

RDW 3.2
MINOR
Revision 2
05-11-84

DISPOSAL OF RADIOACTIVE WASTE
IN 55 GALLON DRUMS

1.0 PURPOSE

The purpose of this procedure is to outline the necessary steps for drumming (55-gallon drums) radioactive waste material for shipment to offsite burial grounds. Solidification and filter disposal is normally done by Operations and is covered in procedure OP-9B.

2.0 REFERENCES

- 2.1 RDW 5.1, Radioactive Material Shipments - General.
- 2.2 Barnwell Site Criteria (CNSI)
- 2.3 Operations Group procedure OP-9B, Solid Waste Processing.
- 2.4 Richland Site Criteria (US Ecology)
- 2.5 Certification of ERDA Contractor's Packaging with Respect to Compliance with DOT Specification 7A Performance Requirements - Phase II Summary Report, MLM-2228 by Monsanto Research Corporation.

3.0 WASTE PROCESSING PRECAUTIONS

- 3.1 All radioactive waste being prepared for offsite shipment must comply with Federal and State regulations, licenses, burial site criteria and Company policies.
- 3.2 All radioactive waste packed in drums must be accounted for as to the physical contents, gross weight and Curie content. To accomplish this, each drum must be accurately identified by physical contents by the person processing the drum and this information recorded on the waste permit (CHP-16).
- 3.3 The following precautions must be observed when drumming waste.
 - 3.3.1 When baling compressible waste, use care to ensure that noncompressible items are removed from the waste to prevent damage to the drum and possible personnel injury.
 - 3.3.2 When baling wet trash, care must be taken to ensure that all liquids are absorbed. This may be accomplished by opening the bag and placing the wet trash between two-inch layers of dry cement. It must be remembered that absorbent materials typically hold much less liquid when compacted than they would otherwise.

3.3.3 No oil may be shipped in any drum of radwaste except as provided in procedure RDW 3.3.

Objects may contain incidental oil if the total amounts to no more than 1% of the package volume. An absorbent such as Hi-Dri must be used to absorb any incidental oil.

3.3.4 Personnel shall be aware of radiation exposure rates during drumming operations. When handling potential high radiation level wastes, personnel should be equipped with high range dosimeters, radiation monitors and have a radiation work permit if required.

NOTE: CONTACT HEALTH PHYSICS IF THE BALER AREA MONITOR (VAMP) ALARMS.

3.3.5 Drums are to be wiped clean when taken out of the baler to eliminate the potential for spreading contamination.

4.0 IDENTIFICATION OF CONTENTS

4.1 Call the control room for a waste permit number.

4.2 Write the waste permit number on the drum lid with an indelible marker such as a Sharpie pen. Make the number at least 1" high.

4.3 Affix a drum processing tag (OPS-14) to the drum lid.

4.4 Mark the tag to indicate the type and origin of the material in the drum. Date and initial the tag.

5.0 NONCOMPRESSIBLE WASTE DRUMMING PROCEDURE

5.1 Noncompressible waste shipped in 55-gallon drums will be cut up and placed in the drum such that the lid will fit properly and the maximum amount of waste can be accommodated within the drum.

5.2 When the drum is full, inspect the lid and ensure that the lid gasket is in place and not damaged. Install lid and tighten.

5.3 Attach two "Caution Radioactive Material" stickers, 180° apart, at the midsection of the drum.

Markings reading "RADIOACTIVE LSA, N.O.S., UN2912" may be substituted for "CAUTION RADIOACTIVE MATERIAL" markings with approval of the engineer or Nuclear Plant Specialist (NPS) assigned to radwaste.

5.4 Weigh the drum and install a lead seal on the lid retaining ring.

5.5 Affix a drum processing tag (OPS-14) to the top of the drum and fill in the appropriate information with indelible ink. Some information such as total activity may not be known at the time of the drum processing and may be added at a later time.

5.6 Survey the drum and place it in the drum storage area.

Post the drum storage area as appropriate for the radiation levels of the drums.

6.0 COMPRESSIBLE WASTE DRUMMING PROCEDURE

6.1 Turn on the compactor vent fan and assure that the area radiation monitor is operating.

6.2 Place drum in compactor.

6.3 Place the compressible waste in the drum.

- NOTE:
1. WHEN DRUMMING TRASH IN PLASTIC BAGS, CUT A HOLE IN THE BAG TO ALLOW AIR TO EXIT DURING COMPACTING.
 2. ENSURE THAT NONCOMPRESSIBLE ITEMS ARE REMOVED FROM THE WASTE.
 3. WHEN BALING WET TRASH, CARE MUST BE TAKEN TO ENSURE THAT ALL LIQUIDS ARE ABSORBED. THIS MAY BE ACCOMPLISHED BY OPENING THE BAG AND PLACING THE WET TRASH BETWEEN TWO-INCH LAYERS OF DRY CEMENT.
 4. TYPICALLY, ABSORBENT MATERIALS HOLD MUCH LESS LIQUID WHEN COMPACTED THAN THEY WOULD OTHERWISE. IF DURING COMPACTION EXCESS LIQUID IS OBSERVED, ADD SUFFICIENT DRY CEMENT TO ABSORB ALL OF THE LIQUID.

