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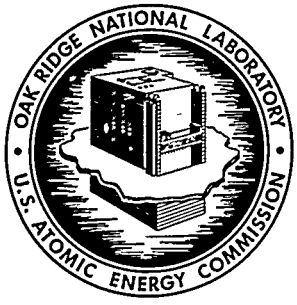

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ORNL
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SUBJECT: ISOTOPES DIVISION SOLID WASTE HANDLING PROCEDURE

TO: Isotopes Division Personnel

FROM: J. H. Gillette

FOREWORD

This procedure presents standard techniques for the safe handling of waste generated in the Isotopes Division. All members of the Division should become well acquainted with this procedure to eliminate unusual difficulties and incidents.

ISOTOPES DIVISION SOLID WASTE HANDLING PROCEDURE

INTRODUCTION

Solid radioactive waste from the Isotopes Division may consist of contaminated bottles, swabs, paper, glassware, laboratory equipment, or any other solid materials used within hot cells, hoods, or glove boxes. These materials may be contaminated with alpha, beta, and gamma activities with beta-gamma radiation readings from 1 mR/hr to >10 R/hr at the surface of the primary package. No liquids are to be intermixed with solid waste but should be channeled through the appropriate liquid disposal system. This procedure is established to assure the safe handling and disposal of these materials and supplement procedure number 5.1 in the ORNL Health Physics Manual.

DEFINITIONS

Low-Level Waste — Those materials which read <1 mR/hr beta-gamma at the surface of the primary package.

Intermediate-Level Waste — Those materials which read from 1 mR/hr to 200 mR/hr beta-gamma at the surface of the primary package.

High-Level Waste — All alpha or pure beta contaminated material.

All process equipment and other highly contaminated material from hot cells, shielded barricades, or glove boxes.

All material with a radiation reading >200 mR/hr.

All high-level beta-gamma wastes are to be transported to FPDL for proper packaging and disposal.

LOW-LEVEL WASTE HANDLING PROCEDURE
(<1 mR/hr)

Containers

Each building in the Isotopes Division which handles radioactive materials will be supplied with disposal cans (Fig. 1) properly labeled for contaminated materials. The disposal can will be supplied with a double layer of plastic bags to guard against possible rupture of the plastic by sharp objects or poor seals formed on the seams (seals should be examined). Low-level waste may be disposed of in these containers.

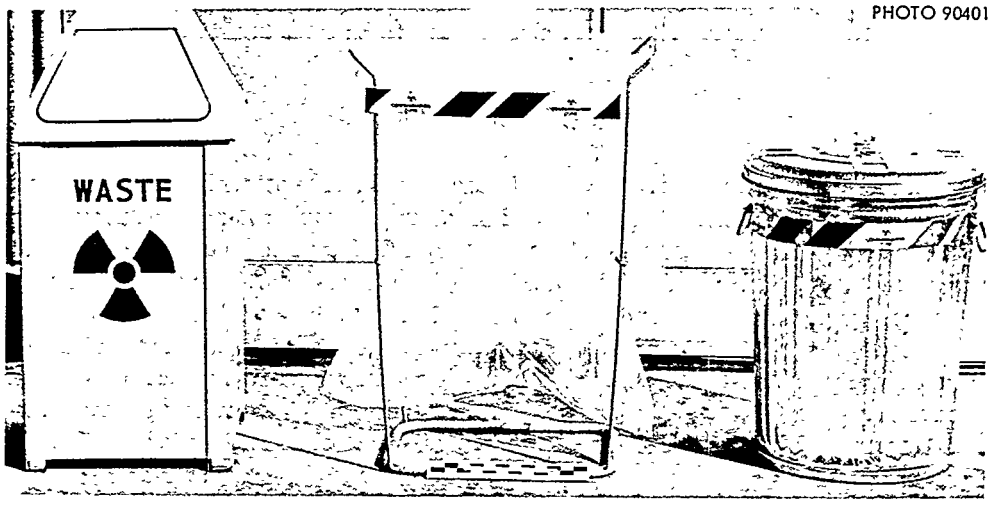

Fig. 1. Contaminated Waste Disposal Containers.

Procedure for Disposal Units Within Defined Limits

When the disposal unit is filled, the chemical operator or technician responsible for waste removal will carefully seal the plastic bag with tape or a heat-sealing device. The sealed package is to be properly tagged with a radiation reading and the individual's name. All plastic bags containing low-level material will be placed in an appropriate container and delivered, by assigned personnel, to the nearest yellow dumpster (Fig. 2) for removal to the burial ground. Clean plastic bags will be installed by the user in all disposal cans and Health Physics personnel will check all cans once per day for radiation and contamination levels above those approved by the Health Physics Manual.

