International Radioactive Material Acceptance Guidelines

Revision 10

AUTHOR			
DEPARTMENT	PRINTED NAME	SIGNATURE	DATE
SGS/Logistics	Donnie Brackett	Donnie Brackett	11-30-2020

REVIEWERS			
DEPARTMENT	PRINTED NAME	SIGNATURE	DATE
Environmental Compliance	Erin Sims-Taylor		11-23-20
Logistics	Nick Arden		11/19/20
Radiation Safety	Duane Quayle		11/24/2020
Maintenance	Roger Jones	for Brad of Roger Jones	11/24/2020
Health & Safety	Joe Fleetwood		11/23/2020
General Manager	Fred Schulz		11/24/2020

AUTHORIZED USER			
DEPARTMENT	PRINTED NAME	SIGNATURE	DATE
Operations	Brian Parsons		11-25-2020

OWNER/APPROVER			
DEPARTMENT	PRINTED NAME	SIGNATURE	DATE
Technical Services	Bruce Stephenson	Donald Brackett for Bruce Stephenson	11-30-2020

- [X] Non-Proprietary
- [ ] Proprietary
- [ ] Restricted Information
- [ ] Safeguards Information
- [ ] Sensitive Security Information

- [ ] New
- [ ] Title Change
- [X] Revision
- [ ] Rewrite
- [ ] Cancellation

Reason for Cancelation: _____

Table of Contents

1. RADIOACTIVE MATERIAL MANAGEMENT

1.1. Purpose and Scope

This document provides Radioactive Material Acceptance Guidelines (RMAG) for Energy*Solutions (ES)* Bear Creek and Gallaher Road facilities located in Oak Ridge, Tennessee. The RMAG provides minimum requirements that international customers must meet to ship radioactive waste to these facilities. The minimum requirements are as follows:

- Radiological acceptance criteria provided in Table 1.
- Special waste types requiring prior ES evaluation and approval before shipping listed in Table 2 – Waste Requiring Prior Approval and Possibly Special Pricing.
- Components, Materials, and Wastes with Special Restrictions per: 10 CFR 110.8 listed in Attachment 7.2, Table 3**.**
- Specific packaging guidelines defined in Attachment 7.1.
- Examples of incinerable material, compactable material, and metals for recycle material can be found in Attachment 7.3, Table 4 (this table simply lists the most common of each category of material.
- Additional restrictions beyond those discussed in the RMAG apply to materials listed in Attachment 7.2, Table 3; Components, Materials, and Wastes with Special Restrictions per 10 CFR 110.8, List of Nuclear Facilities and Equipment under NRC Export Licensing Authority.

Radioactive waste that does not meet the RMAG may be accepted after evaluation of data **PRIOR** to the shipment of waste to the ES facilities. The radioactive waste received at ES that does not meet the RMAG and has not been evaluated and approved by ES may be subject to additional processing surcharges and/or returned at the generator's expense.

All radioactive waste must be shipped in accordance with TS-R-1, International Atomic Energy Agency (IAEA): Regulations for the Safe Transport of Radioactive Material.

Each generator must have authorization from their regulator to accept returned radioactive waste, processed or unprocessed, prior to shipping to the ES facilities.

Each generator who ships radioactive waste to ES for processing must have a valid contract mechanism in place that includes a Return of Material clause as prescribed by E*S*' Tennessee Radioactive Materials licenses. Each generator must have authorization from their regulator to accept returned radioactive waste, processed or unprocessed, prior to shipping to the ES facilities.

1.2. OOW Expiration

OOW approvals generally expire one year after approval and will need to be re-evaluated by both the customer and OOW Committee after one year.

1.3. **ES Facility Information**

ES Facilities	*Main Office*
Energy*Solutions* Services, Inc. Bear Creek Operations (BCO) 1560 Bear Creek Road Oak Ridge, TN 37830	Phone Number.: 865-481-0222 Customer Service: 865-220-1230 Customer Service Fax: 865-220-1612
Energy*Solutions* Services, Inc. Gallaher Road Facility (GRF) 628 Gallaher Road Kingston, TN 37763	Phone Number: 865-481-0222 Customer Service: 865-220-1230 Customer Service Fax: 865-220-1612

2. REFERENCES AND FORMS

2.1. References

None

2.2. Forms (can be found in the Customer Portal

2.2.1. WAG-502-F1, Shipment Summary Form-International

2.2.2. WAG-502-F3, Nonstandard Material Approval-International

3. SHIPPING, PACKAGING, AND DOCUMENTATION REQUIREMENTS

3.1. A completed Shipment Summary Form (WAG-502-F1) shall accompany all shipments.

3.2. A valid Category 2 Tennessee Radioactive Materials License-for-Delivery unless ES acts as a broker on behalf of the generator.

