

Proper Segregation and Disposal of Low-Level Radioactive Waste Procedures Manual

Revision: April 9, 2026

Applies To: University of Michigan (U-M) personnel preparing low-level radioactive waste for collection.

Table of Contents

Table of Acceptable Segregation Categories for Low-Level Radioactive Waste	3
Preparing Solid Low-Level Radioactive Waste for Collection	4
Supplies Available through Hazardous Materials Management (HMM)	4
Using the Waste Container	5
Procedure: Preparing Solid LLRW for Collection	5
Preparing Liquid Low-Level Radioactive Waste for Collection	6
Minimizing and Segregating Waste	6
Mixed Waste	6
Generating Mixed Waste	6
Examples of Chemicals Requiring Separate, Segregated Collection Containers	7
Minimization and Segregation	7
Biological, Toxic, or Carcinogenic LLRW	8
Volatility Controls: Radioiodines, Sulfur-35 Amino Acids, and Other Volatiles	8
Collecting Labware Rinses and Washes	8
What NOT to Place in Waste Jugs	8
Supplies Available through HMM	9
Preparing Jugs for Collection	10
Using the Waste Container	10
Procedure: Preparing liquid LLRW for Collection	10
Denying Waste Collection	10
Preparing Sharps Low-Level Radioactive Waste for Collection	11
Supplies Available through HMM	11
Denying Waste Collection	12
Using the Waste Container	12
Procedure: Preparing Sharps LLRW for Collection	12
Preparing Lead- and Barium-Impregnated Pigs and Objects Impregnated with Lead or Barium for Collection	12
Packaging	13
Procedure: Preparing Lead- and Barium- Impregnated Pigs for Collection	13
Procedure: Preparing Objects Impregnated with Lead or Barium for Collection	13
Preparing Animal Carcass and Animal Tissue Contaminated with Radioactive Material for Collection	14

Freezer	14
Biological Radioactive Waste Containing Other Hazards	14
Reducing Volatile Nature of Radioiodines	14
I-125 and I-131	14
Animal Cages	15
Supplies Available through HMM	15
Procedure: Preparing Animal Carcass and Animal Tissue Contaminated with Radioactive Material for Collection	15
Accepted Liquid Scintillation Fluids (Cocktails)	16
Preparing Liquid Scintillation Vials for Collection	18
Using Non-Approved Liquid Scintillation Fluids	18
Segregating Liquid Scintillation Vials	18
Improper Liquid Scintillation Vials Disposal	18
Boxes for Liquid Scintillation Vials	19
What NOT to Place in Boxes	19
Procedure: Preparing Liquid Scintillation Vials for Collection	19
Preparing Stock Vials for Collection	19
Containers	20
Supplies Available through HMM	20
Using the Waste Container	20
Procedure: Preparing Stock Vials for Collection	21
Completing the Low-Level Radioactive Waste Manifest	21
Procedure: Completing Section A—SOLIDS	21
Procedure: Completing Section B—LIQUIDS	22
Procedure: Completing Section C—Scintillation Vials	22
Procedure: Completing Section D—Sharps, Stock Vials, Lead Pigs, Other Forms	23
Procedure: Completing the Authorized User and Location Information	23
Example of Completed Manifest	24
The Container Label	25
Storage and Labeling	26
Proper Storage of Waste Containers	26
Containers	26
Ordering Containers	27



Table of Acceptable Segregation Categories for Low-Level Radioactive Waste

Use a separate container for each category. In some instances, Environment, Health & Safety (EHS) may require further segregation as necessary for safe handling.

- **Long Lived Isotopes (> 90 days Half-Life)**
 - Category A - H-3 and/or C-14
 - Category B - Na-22, Cl-36, Ca-45, Co-57, Co-58, Fe-59, Co-60, Ni-63, Sr-90, Tc-99, Sn-113, and/or Cs-137, etc. (excluding H-3 and C-14)
- **Intermediate-Lived Isotopes (> 14 days - Less than or equal to 90 days half-life)**
 - Category C - S-35, P-33, Sc-46, Cr-51, Sr-85, Rb-86, Ru-103, and/or Ce-141, etc.
 - Category D - I-125, P-33, Sc-46, Cr-51, Sr-85, Rb-86, Ru-103, and/or Ce-141, etc.
- **Short-Lived Isotopes (< 14 Days half-life)**
 - Category E - P-32, C-11, F-18, Na-24, Br-82, Y-90, Nb-95, Tc-99m, In-111, I131, and/or Tl-201, etc.

Preparing Solid Low-Level Radioactive Waste for Collection

Solid low-level radioactive waste (LLRW) **must** be prepared for collection. Solid LLRW cannot be discarded as normal trash. Solid LLRW includes dry contaminated laboratory materials, equipment, and supplies such as:

- Paper and absorbent pads
- Unbroken glass
- Plastic products
- Contaminated (and potentially contaminated) personal protective equipment (gloves, shoe covers, etc.)

Do not use this procedure if this waste stream is:

- Non-LLRW (paper towels, boxes, etc.); follow the procedure [Disposing of Uncontaminated Waste that Will Not Puncture the Skin](#).
- Liquid LLRW; follow the procedure [Preparing Liquid Low-Level Radioactive Waste for Collection](#).
- Liquid scintillation vials (empty or full); follow the procedure [Preparing Liquid Scintillation Vials for Collection](#).
- Sharps; follow the procedure [Preparing Sharps Low-Level Radioactive Waste for Collection](#).
- Stock vials; follow the procedure [Preparing Stock Vials for Collection](#).
- Animal carcasses, blood, tissue, organs, urine, feces, and bedding; follow the procedure [Preparing Animal Carcasses and Animal Tissues Contaminated with Radioactive Material for Collection](#).
- Lead-shielded containers (“pigs”) and leaded objects; follow the procedure [Preparing Lead- and Barium-Impregnated Pigs and Objects Impregnated with Lead or Barium for Collection](#).
- Large contaminated metal objects; request a special collection.

Supplies Available through Hazardous Materials Management

Hazardous Materials Management (HMM) provides the following supplies. To order these supplies, complete the online [Supplies Request Form](#) or call (734) 763-4568.

- Small (7.5 gallons) yellow fiber drums lined with a bag
- Large (28 gallons) yellow fiber drums lined with a bag



NOTE: EHS reuses the drums, so please refrain from writing or defacing the outside of them.

- LLRW Manifest

LOW-LEVEL RADIOACTIVE WASTE (LLRW) MANIFEST
UN2311, Radioactive Material, low specific activity (LSA-II), 7
University of Michigan, Environment Health & Safety (EH&S)
North Campus Transfer Facility, 1655 Dean Road, Ann Arbor, MI 48109-3196, (734)763-4568

MANIFEST # R 35432

700 - 7.5 gal, 12.5 - 20 gal

SECTION A - Actual Container Label to be affixed to the side of the drum

Sug #	P or Drum	Activity		Activity		Activity	
		alpha	beta	alpha	beta	alpha	beta
1	1.5 - 28						
2	1.5 - 28						
3	1.5 - 28						
4	1.5 - 28						

SECTION B - (Place label around handle)

Sug #	Vol (gal)	Isotope	Activity		Activity		Activity	
			alpha	beta	alpha	beta	alpha	beta
1	1.5							
2	1.5							
3	1.5							
4	1.5							

SECTION C - Scintillation vials

Sug #	Isotope	Activity		Activity		Activity	
		alpha	beta	alpha	beta	alpha	beta
1							
2							
3							
4							

Authorized User: _____ Phone: _____
 Date: (mo/day/yr) _____ Date: (mo/day/yr) _____
 Completed By: _____ *Signature

PLEASE PRINT

IN CASE OF EMERGENCY CONTACT PUBLIC SAFETY (4 HOURS) AT (734) 763-1131

INSTRUCTIONS TO IDENTIFY CHEMICALS IN LIQUIDS

1. If chemical is listed below, please enter corresponding number code and approximate chemical concentration in % by volume in Section B on the front side of the manifest.

2. If chemical constituents are not listed below, please enter number code 99 and approximate concentration in % by volume in Section B on the front side of manifest, and list chemical name(s) and concentration(s) in Section E below.

