



**PHYSICS DIVISION PROCEDURE****HANDLING AND SHIPPING RADIOACTIVE LAUNDRY****1. SCOPE**

1.1 This procedure applies to radiological facilities in the Physics Division.

**2. PURPOSE**

2.1 The purpose of this procedure is to provide requirements for collecting, segregating and surveying radiologically-contaminated laundry for shipment/return to/from an off-site laundry facility.

**3. DISCUSSION**

Radiologically-contaminated laundry is segregated and placed into laundry bags. The laundry bags are collected, surveyed and subsequently placed into shipping carts, shipped to an off-site laundering facility, and returned clean for re-use.

Mending is part of the off-site laundry facility contract. Laundry with small tears or holes should be separated and identified as needing mending. Radiologically-contaminated laundry that cannot be mended will be treated as rad waste.

**4. PRECAUTIONS AND LIMITATIONS**

- 4.1 Items that cannot be laundered shall not be placed in laundry bags.
- 4.2 External bag and cart dose rates shall not exceed 0.4 mR/hr on contact.
- 4.3 Laundry shall not be stuffed or compacted in laundry bags.
- 4.4 Laundry bags should not exceed an estimated weight of 50 pounds.
- 4.5 The amount of laundry per cart should not exceed an estimated weight of 150 pounds.
- 4.6 Laundry bags shall be free of holes and the closure mechanism should be in usable condition.

**5. RESPONSIBILITIES**

- 5.1 The Physics Division Research Support Group Leader is responsible for coordination of radiologically-contaminated laundry shipments.

- 5.2 Radiological Control Technicians are responsible for handling contaminated laundry and performing surveys of laundry bags and carts.
- 5.3 The Transportation Management Organization is responsible for ensuring that the off-site shipment process is compliant with DOT regulations.

## 6. PROCEDURE

### NOTE

Entry into radiation and/or contamination areas and segregation of radiologically-contaminated laundry shall be done in accordance with the applicable Radiological Work Permit (RWP).

- 6.1 General Laundry Handling Practices
  - 6.1.1 Collect radiologically-contaminated laundry, using laundry bags, inside contamination areas.
  - 6.1.2 Segregate laundry that needs mending in a separate laundry bag and label the bag "needs mending" using a removable tag or tape.
  - 6.1.3 Laundry that is in such bad shape that it cannot be mended shall be disposed as rad waste.
  - 6.1.4 Transfer laundry bags from the contamination area to a buffer area using the following guidelines:
    - 6.1.4.1 Should be performed at the area step-off pad.
    - 6.1.4.2 Transfer the laundry bag into a clean empty laundry bag.
  - 6.1.5 Ask the RCT to survey the laundry bags. If external dose rate on laundry bag is greater than 0.4 mR/hr on contact, then:
    - 6.1.5.1 Return laundry bag to the contamination area.
    - 6.1.5.2 Remove the laundry that causes the high dose rate and dispose as rad waste.
    - 6.1.5.3 Transfer the laundry bag from the contamination area to a buffer area using a clean empty laundry bag and ask the RCT to resurvey the laundry bag, ensuring the dose rate is less than 0.4 mR/hr on contact.

- 6.1.6 An RCT shall close the laundry bag using the closure mechanism and attach ORNL-236, Radioactive Material Tag, to each bag.
- 6.2 Preparing Laundry Carts for Shipment
  - 6.2.1 Place closed and tagged laundry bags in laundry cart.
  - 6.2.2 Ask RCT to survey the loaded laundry cart. If external dose rate of loaded laundry cart is greater than 0.4 mR/hr on contact, then:
    - 6.2.2.1 Remove laundry bags from the cart until the dose rate is less than 0.4 mR/hr. (Put bags removed in a separate cart.)
  - 6.2.3 An RCT shall attach ORNL-236, Radioactive Material Tag, to each laundry cart.
  - 6.2.4 Cover laundry cart and attach UN 2910 shipping label to each laundry cart.
  - 6.2.5 Place laundry cart in designated pickup area.
- 6.3 Shipping laundry
  - 6.3.1 The Research Support Group Leader or designee shall complete the blanket bill of lading and make a copy.
  - 6.3.2 The following documents shall be provided to the laundry shipment driver:
    - 6.3.2.1 The original completed blanket bill of lading
    - 6.3.2.2 A copy of the Physics laundry profile
  - 6.3.3 Fax a copy of the completed blanket bill of lading to the Transportation Management Organization at 576-1979.
  - 6.3.4 In the Laundry Logbook, record the date and number of laundry carts shipped.
- 6.4 Receiving Laundry
  - 6.4.1 In the Laundry Logbook, record the date and number of laundry carts received.

