

ROUTING SHEET

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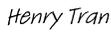
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Olga Ligeti, OHP Group Leader 	Date (MM/DD/YYYY) <small>Electronically signed by: Jeremy Whatley Reason: I have reviewed this document. Date: Sep 7, 2021 08:56 PDT</small>
Jeremy Whatley, RW Group Leader 	Date (MM/DD/YYYY) <small>Electronically signed by: Ryan Ford Reason: I have reviewed and am approving this document. Date: Sep 7, 2021 11:20 PDT</small>
Ryan Ford, Deputy OHP Group Leader 	Date (MM/DD/YYYY) <small>Electronically signed by: Henry Brogonia Reason: I have reviewed this document. Date: Sep 9, 2021 11:34 PDT</small>
Henry Brogonia, RPFO Group Leader 	Date (MM/DD/YYYY) <small>Electronically signed by: Jim Allan Reason: I have reviewed this document. Date: Sep 9, 2021 10:44 PDT</small>
Jim Allan, RPFO Assistant Group Leader 	Date (MM/DD/YYYY) <small>Electronically signed by: Henry Tran Reason: I have reviewed and am approving this document. Date: Sep 7, 2021 12:28 PDT</small>
Henry Tran, DREP Dosimetry and REP Program Manager 	Date (MM/DD/YYYY) <small>Electronically signed by: James Liu Reason: I have reviewed this document. Date: Sep 7, 2021 20:24 PDT</small>
James Liu, DREP Group Leader 	Date (MM/DD/YYYY) <small>Electronically signed by: Marcia Torres Reason: I have reviewed this document. Date: Sep 9, 2021 11:47 PDT</small>
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1.0	10/02/2006	N/A	New Document
2.0	11/14/2006	All	<ul style="list-style-type: none"> • Reorganization Name Changes • Combined Chapters 3&11 Generator instructions • Waste forms moved to Chapter 3 • Combined shipping info under Chapter 9 • Changed requirement for RPFO to conduct survey to authorized individual to reflect HPT capabilities in RWM • Removed 2-way radio section
3.0	07/25/2021 08/31/2021	Various	<ul style="list-style-type: none"> • Upgraded to current procedure format • Removed forms as stand-alone controlled documents, while retaining form instructions. • Added information related to a new version of the RWM Database • Corrected references throughout document • Corrected department names • Updated site description • Added absorbent type: Waste Lock • Revised postings at RAMSY section to reflect current conditions • Added reference to DOE Manual 435.1-1 chg2 • Updated links to SLAC Forms site • Added responsibility and training requirements for contractors • Updated reference to BASO (formerly SSO) • Updated references to Resin Processing procedures • Deleted section on scrap metals recycling suspension and moratorium • Updated description of waste processing areas • Added Ortec Isotopic as waste characterization method • Added reference to DOE Blanket Exemption Request • Added information related to tamper seals for containers

REVISION #	DATE (mm/dd/yyyy)	SECTION(S)	REASON FOR REVISION
			<ul style="list-style-type: none">• Added course 140 and Advanced Mixed Waste Shipper as additional training.• Delete citation to CGS Chemical and General Safety Department• Changed 18-month storage of newly generated waste to 12 months, consistent with DOE M 435.1-1.