00 acetone	21 acrylic compounds	48 lead compounds	90 sodium cyanide
01 acetone formal with no added	22 acrylonitrile	49 lignin	91 sodium dihydrogen sulfate
02 acetic acid	23 acrylamide	50 magnesium chloride	92 sodium hydroxide
03 acetic anhydride	24 acrylonitrile butadiene	51 magnesium sulfate	93 sodium nitrate
04 acetone	25 acetone	52 magnesium carbonate	94 sodium nitrite
05 acetone	26 acetone	53 magnesium hydroxide	95 sodium perchlorate
06 acetone	27 acetone	54 magnesium oxide	96 sodium phosphate
07 acetone	28 acetone	55 methyl alcohol	97 sodium silicate
08 acetone	29 acetone	56 methylamine	98 sodium sulfide
09 acetone	30 acetone	57 methylamine hydrochloride	99 sodium sulfite
10 acetone	31 acetone	58 methylamine	100 sodium sulfite
11 acetone	32 acetone	59 methylamine	101 sodium sulfite
12 acetone	33 acetone	60 methylamine	102 sodium sulfite
13 acetone	34 acetone	61 methylamine	103 sodium sulfite
14 acetone	35 acetone	62 methylamine	104 sodium sulfite
15 acetone	36 acetone	63 methylamine	105 sodium sulfite
16 acetone	37 acetone	64 methylamine	106 sodium sulfite
17 acetone	38 acetone	65 methylamine	107 sodium sulfite
18 acetone	39 acetone	66 methylamine	108 sodium sulfite
19 acetone	40 acetone	67 methylamine	109 sodium sulfite
20 acetone	41 acetone	68 methylamine	110 sodium sulfite
21 acetone	42 acetone	69 methylamine	111 sodium sulfite
22 acetone	43 acetone	70 methylamine	112 sodium sulfite
23 acetone	44 acetone	71 methylamine	113 sodium sulfite
24 acetone	45 acetone	72 methylamine	114 sodium sulfite
25 acetone	46 acetone	73 methylamine	115 sodium sulfite
26 acetone	47 acetone	74 methylamine	116 sodium sulfite
27 acetone	48 acetone	75 methylamine	117 sodium sulfite
28 acetone	49 acetone	76 methylamine	118 sodium sulfite
29 acetone	50 acetone	77 methylamine	119 sodium sulfite
30 acetone	51 acetone	78 methylamine	120 sodium sulfite
31 acetone	52 acetone	79 methylamine	121 sodium sulfite
32 acetone	53 acetone	80 methylamine	122 sodium sulfite
33 acetone	54 acetone	81 methylamine	123 sodium sulfite
34 acetone	55 acetone	82 methylamine	124 sodium sulfite
35 acetone	56 acetone	83 methylamine	125 sodium sulfite
36 acetone	57 acetone	84 methylamine	126 sodium sulfite
37 acetone	58 acetone	85 methylamine	127 sodium sulfite
38 acetone	59 acetone	86 methylamine	128 sodium sulfite
39 acetone	60 acetone	87 methylamine	129 sodium sulfite
40 acetone	61 acetone	88 methylamine	130 sodium sulfite
41 acetone	62 acetone	89 methylamine	131 sodium sulfite
42 acetone	63 acetone	90 methylamine	132 sodium sulfite
43 acetone	64 acetone	91 methylamine	133 sodium sulfite
44 acetone	65 acetone	92 methylamine	134 sodium sulfite
45 acetone	66 acetone	93 methylamine	135 sodium sulfite
46 acetone	67 acetone	94 methylamine	136 sodium sulfite
47 acetone	68 acetone	95 methylamine	137 sodium sulfite
48 acetone	69 acetone	96 methylamine	138 sodium sulfite
49 acetone	70 acetone	97 methylamine	139 sodium sulfite
50 acetone	71 acetone	98 methylamine	140 sodium sulfite
51 acetone	72 acetone	99 methylamine	141 sodium sulfite
52 acetone	73 acetone	100 methylamine	142 sodium sulfite
53 acetone	74 acetone	101 methylamine	143 sodium sulfite
54 acetone	75 acetone	102 methylamine	144 sodium sulfite
55 acetone	76 acetone	103 methylamine	145 sodium sulfite
56 acetone	77 acetone	104 methylamine	146 sodium sulfite
57 acetone	78 acetone	105 methylamine	147 sodium sulfite
58 acetone	79 acetone	106 methylamine	148 sodium sulfite
59 acetone	80 acetone	107 methylamine	149 sodium sulfite
60 acetone	81 acetone	108 methylamine	150 sodium sulfite
61 acetone	82 acetone	109 methylamine	151 sodium sulfite
62 acetone	83 acetone	110 methylamine	152 sodium sulfite
63 acetone	84 acetone	111 methylamine	153 sodium sulfite
64 acetone	85 acetone	112 methylamine	154 sodium sulfite
65 acetone	86 acetone	113 methylamine	155 sodium sulfite
66 acetone	87 acetone	114 methylamine	156 sodium sulfite
67 acetone	88 acetone	115 methylamine	157 sodium sulfite
68 acetone	89 acetone	116 methylamine	158 sodium sulfite
69 acetone	90 acetone	117 methylamine	159 sodium sulfite
70 acetone	91 acetone	118 methylamine	160 sodium sulfite
71 acetone	92 acetone	119 methylamine	161 sodium sulfite
72 acetone	93 acetone	120 methylamine	162 sodium sulfite
73 acetone	94 acetone	121 methylamine	163 sodium sulfite
74 acetone	95 acetone	122 methylamine	164 sodium sulfite
75 acetone	96 acetone	123 methylamine	165 sodium sulfite
76 acetone	97 acetone	124 methylamine	166 sodium sulfite
77 acetone	98 acetone	125 methylamine	167 sodium sulfite
78 acetone	99 acetone	126 methylamine	168 sodium sulfite
79 acetone	100 acetone	127 methylamine	169 sodium sulfite
80 acetone	101 acetone	128 methylamine	170 sodium sulfite
81 acetone	102 acetone	129 methylamine	171 sodium sulfite
82 acetone	103 acetone	130 methylamine	172 sodium sulfite
83 acetone	104 acetone	131 methylamine	173 sodium sulfite
84 acetone	105 acetone	132 methylamine	174 sodium sulfite
85 acetone	106 acetone	133 methylamine	175 sodium sulfite
86 acetone	107 acetone	134 methylamine	176 sodium sulfite
87 acetone	108 acetone	135 methylamine	177 sodium sulfite
88 acetone	109 acetone	136 methylamine	178 sodium sulfite
89 acetone	110 acetone	137 methylamine	179 sodium sulfite
90 acetone	111 acetone	138 methylamine	180 sodium sulfite
91 acetone	112 acetone	139 methylamine	181 sodium sulfite
92 acetone	113 acetone	140 methylamine	182 sodium sulfite
93 acetone	114 acetone	141 methylamine	183 sodium sulfite
94 acetone	115 acetone	142 methylamine	184 sodium sulfite
95 acetone	116 acetone	143 methylamine	185 sodium sulfite
96 acetone	117 acetone	144 methylamine	186 sodium sulfite
97 acetone	118 acetone	145 methylamine	187 sodium sulfite
98 acetone	119 acetone	146 methylamine	188 sodium sulfite
99 acetone	120 acetone	147 methylamine	189 sodium sulfite
100 acetone	121 acetone	148 methylamine	190 sodium sulfite
101 acetone	122 acetone	149 methylamine	191 sodium sulfite
102 acetone	123 acetone	150 methylamine	192 sodium sulfite
103 acetone	124 acetone	151 methylamine	193 sodium sulfite
104 acetone	125 acetone	152 methylamine	194 sodium sulfite
105 acetone	126 acetone	153 methylamine	195 sodium sulfite
106 acetone	127 acetone	154 methylamine	196 sodium sulfite
107 acetone	128 acetone	155 methylamine	197 sodium sulfite
108 acetone	129 acetone	156 methylamine	198 sodium sulfite
109 acetone	130 acetone	157 methylamine	199 sodium sulfite
110 acetone	131 acetone	158 methylamine	200 sodium sulfite
111 acetone	132 acetone	159 methylamine	201 sodium sulfite
112 acetone	133 acetone	160 methylamine	202 sodium sulfite
113 acetone	134 acetone	161 methylamine	203 sodium sulfite
114 acetone	135 acetone	162 methylamine	204 sodium sulfite
115 acetone	136 acetone	163 methylamine	205 sodium sulfite
116 acetone	137 acetone	164 methylamine	206 sodium sulfite
117 acetone	138 acetone	165 methylamine	207 sodium sulfite
118 acetone	139 acetone	166 methylamine	208 sodium sulfite
119 acetone	140 acetone	167 methylamine	209 sodium sulfite
120 acetone	141 acetone	168 methylamine	210 sodium sulfite
121 acetone	142 acetone	169 methylamine	211 sodium sulfite
122 acetone	143 acetone	170 methylamine	212 sodium sulfite
123 acetone	144 acetone	171 methylamine	213 sodium sulfite
124 acetone	145 acetone	172 methylamine	214 sodium sulfite
125 acetone	146 acetone	173 methylamine	215 sodium sulfite
126 acetone	147 acetone	174 methylamine	216 sodium sulfite
127 acetone	148 acetone	175 methylamine	217 sodium sulfite
128 acetone	149 acetone	176 methylamine	218 sodium sulfite
129 acetone	150 acetone	177 methylamine	219 sodium sulfite
130 acetone	151 acetone	178 methylamine	220 sodium sulfite
131 acetone	152 acetone	179 methylamine	221 sodium sulfite
132 acetone	153 acetone	180 methylamine	222 sodium sulfite
133 acetone	154 acetone	181 methylamine	223 sodium sulfite
134 acetone	155 acetone	182 methylamine	224 sodium sulfite
135 acetone	156 acetone	183 methylamine	225 sodium sulfite
136 acetone	157 acetone	184 methylamine	226 sodium sulfite
137 acetone	158 acetone	185 methylamine	227 sodium sulfite
138 acetone	159 acetone	186 methylamine	228 sodium sulfite
139 acetone	160 acetone	187 methylamine	229 sodium sulfite
140 acetone	161 acetone	188 methylamine	230 sodium sulfite
141 acetone	162 acetone	189 methylamine	231 sodium sulfite
142 acetone	163 acetone	190 methylamine	232 sodium sulfite
143 acetone	164 acetone	191 methylamine	233 sodium sulfite
144 acetone	165 acetone	192 methylamine	234 sodium sulfite
145 acetone	166 acetone	193 methylamine	235 sodium sulfite
146 acetone	167 acetone	194 methylamine	236 sodium sulfite
147 acetone	168 acetone	195 methylamine	237 sodium sulfite
148 acetone	169 acetone	196 methylamine	238 sodium sulfite
149 acetone	170 acetone	197 methylamine	239 sodium sulfite
150 acetone	171 acetone	198 methylamine	240 sodium sulfite
151 acetone	172 acetone	199 methylamine	241 sodium sulfite
152 acetone	173 acetone	200 methylamine	242 sodium sulfite
153 acetone	174 acetone	201 methylamine	243 sodium sulfite
154 acetone	175 acetone	202 methylamine	244 sodium sulfite
155 acetone	176 acetone	203 methylamine	245 sodium sulfite
156 acetone	177 acetone	204 methylamine	246 sodium sulfite
157 acetone	178 acetone	205 methylamine	247 sodium sulfite
158 acetone	179 acetone	206 methylamine	248 sodium sulfite
159 acetone	180 acetone	207 methylamine	249 sodium sulfite
160 acetone	181 acetone	208 methylamine	250 sodium sulfite
161 acetone	182 acetone	209 methylamine	251 sodium sulfite
162 acetone	183 acetone	210 methylamine	252 sodium sulfite
163 acetone	184 acetone	211 methylamine	253 sodium sulfite
164 acetone	185 acetone	212 methylamine	254 sodium sulfite
165 acetone	186 acetone	213 methylamine	255 sodium sulfite
166 acetone	187 acetone	214 methylamine	256 sodium sulfite
167 acetone	188 acetone	215 methylamine	257 sodium sulfite
168 acetone	189 acetone	216 methylamine	258 sodium sulfite
169 acetone	190 acetone	217 methylamine	259 sodium sulfite
170 acetone	191 acetone	218 methylamine	260 sodium sulfite
171 acetone	192 acetone	219 methylamine	261 sodium sulfite
172 acetone	193 acetone	220 methylamine	262 sodium sulfite
173 acetone	194 acetone	221 methylamine	263 sodium sulfite
174 acetone	195 acetone	222 methylamine	264 sodium sulfite
175 acetone	196 acetone	223 methylamine	265 sodium sulfite
176 acetone	197 acetone	224 methylamine	266 sodium sulfite
177 acetone	198 acetone	225 methylamine	267 sodium sulfite
178 acetone	199 acetone	226 methylamine	268 sodium sulfite
179 acetone	200 acetone	227 methylamine	269 sodium sulfite
180 acetone	201 acetone	228 methylamine	270 sodium sulfite
181 acetone	202 acetone	229 methylamine	271 sodium sulfite
182 acetone	203 acetone	230 methylamine	272 sodium sulfite
183 acetone	204 acetone	231 methylamine	273 sodium sulfite
184 acetone	205 acetone	232 methylamine	274 sodium sulfite
185 acetone	206 acetone	233 methylamine	275 sodium sulfite
186 acetone	207 acetone	234 methylamine	276 sodium sulfite
187 acetone	208 acetone	235 methylamine	277 sodium sulfite
188 acetone	209 acetone	236 methylamine	278 sodium sulfite
189 acetone	210 acetone	237 methylamine	279 sodium sulfite
190 acetone	211 acetone	238 methylamine	280 sodium sulfite
191 acetone	212 acetone	239 methylamine	281 sodium sulfite
192 acetone	213 acetone	240 methylamine	282 sodium sulfite
193 acetone	214 acetone	241 methylamine	283 sodium sulfite
194 acetone	215 acetone	242 methylamine	284 sodium sulfite
195 acetone	216 acetone	243 methylamine	285 sodium sulfite
196 acetone	217 acetone	244 methylamine	286 sodium sulfite
197 acetone	218 acetone	245 methylamine	287 sodium sulfite
198 acetone	219 acetone	246 methylamine	288 sodium sulfite
199 acetone	220 acetone	247 methylamine	289 sodium sulfite
200 acetone	221 acetone	248 methylamine	290 sodium sulfite
201 acetone	222 acetone	249 methylamine	291 sodium sulfite
202 acetone	223 acetone	250 methylamine	292 sodium sulfite
203 acetone	224 acetone	251 methylamine	293 sodium sulfite
204 acetone	225 acetone	252 methylamine	294 sodium sulfite
205 acetone	226 acetone	253 methylamine	295 sodium sulfite
206 acetone	227 acetone	254 methylamine	296 sodium sulfite
207 acetone	228 acetone	255 methylamine	297 sodium sulfite
208 acetone	229 acetone	256 methylamine	298 sodium sulfite
209 acetone	230 acetone	257 methylamine	299 sodium sulfite
210 acetone	231 acetone	258 methylamine	300 sodium sulfite
211 acetone			



