SAMPLING, SURVEY, AND FREE RELEASE OF URANIUM CONTAMINATED COPPER

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ABSTRACT

Alaron Corporation is a processor of radioactive scrap metals, contracted in 1998 to recycle approximately 192,000 lbs of uranium contaminated granulated copper from a Department of Energy facility. The contaminated granulated copper was also suspected to have residual asbestos contamination. Alaron Corporation developed a methodology to sample, survey and free release this copper using statistical sampling and survey techniques. The same statistical approach was also applied to determination if the material met the definition of Asbestos Containing Material (ACM) as defined by the State of Pennsylvania. The statistical sampling methodology was approved by the customer and the copper was successfully free released. All free released granulated copper was then sold at prevailing scrap prices to a scrap metal recycler for eventual return to commercial applications.

COPPER PROJECT SUMMARY

Per Fluor Daniel Fernald (FDF) BOA# 97WB003276, Task Order# 1, ALARON shipped 199 steel drums of granulated copper over-packaged in 29 steel boxes on 6 flat-bed trucks from the Fernald Environmental Management Project (FEMP) to ALARON's Wampum, Pennsylvania facility between August 18 to August 21, 1998. ALARON unpacked the 29 steel boxes, surveyed them and returned them empty to FDF in two truck shipments September 15 and 16, 1998. ALARON confirmed that the copper was not asbestos containing material by sampling conducted September 2 and 3, 1998. Between September 15, 1998 and October 5, 1998 ALARON conducted radiological surveys of the copper and the emptied drums for unrestricted use. A gross weight of 223,690 pounds of material was received (containers and copper), of which 191,618 was the granulated copper. All of the copper weight received was successfully released for unrestricted use and recycled by Alaron on the scrap copper metal market. Nearly half of the empty drums (88) had internal contamination in excess of ALARON's release criteria (apparently from prior use) and were deemed tertiary waste and packaged for disposal as ALARON radioactive waste. The remaining empty drums were released for unrestricted use.

Estimated ionizing radiation exposure associated with this project was less than 10 millirem total (internal and external). There were no occupational illnesses or injuries associated with this project. The documentation for this project (exclusive of this report) weighs 26 pounds.

BACKGROUND

Scrap copper motor windings accumulated during upgrades of large motors from DOE's Gaseous Diffusion Plants in the 1970% were transferred to the Fernald for decontamination and recycle testing that began in 1980 and concluded in 1981. More than 1500 tons of the copper motor wiring was stored at the Fernald site for this project. Contamination on the copper wiring was identified as uranium, ranging in enrichment from depleted, up to less than 2%, and the presence of asbestos was suspected but not fully quantified. The testing which began in 1980 focused on granulation and air separation (to separate insulation from the copper) and, melting and casting into ingots for eventual reuse within the DOE.

In 1981, the equipment used for the granulation/air separation was upgraded to improve on the removal of insulation material from granulated copper during the air separation stage. This improvement resulted in the decrease of insulation "fluff' in the copper from approximately 3% to less than 0.5% by weight. Subsequently, an additional 192,000 lbs of copper wiring was granulated and air separated in preparation for melt and casting into ingots.Testing was terminated prior to this 192,000 lbs of copper being cast into ingots. The granulated copper was packaged into 30 gallon drums and stored at the Fernald site.

In March of 1998, Fluor Daniel Fernald awarded a contract to Alaron Corporation to take receipt of this granulated copper and complete processing for unrestricted release and recycle.

SCOPE

The Scope of Work for this project involved the transfer of custody, transportation from Fernald of 29 B-25 type boxes loaded with 30 gallon drums of granulated copper, receipt at ALARON's facility, interim storage, processing for recycle, and return of primary and secondary wastes to Fernald for disposal at Nevada Test Site (NTS). Since sampling data received from FDF provided strong indication that all of the radiological contamination and any potential asbestos was contained within the air separated insulation "fluff", Alaron's proposed approach to complete processing would include only surveying of the granulated copper for verification that cross contamination to the copper did not occur and release, no additional processing was anticipated to be necessary.

ALARON provided a qualified transportation broker to the Fernald site to inspect shipments, prepare shipping documentation, and ship the copper. Each shipment of copper was received at ALARON's Northeast Regional Services Facility (NRSF), inspected and off loaded, and staged in an area dedicated for FDF copper storage. Once all shipments were received, processing for recycle commenced.

Boxes of drummed copper were processed in a dedicated processing area. Control was maintained over this project so to ensure that co-mingling with other generator's wastes did not occur. Processing of copper consisted primarily of radiological surveying for free release of each drum of copper. Initially, samples were collected from the granulated copper for the purpose of verifying earlier sample results retrieved by Fernald personnel that asbestos was present in quantities less than action limits for an asbestos monitoring program to be required during radiological surveying for release. Free released copper was sold to a local scrap metal recycler for commercial reuse. ALARON retained all of the scrap resale value.