ES&H DIVISION
RADIATION PROTECTION DEPARTMENT
SLAC-I-760-2A08Z-001

Radioactive Waste Manual

RP Department Document, RW-001



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TABLE OF CONTENTS

1	About the Radioactive Waste Manual (RWM).....	13
1.1	Manual Purpose and Scope.....	13
1.2	Manual Revision.....	13
1.3	How this Manual is Organized.....	13
1.4	Forms and Procedures.....	13
1.5	How to Get Current Radioactive Waste Management Forms.....	13
1.6	Terms and Definitions.....	14
1.7	Acronyms.....	15
1.8	Governing Documents and References.....	16
2	Guidance for Radioactive and Mixed Waste Generators.....	17
2.1	Purpose and Scope.....	17
2.2	Minimize the Amount of Radioactive and Mixed Waste You Generate.....	17
2.3	How Radioactive or Mixed Waste is Generated at SLAC.....	18
2.4	Radioactive or Mixed Waste Generation locations at SLAC.....	19
2.5	Segregation of Radioactive and Mixed Waste.....	21
2.6	Radioactive and Mixed Waste Transfer to RP.....	21
	APPENDIX 3A Radioactive Material Declaration Form.....	23
	APPENDIX 3B Hazardous Waste Determination Form.....	29
	APPENDIX 3C Mixed Waste Generation Request Form.....	34
	APPENDIX 3D Mixed Waste Generation Checklist.....	37
	APPENDIX 3E Additional Information.....	38
3	Moving Radioactive Waste on Site.....	41
3.1	Purpose and Scope.....	41
3.2	General Transport Requirements and Authorization.....	41
3.3	Packaging, Marking, and Labeling.....	42
3.4	Containerization.....	42
3.5	On-Site Transportation of Radioactive or Mixed Waste.....	42
3.6	Spills, Accidents, and Injuries in Transportation.....	43
4	Radioactive and Mixed Waste Acceptance Criteria.....	44

4.1	Purpose and Scope.....	44
4.2	Exceptions to the Waste Acceptance Criteria.....	44
4.3	Unacceptable Waste	44
4.4	Conditional Waste	44
4.5	Packaging Requirements	45
4.6	Additional guidance for damp waste	47
4.7	Radioactive Waste Labels	50
4.8	Additional Labeling for Mixed Waste Accumulation Containers.....	50
4.9	Characterization Documents.....	50
	APPENDIX 5A Waste Acceptance Criteria (WAC) Exception Request Form	52
5	Radioactive Waste Storage Areas	55
5.1	Purpose and Scope.....	55
5.2	The Radioactive Waste Processing Areas	55
5.3	General Radiological Controls	55
5.4	Conduct of Work Operations.....	57
	APPENDIX 6A RP Waste Storage Areas Weekly Inspection Form.....	62
	APPENDIX 6B Emergency Procedure for RAMSY	63
6	Radioactive Waste Processing	65
6.1	Receipt of Radioactive Waste.....	65
6.2	Inventory.....	66
6.3	Waste Segregation	66
6.4	Radioactive Material Container Marking and Labeling.....	66
6.5	Volume Reduction and Minimization	67
6.6	Radiological Characterization	67
6.7	Radioactively Contaminated Solids.....	67
6.8	Unacceptable and Conditional Waste Items.....	68
6.9	Suspect Waste Items.....	68
6.10	Waste Storage Containers.....	68
6.11	Ion Exchange Resins	68
6.12	Waste Container Inventory Sheets	69
6.13	Documentation Review	69

6.14	Packaging of Waste for Shipment	69
7	Radiological Characterization	69
7.1	About Radiological Characterization	69
7.2	Activated and/or Contaminated Solids	69
7.3	Ion Exchange Resins	71
7.4	Liquid Wastes	72
7.5	Scaling Factor Application	72
8	Radioactive and Mixed Waste Disposal.....	73
8.1	Purpose and Scope.....	73
8.2	Commercial Facilities.....	73
8.3	DOE Approval: Exemption Request	74
8.4	Preparing Disposal Containers	75
8.5	Unpacking a Radioactive or Mixed Waste Storage Container	75
8.6	Packing Disposal Containers	78
8.7	Completing Container Documentation	80
8.8	Shipment Preparations.....	81
8.9	Shipment of Radioactive or Mixed Waste.....	83
APPENDIX 9A	Pre-Use Container Inspection Checklist.....	86
APPENDIX 9B	Disposal Container Packing List	88
APPENDIX 9C	Container Closure Inspection Checklist	90
APPENDIX 9D	Disposal Container Checklist	93
APPENDIX 9E	Disposal Container Markings, Labels, and Placards Checklist	94
APPENDIX 9F	Pre-Shipment Container Inspection Checklist	96
APPENDIX 9G	Radioactive Waste Shipment Checklist	98
APPENDIX 9H	Exclusive Use Instructions	99
	INSTRUCTIONS FOR "EXCLUSIVE USE SHIPMENTS"	100
	DRIVER INSTRUCTIONS FOR "EXCLUSIVE USE SHIPMENTS"	101
9	Documentation	102
9.1	About Documentation.....	102
9.2	General Considerations.....	102
9.3	Record Media	103