- Call HMM at (734) 763-4568
- Complete the [EHS Supplies Request Form](#) or the [EHS Waste Pickup Request form](#). You can also call (734) 763-4568.

Preparing Liquid Low-Level Radioactive Waste for Collection

This procedure discusses how to:

- Keep the volume of liquid LLRW generated as low as possible;
- Manage liquid LLRW during research; and
- Prepare liquid LLRW for HMM for collection.

Minimizing and Segregating Waste

Minimizing and segregating radioactive liquid waste prior to collection enhances safety and compliance, protects the environment, and reduces the costs to the University from the research and clinical use of radionuclides.

Mixed Waste

Mixed waste is any waste stream containing LLRW commingled in any manner (solutions, mixtures, alloys) with non-radioactive Environmental Protection Agency (EPA)-restricted chemicals or materials. Mixed waste is expensive and, in some rare cases, impossible to dispose of legally and safely.

NOTE: Contact EHS before generating possible mixed waste to obtain approvals, advice, and handling instructions.

Generating Mixed Waste

The EPA and the Michigan Department of Environment, Great Lakes, and Energy (EGLE) restrict the disposal of many chemicals, metals, and other materials based on properties of reactivity, flammability, corrosivity, or toxicity.

HMM can help you determine if the chemicals you are using with radioactive materials are restricted and will result in mixed waste.

Examples of Chemicals Requiring Separate, Segregated Collection Containers

Waste processors are required to use special and additional handling and disposal methods for restricted chemicals, resulting in substantially higher costs to the University. Minimizing and segregating these wastes promotes safe, compliant disposal, and reduces costs. The following table provides examples of chemicals that may require a separate, segregated collection container from other liquid LLRW.

NOTE: Consult with HMM when using chemicals listed below, or those with similar chemical properties.

- Organic Solvents
 - Ethanol
 - Methanol
 - Butanol
 - Acetonitrile
 - Toluene
 - Acetone
 - Ether
 - Ethyl acetate
 - Isopropanol
 - Xylene
- Halogenated Compounds
 - Methylene Chloride
 - Chloroform
- Toxic Compounds
 - Phenol
 - Compounds of heavy metals such as:
 - Arsenic
 - Barium
 - Cadmium
 - Chromium
 - Lead
 - Mercury
 - Selenium
- Strong Acids
 - Hydrochloric acid
 - Phosphoric acid
 - Trichloroacetic acid
 - Any acid that will lower the pH to 2 or less
- Strong Bases
 - Sodium hydroxide
 - Other hydroxides and amine compounds
 - Any base that will raise the pH to 12.5 or above

Minimization and Segregation

To reduce, or minimize, the amount of liquid LLRW generated:

- Do **not** commingle non-LLRW with LLRW in the same waste container as a means of waste disposal.
- Use experimental protocols that isolate restricted chemicals from radioactive material unless necessary and approved by EHS.
- If approved to use restricted chemicals with radioactive material, you **must** minimize the volume of mixed waste generated. Use only the amount of agents needed to perform the experiment and follow any special instructions from EHS.
- Do not combine mixed waste with non-mixed waste. “After-use mixing” of mixed and non-mixed waste renders the entire contents into a mixed waste and may make disposal of the contents extremely expensive.
- Never combine chemically incompatible waste; there is a risk of violent or toxic reaction. Refer to the [Chemical Hygiene Plan](#), section 5.3 (for storage information go to pages 46-48; for chemical compatibility charts go to pages 48-50). You may also contact EHS if you are not sure about chemical compatibility.

Biological, Toxic, or Carcinogenic LLRW

Ensure biological (blood and urine), toxic, or carcinogenic liquid LLRW are rendered innocuous (i.e., bleach, Lysol detergent, other methods), non-toxic, or otherwise neutralized prior to HMM collection.

NOTE: Special handling instructions or precautions should be given to HMM personnel when requesting waste collections containing biological, toxic, or carcinogenic material.

Volatility Controls: Radioiodines, Sulfur-35 Amino Acids, and Other Volatiles

- Unbound radioiodines (e.g., inorganic forms such as sodium iodide [NaI] or metabolized radioiodines in biological waste) are volatile. Acidity or oxidation enhances the volatile nature of these radiocompounds. **NOTE:** Do not add acids or strong oxidizers (e.g., bleach) to waste containing unbound radioiodines.
- S-35 labeled amino acids (methionine and cysteine) have a propensity to radiolyse and release volatile products. Increased activity in the solution enhances this effect. Millicurie amounts collected in waste containers can accumulate volatile forms of S-35.
- A radiocompound has the same chemical properties as its equivalent unlabeled form including volatility. Contact RSS for approval and instructions before acquiring and using any volatile radiolabeled compound.

Volatility Controls for Liquid LLRW Containers:

- Add about 500 mL of a 0.1 M sodium thiosulfate solution to 4-liter waste jugs before adding radioiodine waste to the jug.
- Always make sure waste containers holding volatile radiocompounds are capped when in storage.
- Only uncap waste containers and fill them in an operating, EHS-certified exhaust hood (> 100 lfm).

Collecting Labware Rinses and Washes

1. When washing reusable, radioactively contaminated lab equipment, collect and pour wash and rinse water from the first and second rinse into a liquid LLRWjug.
2. After the third wash and rinse, analyze a 1-mL sample using a liquid scintillation counter sample of the rinse water and compare it to a 1-mL background sample of tap water. Is the count rate < 3 times background?
 - If YES, discard the rinse water down the sanitary drain (sink).
 - If NO, discard the rinse water into a liquid LLRW jug. Repeat this rinse/count process until the count rate for the rinse water is < 3 times background.

What NOT to Place in Waste Jugs

The addition of dissimilar material into a waste container complicates the efficient handling of the waste, may increase handling costs, and may compromise the safety of all waste handlers. You **must** keep foreign matter and undissolved solids out of waste containers.

- Do not add:
 - Pipette tips
 - Needles
 - Filter paper
 - Precipitates or other undissolved solids
 - Biological material
- Collect liquid waste in liquid waste containers and collect solid waste in its appropriate container.