Procedure for Disposal Units Exceeding Defined Limits

If a container reads >1 mR/hr, see procedure for handling intermediate- or high-level waste.

Contamination waste disposal cans are not to be used for high-level waste materials. Any disposal can reading >200 mR/hr will be reported immediately to supervision and handled as high-level waste.

Procedure for Washable Items

Gloves, shoe covers, etc., will be handled under the same rules that apply to low-level waste except that all washable items reading <20 mR/hr beta-gamma and 25,000 dis/min alpha will be sent to the laundry. All materials above these levels of contamination must go to the burial ground as waste. Disposal cans appropriately labeled for gloves, shoe covers, etc., will be available for those buildings requiring laundry service.

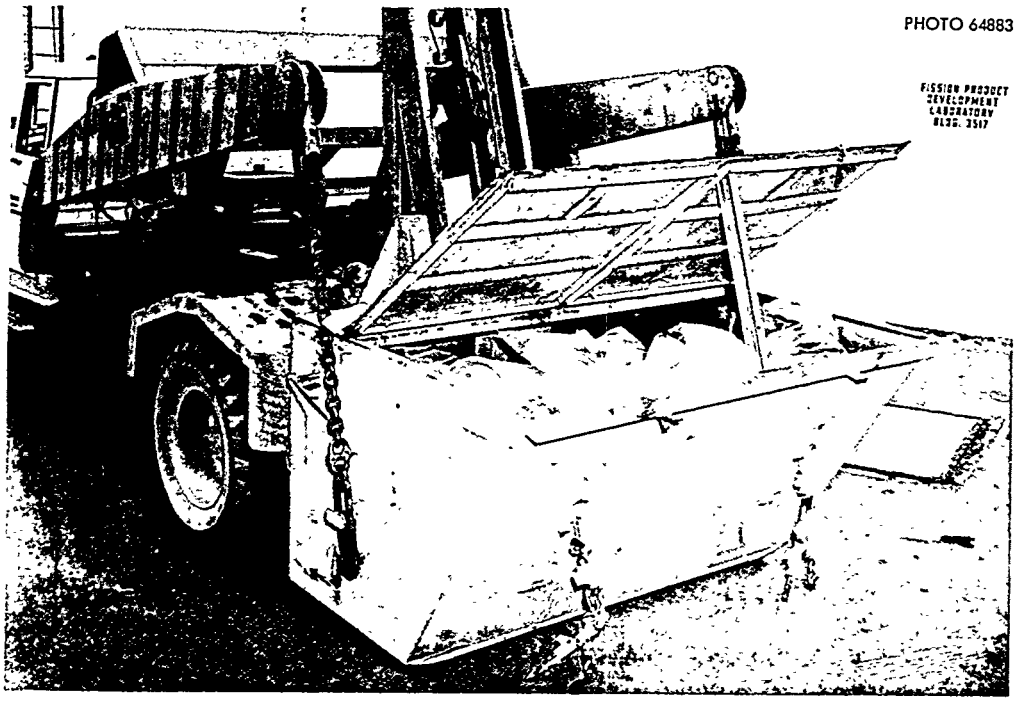

Fig. 2. Yellow Dumpster for Low- and Intermediate-Level Solid Waste Disposal.

INTERMEDIATE-LEVEL WASTE HANDLING PROCEDURE
(1 to 200 mR/hr)

Containers

Materials in the intermediate level of contamination must be handled very carefully to prevent the spread of contamination during all handling operations from the originating area to the burial ground. Materials in this range should be placed in cans or boxes purchased from Stores. Inexpensive cans (Fig. 3) are available in 1-, 2-, 10-, and 20-gal capacities at Building 3036. These may be used as primary and/or secondary containment shells for contaminated waste.

Procedure for Disposal Units Within Defined Limits

After the can is full and the lid sealed, the can should be smeared. If it does not smear more than 1 mR/hr, the can may be placed in a plastic bag, sealed, and transported to the yellow dumpster. If the can smears >1 mR/hr, it must be placed in another solid container and sealed. The surface of the outer container must be smear clean in order to control the spread of contamination at the burial ground.

