH
Brookhaven National Laboratory	CH
General Electric- Vallecitos	RH
Idaho National Laboratory-AMWTP	CH
Idaho National Laboratory -INTEC	RH
Idaho National Laboratory -MFC (Argonne National Laboratory-West)	CH
Los Alamos National Laboratory	CH
Lawrence Berkeley National Laboratory	CH
Lawrence Livermore National Laboratory	CH
Missouri Research Reactor	CH
Nevada Test Site	CH
Oak Ridge National Laboratory	CH/RH
Savannah River Site	CH/RH

EQUIPMENT

CH Equipment

Equipment provided by the CCP LANL-CO mobile loading team, needed for CH loading operations, includes an MLU trailer, which is a flatbed trailer with installed transportainer. The MLU trailer is used for shipping all of the necessary tools and equipment to conduct the loading operations. An adjustable center of gravity lift fixture (ACGLF) is used for removing and installing TRUPACT-II/HalfPACT lids, lifting payloads, and balancing payloads. Elevating work platforms are used to support equipment and workers next to the TRUPACT-II shipping containers. These work

platforms are battery powered and are raised up and down. Tall rolling stairs are used to access raised elevating work platforms. Short rolling stairs are used for accessing stored equipment in the transportainer. TRUPACT-II/HalfPACT lid stands are used for storing TRUPACT-II/HalfPACT lids during the cleaning, maintenance, and while the waste is being loaded into the body of the TRUPACT-II. The CCP LANL-CO mobile loading team uses leak detectors, vacuum pumps, calibrated measurement and test equipment (M&TE) (e.g., load cells, temperature indicating devices, barometers, torque wrenches), and a variety of TRUPACT-II/HalfPACT specialty tools for leak testing and packaging operations. General hand tools and bench-stock inventory of certified TRUPACT-II/HalfPACT spare parts are kept on hand and are used as needed for operations and maintenance. Certified helium and non-certified nitrogen, which are needed to conduct helium leak testing, are normally supplied by the site.

RH Equipment

Equipment provided by the CCP LANL-CO mobile loading team, needed for RH loading operations, also includes an MLU trailer. An elevating work platform is used for personnel accessing the top of the RH-72B cask or Removable Lid Canister (RLC). Tall rolling stairs are used for accessing raised elevating work platforms. Short rolling stairs are used for accessing stored equipment in the transportainer. The rest of the equipment needed for RH loading operations is quite different from the CH equipment. A lid latching tool is used to lock/unlock the RLC lids. A cask stand is used to hold the RH-72B cask when it is removed from the trailer. The cask stand is also used to hold the canister loading silo. A grapple is used (along with a crane) to lift the canister so that it can be lowered into the cask and released once the waste has been placed inside. The grapple is also used to remove RLC lids. An ultra-light lid lift tool is used to remove/install RH-72B cask lids. A lifting yoke is used to remove the RH-72B cask from the trailer. An inner vessel (IV) lid alignment tool is used to align the IV lid remotely. A loading funnel is used to load the RLC into the cask remotely, and prevents damage to the lid/cask body mating surfaces. A helium leak detector and vacuum pump are used for leak testing the container. Calibrated M&TE is used in the RH loading operation (e.g. a load cells, temperature-indicating devices, barometers, torque wrenches). Other equipment includes RH-72B Cask specialty tools, general hand tools, certified RH-72B cask spare parts, a portable bottle rack, miscellaneous certified rigging, cameras, monitoring systems, canister storage stands, lid stands and impact limiter pallets.

Site Supplied Equipment

CH

The site is responsible for providing some of the needed equipment for CH loading operations. A minimum 5-ton bridge crane or minimum 18-ton mobile crane with specified hook heights is normally used for loading HalfPACT's and TRUPACT-II's that will be mounted on a trailer. Other miscellaneous equipment typically provided by the host site includes electrical receptacles, large work areas, denatured alcohol for cleaning

sealing surfaces, gases used in the leak testing process, and office areas where personnel can conduct the transportation certification process and manage the large quantity of paperwork generated for each shipment.