Contact HMM for special handling or processing of acidic or caustic liquids.

Supplies Available through HMM

HMM provides the following supplies. To order these supplies, complete the [EHS Supplies Request Form](#) or call (734) 763-4568.

- 4 liter plastic jugs
- 20 liter plastic jugs



NOTE: Obtain approval from HMM before using glass or other containers for waste.

- LLRW Manifest

LOW-LEVEL RADIOACTIVE WASTE (LLRW) MANIFEST MANIFEST # **R 35433**

UN231, Radioactive material, low specific activity (LSA, IN, 7)
University of Michigan, Environmental Health & Safety (EHS)
North Campus Transfer Facility, 1655 Dean Road, Ann Arbor, MI 48109-2159, (734)763-4568

LLRW (Less Than 20 gal.)

S	E	C	A	Activity		Activity		Activity	
				U-235	U-238	U-235	U-238	U-235	U-238
				1.7	28	1	1	1	1
				1.5	28	1	1	1	1
				1.3	28	1	1	1	1

LLRW (More Than 20 gal.)

S	E	C	A	Activity		Activity		Activity	
				U-235	U-238	U-235	U-238	U-235	U-238

SENTINELATION VIALS (Indicate on the box whether the vial is plastic or glass)

S	E	C	A	Activity		Activity		Activity	
				U-235	U-238	U-235	U-238	U-235	U-238

Authorized User: _____ Phone: _____
 Received Building: _____ Date/Time/Year: _____
 Completed By: _____ Signature: _____

*Signer indicates that each container has been opened for external contamination (single a copy of survey results is available).

IN CASE OF EMERGENCY CONTACT: PUBLIC SAFETY (EHS/HS): (734) 763-1131 LSA-II Exclusive Use Shipper

INSTRUCTIONS TO IDENTIFY CHEMICALS IN LIQUIDS

1. If chemical is listed below, please enter corresponding number code and approximate chemical concentration in % by volume in Section B on the front side of the manifest.


2. If chemical constituents are not listed below, please enter number code 99 and approximate concentration in % by volume in Section B on the front side of manifest, and list chemical names and concentrations in Section 2 below.

90 acetone	25 carbon compounds	48 lead acetate	90 sodium citrate
91 acetic acid	26 cyanide	49 methyl bromide	91 sodium decyl sulfate
92 acrylonitrile	27 DOD/DOIT	50 nitrogen dioxide	92 sodium hydroxide
93 acetone	28 diethylamine	51 phosphorus pentoxide	93 sodium hypochlorite
94 acetone	29 diethylbenzene	52 potassium nitrate	94 sodium iodide
95 acetone	30 diethylbenzene	53 potassium permanganate	95 sodium lauryl sulfate
96 acetone	31 diethylamine	54 potassium sulfate	96 sodium metasilicate
97 acetone	32 diethylamine	55 potassium hydroxide	97 sodium nitrate
98 acetone	33 diethylamine	56 potassium hydroxide	98 sodium nitrite
99 acetone	34 diethylamine	57 potassium hydroxide	99 sodium phosphate
100 acetone	35 diethylamine	58 potassium hydroxide	100 sodium silicate
101 acetone	36 diethylamine	59 potassium hydroxide	101 sodium sulfate
102 acetone	37 diethylamine	60 potassium hydroxide	102 sodium sulfide
103 acetone	38 diethylamine	61 potassium hydroxide	103 sodium sulfite
104 acetone	39 diethylamine	62 potassium hydroxide	104 sodium sulfite
105 acetone	40 diethylamine	63 potassium hydroxide	105 sodium sulfite
106 acetone	41 diethylamine	64 potassium hydroxide	106 sodium sulfite
107 acetone	42 diethylamine	65 potassium hydroxide	107 sodium sulfite
108 acetone	43 diethylamine	66 potassium hydroxide	108 sodium sulfite
109 acetone	44 diethylamine	67 potassium hydroxide	109 sodium sulfite
110 acetone	45 diethylamine	68 potassium hydroxide	110 sodium sulfite
111 acetone	46 diethylamine	69 potassium hydroxide	111 sodium sulfite
112 acetone	47 diethylamine	70 potassium hydroxide	112 sodium sulfite
113 acetone	48 diethylamine	71 potassium hydroxide	113 sodium sulfite
114 acetone	49 diethylamine	72 potassium hydroxide	114 sodium sulfite
115 acetone	50 diethylamine	73 potassium hydroxide	115 sodium sulfite
116 acetone	51 diethylamine	74 potassium hydroxide	116 sodium sulfite
117 acetone	52 diethylamine	75 potassium hydroxide	117 sodium sulfite
118 acetone	53 diethylamine	76 potassium hydroxide	118 sodium sulfite
119 acetone	54 diethylamine	77 potassium hydroxide	119 sodium sulfite
120 acetone	55 diethylamine	78 potassium hydroxide	120 sodium sulfite
121 acetone	56 diethylamine	79 potassium hydroxide	121 sodium sulfite
122 acetone	57 diethylamine	80 potassium hydroxide	122 sodium sulfite
123 acetone	58 diethylamine	81 potassium hydroxide	123 sodium sulfite
124 acetone	59 diethylamine	82 potassium hydroxide	124 sodium sulfite
125 acetone	60 diethylamine	83 potassium hydroxide	125 sodium sulfite
126 acetone	61 diethylamine	84 potassium hydroxide	126 sodium sulfite
127 acetone	62 diethylamine	85 potassium hydroxide	127 sodium sulfite
128 acetone	63 diethylamine	86 potassium hydroxide	128 sodium sulfite
129 acetone	64 diethylamine	87 potassium hydroxide	129 sodium sulfite
130 acetone	65 diethylamine	88 potassium hydroxide	130 sodium sulfite
131 acetone	66 diethylamine	89 potassium hydroxide	131 sodium sulfite
132 acetone	67 diethylamine	90 potassium hydroxide	132 sodium sulfite
133 acetone	68 diethylamine	91 potassium hydroxide	133 sodium sulfite
134 acetone	69 diethylamine	92 potassium hydroxide	134 sodium sulfite
135 acetone	70 diethylamine	93 potassium hydroxide	135 sodium sulfite
136 acetone	71 diethylamine	94 potassium hydroxide	136 sodium sulfite
137 acetone	72 diethylamine	95 potassium hydroxide	137 sodium sulfite
138 acetone	73 diethylamine	96 potassium hydroxide	138 sodium sulfite
139 acetone	74 diethylamine	97 potassium hydroxide	139 sodium sulfite
140 acetone	75 diethylamine	98 potassium hydroxide	140 sodium sulfite
141 acetone	76 diethylamine	99 potassium hydroxide	141 sodium sulfite
142 acetone	77 diethylamine	100 potassium hydroxide	142 sodium sulfite
143 acetone	78 diethylamine	101 potassium hydroxide	143 sodium sulfite
144 acetone	79 diethylamine	102 potassium hydroxide	144 sodium sulfite
145 acetone	80 diethylamine	103 potassium hydroxide	145 sodium sulfite
146 acetone	81 diethylamine	104 potassium hydroxide	146 sodium sulfite
147 acetone	82 diethylamine	105 potassium hydroxide	147 sodium sulfite
148 acetone	83 diethylamine	106 potassium hydroxide	148 sodium sulfite
149 acetone	84 diethylamine	107 potassium hydroxide	149 sodium sulfite
150 acetone	85 diethylamine	108 potassium hydroxide	150 sodium sulfite
151 acetone	86 diethylamine	109 potassium hydroxide	151 sodium sulfite
152 acetone	87 diethylamine	110 potassium hydroxide	152 sodium sulfite
153 acetone	88 diethylamine	111 potassium hydroxide	153 sodium sulfite
154 acetone	89 diethylamine	112 potassium hydroxide	154 sodium sulfite
155 acetone	90 diethylamine	113 potassium hydroxide	155 sodium sulfite
156 acetone	91 diethylamine	114 potassium hydroxide	156 sodium sulfite
157 acetone	92 diethylamine	115 potassium hydroxide	157 sodium sulfite
158 acetone	93 diethylamine	116 potassium hydroxide	158 sodium sulfite
159 acetone	94 diethylamine	117 potassium hydroxide	159 sodium sulfite
160 acetone	95 diethylamine	118 potassium hydroxide	160 sodium sulfite
161 acetone	96 diethylamine	119 potassium hydroxide	161 sodium sulfite
162 acetone	97 diethylamine	120 potassium hydroxide	162 sodium sulfite
163 acetone	98 diethylamine	121 potassium hydroxide	163 sodium sulfite
164 acetone	99 diethylamine	122 potassium hydroxide	164 sodium sulfite
165 acetone	100 diethylamine	123 potassium hydroxide	165 sodium sulfite

99 CODE 99 CHEMICAL NAME(S), % BY VOL.

Jug #	1
2	
3	
4	
5	
6	
7	
8	

- Radioactive Waste Label

Manifest # R-	Isotope	Activity (µCi)		University of Michigan 1655 Dean Road Ann Arbor, MI 48109-2159 Phone: (734) 763-4568 Emergency Contact (24 hours): (734) 763-1131
Container #				
Date (mo/day/yr) / /				
RADIOACTIVE - LSA				

Preparing Jugs for Collection

When preparing liquid waste jugs for collection, ensure:

- The liquid waste container is not filled above the inscribed line.



NOTE: If the container does not have a line, or if the line is faded, do not fill the container beyond the area of the jug where it begins to taper to the jug's mouth. An overfilled jug is more likely to spill and spread contamination.

- The waste jug is **not** leaking.
- A radioactive contamination survey has been conducted to demonstrate the jug is free of external contamination.
- The cap is securely tightened to prevent spillage during collection and transportation.