3.3. DOE/NRC Form 741 (or equivalent) for quantities of Special Nuclear Material (SNM) exceeding 0.49 grams per shipment or source materials exceeding 0.99 kilograms per shipment (10 CFR 40.4 – Definitions and 10 CFR 70.4 – Definitions).

3.4. Test documentation and/or certification for any package requiring such paper work as set forth in either IAEA (international standards) or 49 CFR (American Standards) must accompany shipment including such packages (e.g., Type A Package).

3.5. When materials are imported for energy recovery or recycling, specific care must be taken to minimize non-recyclable material used for shoring or contamination control.

4. RADIOACTIVE MATERIAL ACCEPTANCE GUIDELINES

NOTE

See Table 2 for waste that requires advance approval from ES prior to shipment. Contact your Sales Director or Account Executive regarding advance approval and receipt schedules.

4.1. Resource Waste accepted for recycling

4.1.1. Bulk Metals Recycling

a. Bulk metals (pipe, pumps, valves, tools, file cabinets, etc.) may be melted for recycling. Carbon steel and stainless steel are the preferred alloys for recycling.

b. Metal pieces larger than 4.88 meters x 2.44 meters x 2.44 meters (16 ft. x 8 ft. x 8 ft.) require approval prior to shipping.

c. Metal pieces heavier than 9,080 kilograms (20,000 pounds) per single piece require approval prior to shipping.

d. The following metals are specifically excluded from import: (incidental quantities of the metals listed below may be accepted on a case-by-case basis and MUST be approved prior to shipment).

Not Candidates for Melting
Non-ferrous metals such as brass, bronze, aluminum, cadmium, copper, Inconel, monel, nickel, and chromium
Molybdenum
Uranium metals
Tantalum
Tungsten
Zirconium
Titanium
Magnesium thorium
Metals exceeding 20 mR/hr contact
Metals coated with asbestos
Lead
Galvanized metal with zinc weight percentage >1% of the galvanized metal weight
Stellite
Tin
Oil or solvent contaminated metals
Crushed metal items that contain nonmetallic materials
Alloys with melting points above 1649 degrees C
Bulk metals containing >2% incinerable by weight (e.g. wire insulation, paint, other coatings)
Metal items containing/coated with 50 ppm or greater levels of PCBs must have coating removed

4.1.2. Lead (Pb)

a. Lead bricks, sheets, and shapes that have not been deformed, melted, or significantly gouged are accepted for recycling and beneficial reuse. Lead shot, wool and blankets are not accepted for recycle.

b. Lead shall be packaged separately from non-lead materials. The lead package must be labeled as Lead.

c. Lead-encased metal shapes (LEMS) are accepted for removal of the encasing material and survey and recycling. All LEMS are considered OOW and require approval prior to shipment.

d. Where possible schematic diagrams should be provided for all LEMS prior to shipping. Each LEM shall be marked so it can be linked to the provided diagram(s).

4.1.3. Oil

Oil may be accepted for incineration for the purpose of energy recovery. Oils for energy recovery must not be hazardous as defined in 40 CFR 261, Subpart C – Characteristics of Hazardous Waste and must not exceed allowable levels in the On-Specification Used Oil Table below.

On-Specification Used Oil	
Constituent/Property	**Allowable Level**
Arsenic*	5 ppm or less
Cadmium*	2 ppm or less
Chromium*	10 ppm or less
Lead*	100 ppm or less
Flashpoint***	100^{o} F or higher***
PCBs	Less than 2 ppm
Total Halogens**	1,000 ppm or less

Used Oil (as defined by 40 CFR 279.11) means any oil that has been refined from crude oil, or any synthetic oil, that has been used and as a result of such use is contaminated by physical or chemical impurities.
*This specification is for Total Metals (per above specifications), not TCLP.
**Total halogen concentrations 1,000 ppm but less than 5,000 ppm may be acceptable provided the presumption of mixing has been successfully rebutted.
***Flashpoint ≥100 ^{o} F and <140 ^{o} F require prior approval due to increased storage requirements.

Submission of analytical data will be required Samples of these oils must be collected and analyzed in accordance with the United States Environmental Protection Agency (USEPA) publication SW-846 entitled *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.*

a. Direct Processing - Oils such as diesel, #4, #6, etc. and lubricating oils meeting the following specifications are accepted for direct processing.

