DECOMMISSIONING OF DIVISION OF MILITARY
APPLICATION EQUIPMENT
AT HANFORD

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Research and Engineering Division

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ATLANTIC RICHFIELD HANFORD COMPANY
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ABSTRACT

This report describes the successful decommissioning of plutonium-contaminated equipment used for weapon component fabrication and inspection at the U. S. Energy Research and Development Administration Hanford Plant in Washington state. Special materials, techniques, and equipment were employed during the course of the decommissioning program. Most significant was the development and design of large, double-wall fiberglassed plywood boxes for long-term (20-years, minimum) retrievable storage of the contaminated equipment in underground transuranic waste trenches.

DECOMMISSIONING OF DIVISION OF MILITARY EQUIPMENT AT HANFORD

INTRODUCTION

The Division of Military Application (DMA) decommissioning program at Hanford was authorized through the U. S. Energy Research and Development Administration Albuquerque Operation Office (ERDA-AL) on November 12, 1973. The program was directed by the Richland Operations Office (RL) with management by Atlantic Richfield Hanford Company, utilizing the onsite architect engineer (A-E) and cost plus fixed fee (CPFF) construction service contractors. The DMA equipment and support facilities required for the RL production (KK) programs were retained and transferred to that account.

This report summarizes the results of the program with the details of the scope of work, responsibilities and removal techniques delineated for possible application to other related ERDA programs being considered for the future.

OBJECTIVES

The scope of the decommissioning program provided for the following objectives:

- Removal of all Division of Military Application (DH) fabrication and inspection held in standby status in the 234-5 Z Building.
- Disposition of all contaminated equipment and materials removed by packaging for safe 20-year retrievable storage.
- Reclamation of salvageable materials and equipment for use onsite by other ERDA contractors.
- Restoration of cleared-out areas for other planned Richland Operations Office programs.

SUMMARY

Decommissioning of the DMA standby equipment and facilities was completed, with minor exceptions, on May 25, 1976, and within the estimated cost. The physical work was completed over a 24-month period at final cost of \$2,134,137.

The majority of the plutonium-contaminated equipment was loaded into special Hanford developed fiberglass-reinforced polyester (FRP) plywood boxes for 20-year retrievable storage in a separate, earthen transuranic, waste trench. Lead shielding, instrumentation, and mechanical equipment with an acquisition value of \$120,000, was salvaged and transferred to the Battelle-Northwest (BNW) central equipment pool for onsite use by other ERDA-RL contractors. A total of 61 boxes of varied size and type, with a gross volume of 78,781 cubic feet, a net weight of 328,950 pounds, and containing 5,591 grams of residual plutonium were transferred to the special DMA trench for 20-year retrievable storage. The total does not include seven boxes of equipment from the 234-5 Z Building development laboratory which had been used in technological support of the weapons production program at Hanford. The cleared out areas, after decontamination, painting, and renovation, are being utilized for other ERDA-RL sponsored research and development programs.

HISTORY

The DMA equipment and facilities, located in the 234-5 Z Building at Hanford, were used from 1949 to 1965 for the fabrication, inspection, and packaging for offsite shipment of plutonium weapons components. The DMA equipment occupied approximately two-thirds of the available production floor space. The facilities consisted of two separate production lines (RMA and RMC) each equipped with a central conveyor system tied into glove boxes with capability for casting, ingoting, machining, briquetting, shearforming, phase stabilization, product inspection, radiography, storage, packaging and loadout. From 1965, the majority of equipment was on standby status, although tied into the building services for safety and contamination control. Some of the inspection equipment was transferred to other contractors onsite and certain equipment retained in support of ongoing plutonium production (KK) programs. The cost of continued surveillance, services, and monitoring of the remaining facilities, along with gradual deterioration of glove box gloves and contamination control (plastic) barriers, led to the ERDA decision to remove and package the inactive equipment for safe, retrievable underground storage.

Atlantic Richfield Hanford Company (ARHCO), a prime contractor at Hanford, was assigned management responsibility for planning and execution of the DMA decommissioning program.