Using the Waste Container

1. Use a funnel to decant liquid LLRW into jugs to prevent external contamination.
2. Segregate LLRW by isotope(s). Refer to [Table of Acceptable Segregation Categories for Low-Level Radioactive Waste](#).

Procedure: Preparing Liquid LLRW for Collection

1. Analyze a 1-mL sample from each liquid LLRW jug in a liquid scintillation counter to ensure accurate reporting of radioisotope activity content.
2. Assign a number to each jug. Use 1-8 as preprinted on each manifest.
3. On the manifest, complete Section B and the Authorized User and location information (see "Completing the LLRW Manifest" below).
4. Conduct a removable radioactive contamination survey of the following areas of the jugs:
 - Cap
 - Handle
 - Sides
 - Bottom
5. Is there evidence of removable radioactive contamination?
 - If YES, decontaminate (clean) the outside of the jug and repeat step 4.
 - If NO, go to the next step.
6. Make a copy of the manifest and radioactive contamination survey results for your records.
7. Staple a copy of the radioactive contamination survey results to the manifest.
8. Complete the container label and insert it through the handle and affix the two adhesive ends together.
9. Place the manifest in a location where it is visible for collection and where it will **not** become contaminated.
10. Request a waste collection from HMM using one of the following methods:
 - Call HMM at (734) 763-4568
 - Complete the online [Supply Request](#) or [Waste Pickup Form](#) listed on the [EHS Homepage](#)

Denying Waste Collection

EHS may choose **not** to collect waste jugs or may return jugs to the laboratory of origin for repackaging if any of the following unacceptable conditions are noted:

- External contamination detected on jugs.
- Isotopes(s), activity, or chemical content in the waste jugs are inconsistent with those identified by the waste generator.
- Bi-phasic mixture of liquids in waste jug.
- Cap on jug is **not** an EHS-approved cap.
- Solid material discovered in jug (pipette tips, filter paper, needles, biological material, etc.).

- Jugs filled beyond inscribed line.
- Jugs bloated (positive pressure) or crumpled (negative pressure).
- Writing or defacing noted on jug surface.



Preparing Sharps LLRW for Collection

Sharps are objects which represent a puncture or laceration hazard; the following are examples:

- Needles
- Scalpels
- Intravenous tubing with needle attached
- Blades (razor, X-Acto knife)
- Capillary tubes and pipettes
- Sharp metal objects
- Broken glass objects

Supplies Available through HMM

HMM provides sharps containers. To order sharps containers, call (734) 763-4568 or Complete the [EHS Supplies Request Form](#) .

- **1-gallon sharps container**



- **5-gallon sharps container**



● **LLRW Manifest**

The image shows two forms. The left form is the 'LOW-LEVEL RADIOACTIVE WASTE (LLRW) MANIFEST' (Form R 35432). It includes sections for 'SPECIAL USE LLRW', 'LLRW', and 'NONRADIOACTIVE WASTE'. It contains multiple tables for recording container information, activity levels, and chemical concentrations. The right form is 'INSTRUCTIONS TO IDENTIFY CHEMICALS IN LIQUIDS', which provides a list of chemical codes (99) and their corresponding names and concentrations. It also includes a table for recording the chemical composition of liquids.

● **Radioactive Waste Label**

The image shows a 'Radioactive Waste Label' form. It includes a table for recording 'Manifest # R-', 'Container #', and 'Date (mo/day/yr)'. It also has a table for 'Isotope' and 'Activity (µCi)'. To the right of the table is a yellow 'CAUTION RADIOACTIVE MATERIAL' warning symbol. Below the symbol is the contact information for the University of Michigan: 1655 Dean Road, Ann Arbor, MI 48109-2159, Phone: (734) 763-4568, and Emergency Contact (24 hours): (734) 763-1131.

Denying Waste Collection

Sharps are **not** to be placed into yellow LLRW fiber drums for disposal. Sharp objects discovered in yellow LLRW fiber drums will result in the drum being returned to the laboratory of origin for proper segregation and repackaging.

Using the Waste Container

- Segregate sharps LLRW by isotope(s).
- Securely close (i.e., snap in place) the container to prevent radioactive material from leaking from conditions normally incident to transportation.

Procedure: Preparing Sharps LLRW for Collection

1. Assign a number to each pail or box. Use 1-8 as preprinted on each manifest.
2. On the manifest, complete Section D and the Authorized User and location information (see “Completing the LLRW Manifest” below).
3. Conduct a removable radioactive contamination survey of the following places on each sharps pail or HMM-approved commercially-available container:
 - Pail: Lid, handle, sides, and bottom
 - HMM-approved commercially-available containers: All four sides, top, and bottom
4. Is there evidence of removable radioactive contamination?
 - If YES, decontaminate (clean) the outside of the pail or HMM-approved commercially-available container and repeat step 5.
 - If NO, go to the next step.

5. Make a copy of the manifest and radioactive contamination survey results for your records.
6. Staple a copy of the radioactive contamination survey results to the manifest.
7. Place container label around the handle of the pail and affix the two adhesive ends together or on top of the HMM-approved commercially-available container.
8. Place the manifest in a location where it is visible for collection and where it will **not** become contaminated.
9. Request a waste collection from HMM using one of the following methods:
 - Call HMM at (734) 763-4568
 - Complete the online [EHS Waste Pickup Request form](#)

Preparing Lead- and Barium-Impregnated Pigs and Objects Containing Lead or Barium for Collection

EHS collects lead- and barium-shielded containers (“pigs”), bricks, sheets, and objects impregnated with lead or barium for disposal.

Packaging

Lead- and barium-impregnated pigs **must** be in a sturdy box, taped securely shut, and marked “LEAD PIGS” or “BARIUM PIGS.”

Objects containing lead or barium **must** also be in a sturdy box and taped securely shut.

Procedure: Preparing Lead- and Barium- Impregnated Pigs for Collection

1. Conduct a removable radioactive contamination survey of all sides or surfaces of the lead- or barium-impregnated pigs.
2. Is there evidence of removable radioactive contamination?
 - If YES, decontaminate (clean) the lead object and repeat step 1.
 - If NO, go to the next step.
3. Place lead- or barium-impregnated pigs in a sturdy box.
4. Seal the box securely with lab, duct, or masking tape (**not** “Caution: Radioactive Material” tape).
5. On the manifest, complete Section D--Pigs and the Authorized User and location information (see “Completing the LLRW Manifest” below).
6. Make a copy of the manifest and radioactive contamination survey results for your records.
7. Staple a copy of the radioactive contamination survey results to the manifest.
8. Place the manifest in a location where it is visible for collection and where it will **not** become contaminated.
9. Request a waste collection from HMM using one of the following methods:
 - Call HMM at (734) 763-4568
 - Complete the online [Waste Pickup Request form](#)

Procedure: Preparing Objects Containing Lead or Barium for Collection

1. Conduct a removable radioactive contamination survey of all sides or surfaces of the lead- or barium-objects.
2. Is there evidence of removable radioactive contamination?



- If YES, decontaminate (clean) the lead or barium object and repeat step 1.
 - If NO, go to the next step.
3. Place objects containing lead or barium in a sturdy box.
 4. Seal box securely with lab, duct, or masking tape (**not** “Caution: Radioactive Material” tape).
 5. Place radioactive contamination survey results in a location where they are visible for collection and where they will **not** become contaminated.
NOTE: Objects containing lead or barium do not need a manifest.
 6. For oversized items that cannot be boxed, contact HMM for packaging instructions.
 7. Request a waste collection from HMM using one of the following methods:
 - Call HMM at (734) 763-4568
 - Complete the online [Waste Pickup Request form](#)

Preparing Animal Carcasses and Tissues Contaminated with Radioactive Material for Collection

Use this procedure to prepare animal carcasses and tissues contaminated with radioactive material for collection. Examples of this Waste Stream include the following:

- Animal carcasses
- Blood
- Organs
- Tissues
- Body parts other than teeth
- Products of conception
- Urine/feces
- Bedding

Freezer

Animal carcasses and animal tissue waste **must** be completely frozen prior to collection. Place bags holding carcasses in a freezer designated for animals containing radioactive material.

Authorized Users must notify RSS in writing when planning to store radioactive pathological material in an animal freezer under the authorization of another individual or department.

NOTE: Contact RSS if a radioactive storage freezer is filled to capacity, breaks down, or otherwise becomes ineffective in completely freezing animal carcasses, tissues, blood, etc.

Biological Radioactive Waste Containing Other Hazards

Radioactive blood, tissue, urine, etc. **must** be rendered innocuous or non-toxic prior to HMM collection (e.g., using bleach, detergent, and other methods).

WARNING: Radioiodines or other volatile compounds may become airborne when bleach is added.

NOTE: Authorized Users **must** have EHS approval to generate biohazardous, chemically toxic, or carcinogenic materials in animal tissue. Special handling instructions or precautions **must** be provided to HMM when requesting waste collections containing pathological, toxic, or carcinogenic material.

Reducing Volatile Nature of Radioiodines

Acidic solutions or strong oxidizers (e.g., bleach) enhances the volatile nature of radioiodines (e.g., sodium iodide [NaI]).

To reduce the volatility of the radioiodines in fluids such as urine or blood, add approximately 500 mL of sodium thiosulfate (Na₂S₂O₃) in waste jugs containing liquid radioiodines. The sodium thiosulfate binds free or volatile radioiodine and reduces volatility.

NOTE: Do **not** mix bleach with radioiodines; bleach enhances the volatile nature of radioiodines. Use other EPA-approved disinfectants (e.g., Lysol) to control odors and eliminate pathogens.

I-125 and I-131

Do **not** discard ≥ 5.0 mCi of I-125, I-131, or both in a single bag or container of biological waste unless approved by RSS in advance.

Animal Cages

Plastic animal cages are **not** considered pathological waste. Follow the procedure [Preparing Animal Waste and Bedding Contaminated with Radioactive Material for Collection](#), then decontaminate the cages.