Recycling and Transportation Compliance Support  
 Radiactive Materials Classification and Packaging Calculations

07-Jan-10

Shipment #: Physics Laundry per unit

Special(S)/Normal(N):  Normal  Solid

Weight of radioactive/contaminated material: 1.00E+01 grams

Select M/A2 source: TS-R-1

Isotope	Select Units for Activity			Activity (Ci)	Activity (TBq)	Activity (GBq)	Actual Concentration/		Activity/A2	Meat List?	Activity/LQ Int	Act/RQ	Footcubes	Isotope weight (g)
	Ci	Activity (Ci)	Activity (TBq)				Conc. Limit	Actual Act						
Cs-137	2.18E-06	2.18E-06	8.09E-08	6.05E-05	8.05E-04	8.05E+01	1.01E-04	1.01E-04	Yes	1.01E-01	2.18E-04	2	5.29E-07	
I-125	5.73E-05	5.73E-05	2.12E-06	2.12E-03	2.12E+05	2.12E+00	4.24E-06	4.24E-06	Yes	4.24E-09	5.73E-05		9.21E-03	
Pm-147	5.73E-05	5.73E-05	2.13E-09	2.13E-06	2.13E+03	2.13E-01	2.13E-06	2.13E-06	No	2.13E-03	5.73E-05	2	1.67E-03	
Ta-182	1.25E-05	1.25E-05	4.63E-07	4.63E-04	4.63E+01	4.63E+01	9.26E-07	9.26E-07	No	9.26E-04	1.25E-05		2.01E-00	
Co-60	1.53E-05	1.53E-05	3.54E-07	3.54E-04	3.54E+01	3.54E-01	3.54E-04	3.54E-04	No	3.54E-04	9.56E-07		2.85E-10	
Co-60	1.45E-04	1.45E-04	5.36E-06	5.36E-03	5.36E+03	5.36E-01	2.68E-07	2.68E-07	No	2.68E-04	1.45E-04		1.85E-00	
Co-60	1.26E-06	1.26E-06	4.66E-08	4.66E-05	4.66E+03	4.66E-01	2.68E-07	2.68E-07	No	1.55E-04	1.26E-07		4.12E-10	
Co-60	1.26E-06	1.26E-06	4.66E-08	4.66E-05	4.66E+03	4.66E-01	1.55E-07	1.55E-07	No	1.55E-04	1.26E-07		4.23E-11	
Co-60	2.80E-06	2.80E-06	1.04E-07	1.04E-04	1.04E+01	1.04E-01	1.17E-07	1.17E-07	No	1.17E-04	1.26E-07		1.11E-09	
Co-60	6.25E-07	6.25E-07	2.31E-06	2.31E-03	2.31E+03	2.31E-01	1.04E-07	1.04E-07	No	1.04E-04	2.80E-07		3.57E-10	
Co-60	7.04E-07	7.04E-07	2.90E-08	2.90E-05	2.90E+03	2.90E-01	7.25E-08	7.25E-08	No	7.25E-05	6.25E-08	9	3.57E-10	
Co-60	3.17E-06	3.17E-06	1.17E-06	1.17E-03	1.17E+02	1.17E-01	5.87E-06	5.87E-06	No	5.87E-03	7.04E-05		3.57E-12	
Co-60	2.80E-07	2.80E-07	1.10E-06	1.10E-03	1.10E+03	1.10E-02	1.83E-06	1.83E-06	No	1.83E-05	2.80E-08	3.7	1.82E-12	
Co-60	1.22E-07	1.22E-07	4.53E-09	4.53E-06	4.53E+02	4.53E-02	1.13E-06	1.13E-06	No	1.13E-05	2.86E-08		1.69E-11	
Co-60	2.89E-07	2.89E-07	1.07E-06	1.07E-03	1.07E+02	1.07E-02	1.07E-06	1.07E-06	No	1.07E-05	1.22E-08		7.19E-13	