DISCUSSION

Work Authorization

Various discussions were held between ERDA-RL and ARHCO from 1970 to 1973, on several proposed alternates for disposal of the inactive DMA

facilities. Two cases considered for preliminary engineering studies were:

- Continuation of in-place storage until special new facilities could be provided for dismantling and packaging the equipment in containers suitable for the then proposed salt mine repositories.
- Prompt removal and packaging of equipment in approved containers for 20-year retrievable storage in earthen trenches at Hanford.

The first alternative was ruled out since salt mine technology had not been fully developed, was long-term, and required a high (about \$3,000,000) capital investment. The latter case was selected as an interim solution that could be accomplished in a relatively short period of time at less than one-third the total cost of the salt mine storage alternative.

Initial funds of \$200,000 to proceed with the retrievable storage proposal were authorized to ARHCO by ERDA-RL on November 26, 1973.

Work Plan and Procedures

The initial engineering study on interim, retrievable storage that was submitted as an alternate for decommissioning of the DMA facilities was modified and expanded to include ERDA-RL directive requirements and formally issued on April 26, 1974, as the official work plan document (reference 1) for management and execution of the program. The document specified ARH-3032 (reference 2) as the official guide for handling and storage of radioactive waste. Special procedures, for handling and disposal of hydraulic fluid and oil for example, were prepared separately by ARHCO as required (see Appendix A).

The preparation of detailed procedures for removing individual glove boxes and associated equipment was assigned to the onsite architect-engineer contractor, Vitro Engineering Company, with technical guidance by ARHCO. These procedures, which included applicable checklists, are enumerated in references 3, 4, and 5.

Organization

Atlantic Richfield Hanford Company was assigned prime responsibility for the conduct and execution of the decommissioning program, with assistance from other onsite contractors where required. Vitro Engineering Company provided design and related services while physical demolition and removal was assigned to the onsite construction service contractor, J. A. Jones Company. Photographic and graphics services were obtained from Battelle-Northwest. An organizational chart delineating lines of communication and prime responsibilities is shown in Figure 1. See Appendix B for all figures.

Container Design

The primary design work requested of Vitro Engineering in early May, 1974, was for reliable storage containers to handle the large glove boxes and equipment without the need for dismantling and risking loss of contamination control. Because of the high cost and scarcity of steel at the time, other materials of construction were evaluated. In view of the approved use of fibreglassed, single-wall plywood boxes for containing transuranic waste at the Rocky Flats Plant, it was decided to evaluate the same basic concept for application to the Hanford design. As a result, modular, double-wall boxes of high structural integrity were developed at Hanford using pre-fabricated FRP panels manufactured by Cor-Tec Inc. and depicted in figures 2, 3, and 4. Other approved containers were utilized as conditions dictated and included Hanford steel type I and II. Rocky Flats FRP type, and 55-gallon alkyd-coated steel drums, as shown in figures 5 and 6.

Other design work by Vitro Engineering included architectural and structural additions or modification, shoring requirements to protect low-load floor areas while moving heavy equipment, and material specifications. The specification for fabrication of the FRP plywood boxes, for example, is provided in reference 6. The drawings that detail the FRP plywood boxes and lifting frame design are listed in Appendix C.

Materials and Special Equipment

Certain specialized equipment, along with routine materials required for handling potentially-contaminated equipment, were utilized in the conduct of the decommissioning program. Plastic (polyethylene and polyvinyl chloride) sheeting was employed for fabrication of temporary containment enclosures (greenhouses) for plutonium contamination control. Cloth-backed taped was used for sealing joints and packages. Special polyethylene sleeves were utilized for containment while disconnecting glove boxes from the main conveyors by the "horsetailing" technique described later.

A 50-50 mixture of diatomaceous earth (Dica-Sorb) and commercial, oil-absorbing floor sweeping compound was used for absorbing and converting contaminated oil and hydraulic fluids to a non-liquid form for containment in polyethylene-lined 55-gallon steel drums prior to boxing and transferring to the transuranic storage trench.

Demolition and Removal

Following completion of design and procurement of essential materials, along with approval of work procedures, physical removal of equipment was officially started by J. A. Jones Construction Company on May 28, 1974. A plot plan of the areas requiring equipment removal is shown in figure 7.