For more information about decontaminating cages, refer to [Responsibilities to Decontaminate Animal Cages and Pens Used with Radioactive Materials](#).


Supplies Available through HMM

RSS provides the following supplies to collect radioactive animal carcasses, tissues, and bedding. To order these supplies, call (734) 763-4568 or complete the online [Supplies Request Form](#).

- Yellow opaque plastic bags (4 mil)



- “Caution Radioactive Material - Radioactive Animal or Pathological Waste” tag


**CAUTION
RADIOACTIVE
MATERIAL**
 RADIOACTIVE ANIMAL OR PATHOLOGICAL WASTE

RADIONUCLIDE(S): _____
 ACTIVITY (μCi): _____
 AUTHORIZED USER: _____
 CONTACT PERSON: _____
 PHONE #: _____
 DATE RADIONUCLIDE(S) ADMINISTERED: _____
 DATE WASTE PLACED INTO FREEZER: _____
 DESCRIPTION OF WASTE*: _____
* [Dog, rats, mice, bedding, blood, etc.]

COMPLETE & SECURELY ATTACH THIS TAG TO OUTER YELLOW BAG

University of Michigan
 1655 Dean Road, Ann Arbor, MI 48109-2159
 Phone: (734) 763-4568
 Emergency Contact (24 hours): (734) 763-1131

Researchers are **REQUIRED** to segregate & discard animal and other pathological wastes according to the Radiation Safety Service (RSS) animal freezer and disposal protocols.

[UN3321, Radioactive material, low specific activity (LSA-II), 7]

COMMENTS: _____

- Obtain authorization from RSS prior to using a radioactive designated freezer.
- Pathological waste does not include and must NOT contain: needles, scalpels, razors, syringes, or other sharp objects, dosing vials, chemicals, plastic animal cages or metallic objects.
- Carcasses & pathological material must be placed into a strong, leak proof primary plastic bag (24 mil thick), sealed tightly with tape, and placed into a secondary opaque bag.
- Ensure inner bag is labeled with radioactive tape and the outer bag is tagged.
- Plastic cages must be emptied, washed out, and discarded separately.



NOTE: Do not place radioactive animal carcasses and tissues into:

- Yellow fiber drums used for solid LLRW
- Glass containers

Procedure: Preparing Animal Carcasses and Tissues Contaminated with Radioactive Material for Collection

To prepare animal carcasses and tissues contaminated with radioactive material for collection:

1. Remove all sharps (needles, razors, scalpels, etc.) and metallic objects from carcasses.
2. Double-bag carcasses and tissues in 4 mil plastic bags.
3. Place carcass tissues in the leak-proof yellow plastic bag.
4. Seal the bag tightly with "Caution: Radioactive Material" tape.
5. Complete and attach the "CAUTION RADIOACTIVE MATERIAL: RADIOACTIVE ANIMAL OR PATHOLOGICAL WASTE" tag on the bag with the following information:
 - Radionuclide(s)
 - Activity (mCi)
 - Authorized User / Investigator's Name
 - Contact person and phone number
 - Date Radionuclide(s) administered
 - Date waste placed into freezer
 - Description of waste (such as dogs, rats, mice, bedding, blood)
 - Comments
6. Place the bag in a freezer designated for animals containing radioactive material.
7. Call HMM at (734) 763-4568 for collection.

Accepted Liquid Scintillation Fluids (Cocktails)

EHS approves which liquid scintillation cocktails can be used for research. Refer to the following table for a list of these liquid scintillation cocktails. When ordering liquid scintillation cocktails, verify the name of the liquid scintillation cocktail being ordered. Some manufacturers make a family of liquid scintillation cocktails with similar names, but with different properties; therefore, making one an approved liquid scintillation cocktail, but other variations are not approved. To request approval to use a liquid scintillation cocktail not listed in the table below, contact HMM at (734) 763-4568. HMM may issue special handling and processing instructions for the liquid scintillation cocktail.

Cocktail Names and Manufacturers

- **Ready Safe** - Beckman
- **Scintisafe 30%** - Fisher Scientific
- **Scintisafe Plus 50%** - Fisher Scientific
- **Scintisafe Econo F** - Fisher Scientific
- **Scintisafe Econo 1** - Fisher Scientific
- **Scintisafe Econo 2** - Fisher Scientific
- **Scintisafe Gel** - Fisher Scientific
- **Scintiverse BD** - Fisher Scientific
- **BSC** - GE Healthcare (Amersham)
- **In-Flow 2:1** - IN/US Systems, Inc.
- **ProSafe FC+** - Meridian Biotechnologies
- **ProSafe+** - Meridian Biotechnologies
- **ProSafe HC+** - Meridian Biotechnologies
- **ProSafe TS+** - Meridian Biotechnologies
- **ProFlow G+** - Meridian Biotechnologies
- **ProFlow P+** - Meridian Biotechnologies
- **BetaMax ES** - MP Biomedicals (ICN)
- **CytoScint ES** - MP Biomedicals (ICN)
- **Ecolite (+)** - MP Biomedicals (ICN)
- **EcoLume** - MP Biomedicals (ICN)
- **UniverSol ES** - MP Biomedicals (ICN)
- **Ecoscint H** - National Diagnostics
- **Ecoscint O** - National Diagnostics
- **Beta Plate Scint** - Perkin Elmer (Wallac)
- **Formula 989** - Perkin Elmer (Packard)
- **MicroScint O** - Perkin Elmer (Packard)
- **MicroScint 20** - Perkin Elmer (Packard)
- **Opti-fluor** - Perkin Elmer (Packard)
- **Opti-fluor O** - Perkin Elmer (Packard)
- **OptiPhase HiSafe 2** - Perkin Elmer (Packard)
- **OptiPhase Super Mix** - Perkin Elmer (Packard)
- **Ultima Gold** - Perkin Elmer (Packard)
- **Ultima AB** - Perkin Elmer (Packard)
- **Ultima Gold F** - Perkin Elmer (Packard)
- **Ultima Gold MV** - Perkin Elmer (Packard)
- **Ultima Gold XR** - Perkin Elmer (Packard)
- **Ultima Flo AF** - Perkin Elmer (Packard)
- **Ultima Flo AP** - Perkin Elmer (Packard)
- **Ultima Flo M** - Perkin Elmer (Packard)
- **Bio-Safe II** - Research Products Intl.
- **Bio-Safe NA** - Research Products Intl.
- **Econo-Safe** - Research Products Intl.

Preparing Liquid Scintillation Vials for Collection

HMM will collect empty, filled, or partially-filled liquid scintillation vials containing EHS-approved non-hazardous or biodegradable scintillation fluid, provided the vials are sorted, packaged, and prepared according to the methods described below.

Using Non-Approved Liquid Scintillation Fluids

To obtain approval to use a scintillation cocktail that is not on the approved list contact HMM at (734) 763-4568.

Temporary authorization may be granted to use a non-approved scintillation cocktail if there is a valid research need to use a specific product or type of cocktail. Non-approved scintillation cocktails may require additional handling and packaging requirements, such as decanting into specialty containers.

NOTE: Toluene and xylene-based scintillation fluids are prohibited unless authorization has been received from EHS. Contact HMM for specific collection instructions.

Segregating Liquid Scintillation Vials

To segregate liquid scintillation vials:

- Segregate vials by isotope content; refer to the [Table of Acceptable Segregation Categories for Low-Level Radioactive Waste](#).
- Segregate glass and plastic vials of the same isotope content.
- Use a separate tray and box for each isotope content and the type of container they are in.

Improper Liquid Scintillation Vials Disposal

The following disposal methods are prohibited:

- Discarding scintillation fluid or isotopes down sanitary drains.
- Discarding scintillation vials with solid waste.
- Disposing of commercially- prepared liquid scintillation standards with other scintillation vial wastes.

NOTE: Contact EHS to request a special collection.

Boxes for Liquid Scintillation Vials

The boxes used to package liquid scintillation vials for disposal **must** be undamaged, sturdy, and properly sealed to prevent breakage or leakage of contents. Users will be asked to repackage boxes of scintillation vials saturated with or leaking scintillation fluid.

What NOT to Place in Boxes

The following items **must** NOT be placed in boxes containing liquid scintillation vials:

- Other forms of LLRW (gloves, syringes, paper, pads, etc.)
- Radioactive material stock vials

Procedure: Preparing Liquid Scintillation Vials for Collection

1. Segregate liquid scintillation vials by isotope(s).
2. Segregate vials of the same isotope by type of vial (glass or plastic).
3. Ensure scintillation vial caps are fastened securely and not leaking prior to packaging in trays and boxes.

NOTE: Do NOT tape the tops of scintillation vials.

4. Did the vials come in a flat tray?
 - If YES, place the vials in a flat tray.
 - If NO, place the vials in a plastic bag, then inside a sturdy box.
5. Place absorbent material in the bottom of the appropriate box:
 - If the vials are in a flat tray, place the absorbent pad in the original vial box.
 - If the vials are in a plastic bag (and box), place the absorbent pad in a sturdy box.
6. Pack vial flats or plastic bag containing scintillation vials the appropriate box.
7. Seal box securely with lab, duct, or masking tape (**not** "Caution: Radioactive Material" tape).
8. Write on the top of the box whether the liquid scintillation vials are made of plastic or glass.
9. Assign a number to each box. Use 1-8 preprinted on each manifest.

