Simple Waste Solutions for Complex Facilities – 12433

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ABSTRACT

The buildings in the 300 Area, including several Category 3 nuclear facilities are undergoing deactivation, decommissioning, decontamination and demolition (D4) by Washington Closure Hanford (WCH) as part of the River Corridor Closure Contract (RCCC). The D4 process has generated a wide variety of low-level radioactive and low-level radioactive mixed waste as well as TRU. The Hanford Site-wide Transportation Safety Document (TSD) has been successfully utilized to transport waste streams that otherwise would not be able to be shipped. The TSD accomplished this by establishing a comprehensive set of onsite transportation and packaging performance standards and risk-based standards. The requirements and standards presented are equivalent to DOT and NRC standards (10 CFR 71)

INTRODUCTION

The 300 Area of the Department of Energy (DOE) Hanford Site played a key role in reactor material and fuel research programs. The operational history of the 300 Area and its facilities varied greatly. In addition to housing the Hanford Site fuel fabrication plants, the 300 Area was the center of much of the sites R&D projects. In connection with these activities, chemical process laboratories, test reactors, and numerous ancillary support structures were constructed. The addition of new research and laboratory facilities continued into the 1950s and 1960s to support defense and energy research. New support and laboratory facilities were added in the 1970s for further research on energy, waste management, biological sciences, and environmental sciences.

The buildings in the 300 Area, including several Category 3 nuclear facilities are undergoing deactivation, decommissioning, decontamination and demolition (D4) by Washington Closure Hanford (WCH) as part of the River Corridor Closure Contract (RCCC). The D4 process has generated a wide variety of low-level radioactive and low-level radioactive mixed waste as well as TRU.

The majority of the demolition debris characterized as low-level radioactive mixed waste failed for D008 lead and requires treatment prior to disposal at ERDF. Previously, the standard treatment applied to the debris is macro encapsulation using a flowable grout mixture at ERDF. In the design phase of hot cell disposal the concept of using PolyUrea for macro encapsulation was researched and proposed to the onsite EPA Representative. Since then, poly-urea has been successfully used for macro encapsulation of low-level radioactive mixed waste debris and was specifically used to macro encapsulate the large hot cells removed from Building 327.

Demolition debris is packaged into steel roll-off containers and transported to ERDF for disposal. The debris is typically classified as Low Specific Activity (LSA) I or LSA II material and to a lesser degree transported as Surface Contaminated Object (SCO) I or SCO-II. These waste shipments are performed as US DOT compliant shipments. At times these large items such as hot cells and tanks are shipped to ERDF intact for disposal. These items are typically shipped under special packaging authorization as directed by the Hanford Site-wide Transportation Safety Document (TSD). For example the 327 Hot Cells were packaged inside IP-1 certified soft sided liners and shipped under the TSD.

DISCUSSION

The Building 327 Dry Storage Carousel and the Building 308 Glove Boxes are examples of unique wastes generated during the 300 Area demolition activities.

Building 327 Dry Storage Carousel

The 327 Facility consisted of specially equipped, shielded, and ventilated Hot Cells and laboratories designed for physical and metallurgical examination and testing of irradiated fuels, concentrated fission products, and irradiated structural and testing of irradiated fuel, concentrated fission products, and irradiated structural materials. The Dry Storage Carousel was one of these specially equipped, shielded, and ventilated storage units. It was designed for the storage of small samples that had been processed but may have required further examination. The Dry Storage Carousel is a steel-lined, reinforced concrete tank. Inside the concrete tank is a five-shelf lazy susan. The shelves were positioned by mechanical linkage, a position-indicating device attached to the mechanical linkage