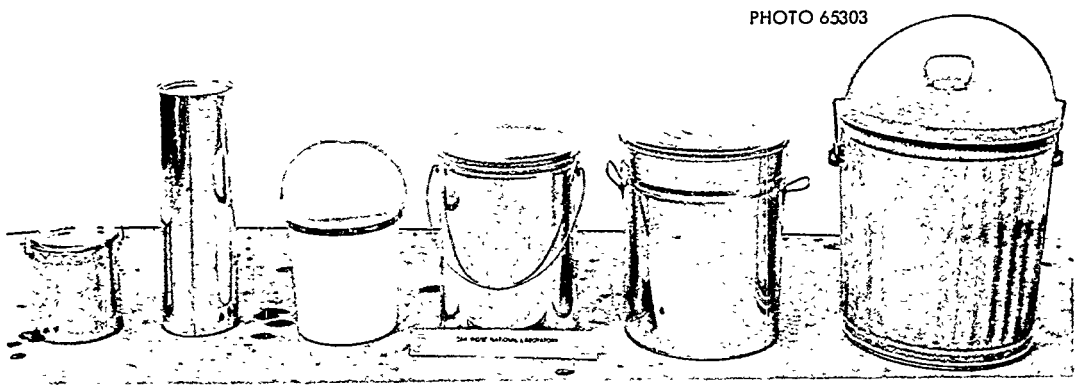

Fig. 3. Waste Disposal Cans.

Procedure for Disposal Units Exceeding Defined Limits

Contaminated waste above the specified limits should be removed from the building as soon as possible to reduce the exposure to personnel. If a can is above the specified limits, it should be placed in a garbage can, which is then sealed and tagged. A special hot truck should be requested to remove the package.

HIGH-LEVEL WASTE HANDLING PROCEDURE
(>200 mR/hr, all alpha and pure beta wastes)

Containers

High-level waste originating from hot cell or glove box operations in the Isotopes Division must be handled with extreme care to prevent exposure to personnel and the spread of high-level contamination within the Laboratory. Table 1 lists the containers used for transporting these materials to FPDL for disposal by the Isotopes Division and the characteristics of these containers.

Procedure

To remove high-level waste from a hot cell, barricade, or glove box, the radioactive material should be reduced to the smallest size possible and segregated into combustibles and noncombustibles. The material is then loaded into a suitable lard can, garbage can, or plastic pail to form the initial containment layer. The container should be sealed in plastic and transferred to one of the carriers previously listed. If a shielded

Table 1. High-Level Waste Carrier Data

Type	Cavity Volume (gal)	Shielding (in. of lead)	Weight (lb)	Normal Building Location	Figure No.
FPDL Bottom Discharge	1.0	4	1,000	FPDL	4
RDL Bottom Discharge	1.0	4	1,500	3047	5
Cobalt Garden	0.1	8	1,800	3029	6
Iodine-131 Ring	0.1	9	3,600	3028	7
SRO	2.0	3.5	2,000	3047 3036	8
Lead Dumpster	100	1	7,500	Burial Ground	9
Stainless Steel Dumpster	20	4	8,500	Burial Ground	10
Schaich Waste Carrier	5	6	5,000	FPDL	11
Cobalt Transfer	0.1	8	3,300	3029	12
Pierce Waste Carrier	11	8	10,000	3047	13
FPDL Top Loader	2.0	4	2,000	FPDL	14
SLFP Carrier	1.0	4	1,500	SLFP	15

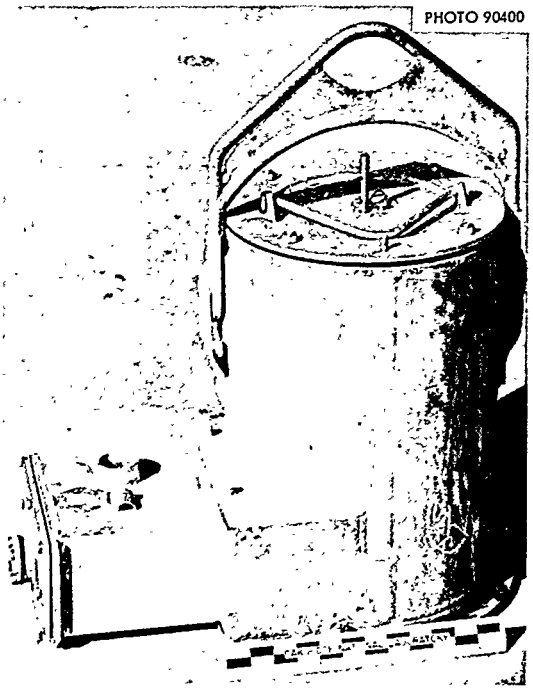

Fig. 4. FPDL Bottom Discharge Waste Carrier.