Work was initiated in the inspection area (room 192) since this was considered the cleanest relative to the degree of contamination inside the glove box and the amount of residual plutonium. Gauging, polishing, radiography, and storage of plutonium weapons components were the only activities performed in the area, leaving the glove boxes contaminated but relatively free of plutonium residues.

All necessary permits, covering planned work sequence with detailed instructions and guidelines, were prepared and issued prior to the start of work for safety and contamination control. This included (a) radiation work procedure (RWP), (b) fire control permit for welding and cutting, and (c) excavation and core-boring permits. These permits were supplemented with special procedures where unusual conditions or need for extra safety precautions existed. An example of this was a procedure, for the removal and transfer of the hydraulic fluid and oil from the mechanical equipment for absorption in a diatomaceous earth mixture to assure long-term containment. Other guidelines were firmed up, including limits established in the ERDA Manual Chapter 0511 for solid transuranic waste disposal of 10 nanocuries per gram activity where measurable. This was later modified to categorize any equipment or materials exceeding one (1) nanocurie per gram (where surveyable) as transuranic waste to be conservative. This was equivalent to 2,500 disintegrations per minute as read with an alpha scintillation instrument such as a portable alpha meter (PAM or Poppy). If a surface were painted or inaccessible for survey, the item was considered potentially contaminated and classified as transuranic waste.

All glove boxes and equipment were counted with a portable sodium iodide (NaI) gamma instrument to determine residual plutonium content prior to performing any physical work as pictured in Figure 8. Clean-outs were made to reduce the quantity to as low as practical value without dismantling equipment. A 500 gram maximum plutonium value was established for transuranic storage of an individual glove box. Good recoveries were obtained from several glove boxes with a final total recovery figure of approximately 3,000 grams.

Using these guides, most of the equipment and materials external to the glove box were salvaged for use by other onsite contractors. Lead shielding on glove boxes was removed for salvage, and to reduce equipment weight and containment box structural requirements. Less than one percent of the lead removed was found to be contaminated.

Removal of auxiliaries such as electrical services, piping, lead, or lead glass shielding, and instrumentation was performed initially to strip the glove box and general area to the bare minimum. Differential pressure gauges were retained to maintain and monitor glove box negative continuously. Combustible materials such as rubber gloves, plastic bags, and the like were removed from glove boxes, however, and transferred to the Z Plant Operations scrap incinerator for residual plutonium recovery.

Plastic greenhouses and sleeves for containment and "horsetailing" glove boxes from main conveyor were used extensively as shown in figure 9. All glove boxes were maintained on a one-half to one-inch water negative until physically removed. If a glove box could not be loaded into a storage box within 24 hours it was connected to auxiliary ventilation using flexible hoses as depicted in figure 10. All box loadings were made outside of the building under ideal weather conditions relative to wind and precipitation. After closure of boxes, the lid was sealed with fiberglass and resin and transported by flat-bed truck to transuranic trench.

Records and Reports

Accurate and detailed records were maintained throughout the decommissioning program for historical purposes and accountability. Special forms were prepared for (1) itemizing box loadings, (2) nondestructive assay, (3) disposal and transfers, and (4) equipment and plutonium accountability. Transuranic storage maps were maintained to show storage arrangement of boxes in transuranic trench. Examples of the forms used are shown in Appendix D. Monthly reports, providing detailed description of methods and techniques employed in decommissioning, along with tabulation of cost, plutonium accountability, and other statistical data, were prepared and issued by ARHCO. In addition, quarterly summary reports with photographs and special procedures, as well as statistical summaries were compiled by ARHCO and formally assembled and issued by ERDA-RL. The records and reports provided a chronological history and preserved significant data applicable to other planned decommissioning programs.

The quarterly reports that were issued contain all significant information and photographs relating to decommissioning procedures, techniques, and equipment. Consequently the step by step methods and detailed descriptions are not repeated in this report. The quarterly reports have been provided with ARHCO document identification numbers for reference purposes as listed in references 7, 8, and 9.

A composite speech article report (reference 10) was also prepared covering initial DMA and related decommissioning programs at Hanford for presentation at the 1975 American Nuclear Society winter meeting in San Francisco, California.