Solids content	≤10% by volume
Aqueous liquid content	≤10% by volume

4.2. Waste Material accepted under a Specific License, per 10 CFR 110

4.2.1. Oil

a. Low BTU Oils - Oils that do not meet the specifications in .1.3 will require enhancement with diesel oil, kerosene or other additives to support combustion. These oils must also comply with 40 CFR 261, 40 CFR 279, USEPA SW-846, and will also require submission of analytical data for approval.

b. Synthetic Fluid - Most synthetic fluids, including Fyrquel electro-hydraulic control (EHC) fluid are acceptable as undiluted but must be labeled SYNTHETIC FLUID.

4.2.2. Aqueous Liquids, Sludges, and Resins

a. Aqueous liquids are acceptable and must meet the following parameters:

Descriptor (Note 1)	Processing Operations			
	Incineration	**Waste Water Evaporator**	**Liquid Evap System**	**Drum Oven**
pH	5 to 9	>2 and <12.5	>2 and <12.5	>2 and <12.5
Solids Content by Volume excluding settled sludge	<1.0%	<1%	<1.0%	<1.0%
Oil Content by Volume	<1.0%	No visual sheen	<1.0%	<1.0%
Chelating Agent by Volume	<1.0%	<1.0%	<1.0%	<1.0%
Flash Point ^{0}F	>140	>250	>200 (Note 2)	>200 (Note 2)
Oil (mg/L)	N/A	N/A	N/A	N/A
Gross Beta-Gamma (µCi/ml)	N/A	<1.0E-3	<1.0E-3	N/A
Gross Alpha (µCi/ml)	N/A	<1.0E-5	<1.0E-6	N/A
Beryllium (mg/L)	<0.02	<0.02	<0.02	<0.02

Note 1: Chemical agents present in the waste stream shall be identified.
Note 2: Actual Flash Point result needed to determine proper processing plan.

b. Sludges are considered to be liquids or semi-solids not meeting the above solids criteria because of special incineration handling requirements.

c. Resins with container contact dose rates in excess of 80 mR/hr require prior approval.

4.2.3. Bulk Dry Active Waste (DAW) for Incineration

RAM consisting of paper, plastic, cloth, rubber, and wood are acceptable. Polyvinyl chloride materials >10% by mass and metal are not candidates for incineration. However incidental small amounts of metal such as nails in boards may be acceptable upon approval.

4.2.4. Large Components for Recycling

ES will evaluate all large components >18,100 kilograms (> 39,900 pounds and will not fit into a standard ISO freight container) for receipt on a case-by-case basis for recycling. Specific examples of large components include heat exchangers, steam generators, low pressure turbines, tanks, closed vessels, and reactor pressure vessels

4.2.5. Compaction, Packaging, and Return to Customer

In an effort to help international generators maximize storage space on their sites, ES will evaluate processing material in order to densify/volume reduce the material for return to generator.

4.2.6. Sources and Standards

Non-metallic sources/standards (e.g. plastic and epoxy) may be acceptable for incineration if activity is <37 kBq per cc (<1µCi per cc). Surface deposited metal sources/standards (e.g. 50 mm Tc-99 disk source) may be acceptable for recycling if total alpha activity is <900 kBq (<0.025µCi) , and total beta activity is <9,000 kBq (<0.25 µCi).

4.2.7. Infectious/Medical Waste

Infectious and potentially infectious wastes are accepted after sterilization or other treatment by the generator such as autoclaving or use of bleach to render the wastes noninfectious. Infectious and potentially infectious wastes are materials that are:

a. Generated in the diagnosis, treatment, immunization of humans or animals, or

b. Generated through research involving such beings (including the production or testing of biologicals) that are contaminated or potentially contaminated with infectious agents known or suspected to cause human illness.

c. Sharps as defined by 49 CFR 173.134 means any object contaminated with a pathogen or that may become contaminated with a pathogen through handling or during transportation and also capable of cutting or penetrating skin or a packaging material. Sharps includes needles, syringes, scalpels, broken glass, culture slides, culture dishes, broken capillary tubes, broken rigid plastic, and exposed ends of dental wires. Sharps will require OOW approval prior to shipment.

4.2.8. Small Sharp Objects

Small sharp objects such as broken glass, knives, scalpel blades, and other small sharp metal objects will require OOW approval prior to shipping.

4.2.9. Non-RCRA-Liquid Scintillation Vials (LSV)

LSVs are acceptable for processing provided that they are packaged in accordance with the requirements of Attachment 1. There are three LSV categories:

- Plastic vials ONLY packaged for direct incineration (most preferred/cost effective)
- Glass and Plastic vials packaged for direct incineration
- Glass or Plastic vials in metal drums for incineration

NOTE:

Glass is not acceptable for incineration except for glass liquid scintillation vials. Any glass thicker than a liquid scintillation vial is unacceptable for incineration without prior approval.