9.4	Length of Retention	103
9.5	Storage Location.....	103
9.6	Responsibilities.....	104
10	Training Requirements	104
10.1	Training for Generators	104
10.2	Training for RP Personnel	104
APPENDIX A	Radioactive Waste Deficiency Report	107
APPENDIX B	Radioactive Low Level Waste Database	110

1 ABOUT THE RADIOACTIVE WASTE MANUAL (RWM)

1.1 Manual Purpose and Scope

The Radioactive Waste Manual (hereafter referred to as ‘this Manual’) will help SLAC National Accelerator Laboratory (SLAC) personnel to manage radioactive waste in a way that protects human health and the environment and is consistent with local, state, and federal regulations.

This manual meets requirements in DOE Contract No. DE-AC02-76SF00515, Section H.5.5.4. The contract states that The Contractor (Stanford University) shall comply with DOE Manual 435.1-1, Chg. 2 (Admin. Chg.), Chapters I and IV. Certain sections are excluded as per Appendix C of the contract.

1.2 Manual Revision

The Radiation Protection Department (RP) Radioactive Waste Management (RWM) Group is the authoring group for this Manual and is responsible for issuing any revisions. To ensure that this Manual remains current, the RWM group will review this Manual for content and regulatory compliance in accordance with document control schedules.

1.3 How this Manual is Organized

This Manual is organized to reflect the steps in which radioactive waste is managed. This Manual starts with an overview of the program, continues with the waste generation process, the transfer of waste to storage areas, the processing and handling that take place at these storage areas, and, ultimately, the shipment and disposal of the waste. This Manual also addresses the documentation needed for managing radioactive waste, and the training requirements associated with the radioactive waste management program.

1.4 Forms and Procedures

Forms and procedures applicable to each Chapter are included in the appendices to that Chapter (for example, Appendices 5A, 5B, and 5C apply to Chapter 5). Forms and procedures applicable to more than one Chapter are included at the end of this Manual as Appendices A and B.

1.5 How to Get Current Radioactive Waste Management Forms

The most current copies of forms needed to generate radioactive waste are in the public Forms section of the Environment, Safety, and Health (ES&H) Web.

Forms used by RWM staff are located within the RP Internal SharePoint site. Each form is a controlled document having a document number and revision number.

1.6 Terms and Definitions

TERM	DEFINITION
Activated Waste	See Radioactive Waste.
Certification or Waste Certification	A process by which a waste generator certifies that a waste or waste stream meets the waste acceptance criteria of the treatment, storage, or disposal facility.
Characterization or Waste Characterization	The identification of waste composition and properties, whether by review of process knowledge or by examination, assay, or sampling and analysis, to determine appropriate storage, treatment, handling, transportation, and disposal requirements.
Chelating Agent or Compound	Chelating agents are the following classes of compounds: Amine polycarboxylic acids such as ethylenediamine tetra acetic acid, diethylenetriaminepentaacetic acid. Hydroxyl-carboxylic acids. Polycarboxylic acids such as citric acid, carboic acid, and gluconic acid.
Fissile material	Material consisting of Uranium 233 (U-233), or Uranium 235 (U-235), or Plutonium 239 (Pu-239), or Plutonium 241 (Pu-241), or any combination of these radionuclides. Fissile material does not apply to materials containing fissile nuclides, unirradiated natural uranium, unirradiated depleted uranium, or to natural or depleted uranium that has been irradiated in thermal reactors only. Natural or depleted uranium (uranium containing less than 0.72% U-235, by weight).
Fissionable material	Material containing nuclides (such as, U-233, U-235, Pu-238, Pu-239, Pu-240, Pu-241, Np-237, Am-241, and Cm-244, 10CFR830.3) capable of sustaining a nuclear fission chain reaction regardless of neutron energy. Such material could only be fissionable by nature of its form, configuration, or environment.
Free-standing liquids	Liquids which readily separate from the solid portion of a waste under ambient temperature and pressure.
Friable asbestos containing waste	Any waste that contains more than one percent asbestos by weight and that can be crumbled, pulverized, or reduced to powder by hand pressure when dry as determined by sampling analysis
Generator	A person whose work activity or process produces radioactive waste.
Mixed Waste or Low-level Mixed Waste (LLMW)	A waste that is managed for both its radioactive and hazardous components. The hazardous component exhibits one or more of the following characteristics: ignitibility, corrosivity, reactivity, or toxicity. Determining whether a waste is hazardous is complex; SLAC waste generators should contact the Radioactive Waste Management Group (RWM) for guidance.
Pyrophoric Material	A liquid or solid that, even in small quantities and without an external ignition source, can ignite after meeting air.
Radioactive Material	A material that has been surveyed and confirmed to be radioactive by RP.