RH

The site is responsible for providing some of the equipment needed for RH loading operations as well. The RH mobile loading team uses a crane with variable ratings, due to process and radiation dose factors. A minimum 6-ton forklift is required to move equipment. Miscellaneous equipment provided includes electrical receptacles, large work areas, denatured alcohol for cleaning sealing surfaces, gases used in the leak testing process, and office areas.

PERSONNEL

CCP LANL-CO Mobile Loading Team

The CCP LANL-CO mobile loading team is comprised of 23 people. Personnel required for both CH and RH shipments, include a transportation certification official (TCO) and a minimum of two loading operators/leak test operators. A CCP LANL-CO manager works schedules and ensures that personnel are available when needed at a site. The TCO builds the payloads and certifies that the waste in the payload containers and the shipments are compliant. Two operators build payloads as designed by the TCO and leak test the payload container.

The training and qualification process for mobile loading personnel is quite rigorous. Packaging operations certification typically requires about 6 months. The core classroom training includes DOE Hoisting and Rigging, Radiological Worker II, Hazardous Waste Operations (HAZWOPER), and Hazardous Materials Packaging and Transportation (HMPT). Each of these courses is 40 hours for the initial qualification and requires frequent requalification. Leak testing certification requires 40 hours of classroom training and 100 hours of on-the-job training under the supervision of a qualified individual. To obtain TCO qualifications normally requires approximately another year and also requires advanced HMPT training. The TCO qualification training is rigorous and is supervised by a qualified TCO who has been designated by CCP as a subject matter expert (SME). There are hundreds of pages of technical material that must be reviewed by the trainee. Once the required reading is complete, comprehension and understanding are evaluated by the SME in a one-on-one, question-and-answer session. Each element on the TCO qualification card must be covered in the process and must be verified by the SME. Operator and leak testing qualifications must be completed before the TCO qualification process can be initiated. The operator qualification process is accomplished using the same SME-supervised process. Many of the core classroom training courses are out of town, so in addition to all of the traveling the mobile loading personnel do to make shipments; they must also travel to attend much of the required core training. These individuals are typically on the road over 70% of the time.

Support Team

CCP- managed by Washington TRU Solutions- is involved throughout the process. CCP personnel must review the sites' waste information, prepare acceptable knowledge reports, perform characterization, certify the waste and prepare a waste profile form. CCP and the site must ensure the bases of operations and the authorization basis are adequate to perform the work. CCP come to an agreement with each site on the terms and conditions of a memorandum of understanding to define the work and each party's roles and responsibilities. CCP also manages the WIPP Waste Information System (WWIS). The WWIS is a computerized data management system used by WIPP to gather, store, and process information pertaining to CH and RH TRU waste that is to be disposed of at WIPP. The WWIS database is a subsystem of the Waste Data System (WDS). Mobile loading personnel build payloads and complete the transportation certification process using the WDS.

Site Supplied Personnel

Both CH and RH operations require a minimum number of site personnel to support loading operations. The site personnel normally include a point of contact, one shipper, one or more radiological control technicians, a crane operator, a forklift operator, and a spotter. The point of contact/shipper generates the manifest and acquires the necessary signatures for the manifest and shipping papers.

OPERATIONS

Pre-Start

In preparation for starting operations at a new location, the CCP LANL-CO mobile loading team will visit the site and evaluates the specific location from which the site has chosen to ship the TRU waste. Many of the sites do not have a covered facility to accommodate loading operations. CH and RH operations can be conducted in an enclosed building or outside. In order to conduct loading and leak testing operations outside, the ambient temperature must be above 40 degrees Fahrenheit (4.4 degree C) and winds must be less than 15 miles per hour (25 km/hr) sustained. If the site has identified an enclosed location, the CCP LANL-CO mobile loading team must ensure that the height of the building can support a crane for loading the payload containers. Other siting requirements that must be met prior to deployment include things like securing certified gases to be used in the leak testing process and ensuring there are adequate space for cranes, work platforms and dedicated electrical outlets for equipment. Mobile loading team personnel work diligently with site representatives to ensure that all safety and regulatory requirements are met well before the scheduled deployment. Sometimes, in order to meet all of these requirements, authorization basis changes are needed. Since these changes can take several months to put in place, identifying them early is critical. Meeting DOE shipping schedules is heavily dependent on pre-work to ensure that the