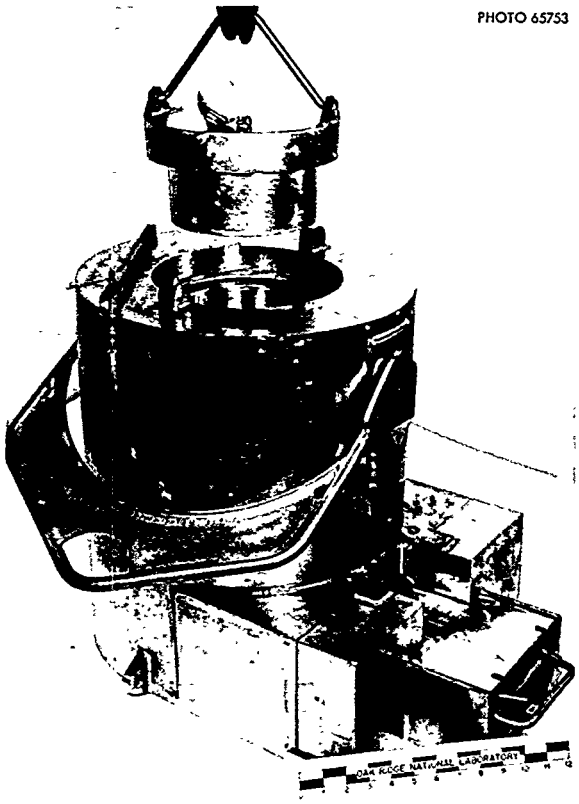

Fig. 5. RDL Bottom Discharge Waste Carrier.

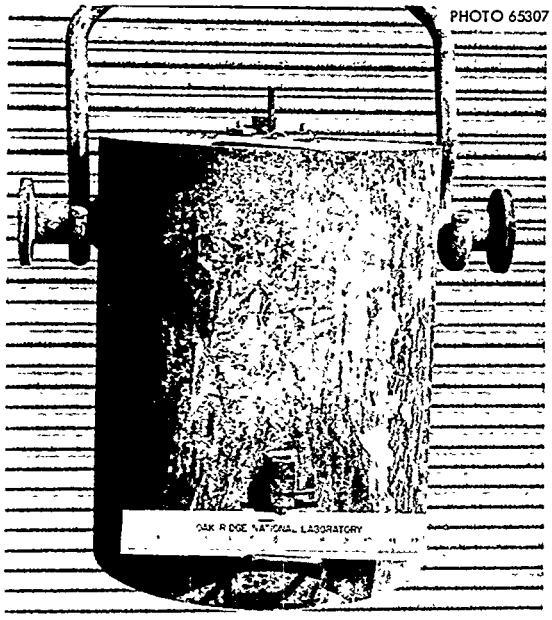

Fig. 6. Cobalt-Garden Transfer Carrier.

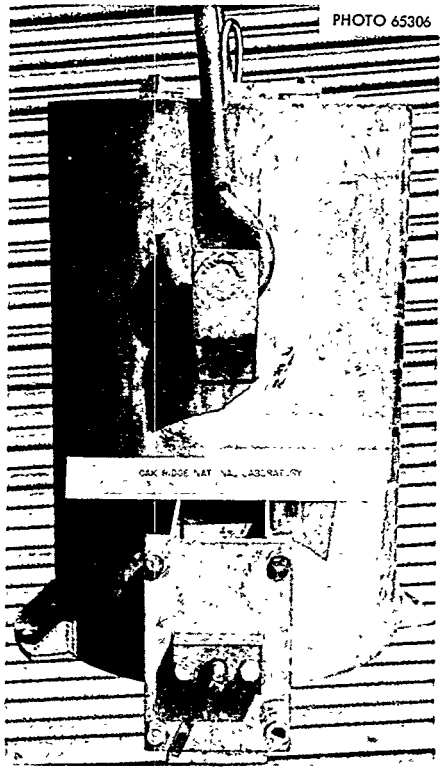

Fig. 7. Iodine-131 Ring Carrier.