4.2.10. Engineered Nanomaterials

Engineered nanomaterials are not acceptable for inspection or processing at the ES Tennessee facilities. An Engineered nanomaterial is any intentionally produced material that has a size in 1, 2, or 3 dimensions of typically between 1-100 nanometers (example: carbon nanotubes or ultrafine particulates). Bucky balls are also included even though they have a size <1nm. Aggregates and agglomerates with size >100nm are included if breakdown may occur creating particles in the 1-100 nm range during the lifecycle.

4.2.11. Stored or Residual Energy

All potentially hazardous stored or residual energy present in any waste for processing, and especially equipment that has not been disassembled, must be identified. Systems, components, or equipment, including batteries which have energy must be relieved, drained, disconnected, restrained, and otherwise rendered deactivated and stable. Hazardous energy items shall be marked as “deactivated” or be marked “Danger- hazardous energy” if hazardous energy has not been addressed.

Potential stored energy would include electrical, mechanical, pneumatic (air), hydraulic, steam, gravity, etc. Examples include springs, static eliminators, capacitors, batteries, elevated movable machine parts, hydraulic systems, pressurized liquid/gas systems, cylinders, etc.

Information such as technical manuals, drawings, or manufacturer information related to equipment with stored or residual energy must be provided to ES OOW for evaluation prior to the shipment of waste or equipment with stored or potential energy. Any removal, disabling, or by-passing of a barrier or safety device intended to protect individuals from stored or residual energy shall be identified.

If the potential energy cannot be released by the customer, then a Special Quote shall be required prior to receipt of the waste or equipment.

4.3. Non-conforming Material

If ES identifies any non-conforming material, the customer will be contacted for proper disposition. The radioactive waste will be put in dispute. Additional charges may apply based on the dispute resolution path.

4.4. Materials Expressly Prohibited from Import

Materials contaminated with Beryllium and Polychlorinated Biphenyls (PCB) are expressly prohibited from import, as well as wastes defined in 40 CFR 261 as Resource Conservation and Recovery Act (RCRA), Off-specification used oil as defined in 40 CFR 279 and wastes defined in U. S. Code: Title 15 Chapter 53 - Toxic Substances Control.

5. RADIOLOGICAL GUIDANCE

Radiological acceptance criteria are defined in Table 1, Radiological Acceptance Criteria – SI Units. Levels of radiation and radionuclide concentrations exceeding those detailed in Table 1 may be accepted on a case-by-case basis, but MUST be approved prior to shipment (Form WAG-502-F3, Nonstandard Material Approval – International).

Table 1. Radiological Acceptance Criteria – SI Units

A. RADIATION AND CONTAMINATION LEVEL OF WASTE		
Waste Type	**Contact Dose Rate with Waste**	**Contamination, Fixed or Removable (Bq/cm^2)**
Metal for Recycling through Melting	≤ 200 µSv/hr	≤8 β–γ ≤1 α
Dry, Active Wastes for Processing	≤1000 µSv/hr	Not Applicable
Lead for Casting	≤ 50 µSv/hr	0.1 α for Uranium and daughters, 0.08 α for transuranics and Thorium, and less than 4 β–γ

B. RADIONUCLIDE CONCENTRATION	
Radionuclide concentration per package shall not exceed the following limits without prior evaluation and approval.	
Metals for Recycle	**Limiting Values**
All Nuclides	≤ 5000 Bq/gm
Co-60	≤ 40 Bq/gm
C-14	≤ 1000 Bq/gm
H-3	≤ 1000 Bq/gm
Cs-137	≤ 5000 Bq/gm
Ni-63	≤ 5000 Bq/gm
Sr-90	≤ 35 Bq/gm
Pu-241	≤ 800 Bq/gm
Total Transuranics (sum of Am-241, Pu-238. Pu-239. Cm-243. Cm-244)	≤ 20 Bq/gm
Special Nuclear Material	≤ 0.49 grams
Source Material	≤ 0.99 kgs
Other Waste Streams	**Limiting Values**
Total, all radionuclides with >5-yr half-lives ***except*** H-3 and C-14	≤ 11 kBq/cc
Total, H-3 and C-14	≤ 5 kBq/cc
I-125	≤ 3700 kBq/package
Other mixed fission and activation products, Z <84	≤ 200 kBq /cc
Tc-99	≤0.13 kBq/cc
Th-232	≤40 kBq/m3 or 1e-5 gm Th/cc of waste
U-238 as metal or oxide	≤20 kBq/cc or 1.6E-3 g U/cc of waste
Depleted Uranium or Natural Uranium as metal or oxide	≤ 120 kBq / m3 or 6e-6 gm U/cc of waste
TRUs and Ra-226 for processing	≤ 90 Bq/g and less than 1% of activity
No shipment shall equal or exceed 10 CFR 110, Appendix P Category 2 quantities of radionuclides (Sum of Fractions Applies)	
Special Nuclear Material	≤ 0.49 grams
Source Material	≤ 0.99 kgs