TERM	DEFINITION
Radioactive Waste, Activated Waste, Low-level Waste (LLW), or Low-level Radioactive Waste (LLRW)	<p>Any SLAC garbage, refuse, sludges, and other discarded material, including solid, liquid, semisolid, or contained gaseous material that must be managed for its radioactive content.</p> <p>Low-level radioactive waste is radioactive waste that is not high-level radioactive waste, spent nuclear fuel, transuranic waste, byproduct material (as defined in section 11e.(2) of the <i>Atomic Energy Act of 1954</i>, as amended), or naturally occurring radioactive material</p>
Radioactive Waste, High-Level Waste (not applicable at SLAC)	<p>High-level waste is the highly radioactive waste material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and other highly radioactive material that is determined, consistent with existing law, to require permanent isolation.</p>
Release	<p>The spilling, leaking, pumping, emitting, discharging, injecting, escaping, leaching, dumping, or otherwise disposing of a substance into the environment.</p>
Source Reduction	<p>Choosing a non-hazardous substitute for a material that, when used, would end up being a hazardous waste. Source reduction is the primary method for minimizing the amount of hazardous waste generated at SLAC. This waste minimization method is required by the SLAC Waste Minimization and Pollution Prevention Plan.</p>
Storage	<p>The collection and management of waste for the purpose of awaiting treatment or disposal.</p>
Treatment	<p>Any method, technique, or process, which changes or is designed to change the physical, chemical, or biological character or composition of a waste for purposes such as:</p> <ul style="list-style-type: none"> • Reduce its volume. • Make it less hazardous. • Make it safer for storage, transportation, and disposal.
Waste Acceptance Criteria (WAC)	<p>The technical and administrative requirements that need to be satisfied before a waste item can be accepted at a waste treatment, storage, or disposal facility.</p>
Waste Certification	<p>See Certification.</p>
Waste Characterization	<p>See Characterization.</p>

1.7 Acronyms

ALARA	As Low As Reasonably Achievable
BASO	Bay Area Site Office
BMP	Best Management Practice
CCR	California Code of Regulations
CCW	California Combined Waste

CFR	Code of Federal Regulations
CIR	Container Inventory Record
CPC	Container Products Corporation
DOE	Department of Energy
DOT	Department of Transportation
DTSC	Department of Toxic Substances Control (California)
EPA	Environmental Protection Agency
ES&H	Environment, Safety & Health
RPFO	Radiation Protection Field Operations
HPT	Health Physics Technician
LCW	Low Conductivity Water
LLW	Low-Level Waste
LLMW	Low-Level Mixed Waste
LLRW	Low-level Radioactive Waste
LQ	Limited Quantity
LSA	Low Specific Activity
SDS	Safety Data Sheet
MW	Mixed Waste
MWAA	Mixed Waste Accumulation Area
NEPA	National Environmental Policy Act
NRC	Nuclear Regulatory Commission
RP	Radiation Protection Department
PPE	Personal Protective Equipment
RAM	Radioactive Material
RAMSY	Radioactive Material Storage Yard
RCRA	Resource, Conservation, and Recovery Act (a Federal Act)
NON-RCRA	Non-Resource, Conservation, and Recovery Act
RMMA	Radioactive Material Management Areas
RQ	Reportable Quantity
RWDR	Radioactive Waste Deficiency Report
RWM	Radioactive Waste Management Group
RWSA	Radioactive Waste Storage Area
SLAC	SLAC National Accelerator Laboratory
TSDF	Treatment, Storage, and Disposal Facility
WAC	Waste Acceptance Criteria
WM	Waste Management Group