Transuranic Storage

All boxes containing the removed DMA equipment were placed in a single earthen trench that measured approximately 24 feet wide by 1,000 feet long by 13 feet deep. The trench is located in the Hanford 200 West Area burial garden 218-A-3A. The first box was located six feet from the adjacent box to permit easy recovery in five years to analyze the effects of soil on the fiberglassed plywood. All other boxes were located with a minimum spacing of one foot, except where the residual plutonium exceeded

250 grams, which necessitated three feet minimum spacing from other containers. Single wall fibreglassed plywood boxes of the Rocky Flats type were stacked two deep to reduce earth load on the bottom box.

A total of 61 boxes of various types and sizes were stored in the trench from the DMA and related weapons decommissioning programs. Additional spacing remains for storing other containers of obsolete, plutonium-contaminated equipment being removed from non-DMA laboratory and process areas in the 234-5Z Building. A tabulation of all DMA boxes transferred to transuranic storage, along with a residual plutonium content, volume, and weight is provided in figure 11.

Cost Summary

The total cost for the decommissioning program was \$2,134,317 compared to \$1,960,000 estimated at the start of the program. Rescoping of the program in 1975 to include additional equipment and conveyor line removals increased the original estimated cost by \$200,000 which was approved and budgeted. This work was completed at a lower cost to provide a net underrun of approximately \$25,000, not including the estimated \$120,000 value in salvaged equipment and materials.

A tabulation of costs by quarters and participants is provided in figures 12 and 13.

Facility As-Built

The service for detailed as-building of the decommissioned areas was provided jointly by Vitro and ARHCO design personnel. The as-built work was performed over a five month period at a cost of \$44,317. In total, 1,661 drawings were reviewed, 1,338 drawings voided, and 239 drawings revised. No attempt was made to as-build remaining existing facilities in the affected areas, such as duct level ventilation. Only those portions affected by the DMA removal work were as-built to the point of removal. If a portion of an electrical control or ventilation system were removed, that portion was delineated on drawings by cross-hatching or ruling out. An area arrangement plan of the facility with equipment removed and relocated is shown in figure 14 for comparison with facility at start of program as shown in figure 7.

REFERENCES

1. ARH-3079, April 26, 1974, H. E. Johnson, "Work Plan For Removal of Division of Military Equipment 234-5Z Building"
2. ARH-3032, April 29, 1976, J. E. Anderson, "Specifications and Standards for the Packaging, Storage and Disposal of Richland Operations Solid Wastes"
3. Vitro-R-286, June 1976, H. E. Adkins and H. C. Stahl, "Sequence and Check Sheets for the Division of Military Application (DMA) Equipment Removal from 234-5Z Building, HI Line Equipment"
4. Vitro-R-297, July 1974, H. E. Adkins and H. C. Stahl, "Sequence and Check Sheets for the Division of Military Application (DMA) Equipment Removal from 234-5Z Building, HA Line Equipment"
5. Vitro-R-311, December 1976, H. E. Adkins and H. C. Stahl, "Sequence and Check Sheets for the Division of Military Application (DMA) Equipment Removal from 234-5Z Building, HC Line Equipment"
6. CE-0948-PI, Revision 3, January 19, 1976, Vitro Engineering Corporation, "Procurement Specification for Fiberglass Reinforced Plastic (FRP) Plywood Retrievable Container Modules"
7. ARH-R-169 4Q, June 1974, Energy Research and Development Administration, "Quarterly Report - Decommissioning of Military Application Equipment at Richland Operations Office"
8. ARH-R-170 1Q-4Q, September 1974, December 1974, March 1975, and June 1975, Energy Research and Development Administration, "Quarterly Report - Decommissioning of Military Application Equipment at Richland Operations Office"
9. ARH-R-215 1Q-3Q, September 1975, December 1975, and March 1976, Energy Research and Development Administration, "Quarterly Report - Decommissioning of Military Application Equipment at Richland Operations Office"
10. ARH-SA-223, May 1975, M. N. Raile, "Demolition and Removal of Plutonium-Contaminated Facilities at Hanford"

ACKNOWLEDGEMENT

The author wishes to acknowledge the assistance of Mr. D. W. Corbell of ARHCO in providing necessary tracking and liaison in identifying and completing record forms necessary for equipment and plutonium accountability, and to Mr. W. (Bill) Mailleaux of J. A. Jones Construction Company for his personal interest in directing construction activities along with providing timely suggestions and recommendations for improved and safer methods in the execution of the demolition and removal work.