6. WASTES REQUIRING PRIOR APPROVAL

The items listed in Table 2 require advance approval from ES prior to shipment. Additionally, these items shall be specifically identified on the Shipment Summary Form (WAG-502-F1), which is to be included with the shipment. Contact your account executive regarding advanced approval and receipt schedules. If the following material is shipped to ES without prior approval, it will be subject to waste processing surcharges or returned at the generator's expense.

Table 2 – Waste Requiring Prior Approval and Possibly Special Pricing Consideration

Ref.	Requirement
General	Non-radiological hazards shall be identified
General	Due to the non-routine nature of the types of wastes generated during decommissioning projects, ES reserves the right to review for approval radioactive wastes that originate from decommissioning projects
General	All cask/OOW shipments (minimum of 3 days prior to arrival of shipment)
General	Wooden or fiber outer containers and poly-wrapped flatbed loads
General	Shipments requiring specialty container or dunnage returns
All	Waste that does not meet the ES WAG or requires expedited processing
5.1.1.b	Metal pieces larger than 16 ft. x 8 ft. x 8 ft.(4.88 meters x 2.44 meters x 2.44 meters) per individual piece or combination of integral pieces
5.1.1.c	Metal pieces heavier than 20,000 lbs. (9,080 kilograms) per single piece
5.1.1.d	Bulk Metals that require special evaluation
5.1.2	Lead & LEMS
5.2.4	Large Components
5.2.6	Sealed sources
5.2.7.c	Sharps as defined in 49 CFR 173.134
5.2.8	Small Sharp Objects
5.1.3b	Used Oil Flashpoint ≥100 º F and < 140 º F
5.2.9	Liquid Scintillation Vials
5.2.10	Engineered Nanomaterials
5.2.11	Stored or Residual Energy
5.3	Non-conforming Material
Table 1	When levels in Table 1 are exceeded

7. ATTACHMENTS

7.1. Specific RAM Packaging and Shipping Guidelines

7.2. Table 3 — Components, Materials, and Wastes with Special Restrictions per: 10 CFR 110.8 Import/Export Evaluations for Applicability of Appendices

7.3. Table 4 — Examples of Incinerable, Compactable, and Metal Melt Material

Attachment 8.1, Specific Waste Packaging and Shipping Guidelines

All waste shipped to ES, shall be delivered in qualified containers per IAEA standards and 49 CFR standards. Wood, fiberboard or super-sack containers require coordination for storage purposes. As a minimum, containers shall meet IP-1 standards. Any deviations shall require prior written approval from ES.

Unless prior written approval is provided, all containers without lifting devices over 34 kilograms (75 lbs.) must be palletized, excluding standard drums 113 liter to 321 liter (30-gal to 85-gal). Cubic yard boxes may be double stacked provided they contain legs or have 2" x 4" wood spacer boards sized to fit the containers placed vertically on the floor and between the boxes in order to be removed by a Fork Lift without manual lifting. The boards will be considered sacrificial and incinerated with the boxes, unless requested to be returned with the conveyance.

Any equipment not shipped in its original or intended configuration should be noted on manifest additional notes page or the OOW form. An example would be a compactor or baler that was normally operated in a vertical configuration and now being shipped in a horizontal configuration possibly creating additional pressure applied to certain components.

Material Types

The guidance provided in this attachment applies to packaging for the following material types.

- DAW in Bulk Containers for Sorting, Compaction, and Incineration
- DAW for Direct Compaction
- Aqueous Liquids for Direct Incineration
- Animal/Biological Waste for Direct Incineration
- DAW in Non-Bulk Containers for Direct Incineration
- Resins and Sludges for Drying/Incineration
- Oil for Direct Incineration
- Non-RCRA Liquid Scintillation Vials Shipments
- Cask Shipments
- Small Sharp Objects

DAW in Bulk Containers for Sorting, Compaction, and Incineration

1. Place waste to be sorted inside poly-bags and load the poly-bags into bulk containers.

   NOTE
   Bulk containers larger than 2.8 cubic meter (100 ft^3) containers shall be capable of being off-loaded through the end. Also note that large cargo containers of DAW accepted at ES are limited to top and end-loading sealand type containers. Intermodals may be acceptable with prior approval.