Based on process knowledge and characterization data the Dry Storage Carousel was assigned as characteristic for lead and required macro-encapsulation prior to be disposed at the Environmental Restoration Disposal Facility (ERDF). Poly-urea was applied to the exterior of the Dry Storage Carousel meeting the specification of macro-encapsulation. Poly urea is an elastomeric coating that has several unique properties. Poly urea is a durable coating for macro-encapsulation due to its tensile strength, elongation, and resistance to tears, punctures, and chemicals. When used as a macro-encapsulation coating, poly urea can be applied over steel, geotextile fabric, concrete, wood, fiberglass, and masonry. Poly urea chemically binds to itself producing a seamless membrane after being applied to a surface. Given that frequent failures of coatings are at the seams, the fact that poly urea has no seams significantly reduces the potential for coating failures. As a coating, poly urea is completely waterproof and can be used above or below ground and in fresh water or salt water, regardless of depth. In addition, it is resistant to many solvents, acids, and other corrosive compounds. As a result, poly urea will resist the harsh chemical environment that can form in landfills due to water infiltration and the corrosive chemicals that can form as a

result of degradation of organic based materials in the landfill. It is also very durable and abrasion resistant and is flexible and can stretch substantially after curing.

The Dry Storage Carousel weighed an estimated 102,332 kg and occupied a volume of approximately 42 m^3. The calculated residual radionuclide inventory contained inside the Dry Storage Carousel is 10 Ci representing an effective A_2 of 19.2. The radiological inventory requires the use of a Type B package. Therefore the Dry Storage Carousel was packaged and transported under the Hanford Site-wide Transportation Safety Document (TSD). The TSD addresses onsite "equivalent safety" by establishing a comprehensive set of onsite transportation and packaging performance standards and risk-based standards. The requirements and standards presented are equivalent to DOT and NRC standards (10 CFR 71) currently used for commercial offsite transportation. Hanford Site standards, however, are developed to be reflective of the unique transport environment within Hanford Site boundaries. Hanford Site restricted roadways, fenced facilities, Hanford Patrol inspection points, and barricades, as well as weather and physical location, shape Hanford's unique transportation environment. Additionally, Hanford Site contractors retain control over all onsite shipments, provide enhanced worker training, and possess unique site emergency preparedness and response capability that influence safety across the Hanford Site.

The TSD provides special packaging authorization (SPA) for various waste types and payloads. The Dry Storage Carousel was package and shipped under the TSD Mono SPA. The packaging requirements were to place the Dry Storage Carousel inside two IP-1 packages. This was accomplished by using two Soft-Sided IP-1 packages. The package was then transported to ERDF at 5 mile per hour utilizing a rolling road closure.

Building 308 Glove Boxes

Fifty-one glove boxes in the 308 Building were assayed for residual plutonium holdup quantity using non-destructive assay (NDA) methods during the period of August 1991 to January 1992. Two different gamma ray measurement systems were utilized during the assays. A low-resolution, high efficiency sodium iodide (NaI) detector based system was used for the majority of the assays. A high-resolution, low efficiency high purity germanium detector based system was used in instances where Cs-137 was detected. Both detectors were collimated to exclude background gamma ray sources as much as possible. For most items assayed the residual plutonium quantities were at or below the detection limit (0.2 to 0.3 gram per lineal foot) for the instruments. Geometric uncertainties associated with the precise location of the plutonium within the glove boxes were cause for reporting the NDA results as best, low, and high values. The best value was considered the best estimate of the holdup quantity for the available technology at the time the NDA was performed. The actual plutonium content was most likely between the low and high values.

The contamination on the internal surfaces of the glove boxes was rendered immobile by applying an approved fixative. The exterior surfaces of the glove boxes were wiped

down to reduce removable contamination to levels that are as low as reasonably achievable. The glove boxes were then wrapped with multiple layers of 10-mil low density polyethylene (LDPE). The seams of the LDPE were overlapped and sealed using cargo tape to minimize the potential for the spread of contamination. Sufficient tape was used to seal all seams and to take up any slack in the LDPE. Softeners were used where any straps or restraints contacted the plastic.

The glove boxes were shipped to Perma-Fix Northwest (PFWN) for size reduction and repackaging into WIPP standard waste boxes (SWBs). Since each glove box contained an estimated radiological inventory greater than an A_2 the TSD was utilized to ship the glove boxes to the PFWN facility.

REFERNCES

DOE 2011, Hanford Sitewide Transportation Safety Document, DOE/RI-2001-36, Revision 1-E, May 2011