APPENDIX

Appendix A - Unique Procedure No. 74-7-2

Appendix B - List of Figures (B-1 - B-14)

Appendix C - FRP Box Drawing List

Appendix D - Miscellaneous Forms (D-1 - D-5)

Plutonium Processing Unique Procedure

Unique Procedure No. 74-7-2

TRANSFERRING HYDRAULIC FLUID AND OILGeneral

This procedure provides for transferring of radioactive hydraulic fluid and oil to 55-gallon drums for disposal. The liquids to be disposed of are those associated with the Division of Military Application (DMA) equipment to be removed from the 234-5 Building. Reservoirs to be transferred are listed in table 1. Fluids, not requiring transuranic burial, may be disposed of using 30-gallon drums or any other suitable metal container.

Safety

Plutonium contamination is one of the anticipated hazards. Care must be taken to prevent the spread of contamination.

The fluids themselves present two possible hazards. Some of the liquids are flammable, and appropriate precautions should be observed when handling them. Spillage may cause slippery floors, as well as possible spread of contamination, and should be avoided.

Site preparation should be designed and carried out to allow safe and efficient operation. Appropriate preparation of the area is left to the discretion of supervision in charge of transfer operation.

NOTE: ARH-3032 sets limits on plutonium content and activity of materials to be buried at the transuranic burial site, in accordance with 20-year retrieval criteria. No more than 200 grams of plutonium may be buried in a 55-gallon drum. Laboratory results should therefore be received and evaluated before the fluids are transferred to the drum. The quantity of plutonium to be transferred to the drum should be estimated and verified as being less than 200 grams before proceeding with the transfer.

Fluids of the same type may be mixed in the drums. However, care must be taken to note total plutonium transferred to any one drum.

Accurate records of all transfers must be maintained. A data sheet is provided with this procedure.

Procedure

1. Prepare area for transfer as supervision directs. Use absorbent paper to soak up any spills.
2. Obtain 55-gallon drum for liquid transfer. Inspect drum protective coating to insure integrity. A standard plastic drum liner should also be utilized.

Plutonium Processing Unique Procedure

Unique Procedure No. 74-7-2

3. Use vacuum pump and standard 3-liter bottle provided by project engineer. Do not transfer any fluid until plutonium content has been determined and transfer approved.
4. Determine whether fluid addition plug or reservoir vent plug is more accessible for fluid transfer. Transfer fluid from most convenient location.
5. Obtain pipefitter's assistance in removing plug.
6. Secure pump and transfer bottle in place.
7. Fill drum approximately one-third full on a well-mixed 50-50 mixture of commercial oil-absorbing floorsweeping compound and Grefco Inc. Dicasorb, John's-Mansville Microcell-E, or approved equal.
8. Transfer fluid into bottle, avoiding spillage. Do Not Overfill.
9. Empty bottle onto the absorbent mixture in the 55-gallon drum by pouring the fluid evenly over the surface of the mixture. Avoid liquid pooling in the drum by mixing with a stirring rod that can be disposed of.
10. Record the volume of liquid transferred to the drum each time.
11. Continue in like manner until about 8 gallons have been transferred, or until the liquid is not readily absorbed by the absorbent mixture. Be sure to limit transfers to less than 200 grams plutonium equivalent.
12. Add another layer of absorbent mixture to the drum and repeat steps 8-11.
13. Continue until drum is filled to within 3 inches of the top, or as supervision directs.
14. Seal drum liner and drum lid.
15. Label drum. Check supervisor for correct identification.
16. Record total volume of liquids transferred to the drum and plutonium content.
17. Remove vacuum pump and transfer bottle from secured position.
18. Replace reservoir plug. Obtain pipefitter's assistance.
19. Move drum to transfer storage area. If it is necessary to move an unfilled drum to another transfer area, seal it in plastic and take care to avoid spillage.
20. Clean up transfer area.