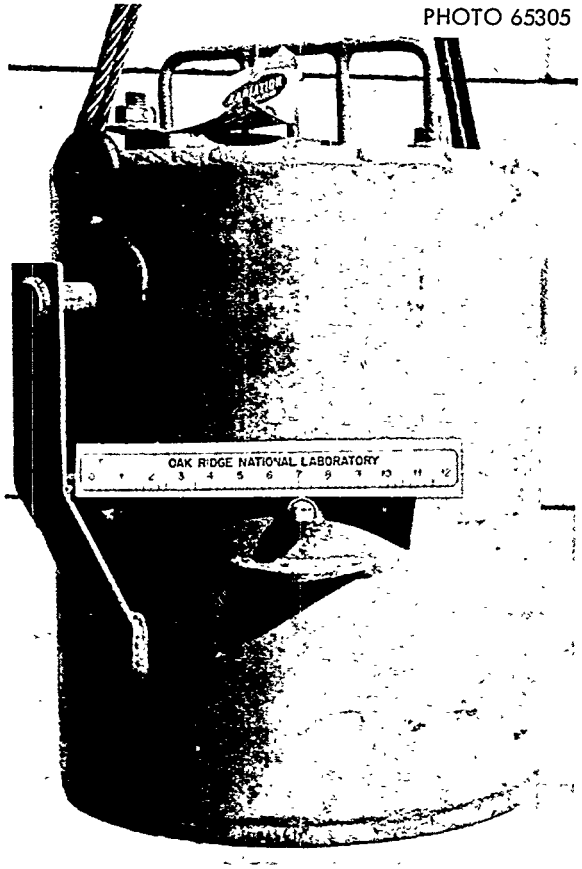

Fig. 8. SRO Carrier.

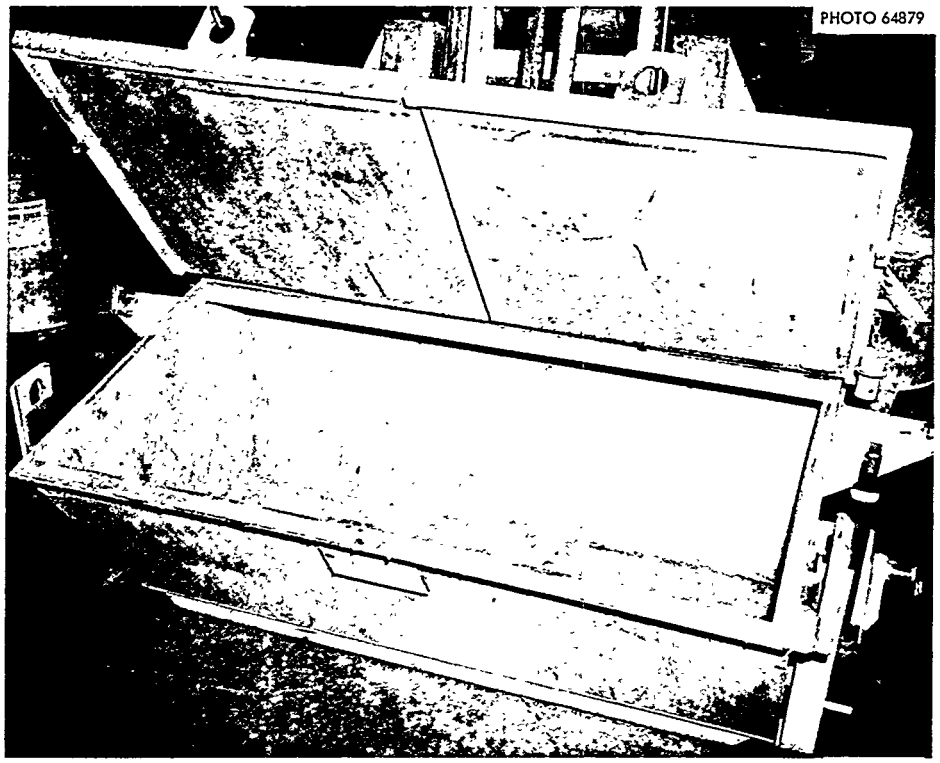

Fig. 9. One-Inch Lead Dumpster.