OPERATING PROCEDURES

The over-all governing document for this project was ALARON plan PL-AR-0898-031, "FDF Granulated Copper Project Work Plan". This detailed the scope of work, project management and quality oversight, applicable regulatory requirements ,inspection, transfer, and transport of granulated copper, receipt of shipments at Wampum, material processing method, surveying material for unrestricted release, material storage and tracking, waste management and transport, records and reports, index of existing applicable procedures and schedule for submittal of non-existing procedures. Included as appendices A through E to this plan were: ALARON's Health and Safety Plan, RSF-IH-303, ALARON health physics procedure RSF-HP-08, "Radioactive Material Shipment", ALARON quality assurance procedure RSF-QA-110"Fluor Daniel Fernald (FDF) Metals Recycling Quality Assurance Project Plan", ALARON work instruction WI-RSF-0698-036, "Sampling of Copper Granules for Asbestos Analysis" and a residuals management plan.

FDF QUALITY ASSURANCE PRE-WORK AUDIT

July 21, 1998 FDF conducted a pre-work audit at ALARON's Wampum facility. During this audit, FDF identified a desire to have the person who conducts asbestos sampling at Wampum trained as an asbestos building inspector per Environmental Protection Agency requirements. FDF also indicated that a sample of the granulated copper in question had been analyzed for total uranium (2.2 parts per million total uranium in copper) and uranium-235 enrichment (1.029 weight percent U-235). This enrichment would indicate a specific activity of 795,000 pico-curies uranium per gram of uranium. Taking this as indicative of the entire lot of 192,000 pounds of copper, the total Special Nuclear Material (SNM) is 1.9 grams of U-235 and the total activity is 150 microcuries of uranium. At this concentration and activity, the shipments were not required to be regulated by the U.S. Department of Transportation for radioactive material.

SHIPMENT FROM FERNALD TO ALARON

An ALARON shipping broker traveled to Fernald site August 17, 1998 and remained there until August 20, 1998 to ensure that the 29 boxes were properly loaded, blocked, braced and tied down. He provided pre-cut lumber for blocking and bracing and prepared bills of lading for each of the loads per RSF-HP-08. Tri-State motor transit, acting as subcontractor for ALARON, carried the loads to Wampum. The shipping schedule skipped August 18 because one of the TriState drivers scheduled for pick-up on August 18 was delayed. Tri-State caught up with the schedule because one tractor had a driver team that was able to pick up three loads. Details are as follow.

Outgoing Shipment Number	Date Shipped	Number of Boxes	Gross Weight (pounds)	SNM (g)	Date Received	Incoming Shipment Number	ALARON Gross Weight
98-RDM-001	08/17/98	5	34,622	1	08/18/98	98-043	34,560
98-RDM-002	08/17/98	5	38,410	2	08/18/98	98-044	38,500
98-RDM-003	08/19/98	5	39,638	2	08/20/98	98-046	39,640
98-RDM-004	08/19/98	5	39,334	2	08/19/98	98-045	39,300
98-RDM-005	08/20/98	4	31,888	1	08/21/98	98-048	31,900
98-RDM-006	08/20/98	5	39,788	2	08/21/98	98-047	39,790
Totals		29	223,680	10			223,690

Note that the SNM amount reported on the NRC form 741 nuclear material transaction reports from FDF is more than five times the actual amount based on FDF's analysis results. Note also that if FDF had used actual data for 741 data (rather than inputting an internal FDF procedure minimum U concentration) all the packages would have been less than 0.1 grams SNM per package and less than 0.4 grams per shipment and no 741's would have been required.

MASS BALANCE AND THROUGHPUT		
Description	**Weight (lbs)**	**Average Throughput Rate**
Total gross weight received	223,690	14,913 lbs per shift
Box weight (29) returned to FDF	24,392	
125 Empty drums free released	4,600	
88 Contaminated drums processed as tertiary waste	3,080	
Secondary and copper waste	0	
Free released copper	191,618	

Radiological survey for free release began on September 15 and concluded on October 5. There was one shift operating on a five day, ten hour schedule. A total of fifteen shifts were worked to complete this project.

RECEIPT AT ALARON

As the shipments were received at Wampum between August 18 to August 21, 1998, the steel boxes containing the copper were treated as though they were radioactive and unloaded, inspected, surveyed for external dose and contamination levels and weighed per RSF-HP-03. All the boxes were less than ALARON unrestricted area removable contamination levels (1000 dpm/100 cm^2 and 100 dpm/100 cm^2) on external surfaces. The individual boxes were tagged and entered in inventory per RSF-HP-13 and stored in a dedicated FDF storage area (inside the F1 building west of the instrument room in bays 4, 5, 6 and 7).

TRAINING ON WORK PLAN

August 24, 1998, ALARON facility manager and president conducted all-hands training for the FDF copper project. Using the FDF Granulated Copper Project Workplan, plan PL-AR-0898-031 (approved and issued August 24, 1998) as an outline, he described the copper project and explained individual work assignments and responsibilities under the plan.