Plutonium Processing Unique Procedure

Unique Procedure No. 74-7-2

Prepared by *J. M. H. [Signature]* Date 8/13/74
Engineer - Plutonium Finishing Process Engineering

Reviewed by *P. A. [Signature]* Date 8/13/74
Engineer - Plutonium Finishing Process Engineering

Approved by *J. R. [Signature]* Date 8/13/74
Manager - Plutonium Finishing Process Engineering

Reviewed by *[Signature]* Date 8/22/74
Planner and Scheduler - Plutonium Processing

Issued by *OC [Signature]* Date 8/22/74
for Manager - Plutonium Processing

Void After 8-1-75

LIST OF FIGURES

<u>Figure</u>	<u>Description</u>
1	Division of Military Application Organization Chart
2	Partially Assembled FRP Box
3	Completed FRP Boxes
4	Filled FRP Box Being Loaded in Trench
5	Hanford Type I Steel Box
6	Rocky Flats Type FRP Box
7	Division of Military Application Area Plot Plan - Prior to Decommissioning
8	Portable NaI Gamma Counting Equipment In Use
9	Plastic "Horsetailing" Sequence - Glove Box Removal
10	Glove Box Removed and Connected to Temporary Exhaust
11	Box Transuranic Storage Chart
12	Program Cost Summary - By Fiscal Years
13	Program Cost Summary - By Participants
14	Division of Military Application Area Plot Plan - After Decommissioning

DIVISION OF MILITARY APPLICATION DECOMMISSIONING PROGRAM
ORGANIZATIONAL CHART

Figure 1

Figure 2

Partially assembled FRP plywood modular container for 20-yr. retrievable storage

Figure 3

Completed FRP plywood modular containers for 20-yr. retrievable storage.

Figure 4

Filled FRP box being lowered in trench.

Figure 5

Hanford Type I steel box for transuranic storage.

Figure 6

Rocky Flats type FRP box for transuranic storage.

DMA Equipment Removal

Equipment Requiring Removal

Figure 7
Plot Plan DMA Area

Figure 8

Horsetailing sequence-HC-40 separated from conveyor and plastic sleeve gathered and taped.

Figure 9

Portable sodium iodide (NaI) gamma counting equipment in use.

Figure 10

HI-73E Glovebox from main conveyor line and tied into temporary exhaust (top)

DIVISION OF MILITARY APPLICATION EQUIPMENT REMOVAL
TRANSURANIC STORAGE DATA

Fiscal Years	<u>Total 1975</u>	<u>Total 1976</u>	<u>GRAND TOTAL</u>
A. FRP PLYWOOD BOXES			
12-foot	3	12	15
12-foot custom	1	0	1
16-foot	4	3	7
20-foot	8	15	23
B. HANFORD TYPE STEEL BOXES			
Type I	3	3	6
Type II	0	1	1
C. ROCKY FLATS TYPE FRP BOXES	7	1	8
TOTAL BOXES	<u>26</u>	<u>35</u>	<u>61</u> ⁽¹⁾
Total Volume (cubic feet)	28,771	50,010	78,781
Total Net Weight (lbs.)	162,100	166,850	328,950
Total DMA Plutonium (grams)	1,138	4,036	5,174
Total Operations Plutonium (grams)	<u>149</u>	<u>268</u>	<u>417</u>
TOTAL PLUTONIUM(COMBINED) (grams)	<u>1,287</u>	<u>4,304</u>	<u>5,591</u>

(1) Does not include seven boxes from development laboratory which have been reported under separate non-Division of Military Application accounting.

FIGURE 11

DIVISION OF MILITARY APPLICATION EQUIPMENT REMOVAL
QUARTERLY AND FISCAL YEAR COSTS

	<u>Actual Cost</u> <u>By Quarters</u>	<u>Total Cost</u> <u>By Fiscal Year</u>
FY 1974	\$118,307	\$ 118,307
FY 1975		
First Quarter	152,080	
Second Quarter	215,216	
Third Quarter	343,882	
Fourth Quarter	368,822	1,080,000
FY 1976		
First Quarter	245,155	
Second Quarter	269,150	
Third Quarter	255,291	
Fourth Quarter	122,097	891,693
TRANSITION FY 1976 (ACCRUED FUNDS)	44,317	44,317
 TOTAL COST	 <u>\$2,134,317</u>	 <u>\$2,134,317</u>