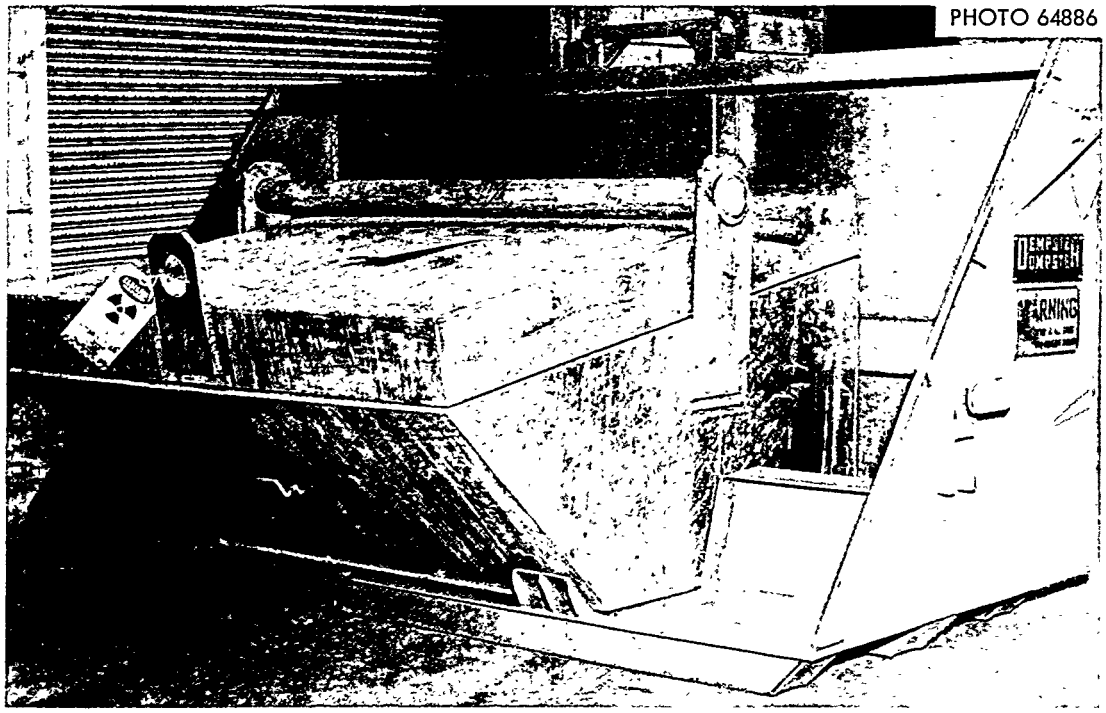

Fig. 10. Stainless Steel Dumpster.

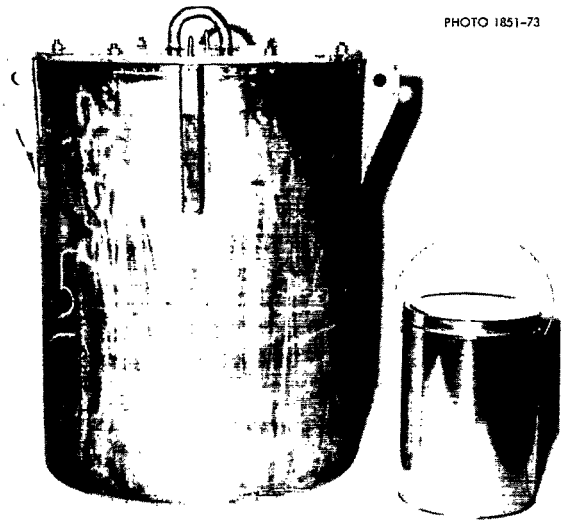

Fig. 11. Schaich Waste Carrier.

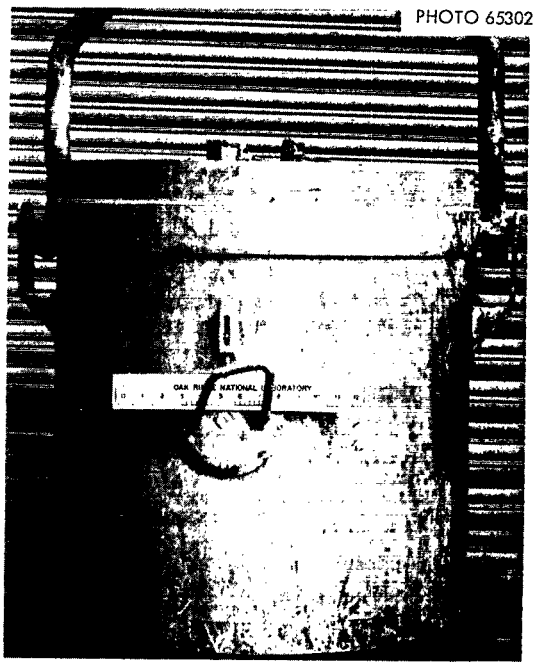

Fig. 12. Cobalt Transfer Carrier.

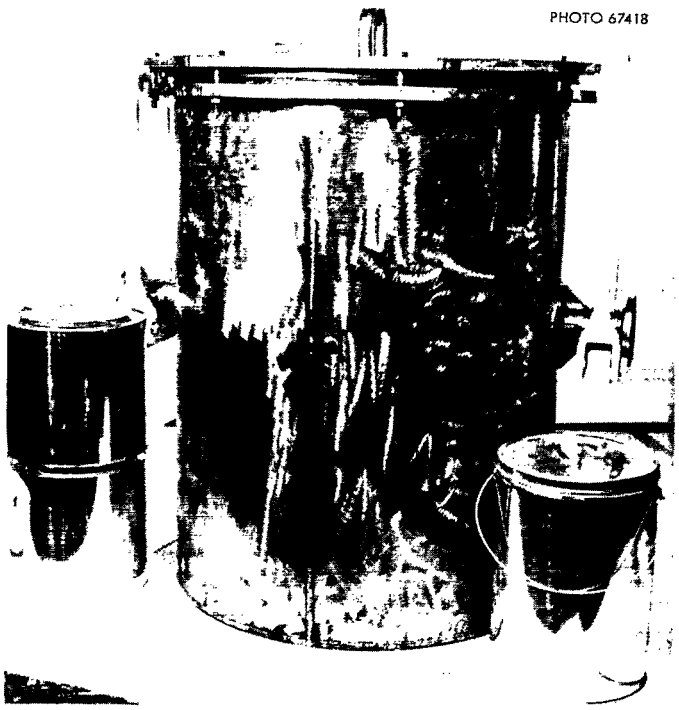

Fig. 13. Pierce Waste Carrier.