2. **Hot particle waste** received in packages other than 55-gal drums or ES inner-pack boxes must be size reduced prior to receipt to less than 76 cm W x 96 cm L x 112 cm H (30x W x 38x L x 44x H). Hot particle waste shall be double bagged, or wrapped in plastic, and marked on the outermost container:

CONTAINS HOT PARTICLE WASTE—DO NOT OPEN

3. **High Dose Rate Waste >2 mSv/hr (>200 mR/hr)** received in packages such as bags, boxes or other discrete items shall be clearly marked and visible upon opening and unloading of bulk waste containers. The use of colored tape, paint or other clearly marked identifier may be used.

4. **Co-mingled incinerable/compactable waste** for sorting shall be positioned in the bulk container to allow off-loading first. DAW for compaction or incineration which is packaged within the same bulk container (e.g., metal boxes, cargo containers) as wastes that require other processing methods (i.e., metals processing) shall be either segregated by use of partitions or placed in separate containers within the bulk package and must be clearly labeled. Materials needing other processing methods that are packaged within the same bulk container as wastes for sorting and incineration are also subject to the specific waste packaging guidelines for the applicable processing method.

DAW for Direct Compaction

1. ES requires the customer ensure waste packaged for direct compaction has been sorted to remove non-conforming materials.

2. Package DAW for direct compaction in 208 liter (55-gal) steel drums or ES-provided inner-pack (IP) boxes. ES provided inner packs shall not exceed a gross weight of 385 kilograms (850 pounds).

NOTE

ES does not consider inner-pack boxes strong-tight containers. Therefore, inner-pack boxes must be shipped inside another qualified outer container.

3. Do not place large metal pieces, such as piping, rods, or steel bars, in the drum or inner-pack box vertically. Place other miscellaneous metal pieces either horizontally or diagonally in the inner-pack box or drum.

4. **Asbestos (friable and non-friable) material received for compaction in packages other** than 208 liter (55-gal) drums or ES inner-pack boxes must be size reduced prior to receipt to less than 76 cm W x 96 cm L x 112 cm H (30x W x 38x L x 44x H). Asbestos shall be double bagged using six mil polybags, and marked with the required asbestos warning labels.

Aqueous Liquids for Direct Incineration

1. Put the primary containers in outer-packs to provide double containment in the event of leakage or spillage from the primary container.

2. Use of 113 liter to 321 liter (30-gal to 85-gal) non-leaking polyethylene containers for liquids and sludges is acceptable. In addition, ensure the containers are compatible with the liquids being transported.

3. Over-packed packages containing liquids may be packaged within the same bulk container as materials that require other processing methods; however, the packages need to be segregated by use of partitions. Materials for sorting and incineration should be positioned in the bulk container to allow off-loading first.

4. Bulk quantities of aqueous liquids are acceptable in certified tankers and certified portable tanks designed with forklift pockets compatible with standard fork trucks per IAEA standards and 49 CFR standards.

5. Drums shall not be double stacked in ISO freight containers.

Animal/Biological Waste for Direct Incineration

1. **Inner Wrapping:** Double wrap animal/biological waste that contains liquids or could decompose to produce liquids/fluids using two 4-mil clear poly-bags. Close each bag by heat sealing or taping. Put the bag into a cardboard box or fiberboard drum, with a minimum of 2 in. of incinerable absorbent in the bottom. In all instances, use boxes/drums with no metal parts.

   Wrap other animal/biological waste, including contaminated nonmetal laboratory equipment and trash, in one 4-mil clear poly-bag. Heat seal or tape the bag prior to placing it into the cardboard box or fiberboard drum. Biological wastes shall not be mixed with non-incinerables in the same container.

2. **Outer Container:** Only one generator's waste shall be placed in an individual box/drum. Use cardboard boxes or fiberboard drums with no metal parts. Securely close each box/drum with duct tape so that all edges or flaps are not visible. The box or drum is limited to a maximum of 53 cm x 53 cm x 53 cm (21x x 21x x 21x) and 34 kilograms (75 lbs.) gross weight per package.

   Clearly mark each package with the generator's name, and number the package to correspond with the manifested entry. Mark the top of the container, **THIS END UP**. Mark at least two opposite sides of the container:

   BIOLOGICAL WASTE — FOR INCINERATION ONLY

   NOTE:

   DO NOT mark containers as BIOHAZARDOUS. Biohazardous means the same as infectious at ES.