FIGURE 12

DIVISION OF MILITARY APPLICATION EQUIPMENT REMOVAL

FISCAL YEAR COST SUMMARY BY PARTICIPANTS

Fiscal Year	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>TOTAL</u>	
J. A. Jones Company	\$73,533	\$745,556	\$550,828	\$ 8,829	\$1,378,756	
Vitro	41,737	70,182	26,808	(1,983) ⁽¹⁾	136,744	
Battelle-Northwest	-0-	2,067	1,032	-0-	3,090	
ARHCO	3,037	107,963	107,299	661	218,960	
ARHCO Overheads	-0-	154,232	240,085	2,450	396,767	
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	
TOTAL	\$118,307	\$1,080,000	\$926,043	\$9,967	\$2,134,317 ⁽²⁾	27

(1) Credit

(2) Total billed to ERDA-AL was \$2,124,350.47. Fiscal Year 1977 costs (after September 30, 1976) charged to ARHCO Z Plant operating expense account in lieu of excess transuranic boxes transferred.

FIGURE 13

492'-3"
 FIRST FLOOR PLAN 234-5 Building

DMA Equipment Removal

Figure 14

Plot Plan-DMA Area All Equipment Removed

FRP PLYWOOD BOX DESIGN DRAWING LIST

H-2-27440 Sheets 1-4	20-ft Modular Storage Container
H-2-27441 Sheets 1-3	16-ft Modular Storage Container
H-2-27442 Sheets 1-4	12-ft Modular Storage Container
H-2-27443	Lifting Frame
H-2-27445 Sheets 1-3	12-ft Custom Storage Container

SPECIAL RECORD FORMS

1. DMA Equipment Removal - Box Record
2. Plutonium Accountability and Safeguards Record
3. Onsite Radioactive Shipment Record
4. Solid Waste Burial Record
5. Transuranic Dry Waste Storage

DIVISION OF MILITARY APPLICATION EQUIPMENT REMOVAL
BOX RECORD

Sheet: _____ of _____

Date: _____

Box No. _____

Extension (1-Ft or 2-Ft) _____

*Grams Pu: _____

Gross Weight _____ lbs.

Lift Frame Wt. _____ lbs.

**Box Tare _____ lbs.

(-) Total Tare Weight _____ lbs.

Net Weight _____ lbs.

Itemized List of Equipment Loaded (Show identification number where available).

* To be filled out by Operations Contact Engineer

** Box Tare includes lid, and extension when used.

ATLANTIC RICHFIELD HANFORD COMPANY
DIVISION OF MILITARY APPLICATION
EQUIPMENT REMOVAL - 234-5 Z BUILDING
PLUTONIUM ACCOUNTABILITY AND SAFEGUARDS

REPORT NO. _____

THIS IS TO ACKNOWLEDGE THAT GLOVE BOX (OR EQUIPMENT PIECE) _____

OR APPROXIMATELY _____ CUBIC FEET VOLUME HAS BEEN COUNTED USING
A PORTABLE SODIUM IODIDE GAMMA SCINTILLATION DETECTOR. BASED UPON THESE
MEASUREMENTS THE RESIDUAL PLUTONIUM CONTENT IS CALCULATED TO BE IN THE
RANGE OF _____ TO _____ GRAMS WITH A BEST VALUE
OF _____ GRAMS.

C. H. KINDLE, CHEMIST_____
DATE_____
D. E. TURNER, MANAGER
PROCESS CONTROL LAB._____
DATE

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Atlantic Richfield Hanford Company
Richland, Washington 99352 RADIATION PROTECTION RECORD
ONSITE RADIOACTIVE SHIPMENT RECORD

NAME	CONTRACTOR AND COMPONENT	BUILDING AND AREA	PHONE
TO			
FROM			
CARRIER		VEHICLE NO.	

DESCRIPTION

ITEM: _____ OR MATERIAL: _____

TYPE OF INNER CONTAINER: _____

TYPE OF OUTER CONTAINER: _____

RADIATION CONDITIONS
OUTER CONTAINER

DOSE RATES (β - γ) AT SURFACE _____ MREM/HR. AT 3 FT. _____ MREM/HR.