mobile loading team can be productive very quickly. Site specific training is also required for the CCP LANL-CO mobile loading team personnel. This requires that the personnel be deployed as much as a week prior to the date operations are scheduled to begin. After setting up the MLU and ancillary equipment, the next step is usually a dry run of the operation or a management safety assessment (MSA). This is normally observed by site personnel and sometimes local regulatory agency staff. The MSA is followed by a DOE-Carlsbad Field Office (CBFO) audit. This process is quite rigorous and normally requires a week. Once any issues raised have been resolved, hot operations can begin.

CH Operations

The TCO will select a group of containers from the WDS system that have been certified for shipment by a CCP waste certification official (WCO) and begin building virtual payloads. The WCO will send the TCO build sheets for standard waste boxes and ten drum overpacks. The payloads are then subjected to a series of limit checks to ensure they comply with all of the applicable requirements. This step typically requires 2 to 3 hours. It can take much longer in some instances. For example, a container might have to be removed from a group of containers if, upon visual inspection, the TCO discovers a dent in the container after it has been moved from storage to the loading area. This is a somewhat common occurrence. The process to rebuild a new shipment (after replacing the dented drum) and conduct all of the limit checks again is very time consuming. If a shipment includes some relatively heavy drums, the drums will be arranged to optimize balance. In addition, the TCO must ensure that weight restrictions are met. The drums and shipping containers have weight limits, as do the trucks and trailers. The TCO must also ensure that the payload dose rate is less than 200 millirem per hour on contact (2 mSv/hr). The TCO also verifies the fissile gram equivalent (FGE) levels are below required maximum limits. The TCO ensures the waste containers are appropriately vented and that the flammable gas content of the payload is below the specified level. The TCO also ensures that the decay heat for the payload is less than the specified limit of 40 watts. Once the containers have been selected and the TCO has completed the required visual inspections, the loading process begins.

Once the payload is built, the mobile loading operators remove the TRUPACT-II lids and load the waste containers. The typical configuration is 14 drums arranged and secured in 2 7-pack layers. Once the containers are loaded in the TRUPACT-II, the operators secure the lids and begin the leak testing process. Leak testing can take anywhere from 2 to 12 hours, depending on the specific waste inside. For example, high-wattage waste requires a 12 hour pump down and a 2 1/2 hour back-fill with nitrogen prior to leak testing. The backfill time varies and is dependent on altitude. Once the evacuation backfill process is complete, the leak testing can begin. High-wattage waste must ship within 24 hours after completing the leak test, or the mobile loading team must open the TRUPACT-II and start again. High wind, snow or equipment problems are some of the reasons a shipment might not occur. This would cause a high wattage shipment to be reopened and the process would have to be repeated beginning with cleaning and inspecting the lids and mating surfaces.

Leak testing equipment is very sensitive, and the requirements for a tight seal leave little room for error. One of the more common reasons for leak test failure is a saturated O-ring. O-rings are used to seal mating surfaces where the lids contact the body of the shipping containers. The O-rings are very large and are re-used (after careful inspection) because of their cost. Helium is introduced into the space between the lids of the inner and outer containment vessels at the start of the leak testing process. A helium leak detector is connected to a port outside the O-ring. A vacuum is applied to ensure no (or very little) helium passes around the O-ring. Usually, the O-rings have adequate time to offgas between their last use in a leak test and the current use. Sometimes they still have enough helium in them to cause the leak test to fail (a false positive). More often than not, the leak test verifies the container is tight. This is due to the quality of engineering and manufacture of the container, and the level of rigor applied by the mobile loading operators during the loading process.