Co-60	1.56E-07	1.56E-07	5.77E-05	5.77E-02	5.77E+01	5.77E-04	9.31E-09	9.31E-09	No	9.31E-06	2.99E-08		2.74E-10	
Co-60	2.27E-07	2.27E-07	8.36E-08	8.36E-05	8.36E+02	8.36E-04	9.31E-09	9.31E-09	No	9.31E-06	1.56E-08		5.24E-12	
Co-60	4.99E-07	4.99E-07	1.04E-08	1.04E-05	1.04E+00	1.04E-02	9.22E-09	9.22E-09	No	9.22E-06	2.27E-08		4.68E-12	
Co-60	2.34E-06	2.34E-06	8.67E-06	8.67E-03	8.67E+02	8.67E-02	9.67E-09	9.67E-09	No	9.67E-06	4.99E-07		1.92E-10	
Co-60	4.85E-08	4.85E-08	1.83E-06	1.83E-03	1.83E+02	1.83E-03	4.59E-09	4.59E-09	No	4.59E-06	2.34E-08		2.85E-09	
Co-60	3.70E-06	3.70E-06	1.37E-09	1.37E-06	1.37E+02	1.37E-03	3.43E-09	3.43E-09	No	3.43E-06	2.00E-09		7.81E-13	
Co-60	2.70E-06	2.70E-06	1.03E-04	1.03E-01	1.03E+02	1.03E-02	3.43E-09	3.43E-09	No	3.43E-06	3.70E-09		4.67E-10	
Co-60	2.57E-06	2.57E-06	9.52E-10	9.52E-07	9.52E+00	9.52E-02	3.43E-09	3.43E-09	No	3.43E-06	2.78E-08		1.87E-10	
Co-60	4.07E-06	4.07E-06	1.51E-09	1.51E-06	1.51E+02	1.51E-02	3.02E-09	3.02E-09	No	3.02E-06	2.57E-07	9	5.59E-13	
Co-60	1.93E-06	1.93E-06	7.13E-08	7.13E-05	7.13E+01	7.13E-03	2.39E-09	2.39E-09	No	2.39E-06	4.07E-09		5.59E-13	
Co-60	3.32E-09	3.32E-09	8.59E-10	8.59E-07	8.59E+01	8.59E-03	2.15E-09	2.15E-09	No	2.15E-06	1.93E-06		2.10E-11	
Co-60	5.22E-07	5.22E-07	1.95E-06	1.95E-03	1.95E+02	1.95E-03	1.95E-09	1.95E-09	No	1.95E-06	2.32E-09		2.77E-13	
Co-60	3.17E-06	3.17E-06	1.17E-06	1.17E-03	1.17E+02	1.17E-03	1.95E-09	1.95E-09	No	1.95E-06	5.22E-09		1.97E-10	
Co-60	1.18E-07	1.18E-07	4.37E-09	4.37E-06	4.37E+01	4.37E-03	1.47E-09	1.47E-09	No	1.47E-06	3.17E-06		1.49E-12	
Co-60	2.24E-06	2.24E-06	8.29E-10	8.29E-07	8.29E+01	8.29E-02	1.46E-09	1.46E-09	No	1.46E-06	1.18E-07		1.12E-11	
Co-60	5.62E-06	5.62E-06	2.06E-05	2.06E-02	2.06E+01	2.06E-02	1.35E-06	1.35E-06	No	1.35E-06	2.24E-06	9	3.89E-10	
Co-60	5.25E-09	5.25E-09	2.31E-10	2.31E-07	2.31E+01	2.31E-04	1.04E-09	1.04E-09	No	1.04E-06	5.62E-06		1.73E-12	
Co-60	2.95E-06	2.95E-06	1.09E-09	1.09E-06	1.09E+01	1.09E-03	4.63E-10	4.63E-10	No	4.63E-07	6.25E-10		3.67E-13	
Co-60	1.45E-08	1.45E-08	8.67E-11	8.67E-08	8.67E+00	8.67E-04	1.95E-03	1.95E-03	No	1.95E-07	2.95E-09		2.92E-12	
Co-60	4.06E-06	4.06E-06	1.51E-10	1.51E-07	1.51E+01	1.51E-02	2.24E-10	2.24E-10	No	2.24E-07	4.06E-09		1.40E-11	
Co-60									No	3.16E-07	4.06E-09		3.14E-12	

