

**Packaging and Transportation of Hazardous Materials for Disposition from the
Argonne National Laboratory Building 330 Decommissioning-11466**

Andy Riddick
Cavanagh Service Group, Inc.
261 East Broadway, Suite 200
Salt Lake City, UT 84111

Lee J. Stevens
Argonne National Laboratory
9700 South Cass Avenue
Argonne, IL 60439

INTRODUCTION

Argonne National Laboratory (ANL) awarded, under the American Reinvestment and Recovery Act (ARRA) funding, the demolition and deconstruction (D&D) of building 330 to Clauss Construction (Clauss). Cavanagh Services Group, Inc. (Cavanagh) as a teaming partner with Clauss was responsible for the compliant packaging, manifesting and transportation of hazardous material to Nevada Test Site Disposal Facility (NTS).

The packaging for this project consisted of bulk bags and reusable, Cavanagh-owned intermodal containers. Packaging selections were made based on destination, waste type, and lessons-learned from previous waste shipping projects.

The mode of transportation selected for this project was on-highway, flatbed trucks. A total of 600+ truck shipments were required to transport all project waste.

The focus of this paper is to assist in continuously improving industry knowledge by sharing the project achievements.

BACKGROUND

Building 330 (Figure 1) was designed and built specifically to house the CP-5 reactor. The entire building supported operation of the reactor until it was shut down in 1979. During the years of 1991 to 2000, the reactor and associated equipment were completely removed leaving the concrete structure of the building remaining.



Figure 1: Building 330 at Argonne National Laboratory

The remaining structure included a 21m-diameter room with a .3m-thick poured concrete exterior wall with a height of 12.8 meters to the top of a domed ceiling. Building 330 also contained two storage areas. Room C-117, the Rod Storage Room, is 8.53m by 13.72m by 7.32m tall and was originally used to place and remove spent fuel rods, but was eventually used for storing reactor parts and experimental equipment. Wing E was designed and built to store spent fuel rods and is 13.72m by 17.37m with .3m-thick poured concrete walls.

PACKAGING

Cavanagh's scope of work consisted of exclusively providing waste packaging and requisite shipper support for shipments under the NTS Certified Shipper Program for all contaminated waste generated by the D&D of building 330 and related soils.

Cavanagh prepared a cost-benefit analysis for the approach to packaging and shipping support. Cavanagh presented the best option to suit the customers' needs and priorities while providing the highest level of safety, quality and value.

Multiple packaging options were selected to accommodate the different types and sizes of waste generated by the project. For soils and small debris, a soft-sided DOT-certified Industrial Packaging 1 (IP-1) 7 cubic meter (cu. yd.) bulk bag (Figure 2) was selected. For metal and larger debris, Cavanagh-owned 19 cubic meter intermodal roll-on/roll-off containers (Figure 3) were chosen. These metal containers are also DOT-certified IP-1 and reusable.



Figure 2. Bulk Bag w/Single Point Lift



Figure 3. Cavanagh Intermodal

Cavanagh assisted in the development of a soft-sided, bulk bag, featuring innovative straps a single lift point design for lifting of the loaded bulk bags. Soft sided, bulk bags traditionally require a lifting frame attached to a crane or special heavy-duty forklift with a 12 ton lift capacity. The innovative single point lift design eliminated the need for lifting frames thereby saving the project an estimated ten thousand dollars. It also permitted lifting and maneuvering of loaded bulk bags at the site using existing on-site excavators; in doing so it eliminated the need for special large and expensive cranes or forklifts.

Further, the use of a lifting frame requires that each individual strap be manually attached to its corresponding hook on the lifting frame. Once the loaded bags have been placed in position following a move, each individual strap must be manually disconnected from the loading frame hooks. This lifting frame approach is labor intensive and increases the safety risk to personnel performing the attachment to and disconnecting of bag straps from the lifting frame hooks.

Cavanagh provided over twelve hundred DOT compliant IP-1-certified bulk bags to the project. Cavanagh's scope included the procurement, quality assurance and loading oversight of the bulk bags.