1.8 Governing Documents and References

1. *DOE Manual 435.1-1*. Approved 7/9/99. Change 1 6/19/01
2. *SLAC Radiological Control Manual* [SLAC-I-720-0A05Z-001], latest revision
3. *SLAC Environment, Safety, and Health Manual*, [SLAC-I-0A29Z-001], latest revision
4. Title 22 *California Code of Regulations*, Division 4.5
5. Title 10 Code of Federal Regulations
6. Title 40 Code of Federal Regulations

7. Title 49 Code of Federal Regulations
8. Technical Evaluation Report to Support the Application for Authorized Limits for Off-Site Disposal of SLAC Low-Activity Waste at Us Ecology Idaho per DOE Order 458.1, September 26, 2018.

2 GUIDANCE FOR RADIOACTIVE AND MIXED WASTE GENERATORS

2.1 Purpose and Scope

This Chapter provides guidance for generators of radioactive and mixed waste. This chapter will help you:

- Minimize the amount of radioactive and mixed waste you generate.
- Segregate radioactive and mixed waste at the point of generation.
- Characterize and package radioactive and mixed waste to ensure its effective and safe transfer to the RP Radioactive Waste Management Group.

2.2 Minimize the Amount of Radioactive and Mixed Waste You Generate

Minimization of radioactive and mixed waste generated at SLAC is a team effort. Managers and supervisors shall ensure that employees who generate radioactive and mixed waste complete ES&H Course #105, “Introduction to Hazardous Waste Management.”

The following work practices will help minimize the amount of radioactive and mixed waste generated.

2.2.1 Include RP on Your Team

Prior to initiating new projects with the potential for generating radioactive or mixed waste, contact the RP Radioactive Waste Management (RP RWM) Group, at **extension 2823**, to obtain tips on waste minimization measures. The generation of mixed waste requires pre-generation authorization. Please complete a “Mixed Waste Generation Request” form (SLAC-I-760-2A08J-003, “Mixed Waste Generation Request Form”) and submit to RP RWM Group to identify available treatment and disposal options. Generation of wastes without an identified treatment/disposal path requires authorization from the generator’s Associate Laboratory Director, the ES&H Division Director, and BASO prior to generation. For more information see SLAC-I-760-2A08J-002, “Hazardous Waste Determination Form”.

2.2.2 Plan to Minimize Waste generation

Plan work projects ahead of time, particularly those to be performed in Radioactive Material Management Areas (RMMAs).

- Perform as much work as possible outside of SLAC RMMAs.
- Reduce tool and equipment exposure, only bring items required to perform work activity into an RMMA.

- Prevent inadvertent irradiation or contamination of tools, equipment and hazardous materials used in an RMMA.
- Avoid using hazardous materials in the design and manufacture of accelerator equipment and components if it could become activated or contaminated.
- To avoid potential generation of mixed wastes, consult with the ESH Waste Minimization Coordinator for non-hazardous alternative materials.
- Complete the “Mixed Waste Generation Checklist” (SLAC-I-760-2A08J-004). (See Section 4.1 in this Chapter for a definition and locations of SLAC RMMAs.)

2.2.3 Designate Tools for Use

Do not discard activated or contaminated tools. Specifically designate them for use in accelerator or contamination areas.

2.2.4 Maintain Good Housekeeping

Minimize waste generation by maintaining good housekeeping practices while you work. When you have finished your work, call RP at extension 4299 to survey the items to be removed from the RMMA. Do not leave items inside accelerator housings, as subsequent beam operations could activate them.