10. On the manifest, complete Section C and the Authorized User and location information (see “Completing the LLRW Manifest” below).
11. Conduct a removable radioactive contamination survey for the following areas for each box:
 - All four sides
 - Top
 - Bottom
12. Is there evidence of removable radioactive contamination?
 - If YES, decontaminate (clean) the outside of the box and repeat step 11.
 - If NO, go to the next step.
13. Make a copy of the manifest and radioactive contamination survey results for your records.
14. Staple a copy of the radioactive contamination survey results to the manifest.
15. Complete the container label and affix it to the top of the box.
16. Place the manifest in a location where it is visible for collection and where it will **not** be contaminated.
17. Request a waste collection from HMM using one of the following methods:
 - Call HMM at (734) 763-4568
 - Complete the online [Waste Pickup Request form](#)

Preparing Stock Vials for Collection

Empty radioactive material stock vials with no visible residue can be disposed of in fiber drums as solid waste.

Containers

Place stock vial in a closeable container that is sufficiently strong enough to hold it, such as a strong, durable carton or a pail with lid. HMM can supply plastic pails at no charge, upon request.

Line the container with a plastic bag or place an absorbent plastic-backed pad (e.g., blue pad or Benchkote®) on the bottom of the container to contain or absorb any liquid that may leak.

Supplies Available through HMM

HMM provides the following supplies to collect stock vial waste. To order these supplies, call (734) 763-4568 or complete the online [Supplies Request Form](#).

- 1-gallon pail
- 5-gallon pail





- Box: Affix on the top of the box.
 - Pail: Place around the handle and affix the two adhesive ends together.
9. Place manifest in a location where it is visible for collection and where it will **not** become contaminated.
 10. Request a waste collection from HMM using one of the following methods:
 - Call HMM at (734) 763-4568
 - Complete the online Supply Request or Waste Pickup Form listed on the [EHS Homepage](#)

Completing the LLRW Manifest

The LLRW manifest provides a profile and a record of the types (solid, liquid, scintillation vials, sharps, and stock vials) and quantities of LLRW prepared for collection.

Procedure: Completing Section A—SOLIDS

1. Record the assigned solid waste drum **Number** on each solid waste drum.

NOTE: Solid waste drums have an assigned number, which is located on the side of the drum. Large drum numbers begin with “LD,” small drum numbers begin with “SD.”
2. Circle the applicable solid waste drum size:
 - Small solid waste drums = 7.5 or SD
 - Large solid waste drums = 28 or LD
3. Record the **Isotope(s)** and **Activity(s) (μCi)** of each isotope in the solid waste drum. The following example shows how the manifest looks when Section A is complete:

SOLIDS (Place Container Label on decal on side of yellow fiber drum.)												
S E C A	RQ	# on Drum	Size (Circle)	Isotope	Activity		Isotope	Activity		Isotope	Activity	
					(kBq)	(μCi)		(kBq)	(μCi)		(kBq)	(μCi)
		LD-5125	SD (LD)	H-3		(200)	C-14		(120)			()
		SD-5364	SD (LD)	S-35		(130)	P-33		(60)	Cr-51		(35)
		LD-5394	SD (LD)	P-32		(90)			()			()

4. Complete the next applicable section.

Procedure: Completing Section B—LIQUIDS

1. In the **Vol (L)** box, indicate, using whole numbers, the volume of liquid (liters) in each individual liquid waste jug.
2. Record the **Isotope(s)** and corresponding **Activity(s) (μCi)** of the liquid waste within each liquid waste jug.
3. Refer to the back of the manifest and use the table to describe the chemical constituents of the liquid contained within each liquid LLRW jug.
 - If the liquid LLRW contains a chemical listed on the back of the manifest:
 - In the **Code** box, write the corresponding code.
 - In the **% by vol** box, write the percentage of the corresponding chemical, then go to the next step.
 - If the liquid LLRW contains a chemical that is NOT listed on the back of the manifest:
 - In the **Code** box, write 99.
 - In the **% by vol** box, write the percentage of that chemical contained in the liquid waste jug.
 - On the back of the manifest, in Section E, write the name of each chemical in the liquid waste jug NOT listed on the back of the manifest.
 - If the liquid LLRW does not contain ANY added chemicals:
 - In the **Code** box, write 00.
 - In the **% by vol** box, write the percentage of water in the waste.

Each container of liquid **must** be described by a code to ensure the liquid is profiled accurately and completely. The following example shows how the manifest looks when Section B is complete:

LIQUIDS (Place label around handle)																
RQ	Jug #	Vol. (L)	Isotope	Activity		Isotope	Activity		If chemical(s) present—enter number code from back & concentration							
				(kBq)	(μ Ci)		(kBq)	(μ Ci)	Code	% by Vol.	Code	% by Vol.	Code	% by Vol.	Code	% by Vol.
S E C B	1	4	C-14	(30)	H-3	(110)	00	100								
	2	4	P-32	(90)		()	27	20								
	3	4	I-125	(210)	P-33	(60)	00	100								
	4	4	P-32	(150)		()	00	100								
	5	4	P-32	(150)		()	51	5	63	2	79	10				
	6	4	S-35	(60)	P-33	(15)	17	15	32	5	48	3				
	7	20	I-125	(240)		()	00	100								
	8	20	P-32	(115)		()	00	100								

4. Complete the next applicable section.

Procedure: Completing Section C—Scintillation Vials

- Record the **Isotope(s)** and corresponding **Activity(s) (μ Ci)** for each box scintillation vials.
- Circle the correct type of vials in the scintillation vials box:
 - If the vials are plastic, circle **P**.
 - If the vials are glass; circle **G**.
 - If a multi-well tray, write and circle a “**T**” between the “**P**” and “**G**.”
- In the **Identify Scintillation Cocktail** box, write the name of the liquid scintillation cocktail that is in the vials.

NOTE: Write “Empty” if no cocktail is used OR the vial once contained a cocktail, but the contents were decanted into another container.

The following example shows how the manifest looks when Section C is complete:

SCINTILLATION VIALS (Indicate on the box whether the vials are plastic or glass.)												
RQ	Box #	Isotope	Activity		Isotope	Activity		Isotope	Activity		Plastic or Glass	Identify Scintillation Cocktail
			(kBq)	(μ Ci)		(kBq)	(μ Ci)		(kBq)	(μ Ci)		
S E C C	1	H-3	(20)	C-14	(170)	()	()				G	Rinsate
	2	P-32	(100)		()	()					P	Scintiverse B10
	3	S-35	(75)		()	()					P	Scintiverse B10
	4	P-32	(100)		()	()					P	Ecolite (+)
	5		()		()	()					P	G

4. Complete the next applicable section.

Procedure: Completing Section D—Sharps, Stock Vials, Lead Pigs, Other Forms

- Is the LLRW in the form of sharps or stock vials?
 - If YES, write a **checkmark** in the appropriate box, record the **Isotope(s)** and corresponding **Activity(s)** for each container.
 - Go to the next step.
- Is the LLRW in some other form?
 - If YES, consult with HMM for more information about how to prepare the LLRW for collection.
 - Go to the next step.
- Does the LLRW consist of lead or barium “pigs” (small shields for stock vials)?
 - If YES, and the pigs contain lead or barium, place a **checkmark** in the appropriate box, then go to the next step.
 - Go to the next step.



The following example shows how the manifest looks when Section D is complete:

S E C D	RQ	Pkg. #	SHARPS (✓)	STOCK VIALS (✓)	OTHER	Isotope	Activity		Isotope	Activity		Isotope	Activity		PIGS (✓)	
							(kBq)	(µCi)		(kBq)	(µCi)		(kBq)	(µCi)	LEAD	BARIUM
		1		✓		P-32	(600)	(450)	S-35	(450)			()	()		
		2		✓		I-125	(420)	()		()			()	()		
		3	✓			H-3	(190)	(60)	C-14	(60)			()	()		
		4	✓			Co-57	(55)	(140)	Na-22	(100)			()	()		

4. Complete the next applicable section.

Procedure: Completing the Authorized User and Location Information

1. Complete the following contact information:

- Authorized User: The RSS-approved Authorized User
- Phone: The telephone number of the laboratory
- Room #/Building: The room number and building name

2. Write the date the manifest was prepared.

3. Print your name.

4. Sign the manifest attesting that each container has undergone a radioactive contamination survey and is free of removable contamination.

The following example shows how the manifest looks when the Authorized User and location information is completed:

PLEASE PRINT Authorized User: John Smith Phone: 763-4568
 Room #/Building: 4100 MSRB III Date (mo/day/yr): 2/11/2026
 Completed By: John Doe *Signature: [Signature]
 *Signature indicates that each container has been swiped for external contamination (staple copy to manifest).