As the project was gaining momentum Cavanagh was able to implement corrective actions from lessons-learned by modifying procedures and practices in the field. The loading of the bulk bags was one of those lessons identified.

Operational observations during the first few days of bulk bag loading uncovered a procedural challenge. The bucket on the excavator that was used to load the bulk bags was determined to be too large for proper loading. The large bucket was approximately 2m in depth. The procedure called for the full bucket to be placed over the open and empty bulk bag. During loading, the top of the bulk bag is approximately 2m off the ground. As the large bucket was rotated to dump its

contents into the bulk bag, the debris in the back of the bucket rolled and fell a total of 2m to 3m. Falling this distance, the larger debris components gained velocity and the total energy release when hitting the inside of the bulk bag resulted in perforations in the bulk bag rendering the bulk bags unusable for shipment.

Cavanagh identified a solution and worked with the project team to implement the use of a smaller bucket on the excavator used to load the bulk bags. In addition to the change in bucket size, the method of emptying the bucket into the bulk bag was altered to reduce tearing or perforation on the bag. The smaller bucket permitted the operator to lower the bucket into the bag and use a reverse scoop motion to empty the contents in a controlled and safe manner (Figure 4). In addition to the bucket, Cavanagh also worked with the bulk bag vendor to develop floor padding for the bottom of the bags to provide additional reinforcement against potential damage.



Figure 4: Loading Bulk Bag

The intermodal containers used for the project were part of Cavanagh's fleet. All Cavanagh containers are strictly maintained in accordance with Cavanagh's procedures which define the level of inspection and the routine maintenance and repairs required to maintain the IP-1 certification of the containers.

Cavanagh engaged in discussions with NTS at the beginning of the project to gain permission to use the reusable roll-on/roll-off containers, a practice not typical with disposal at NTS. Loading techniques were also discussed which ensured that the containers were loaded uniformly to achieve a smooth and successful unloading at NTS. Additional measures were also taken in developing a compliant intermodal liner which would easily slide out of the container without compromising liner integrity, a major concern of NTS.

Cavanagh worked closely with NTS representatives to assure that the reusable intermodal containers would be unloaded at NTS without issues. One concern offered by NTS involved the potential for one or more metal waste components becoming jammed inside of the loaded intermodal, which in turn could prevent the

unloading. To address this concern, Cavanagh helped develop a detailed loading procedure for use at ANL when placing scrap metal waste into the intermodals.

Cavanagh remained in close contact with NTS during the unloading phase of the first batch of 4 containers. NTS operations personnel offered some suggestions which Cavanagh incorporated as project lessons-learned. All of the containers met the NTS Waste Acceptance Criteria (WAC) and were unloaded and released back to the ANL project.

TRANSPORTATION

Throughout all phases of the project, Cavanagh instituted continuous improvement initiatives which resulted in several efficiency and safety gains. One of the most notable efficiency gains was the generation of manifests and shipping documents days ahead of the scheduled ship date. This significantly decreased the amount of time the trucks were idle at the ANL project site. Project Managers from Cavanagh's corporate office visited the site on a routine basis to review process flows and to perform onsite time studies. The improvements developed were incorporated into the project procedures and implemented, resulting in increased productivity and safety of the project.

Cavanagh was also responsible for providing roundtrip truck transportation from the project site to NTS and back. In addition to transportation, Cavanagh provided an onsite DOT-certified shipper broker and experienced scheduler. Once the packages were filled, Cavanagh's shipper prepared the on-site shipping documents and waste manifests. Cavanagh's shipper was also responsible for inspections and reviews to ensure compliance with DOT regulations, DOE Orders, and Transportation Safety Basis. Prior to transport Cavanagh's DOT-certified shipper applied the appropriate placarding and labeling to the packages and trucks for shipment.

Shipping multiple trucks per day to NTS posed several challenges that the project team was able to identify and address early in an effort to prevent a negative impact to the project success. With both ANL and NTS only operating on a four day work week and the one-way travel time of 3 to 4 days from project site to the disposal facility, scheduling the arrival of trucks into NTS became a critical piece of the project schedule strategy.