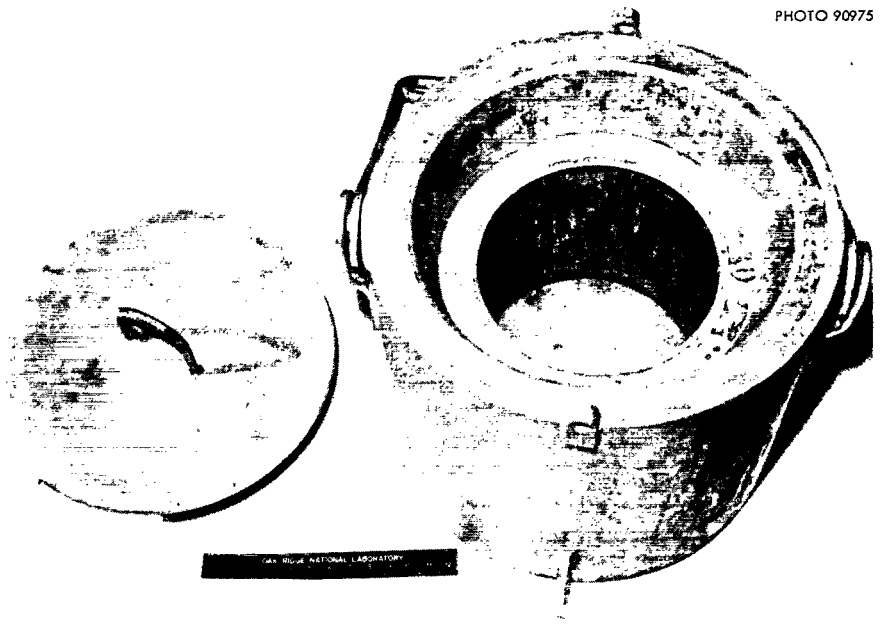

Fig. 14. FPDL Top Loader.

dumpster is used (Figs. 9 and 10), it should be placed in the cell or immediately adjacent to the cell for loading with manipulators or long tongs. After the dumpster is loaded and cleaned to shipping tolerances, it should be tagged and immediately removed from the area.

Bottom discharge carriers cannot handle cans sealed in plastic bags. Thus, waste materials should be bagged in plastic and placed in a can or plastic pail; the can or pail should be sealed and finally washed free of all loose contamination before being loaded into the carrier. This procedure will reduce the possibility of contamination at the FPDL or burial ground and aid in the decontamination of the waste carrier.

Material placed in lead-shielded dumpsters must smear less than 10 mR/hr on the outer surface of the package, and the burial ground personnel must be notified as to its contents.

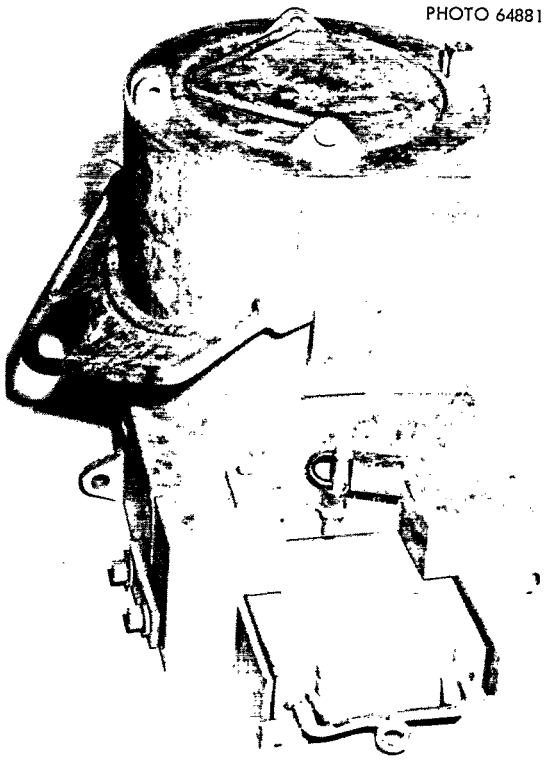

Fig. 15. SLFP Carrier.