   Animal carcasses/tissue shall arrive frozen at ES.

3. **Bulk Container Packaging:** All packaging requirements for individual packages apply to each package in the bulk container.

Packages containing animal/biological waste may be packaged within the same bulk container as wastes that require other processing methods; however, the packages need to be segregated by use of partitions. Wastes for sorting and incineration should be positioned in the bulk container to allow off-loading first.

DAW in Non-Bulk Containers for Direct Incineration

1. ES will work with generators on an individual basis to develop programs and procedures for direct incineration of material. Each generator MUST be approved by ES to participate in a direct incineration program prior to shipping materials. The following items are typical requirements for a direct incineration program, but there may be more depending on individual circumstances:

   - Package limited to one cubic meter with no single dimension greater than one meter and gross weight not to exceed 100 kilograms (220 lbs.)
   - No metal on or inside the package
   - No free standing liquids in the same package with DAW for direct incineration
   - Material shall be double bagged and heat-sealed or taped

Clearly mark each package with the generator's name, address, contact name, and phone number; number the package to correspond with the manifest entry. Each package shall contain only one generator's material.

Resin and Sludge for Drying/Incineration

Resins and sludges may be packaged in steel or poly liners provided the liner is overpacked in a cask and the resin/sludge can be transferred directly from the liner while in the cask. Liners placed directly on the floor of the conveyance or bulk container (e.g., Sealand) are strictly prohibited. ES*s* will accept DOT drums designed for liquids, DOT portable tanks (with fork pockets), and DOT-certified tankers. Small (<30 gallons) polyethylene containers must be overpacked.

NOTE

The preferred packaging for low-dose-rate *sludges* <500 µSv/hr(<50 mRem/hr) for incineration is steel or poly drums or boxes (preferably 1.4 m^3 (50 ft^3) type.

Dewatering laterals that contain multiple-cartridge filters (filter trees) make liners unusually difficult to empty and should be avoided.

Oil for Direct Incineration

Synthetic fluids, including EHC fluids, must be packaged in separate freight containers from petroleum-based oils.

Use of 113 liter to 321 liter (30-gal to 85-gal) non-leaking polyethylene containers for oil is acceptable. In addition, ensure the containers are compatible with the oil being transported.

Put the primary containers in steel or poly outer-packs to provide double containment in the event of leakage or spillage from the primary container.

Over-packed packages containing oil may be packaged within the same bulk container as materials that require other processing methods; however, the packages need to be segregated by use of partitions. Oils should be positioned in the bulk container to allow off-loading first.

Drums shall not be double stacked in ISO freight containers.

Non-RCRA Liquid Scintillation Vials

Liquid Scintillation Vials (LSVs) are acceptable only if packaged in accordance with the following.

Fiberboard containers —

- ☐ Shall be double-bagged in sturdy and leak-resistant polyethylene liners. Add enough incinerable absorbent in each bag (e.g., saw dust, corn cobs) to absorb double the amount of liquid contained in the package. Non-incinerable absorbent material (e.g., kitty litter and diatomaceous earth or vermiculite) is not accepted without prior approval.
- ☐ Must not exceed 50 kilograms (110 lbs.) container gross weight. Wood cribbing and/or pallets may be required as specified by the beginning of Attachment 1 for containers over 34 kilograms (75 lbs.)

Poly or Fiber drums —

- ☐ If packaged in open head drum, shall be double-bagged, containing enough incinerable absorbent to absorb double the amount of liquid contained in the package.
- ☐ Packages exceeding 34 kilograms (75 lbs.) need to be palletized or loaded with wood runners underneath the packaging.
- ☐ Poly and fiber drums for direct incineration shall not have a metal closure ring.

Cask Shipments

1. All cask shipments require prior approval from ES.
2. Customers using an NRC-licensed or other cask not owned by ES or subsidiaries shall ensure that ES is a “Registered User” of the licensed cask prior to shipment to an ES facility.
3. Third-party cask documents (Certificate of Compliance, Safety Analysis Report and handling and maintenance procedures and drawings) shall be made available to ES as the NRC Registered User of the cask prior to shipment of the cask to an ES facility.
4. Individual internal packages need to be clearly marked to match the itemized manifest line items on NRC Form 541. Additional description of package/loading configuration (e.g. super-sack, drum pallet, rigging) needs to be noted on Shipment Summary Form.
5. Any external smearable levels on packages inside cask exceeding 1,000 dpm/100 cm2 beta/gamma and 100 dpm/100 cm2 alpha requires prior notification.