6.4 Adjust drum under compactor ram, close the door and operate compactor.

6.5 Continue Steps 6.3 to 6.4 until the drum is full.

6.6 When the drum is full, remove it from the compactor, install the drum lid and tighten, weigh the drum and affix lead seal. Clean the drum surfaces.

NOTE: ENSURE THAT THE LID GASKET IS IN PLACE.

6.7 Attach two "Caution Radioactive Material" stickers, 180° apart, at the midsection of the drum.

Markings reading "RADIOACTIVE LSA, N.O.S., UN2912" may be substituted for "CAUTION RADIOACTIVE MATERIAL" markings with approval of the engineer or NPS assigned to radwaste.

- 6.8 Affix a drum processing tag (OPS-14) to the top of the drum and fill in the appropriate information. Some information such as total activity may not be known at the time of the drum processing and may be added at a later time.

NOTE: ALL ENTRIES ARE TO BE MADE WITH WATER RESISTANT INK.

- 6.9 Survey the drum and place it in the drum storage area. Post the storage area as appropriate.

7.0 SOLIDIFICATION IN DRUMS

- 7.1 Prior to solidifying liquid or wet waste:

7.1.1 Obtain a sample of the waste for isotopic analysis. This sample should be identified by the waste permit number of the drum(s) being filled.

7.1.2 Review the burial site criteria and assure that only an approved solidification agent is used.

7.1.3 If cement is used, assure that it is type 1.1.0 masonry cement from Western Lime & Cement Company.

- 7.2 Solidification of wet waste should be done following Steps 7.2.1 to 7.2.13 below.

7.2.1 Begin layering the wet waste between equal layers of dry cement.

NOTE: AS A RULE OF THUMB, 15 TO 20 GALLONS OF LIQUID OR WET WASTE WILL BE ABSORBED BY APPROXIMATELY FIVE BAGS OF CEMENT. THIS QUANTITY OF WASTE AND CEMENT WILL NORMALLY FILL ONE 55-GALLON DRUM.

7.2.2 Record the total volume of both waste and cement placed in the drum on waste permit form CHP-16. (This information is required for calculating drum Curie content.)

7.2.3 Clean all waste and cement residue from the drum lid sealing surfaces and install lid and tighten.

7.2.4 Place two "Caution Radioactive Material" labels 180° apart on the midsection of the drum. Markings reading "RADIOACTIVE LSA, N.O.S., UN2912" may be substituted with approval of Nuclear Plant Specialist - Radwaste or HP supervisor.

- 7.2.5 Obtain a waste permit number from the DSS, or his designate.
- 7.2.6 Attach a drum processing tag (OPS-14) to the top of the drum and enter:
 - a. Waste permit number.
 - b. Gallons (volume) of waste, date and initial.
- NOTE: USE WATER RESISTANT INK TO MAKE ENTRIES ON DRUM PROCESSING TAG.
- 7.2.7 Move the drum to the drum staging area.
- CAUTION: A RADIATION SURVEY SHALL BE TAKEN OF EACH DRUM PRIOR TO IT BEING PLACED IN THE DRUM STAGING AREA. SHOULD THE DRUM STAGING AREA BECOME A HIGH RADIATION AREA, THE AREA SHALL BE POSTED AS PER PROCEDURE HP 8.3.
- 7.2.8 After the drum has set up for at least eight hours, remove the lid and sprinkle dry cement onto any standing water until all moisture is absorbed. Leave the lid off for at least 24 hours.
- 7.2.9 After 24 hours, if no free liquid is observed, clean the lid sealing surfaces, install lid and tighten. If free liquid is observed, add additional dry cement and allow drum to set for an additional 24-hour period. Repeat this addition until all free liquid is absorbed. Attach lead seal.
- 7.2.10 Clean the drum, removing any residual dirt, cement or waste residue.
- 7.2.11 Weigh the drum and record the drum weight on the drum processing tag (OPS-14). Date and initial.
- 7.2.12 Complete the drum processing tag (OPS-14).
 - a. Solids; not applicable; date and initial.
 - b. Liquid absorbed; date and initial.
 - c. Drum sealed; date and initial.
- 7.2.13 Return drum to staging area for shipment processing.
- 7.3 Solidification of liquids in drums should be done on the drum roller in accordance with procedure OP-9B.

8.0 DRUMMING BAG FILTERS

- 8.1 Refer to OP-9B, Solid Waste Processing, to drum filters.
- 8.2 When filters are added to a drum, notify the Operations office of the number and type put in the drum.

9.0 ACTIVITY CALCULATIONS

9.1 Compressible & Noncompressible Miscellaneous Trash

- 9.1.1 Calculate the total activity of the drum using the following formula:

$$Ci = Wt \times mR/hr \times 5.6E-07$$

Where Ci = Total Curies per drum

Wt = Weight of drum in pounds

mR/hr = Average contact reading in mR/hr

- 9.1.2 Record the total beta-gamma activity (Curies) in the appropriate column of form CHP-43.