2.2.5 Segregate Your Waste

To prevent cross-contamination, segregate and manage the following waste streams separately:

- General landfill waste (non-radioactive and non-hazardous)
- Hazardous waste (hazardous, non-radioactive)
- Contaminated LLRW (radioactive, non-hazardous)
- Activated LLRW (radioactive, non-hazardous)
- Mixed waste (radioactive and hazardous)

Additionally, each waste type must be separated by physical form. Keep liquids separated from solids as they have differing treatment and disposal paths.

Note: See Section 5 of this Chapter for additional segregation guidance for contaminated, activated LLRW and LLMW.

2.3 How Radioactive or Mixed Waste is Generated at SLAC

Radioactive waste is generated when radioactive accelerator components and systems undergo repair, maintenance, or replacement. Whenever these activities include a hazardous component or introduction of a hazardous substance, the resulting waste will be a mixed waste. The primary operations that generate radioactive and mixed waste include, but are not limited to the following:

2.3.1 Operating the Accelerator

Components inside the accelerator housing may become activated during accelerator operations due to exposure to radiation fields (such as photons and neutrons) generated by the electron/positron beams. The removal, maintenance, and replacement of these activated accelerator components generates radioactive or mixed waste.

2.3.2 Shielding the Accelerator Housing and Components

Shielding materials used to reduce external dose rates to personnel may become activated during beam operation. When the shielding material is no longer needed and is removed, it may be radioactive or mixed waste.

2.3.3 Cooling Accelerator Components

The resin columns, filters, piping, and valves of the low conductivity water (LCW) system collect radioactive erosion and corrosion products. In addition, the water in the LCW system may become activated as it circulates. Therefore, resin, filter replacement, or other maintenance and repair operations can generate radioactive or mixed waste.

2.3.4 Disassembling or Mechanically Altering Components

Disassembly or mechanical alterations, such as cutting, grinding, machining, drilling, sanding, and welding, of a radioactive accelerator component can generate radioactive waste. These operations can also generate removable surface contamination that requires workers to use appropriate anti-contamination clothing and contamination enclosures that are then disposed of as radioactive or mixed waste.

2.3.5 Storage of Radioactive Accelerator Components

Radioactive accelerator components being stored for future use but found to have no further use are disposed of as radioactive or mixed waste.

Note: See Appendix 3E for a list of common hazardous materials.

2.4 Radioactive or Mixed Waste Generation locations at SLAC

In general, radioactive, or mixed waste is generated in the following areas and systems:

2.4.1 Radioactive Material Management Areas (RMMAs)

An RMMA is an area where the potential exists for radioactive contamination due to the presence of unencapsulated, unconfined radioactive material, or material exposure to beams of particles capable of causing activation. The introduction of hazardous materials in these areas makes them vulnerable to contamination or activation,

potentially rendering them mixed wastes. The RPFO Group maintains a current list of RMMAAs.

2.4.2 Portions of the LCW System

Sections of the accelerator's LCW cooling systems, including resin columns, filters, piping, valve systems, and water may be radioactively contaminated or activated. Please also refer to the current version of RP "Transfer and Gross Dewatering of Ion Exchange Resin" procedure (SLAC-I760-2A30C-005) for more details. The RPFO Group maintains a current list of LCW systems that are potentially radioactive.

2.4.3 Contaminations Areas

All materials from Contamination Areas including airborne radioactivity areas are considered radioactive.

2.4.4 Radioactive Material Storage Areas

SLAC stores various radioactive materials on site for future use. These materials are maintained in radioactive material storage areas.

2.4.4.1 Material Removal

Material, including waste, from any of the above listed areas is considered potentially radioactive either by activation or contamination and must be surveyed by RPFO Group prior to removal from the area.

2.4.4.2 Exceptions

1. Material that were not inside the accelerator housing during beam operation and not taken inside a known Contamination Area can be removed without being surveyed by RP.

Example:

Tools and equipment taken into an accelerator housing (when the beam is off) to perform maintenance and not used in a posted contamination area.

However, any item removed from an accelerator component during this maintenance activity must be surveyed by RP prior to removal from the area, since the item was in the accelerator housing during beam operation

2. During off-hours, if an RP Health Physics Technician (HPT) is not available, an accelerator operator who is a qualified Limited Radiological Control Assistant (LRCA) can survey material for removal from an RMMA. However, all material shall be marked and labeled as radioactive material. Only RP can release material from radiological controls.