Once the leak test is complete and the tightness requirements are verified, the TCO finalizes the transportation certification and shipping paperwork. Commercial Vehicle Safety Alliance (CVSA) inspections are conducted, the manifests and shipping papers are completed and signed, and the shipment is released for transport.

Intersite shipments require all of the steps above to be performed by the TCO and the CCP LANL-CO mobile loading operators. The only difference between shipping waste to WIPP and shipping waste to INL from small quantity sites, for the mobile loading team, is the waste being shipped to the WIPP must be completely characterized and certified as WIPP compliant. Shipments to INL require only that the TRUPACT Authorized Methods for Payload Control (TRAMPAC) requirements be met. TCO's are able to use a module in the WDS, loaded with intersite shipping containers from a small quantity site, which allows them to build virtual payloads to verify compliance. Once the actual payloads are built the steps to load, leak test and ship are the same.

Figures 1 and 2 show CH loading and leak test operations.



Fig.1 Photograph loading a TRUPACT II.



Fig. 2 Photograph of a leak testing TRUPACT II shipment.

RH Operations

RH mobile loading operations require many of the same steps as CH except the CCP WCO provides the TCO with a build sheet that lists canisters to load into an RH canister. The CCP LANL-CO mobile loading team then loads the RH canister into an RH-72B and completes leak testing. The TCO then finalize the transportation certification and shipping paperwork, manifests and shipping papers are completed and signed, and CVSA inspections are completed. The shipment is then ready to leave the site.

Figures 3 and 4 show RH operations.



Fig. 3 Cask loading operation



Fig. 4 Photograph of loading an RH 72B

SUMMARY

The CCP LANL-CO mobile loading team travels to DOE TRU waste sites to ship TRU waste to INL or to the WIPP. An average of 30 shipments per week are made to the WIPP from the large quantity sites combined. The mobile loading team has national certification for both CH and RH waste loading and shipping. CH shipments use either the TRUPACT-II or the HalfPACT. RH shipments go directly to WIPP in an RH-72B cask.

The mobile loading function began as a service for small quantity sites and has grown to a staff of 23 individuals who support transportation operations at both large and small quantity sites across the DOE complex. The CCP LANL-CO mobile loading team is currently providing services at 5 locations simultaneously while ensuring that training, qualifications, and re-qualifications are attained and maintained for the entire team. Loading TRU waste into any of the shipping containers requires compliance with all applicable regulations and requirements, calibrated equipment, and trained staff. There are currently 8 certified TCO's on the team and 3 in the qualification process. All 23 members have completed the basic core training and are currently qualified as operators.

The CCP LANL-CO mobile loading team can typically load a shipping container in one day and has loaded as many as 6 shipments per week. The days are long and are filled with challenges. For example, an O-ring might be saturated with helium, a container might have sustained prior damage, a shipment might be weight restricted or high wattage, and the process can require much more time to complete. The TCO must resolve the issue and/or change the containers to ensure a compliant shipment. If an O-ring is saturated with helium and the leak test fails, the lids must be removed and a new O-ring installed and the leak test must be repeated. If a waste container is damaged in transit to the loading area, the TCO must take that container out of the payload and rebuild it. It can take as many as 12 to 14 hours to complete the necessary changes and repeat the transportation certification process. The team is on call 24 hours a day, and 7 days a week. Because personnel must service sites around the complex, vacations are short and holidays typically do not exist. The team travels on Sundays to arrive in time to load and ship on Monday or leaves on a holiday in order to ship the next day. The team works tirelessly with the site to ensure that the waste is compliant and shipments are made safely and on schedule.

To date, the CCP LANL-CO mobile loading team has shipped over 2,100 compliant shipments of waste. The primary goal of the team is to efficiently load, certify and ship all CH and RH TRU waste safely and compliantly to WIPP and INL.

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