NOTE: TRITIUM ANALYSIS IS NOT REQUIRED FOR NONCOMPRESSIBLE OR COMPRESSIBLE WASTE.

- 9.1.3 Check off the "Average Isotopic Percentage" box on the waste permit.

- 9.1.4 Sign the waste permit (CHP-16) on the "Calculated By" line and return the form to the Health Physics Supervisor.

- 9.1.5 The engineer or NPS assigned to radwaste will review the total activity in the drum and determine if it is a Type "A," Type "B" or Highway Route Controlled Quantity according to RDW 5.1, Section 3.0. In addition, the procedure in RDW 3.8 will be used to determine which waste classification the drum comes under.

9.2 Solidified Waste

- 9.2.1 Obtain the appropriate Special Radiological Analysis form (CHP-24) from Chemistry.

- 9.2.2 Attach the Radiological Analysis form to the Waste Permit (CHP-16) and check the "Special Radiological Analysis" box on the waste permit.

9.2.3 Calculate the activity using the following formula:

Formula: $A = (C) (V) (1E-06)$

Where: A = Total activity in Curies.

C = Total activity concentration of sample
in $\mu\text{Ci}/\text{cc}$ or $\mu\text{Ci}/\text{gram}$.

V = Volume (cc's or grams) of the liquid or
wet waste that has been mixed with cement
and placed in the drum.

9.2.4 Enter total activity under the appropriate column of the
Waste Operation Report (CHP-43).

9.2.5 Sign the waste permit form on the "Calculated By" line and
return it to the Health Physics Supervisor.

9.2.6 The engineer or NPS assigned to radwaste will review the
total activity in the package and determine if it is a
Type "A," Type "B" or Highway Route Controlled Quantity
according to RDW 5.1, Section 3.0. In addition, RDW 3.8
will be used to determine which waste classification the
package comes under.

9.3 Bag Filter Activity

Bag filter activity is determined by two parameters, number of
filters and type of filter.

9.3.1 The number and type of filters are obtained from
Operations records or the waste permit log maintained by
the NPS or engineer assigned to radwaste.

9.3.2 The estimated activity per filter is tabulated below.

TABLE 1
ACTIVITY OF FILTERS

Type	Activity per Filter
Waste Evaporator Feed	5.1 mCi
Blowdown Evaporator Bottoms	5.2 mCi
Steam Generator Blowdown	0.00022 mCi

9.3.3 Total Activity = Number of Filters x Activity per Filter

Example: 20 blowdown evaporator filters in a drum,
Activity = 20 filters x 5.2 mCi/filter =
104.0 mCi

10.0 PREPARATION FOR SHIPMENT

- 10.1 Obtain the Waste Operations Report (CHP-43).
- 10.2 At the drum staging area, ensure that the drum processing tag (OPS-14) is attached and the appropriate sections are completed.
- 10.3 Select the waste drum to be processed and complete the waste permit (CHP-16), drum processing tag (OPS-14) and the waste operation report (CHP-43) as required below.
 - 10.3.1 Enter the waste permit number in the container/permit number column of the waste operation report (CHP-43).
 - 10.3.2 Using the codes at the top of form CHP-43, identify the container and contents and enter this in the contents and volume column of CHP-43.
 - 10.3.3 Enter the date filled and the initials of the person who filled the drum (from the drum processing tag, OPS-14) in the columns provided in form CHP-43.
 - 10.3.4 Record the drum weight on form CHP-43.

NOTE: DRUMS WEIGHING \geq 840 POUNDS MUST MEET THE REQUIREMENTS OF LSA MATERIAL.

- 10.3.5 Perform a beta-gamma survey of the drum. Determine the highest contact reading on the bottom, side and top of the drum. In addition, determine the average radiation reading around the side of the drum. The transport index must also be determined by measuring the radiation level at 1 meter (3.3 feet) from any direction of the drum to include the top and bottom. Care must be taken when performing these surveys to ensure that accurate results are obtained.

Record all the information on the CHP-43.

- 10.3.6 The drum should be cleaned prior to taking a smear survey.

10.3.7 After the drum is cleaned, perform a smear survey. A sufficient number of smears should be taken to ensure that a representative area of the drum is surveyed. Count the smears for beta-gamma and alpha contamination. Record results of survey on Form CHP-43.

NOTE: THE POLICY OF PBNP IS TO MAINTAIN CONTAMINATION LEVELS AT EQUAL TO OR LESS THAN MDA UNLESS OTHERWISE AUTHORIZED BY A CHP SUPERVISOR.

10.3.8 Refer to procedures RDW 5.1 through 5.5 to determine the proper labeling and marking requirements for the package. Mark and label the drum as appropriate.

10.3.9 Using indelible ink, mark the weight, waste permit number, and highest 1 meter (3.3 feet) radiation reading on the drum head in letters at least 1" high. The 1 meter (3.3 feet) reading should be circled.

10.3.10 Using indelible ink, sign off OPS-14 tag on radiological surveys complete line.

10.3.11 Upon completion, place the drum in the drum staging area for shipment.

10.3.12 Perform a radiation survey of the drum storage area and update postings according to procedures.

10.3.13 Complete the waste permit form (CHP-16) as appropriate.