6. All shipments shall strictly comply with the applicable Certificate of Compliance for the cask in use (i.e., lid torqueing, sealing gaskets, weight restrictions, and shoring requirements).

   - Liners containing "grapple bails" are to be identified on the Waste Manifest Form. If the liners have non-ES supplied bails, the customer must provide the proper grapple lifting device and instructions or procedure for its use. These are to be provided prior to or at the time the liner is offered for shipment. The customer-provided grapple lifting device may need to be made available at later times to move the liner within the facility.

     NOTE

     Liners containing non-ES grapple bails must have appropriate lifting cables attached if the above criteria cannot be met.

     CAUTION

     Customer-provide grapple lifting devices may have to be shipped separate from the liner if liner requires overweight permit.

   - All drums shall be palletized and pallets shall have proper lifting devices attached. Boxes shall be equipped with appropriate lifting devices or palletized.

   - Disposal container and/or pallet shall have the lifting device secured at the top of the container(s). This is to prevent the cable from becoming caught under or between the container(s) or pallet.

     NOTE

     Lifting devices shall be of sufficient length to allow retrieval and crane hook-up without physically entering the cask. Ensure lifting devices are secured as to prevent them from getting trapped between packages and cask wall.

   - Disposal container with wire rope/synthetic slings and shackles shall have the shackle pins zip tied or otherwise secured to prevent loosening or backing out.

   - For shipments consisting of high-integrity containers, the pallets on which the containers are placed are considered sacrificial since the pallets are used for proper placement in the concrete vaults.

   - When using liners to ship high rad DAW, "wide mouth" liners must be used if the liner is to be returned to the customer. "Small mouth" liners will be cut up and processed as waste.

   - When using pallets, the containers shall be positioned to remain balanced and stable on the pallet when lifted clear of the cask.

   - When tall, slender containers (i.e., demineralizers) are loaded on a pallet inside a cask, the containers shall be tied or secured together at the tops to prevent containers from falling off the pallets during off-loading. This is not required for a single tier of drums that are placed on a pallet.

   - Palletized drums inside a cask shall be loaded to prevent shifting of drums resulting in increased radiation levels measured outside the cask.

- Soft side packages shipped in cask shall be closed per manufacturer's specifications and shall include appropriately rated and accessible lifting devices.

Small Sharp Objects

Sharp objects such as broken glass, knives, scalpel blades, and other small sharp metal objects shall be bagged separate from other waste and labelled with "Small Sharp Objects" on the outer packaging.

Attachment 7.2, Table 3
Components, Materials, and Wastes with Special Restrictions per: 10 CFR 110.8, List of Nuclear Facilities and Equipment under NRC Export Licensing Authority

App.	Description
A	Nuclear Reactor Equipment
B	Gas Centrifuge Enrichment Plant Components
C	Gaseous Diffusion Enrichment Plant Assemblies and Components
D	Aerodynamic Enrichment Plant Equipment and Components
E	Chemical Exchange or Ion Exchange Enrichment Plant Equipment and Components
F	Laser-Based Enrichment Plant Equipment and Components
G	Plasma Separation Enrichment Plant Equipment and Components
H	Electromagnetic Enrichment Plant Equipment and Components
I	Reprocessing Plant Components
J	Uranium Conversion Plant Equipment and Plutonium Conversion Plant Equipment
K	Equipment and Components for the Production of Heavy Water, deuterium, and Deuterium Compounds
M	Categorization of Nuclear Material
N	Lithium Isotope Separation Facilities, Plants, and Equipment
O	Fuel Element Fabrication Plant Equipment and Components

NOTE: See 10 CFR 110 for details

Attachment 7.3, Table 4
Examples of Incinerable Material, Compactable Material and Metal Melt

Incinerable	Compactable	Metal Melt
Paper and Paper Towels	Large PVC Components	Empty Waste Drums
Tyvek Coverall, booties and Hoods	Insulation and Fire Blankets	Light Gauge Metals
Plastic booties	Ventilation Filters That Contain Metal	Welding rods
Rubber Booties	Metal Reinforced Air Hoses	Metals Cans
Plastic suits	Electrical Cable	Metal Mop Buckets and presses
Rubber Gloves		Heavy Gauge Metal
Plastic and glass bottles		Tools
Wood		Tanks and Components
Cardboard		Piping
Mop heads – dry or damp		Valves
Smears/filter papers		
Cloth		
Rope and nylon slings		
Floor Buffing Pads		
Safety Shoes		
Cotton Gloves		
Vicraft hoods		
Floor sweepings, dust bane, stay dry, etc.		

NOTE: Call your ES Technical Representative for questions regarding materials not listed on this table.