UNLOADING COPPER SHIPPING CONTAINERS

Between August 26 to August 28, 1998 the steel boxes were opened and the steel drums within were individually removed from their box, surveyed for external dose and contamination levels and weighed. All the drums were less than ALARON unrestricted area removable contamination levels on external surfaces. As the boxes were emptied, each box was surveyed internally (all the boxes were less than ALARON unrestricted area removable contamination levels internally), its lid was replaced and the empty, closed box was removed to a designated FDF empty container storage area and treated as non-radioactive.

Each of the 199 individual drums was tagged and inventoried to enable tracking to both its specific incoming shipment and to a specific steel box and stored in the inside FDF storage area. Fourteen of these drums were over packed in 55 gallon steel drums. Each of these over packs were opened and the inside 30 gallon drum was removed, surveyed and relabeled and tagged to

correspond to the inventory number of its over pack. The empty 55 gallon drums were retained in the inside FDF storage area for separate survey for unrestricted use later.

ASBESTOS SURVEYS

Prior to work on bulk granulated copper, asbestos sampling was conducted to verify that an asbestos hazard did not exist. The work plan originally specified a composite sample from 12 drums randomly chosen. To get better statistics, the top half and bottom half of each drum was considered a prospective sample location, and 10% of these locations were sampled. Each sample location was assigned a random number between 0 and 9; the locations with a number 5 (40 locations from 39 separate drums) were chosen for sampling. All asbestos samples collected were surveyed and met ALARON criteria for release for unrestricted use before shipping to UEC for asbestos analysis.

An initial one liter (about 10 pounds) sample was collected for a scoping study by UEC (the AIHA-certified industrial hygiene laboratory doing the asbestos analysis) August 31, 1998. After the scoping study was analyzed UEC indicated that a one pound sample size was sufficient. An additional 40 samples were collected from September 1 and 2. The worker retrieving samples wore a breathing zone air sampler to collect airborne-asbestos exposure data. UEC's report dated September 10, 1998 indicated all the bulk copper samples submitted for asbestos analysis were less than 0.1% asbestos. As part of their analysis, UEC also determined the non-copper fraction of the samples submitted (range <0.1% to 3%, mean 0.4% non-copper by weight). Airborne asbestos analysis results indicated less than 0.01 fibers per cubic centimeter.

SURVEY AND RETURN OF EMPTY BOXES

As the boxes were emptied of the drums containing copper, each box was surveyed internally (all the boxes were less than ALARON unrestricted area removable contamination levels internally), its lid was replaced and the empty, closed box was removed to a designated FDF empty container storage area and treated as non-radioactive. These surveys took place between September 1 and September 9. The boxes were shipped September 15 and 16, 1998 (Tri-State Motor Transit was the carrier) in two non-radioactive loads back to FDF (FDF had requested that these containers be returned for reuse).

RADIOLOGICAL SURVEYS FOR UNRESTRICTED RELEASE

Once asbestos analysis results were received, sampling of the shredded copper and surveys for release for unrestricted use began. A project specific acceptance sampling/survey plan was prepared to specify survey methods for statistical sampling and surface survey for release of the copper. Sample survey activities were conducted in accordance with Alaron's existing procedure for survey and release of surface decontaminated materials. By this plan, three (1) litre samples would be retreived from each drum and surveyed over 100% of their surface area. In addition to the surveys required in the acceptance sampling/survey plan, gamma spectroscopy was performed on all the samples for isotopic verification. If all three samples were deemed radiologically "clean", the samples would be returned to their respective drums and the entire

contents free released for recycle. This approach eliminated the time consuming and expensive approach of surveying 100% of the drum's contents prior to free release.

During the survey process, 88 thirty-gallon drums were identified as internally contaminated. These drums seemed to be recycled bung-type (closed top drums) with the top cut out and fitted with a removable lid and locking ring. They all showed evidence of corrosion on the inside wall and bottom. Out of concern that this contamination might transfer to the shredded copper during the dumping, several of the most highly contaminated drums were emptied into a clean drum and the dumped copper was resampled and resurveyed. No transfer of contamination was detected and the copper was returned to free release.

QUALITY ASSURANCE AUDITS

Throughout the project, management conducted evaluations to ensure compliance with the work plan. Ten percent of the copper samples surveyed were subjected to an independent, second-person over-check of the survey.

DISPOSITION OF EMPTY DRUMS

As empty drums accumulated, the clean drums were surveyed for unrestricted use.These drums were each given a 100% survey, as described in RSF-HP-09 and dispositioned as clean scrap steel (each of the 30 gallon drums had two holes in the side from sampling). Contaminated drums were segregated as they were emptied and stored in a radioactive materials area. The contaminated drums were processed as part of ALARON's tertiary waste. These drums are being used as pre-compaction containers for other ALARON dry compactable waste streams and compacted with the drum lids on. The resulting puck meets the size acceptance criteria for disposal at Envirocare and places compactable waste in a convenient form.