IN CASE OF EMERGENCY CONTACT PUBLIC SAFETY (24 HOURS) AT (313) 763-1131

DOC	mR/hr	INITIALS
OSEH Use Only		

LSA-II
Exclusive Use Shipment

5. Attach a copy of the radioactive contamination survey to the manifest.

Example of Properly Completed Manifest

LOW-LEVEL RADIOACTIVE WASTE (LLRW) MANIFEST												MANIFEST #				
Radioactive material, LSA, n.o.s., 7, UN2912												R 23292				
University of Michigan • Occupational Safety and Environmental Health (OSEH) North Campus Transfer Facility • 1655 Dean Road • Ann Arbor, MI 48109-2159 • (313) 763-4568																
SOLIDS (Place Container Label on decal on side of yellow fiber drum.)																
S E C A	RQ	# on Drum	Size (Circle)	Isotope	Activity		Isotope	Activity		Isotope	Activity					
					(kBq)	(µCi)		(kBq)	(µCi)		(kBq)	(µCi)				
		LD-5125	SD (LD)	H-3	(200)		C-14	(120)								
		SD-5364	SD (SD) LD	S-35	(130)		P-33	(60)		Cr-51	(35)					
		LD-5394	SD (LD)	P-32	(90)											
LIQUIDS (Place label around handle)																
S E C B	RQ	Jug #	Vol. (L)	Isotope	Activity		Isotope	Activity		If chemical(s) present—enter number code from back & concentration						
					(kBq)	(µCi)		(kBq)	(µCi)	Code	% by Vol.	Code	% by Vol.	Code	% by Vol.	
		1	4	C-14	(30)		H-3	(110)		00	100					
		2	4	P-32	(90)					27	20					
		3	4	I-125	(210)		P-33	(60)		00	100					
		4	4	P-32	(150)					00	100					
		5	4	P-32	(150)					51	5	63	2	79	10	
		6	4	S-35	(60)		P-33	(15)		17	15	32	5	48	3	
		7	20	I-125	(240)					00	100					
		8	20	P-32	(115)					00	100					
SCINTILLATION VIALS (Indicate on the box whether the vials are plastic or glass.)																
S E C	RQ	Box #	Isotope	Activity		Isotope	Activity		Isotope	Activity		Plastic or Glass	Identify Scintillation Cocktail			
				(kBq)	(µCi)		(kBq)	(µCi)		(kBq)	(µCi)					
		1	H-3	(20)		C-14	(170)					G	Rinsate			
		2	P-32	(180)								P	Scintiverse B/D			
		3	S-35	(75)								P	Scintiverse B/D			
		4	P-32	(100)								P	Ecolite (L)			
		5										P	G			
S E C D	RQ	Pkg. #	SHARPS (✓)	STOCK VIALS (✓)	OTHER	Isotope	Activity		Isotope	Activity		Isotope	Activity		PIGS (✓)	
							(kBq)	(µCi)		(kBq)	(µCi)		(kBq)	(µCi)	LEAD	BARIUM
		1		✓		P-32	(600)		S-35	(450)						
		2		✓		I-125	(420)									
		3	✓			H-3	(190)		C-14	(60)						
		4	✓			Co-57	(65)		Co-45	(140)		Nd-147	(180)			
PLEASE Authorized User: <u>John Smith</u> Phone: <u>763-4568</u>																
PRINT Room #/Building: <u>4100 MSRB 111</u> Date (mo/day/yr): <u>2/11/2026</u>																
Completed By: <u>John Doe</u> *Signature: <u>[Signature]</u>																
*Signature indicates that each container has been swiped for external contamination (staple copy to manifest).																
IN CASE OF EMERGENCY CONTACT PUBLIC SAFETY (24 HOURS) AT (313) 763-1131												LSA-II Exclusive Use Shipment				
DOC _____ mkt/ty _____ INITIALS _____												OSEH Use Only				

INSTRUCTIONS TO IDENTIFY CHEMICALS IN LIQUIDS


- If chemical is listed below, please enter corresponding number code and approximate chemical concentration in % by volume in section B on the **front** side of manifest.
- If chemical is not listed below, please enter number code **99** and approximate concentration in % by volume in section B on the **front** side of manifest, and list chemical name(s) and concentration(s) in Section E below (please list in same order as listed on front):

- | | | | |
|---|--|--|--|
| 01 • acetamide | 22 • cyclohexane | 48 • lead compounds (specify below) | 89 • sodium chloride |
| 02 • acetic acid | 23 • DDD/DDT | 115 • magnesium chloride | 90 • sodium citrate |
| 100 • acetic anhydride | 108 • dextran sulfate | 97 • magnesium phosphate | 93 • sodium dodecyl sulfate (SDS) |
| 03 • acetone | 24 • dichlorobenzene | 116 • magnesium sulfate | 73 • sodium hydroxide |
| 04 • acetonitrile | 25 • dimethylsulfoxide (DMSO) | 49 • mercaptoethanol | 74 • sodium hypochlorite |
| 05 • acrylamide | 109 • DMEM media | 50 • mercury compounds (specify below) | 123 • sodium iodide |
| 07 • ammonium compounds (specify below) | 26 • epinephrine | 51 • methanol | 124 • sodium lauryl sulfate (SLS) |
| 08 • arsenic compounds (specify below) | 27 • ethanol | 117 • methoxyethanol | 92 • sodium phosphate |
| 09 • barium compounds (specify below) | 28 • ether | 54 • methyl benzene | 125 • sodium thiosulfate |
| 10 • benzene | 29 • ethidium bromide (EtBr) | 52 • methylene chloride | 126 • sucrose |
| 11 • benzo(a)pyrene | 30 • ethyl acetate | 53 • methyl ethyl ketone | 75 • sulfuric acid |
| 95 • blood | 31 • ethylbenzene | 58 • naphthalene | 127 • taurine |
| 88 • boric acid | 32 • ethylene diamine tetraacetic acid (EDTA) | 59 • nitric acid | 76 • tetrachlorobenzene |
| 101 • bovine albumin | 33 • ethylene glycol-bis (β-amino ethyl ether)-tetraacetic acid (EGTA) | 60 • nitrobenzene | 77 • tetrachloroethene |
| 102 • bromophenol blue dye | | 118 • perchloric acid | 128 • tetrahydrofuran |
| 12 • butanol | | 62 • perflour | 78 • toluene |
| 13 • cadmium compounds (specify below) | | 63 • phenol | 79 • trichloroacetic acid (TCA) |
| 103 • calcium chloride | | 64 • phosphoric acid | 80 • trichloroethylene |
| 104 • calcium sulfate | | 65 • phthalates | 129 • trifluoroacetic acid |
| 14 • carbon tetrachloride | | 91 • potassium chloride | 87 • TRIS buffer |
| 16 • chlorobenzene | | 66 • potassium permanganate | 81 • uranyl acetate |
| 17 • chloroform | | 119 • potassium phosphate | 82 • uranyl nitrate |
| 18 • chlorophenol | | 67 • propanoic acid | 83 • urea |
| 105 • choline chloride | | 68 • pyridine | 84 • vinyl chloride |
| 19 • chromium compounds (specify below) | | 94 • saline sodium citrate (SSC) | 85 • xylene |
| 106 • citric acid | | 69 • scintillation fluid (specify below) | 130 • xylene cyanol |
| 107 • coomassie blue dye | | 70 • selenium compounds (specify below) | 86 • zinc compounds (specify below) |
| 20 • copper compounds (specify below) | | 71 • silver compounds (specify below) | 99 • OTHER (SEE INSTRUCTIONS ABOVE) |
| 96 • culture medium | | 120 • sodium acetate | |
| 21 • cyanide compounds (specify below) | | 72 • sodium azide | |
| | | 121 • sodium bicarbonate | |
| | | 122 • sodium carbonate | |

Jug #	CODE 99 CHEMICAL NAME(S), % BY VOL.
1	
2	
3	
4	
5	
6	Lead Acetate
7	
8	

The Container Label

Complete and attach an identification label to each container of LLRW pending collection. The label associates the container to a LLRW manifest describing the contents of the container, along with other information necessary for transportation and disposal.

Manifest # R-	Isotope	Activity (μCi)		University of Michigan 1655 Dean Road Ann Arbor, MI 48109-2159 Phone: (734) 763-4568 Emergency Contact (24 hours): (734) 763-1131
Container #				
Date (mo/day/yr) / /				

RADIOACTIVE – LSA

Each container label **must** include the following information:

- Manifest Number
 - The pre-printed number is located on the upper-right corner of the LLRW manifest.
- Container Number
 - A pre-designated number that can be found marked on the side of the drum. Large drum numbers begin with “LD” and small drum numbers begin with “SD.”
 - For liquid waste, scintillation vials, sharps, and stock vials, the line number on the manifest corresponding to the container entry.



- Date (month/day/year)
 - The date the manifest was prepared.
- Isotope/Activity
 - Each isotope in the container and its activity (μCi). This must match the associated information on the manifest for the container.

Placement of the container label:

- Solid waste drum
 - Affix label where it says, “Place container label here” on the side of the drum
- Liquid waste jug
 - Insert label through handle and affix the two adhesive ends together
- Scintillation vial box
 - Affix label to the top of the box
- Sharps
 - Pail: Place label around handle and affix the two adhesive ends together
 - Other commercially-available approved containers: Affix label to top of the container
- Stock vial
 - Box: Affix label to the top of the box
 - Pail: Place label around handle and affix the two adhesive ends together

Storage and Labeling

LLRW **must** be stored in HMM-provided or approved containers. The containers **must** be:

- Sufficiently strong to hold the waste
- Handled in a manner to minimize breakage and spillage
- Identified as containing radioactive material according to RSS guidelines

Proper Storage of Waste Containers

LLRW containers **must** be stored in a safe, secure, and easily identifiable location within your laboratory. HMM will inspect containers and documentation prior to collection.

Store LLRW in an area that will limit radiation exposure to laboratory personnel. Use appropriate shielding, if necessary. Contact RSS at (734) 647-1143 for recommended location and shielding of LLRW.

Containers

HMM supplies specific types of containers for different types of LLRW at no cost. Use these containers for LLRW.

NOTE: All containers **must** be labeled with “Caution: Radioactive Material” tape.

Type of LLRW, Container to Use, and Availability

- **Solid LLRW**
 - Small (7.5 gallon) or large (28 gallon) yellow fiber drum
 - HMM provides
- **Liquid LLRW**
 - 4 liter (1 gallon) or 20 liter (5 gallon) plastic jug
 - HMM provides
- **Scintillation vials**



- Boxes
 - Use the original box
- **Sharps**
 - 1 gallon or 5 gallon plastic pail
 - HMM provides
 - Other commercially-available approved container
- **Stock vials**
 - Box
 - Any sturdy box
 - 1 gallon or 5 gallon plastic pail
 - HMM provides
- **Animals and related waste**
 - Yellow opaque plastic bag (4 mil)
 - HMM provides the bag and identification tags

Ordering Containers

To order the containers, contact HMM using one of the following methods:

- Call (734) 763-4568
- Complete the online Supply Request or Waste Pickup Form listed on the [EHS Homepage](#).

To order the yellow opaque plastic bags and identification tags (for animals and animal waste), call (734) 647-1143.