* DOSE RATES (η) AT SURFACE _____ MREM/HR. AT 3 FT. _____ MREM/HR.

SMEARABLE CONTAMINATION _____ β - γ _____ α

* WHEN APPLICABLE

SURVEYED BY	DATE	☐ INSPECTION NOT PERMITTED ☐ INSPECTION PERMITTED	RADIATION MONITORING APPROVAL	DATE
-------------	------	--	-------------------------------	------

INSTRUCTIONS

1. AFFIX THE RADIATION SYMBOL TO CONTAINER(S).
2. DO NOT LEAVE SHIPMENT UNATTENDED WHEN NOT IN A RADIATION ZONE.
3. IN CASE OF ACCIDENT OR SPILL, NOTIFY RADIATION MONITORING IMMEDIATELY.
4. RECEIVER TO NOTIFY RECEIVING RADIATION MONITORING AND SENDER UPON DELIVERY.

THIS SHIPMENT RECORD IS VALID FOR THE APPROVED DATE ONLY.

APPROVAL TO SHIP	AUTHORIZED SIGNATURE _____	☐ CLASSIFIED ☐ NOT CLASSIFIED	SHIPPING DATE
---------------------	-------------------------------	--	---------------

CHECKED OUT OF	AREA	AREA	AREA	AREA
PATROLMAN NUMBER				
TIME DATE				

54-6000-079 (3-73)

DISTRIBUTION: WHITE - (RECORD COPY) TO RADIATION MONITORING AT ORIGIN
CANARY - ACCOMPANY SHIPMENT TO RECEIVER
PINK - ARHCO SECURITY
BUFF - ATTACH TO SHIPMENT

SOLID WASTE BURIAL RECORD

200 AREA PLATEAU DISPOSAL SITE OPERATED FOR RL - AEC
BY ATLANTIC RICHFIELD HANFORD COMPANYDISPOSAL SITE THIS PORTION OF FORM TO BE COMPLETED BY
ARHCO REPRESENTATIVE AT DISPOSAL SITE.

AREA	BURIAL GARDEN NO.	TRENCH NO.
CAISSON NO.	COORDINATES N _____ W _____	
REMARKS		
DATE	TIME	
SIGNATURE		

SHIPPER

SHIPMENT NO.	
COMPANY	
BUILDING:	AREA:
ADDRESS (OFF SITE)	
DATE	
SIGNATURE	

PHYSICAL DESCRIPTION

MATERIAL CONTENTS (NOTE ANY SPECIAL CONDITIONS) E.G., DISSOLVER, PUMP, SAMPLING OR LABORATORY PAPER WASTE, TIMBERS, RESIN.							
CONTAINER	BOX	NO.	LENGTH	WIDTH	HEIGHT	☐ HANFORD STANDARD CARDBOARD	
	DRUM	NO. AND SIZE					
	OTHER	NO. AND SIZE					
TOTAL VOLUME (FT ³)							

ACTIVITY DESCRIPTION

GENERAL ACTIVITY DESCRIPTION (E.G., LONG-LIVED ISOTOPES SUCH AS PU, CO, SF, CS; MIXED FISSION PRODUCTS; ACTIVATION PRODUCTS)			
PLUTONIUM		URANIUM	
GRAMS	GRAMS	ENRICHMENT	CURIES
DOSE RATE			
_____ m R/hr at _____		☐ SURFACE ☐ INCHES ☐ FEET	
DISTRIBUTION:		BY ORIGINATOR	
WHITE - } ARHCO YELLOW - } PINK - RETAIN GOLDENROD - (BNW) WD&D, 325 BLDG. GOLDENROD - (DUN) WASTE DISPOSAL COORDINATOR, 1760-M BLDG. GOLDENROD - (ITT/FSS) ENGINEERING PLANNING, RM. 477, FED. BLDG.		BY ARHCO - SIGN AND FORWARD TO: WHITE - ARHCO SUPERVISOR OF BURIAL GROUND YELLOW - BNW WASTE DISPOSAL AND DECONTAMINATION, 325 BLDG. YELLOW - DUN WASTE DISPOSAL COORDINATOR, 1760-M BLDG. YELLOW - ITT/FSS ENGINEERING PLANNING, RM. 477 FED. BLDG.	

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