High-level waste material should not be removed from a cell until a proper shielding device is ready to receive the package. Garbage cans with improvised shielding may be used with the supervisor's approval, provided prior arrangements for removal have been made with burial ground personnel. The burial ground supervisor will determine if the hot truck or a shielded dumpster is required for removing the cans.

Additional Precautions for Handling High-Level Wastes

1. Wash and drain all equipment before removal.

2. Place all glassware and sharp objects in lard cans or garbage cans. This should apply to all levels of waste.

3. All radioactivity used for heat sources should be segregated from all burnable materials and placed in suitable steel containers for immediate disposal.

4. All alpha materials should be triply contained. If heat is no problem, the recommended procedure is a tin can sealed in plastic and then sealed in a cardboard shipping container.

5. When containers present a hazard from external radiation and cannot be immediately removed from the area, a radiation zone shall be established following the guidelines shown in Table 2.

Table 2. Guide for Establishment of Radiation Zones

Dose-Rate Range (rem/hr)	Immediate Action	Follow-up Action
0.003-0.006	Post low-level tags if the accumulated daily dose to personnel may be 20 mrem	Periodic review
0.006-1	Post warning signs or tags	Rope off the area if the accumulated weekly dose may be 1 rem
1-3	Post warning signs or tags; rope off	Errect a barricade which provides absolute exclusion of personnel. If the accumulated weekly dose in the area may be 12 rem, lock or block entrance
>3	Post warning signs and tags; erect barricades; lock and/or block all entries	

6. Transuranic solid wastes from the Isotopes Division are to be handled as high-level wastes and segregated into Class A or B per Health Physics Procedure Manual No. A9. This procedure is as follows.

INTERIM PROCEDURE FOR STORAGE OF TRANSURANIUM SOLID WASTE

1. Solid waste originating in operating areas where transuranium elements are handled shall be segregated into Class A and Class B.

   Class A

   a. Waste originating in areas where the alpha surface contamination does not exceed the following values:

      Direct Reading — 300 d/m/100 cm^2 (average)
      3000 d/m/100 cm^2 (maximum)

      Transferable — 30 d/m/100 cm^2 (average)
      300 d/m/100 cm^2 (maximum)

   b. Waste, regardless of origin, which does not exceed 10 $\mu Ci/ft^3$.

   Class B

   Waste which exceeds the above surface contamination values and/or activity concentration.

2. Class A waste shall be deposited in yellow dumpsters for burial in the conventional manner.

3. Normally, when radiation levels at the surface of the containers will permit, Class B waste shall be deposited in one of the four types of containers listed below:

   a. 30-gal drums (stainless or coated steel) (Fig. 16).

   b. 55-gal drums (stainless or coated steel) (Fig. 16).

Fig. 16. 55- and 30-gal Drums.

c. Concrete cask (thin wall)

Outside dimensions — 51-in. OD by 7 ft
Inside dimensions — 42-in. ID by 6 ft 1 in.

d. Concrete cask (thick wall)

Outside dimensions — 51-in. OD by 7 ft
Inside dimensions — 27-in. ID by 4 ft 10 in.

The above containers may be obtained from Solid Waste Storage, telephone 3-6356.

In those cases when the above containers do not provide adequate shielding for the radioactivity to be transported and/or stored, other containers may be used subject to the approval of Solid Waste Storage personnel.

The four specified containers, when filled, will be stored in a roofed and drained trench. A minimum of rock back-fill will be used. Those containers holding high radiation level waste will be deposited in shielded, water-tight auger holes.

4. If at all feasible, burnable and nonburnable waste should be deposited in separate containers. Containers must be labeled as follows: B (burnable), NB (nonburnable), or BNB (mixture of burnable and nonburnable). Cost distribution for handling and storing solid waste will be based on the number and type of containers used.

5. Storage records shall be maintained. In addition to the requirements of Health Physics Procedure 4.1, the receivers shall apply a permanent tag to each container, radiation level permitting, which is referenced to a computer log. Where the radiation level is too great, the storage location (auger hole, etc.) shall be referenced.

6. The computer log shall designate the Accountability Transaction Number (Form TX-4342), storage location, volume and type of waste, and amount of transuranium material. A monthly computer print-out shall be sent to Safety and Radiation Control (R. G. Affel).

7. The amount of fissile material permitted in the containers in item 3 is the following:

   a. 30-gal drum — 20 grams

   b. 55-gal drum — 36 grams

   c. Concrete cask (thin wall) — 200 grams

   d. Concrete cask (thick wall) — 96 grams