Figure 5: Shipment Verification

Due to the aggressive shipping schedule of up to seven trucks per day, no single carrier could provide the total volume of trucks and drivers required for all of the shipments. As a result, Cavanagh contracted with multiple carriers. With support from the carriers, Cavanagh developed an innovative approach to scheduling inbound trucks to the NTS. This was accomplished by using several secured temporary storage yards in various locations between ANL and NTS. Cavanagh was able to manage the multiple carriers and the scheduled departure and arrival times with greater accuracy.

As identified above, Cavanagh had an experienced scheduler in place who communicated with the drivers to coordinate arrival times to minimize delays for both the drivers and the ANL. The Cavanagh scheduler coordinated the incoming and outgoing trucks to ensure that the aggressive shipping schedule was maintained without unnecessary delays which also decreased the project cost by decreasing trucking demurrage. This required working with both the ANL project personnel as well as the NTS receiving department. The scheduler also performed very detailed inspections of the loaded transport to ensure compliance with the NTS WAC was met.

NTS DISPOSAL FACILITY

The Building 330 D&D contract from ANL required the disposal of waste at NTS for the project. Prior to project start-up ANL underwent the NTS WAC Implementation Crosswalk. This crosswalk required detailed documentation demonstrating the implementation of the NTS WAC into the ANL project programs. Cavanagh provided personnel with NTS WAC experience onsite and detailed project plans in support of this vital crosswalk. Cavanagh's on-site support and expertise was instrumental in obtaining the waste program certificate required in order to ship to NTS.

As part of the NTS crosswalk mentioned above, the project was authorized by NTS to ship large metal debris in intermodal containers to the disposal facility to be

emptied and returned for reuse. The return of emptied containers from NTS for reuse by the project is rarely accepted by NTS. Cavanagh transported and delivered over twelve thousand tons of debris to NTS disposal facility in the first six months consisting of over 600 truck conveyances using this packaging method.

ADDITIONAL SCOPE

Cavanagh prepared a broad scope of documents including a project-specific Transportation Plan outlining a detailed approach including loading operations and safety measures, conveyance type, transportation, routes, roles and responsibilities of project personnel, lines of communication, and package inspections. Cavanagh also prepared a Load Securement Plan to outline the safe and compliant approach to securing the loaded waste packages to the conveyance for transport. All plans and procedures were developed in compliance with DOE, DOT, EPA, state, and local hazardous waste regulations and requirements.

During the initial start up of the shipping campaign, the DOE performed a Transportation Compliance Assessment Program (TCAP) audit of ANL. This unexpected audit incorporated all hazardous shipping activities from the ANL site including the building 330 project. As a result, the TCAP reviewed all details of the transportation procedures and processes developed by Cavanagh for the project. The TCAP audit had no findings associated with the project.

SUMMARY

The packaging and transportation, in support of the demolition and disposal for Building 330, began in April of 2010 and was completed in January 2011 with the total number of packages and on-highway trucks exceeding 1,250 and 600+ respectively. The complex logistics, varying package types and expedited shipping schedule combined for a challenging project.

The key successes of this packaging and shipping campaign were the uniqueness of the single point lift bulk bags, gaining approval from the NTS to ship waste in reusable, roll-on/roll-off intermodal containers and the innovative scheduling strategy to control the truck arrival and departure times at ANL and NTS.

The packaging and transportation of hazardous materials for disposition from ANL building 330 D&D required an aggressive packaging and shipping campaign of up to 70 packages and 35 trucks per week. A total of 600+ DOT compliant truck loads of waste was packaged and delivered from ANL to NTS. All packages were delivered and accepted under the NTS WAC using an NTS approved waste certification program developed at the beginning of the project. Over the course of the project, Cavanagh on-site personnel worked for over 3,000 total man-hours without a safety incident meeting the project safety goals. The project was successfully accomplished without incident, on schedule and within budget.

References

1. DOE Nevada Test Site Waste Acceptance Criteria
2. RFP #AF61-p-00409-00 for Argonne Building 330 D&D
3. Department of Transportation Reg Guides