Packaging and Transportation Compliance Support  
 Radiactive Materials Classification and Packaging Calculations

07-Jan-10

Shipment #: Physics Laboratory (part 10)

Weight of radioactive/  
contaminated material:

grams

Species(S)/Normal(N): Normal

1.00E+00

Solid/G/Liquid(G): Solid

Select A1/A2 source:

TS-R-1

Select Units for Activity

Isotope	CI	Activity (Ci)	Activity (TBq)	Activity (GBq)	Actual Concentration/ Conc. Limit	Actual Act/ Activity Limit	Must List?	Activity/ LO limit	Act/RQ	Footnote	Isotope weight (g)
U235	1.92E-07	1.92E-07	7.16E-09	7.16E-09	7.16E-09	7.16E-09	No	1.79E-07	1.93E-09	2	2.01E-11
U238	3.16E-06	3.16E-06	1.17E-09	1.17E-09	1.17E-09	1.17E-09	No	1.46E-07	3.16E-10		2.69E-11
Th232	6.99E-09	6.99E-09	2.56E-10	2.56E-10	2.56E-10	2.56E-10	No	1.29E-07	6.99E-09	3	3.11E-13
Pa231	8.45E-08	8.45E-08	3.12E-09	3.12E-09	3.12E-09	3.12E-09	No	7.90E-09	8.45E-10		3.94E-11
Ac227	5.53E-08	5.53E-08	2.05E-09	2.05E-09	2.05E-09	2.05E-09	No	5.11E-09	5.53E-10		2.50E-12
Th230	9.97E-10	9.97E-10	3.69E-11	3.69E-11	3.69E-11	3.69E-11	No	1.29E-08	9.97E-11		5.59E-14
Pa230	3.87E-10	3.87E-10	1.43E-11	1.43E-11	1.43E-11	1.43E-11	No	4.77E-09	3.87E-11		6.99E-11
U234	2.34E-10	2.34E-10	8.67E-12	8.67E-12	8.67E-12	8.67E-12	No	2.99E-10	2.34E-12		4.13E-12
Th231	2.99E-11	2.99E-11	1.04E-13	1.04E-13	1.04E-13	1.04E-13	No	0.00E+00	2.99E-15		1.22E-09
U233	2.34E-11	2.34E-11	8.67E-13	8.67E-13	8.67E-13	8.67E-13	No	0.00E+00	2.34E-13		2.89E-10
U235	1.72E-09	1.72E-09	6.37E-10	6.37E-10	6.37E-10	6.37E-10	No	0.00E+00	1.72E-07	2,5	6.31E-02
Totals:	2.62E-04	2.62E-04	9.69E-06	9.69E-06	4.70E+05	1.33E+02		1.10E-01	2.89E-04		

Rad mat? LSA ? III Yes

DOT HRCQ? No

With in Profile limits? RWA

A2 for mixture (TBq): 0.95E-02

Pkg level: No

Ltd Qty: No

RQ ? No

Flasht? No