2.4.4.3 Disassembly or Mechanical Alteration of Radioactive Material

One must contact RPFO Group at **x4299** prior to cutting, grinding, machining, drilling, sanding, welding, or otherwise altering or disassembling a radioactive accelerator component, as these actions may generate removable surface contamination, and expose workers.

2.5 Segregation of Radioactive and Mixed Waste

In addition to segregating potentially radioactive and suspected mixed wastes from each other, mixed wastes need to be separated by hazardous characteristics and constituents if possible. The waste should further be sorted according to the following categories:

- Cables
- Compactible waste (for example, paper, plastic, rubber, and anti-contamination clothing.)
- Concrete
- LCW Filters
- Metals: separate by their predominant component such as copper, iron, stainless steel, and aluminum.
- Resins
- Liquids
- Solids

Segregating waste into like materials assists with the proper radionuclide identification and radioactivity quantification.

2.6 Radioactive and Mixed Waste Transfer to RP

When you generate a potentially radioactive or suspected mixed waste, contact RPFO Group at **x4299** to survey and analyze the waste for radioactivity. Depending upon the physical form of the waste (for example, water, or finely divided materials), representative samples may be needed to determine if radioactivity is present.

2.6.1 Non-Hazardous/Non-Radioactive Waste

If RP determines that your waste is non-hazardous and non-radioactive, no further radiological controls will be needed to manage the waste. RPFO will “green tag” the waste.

- Transfer salvageable materials such as metals, cables, and electronics to SLAC Salvage. Before transferring the material to Salvage, you must complete a Salvage Form.
- Recycle materials such as paper, plastic, and wood.
- Dispose of waste that is neither salvageable nor recyclable.

2.6.2 Hazardous/Non-Radioactive Waste

If your hazardous waste has been found to be non-radioactive, RPFO will affix a “green tag” to it indicating so. Such waste should be transferred to the WM Group

for proper treatment and disposal. For additional guidance contact the WM Group at x2399.

2.6.3 Radioactive Waste

If your waste is determined to be radioactive, do the following:

1. Package, mark, and label
2. Package, mark, and label the radioactive waste in accordance with the instructions in Chapter 4 of this Manual.
3. Certify that the waste meets the Waste Acceptance Criteria
4. Certify that the waste meets the Waste Acceptance Criteria in Chapter 4 of this Manual by completing a Radioactive Material Declaration Form . If the hazardous waste classification of a waste item is unknown, complete a Hazardous Waste Determination Form and submit it to the RP RWM Group for evaluation.
5. Property Control
6. Notify Property Control (PC) of the planned disposal of a PC# tracked item as radioactive waste.
7. Transfer Notification
8. Notify RPFO at x4299 that the waste is ready to be transferred to an RP LLRW storage area.

2.6.4 Mixed Waste

If your waste is determined to be both radioactive and hazardous, do the following:

1. Package, mark, and label
2. Package, mark, and label the radioactive waste in accordance with the instructions in Chapter 5 of this Manual.
3. Certify that the waste meets the Waste Acceptance Criteria
4. Certify that the waste meets the Waste Acceptance Criteria in Chapter 4 of this Manual by completing a Radioactive Material Declaration Form.
5. Property Control
6. Notify Property Control (PC) of the planned disposal of a tracked item as mixed waste.
7. Transfer Notification
8. Notify RPFO at x4299 that the waste is ready to be transferred to an RP LLMW storage area.

Transfer the waste to the appropriate storage location in accordance with Chapter 4 of this Manual and the SLAC “On Site Hazardous Materials Transportation Safety Document.”

APPENDIX 3A Radioactive Material Declaration Form SLAC-I-760-2A08J-001

A copy of this form is available from the RP Department or from the *Forms* section of the ES&H Website at: <http://www-group.slac.stanford.edu/esh/forms/radmatdec.pdf>

How to Complete the Radioactive Material Declaration Form

The generator completes Blocks A through E and then forwards the form to the RPFO Group.

Block A Item Description

Provide a detailed description of the item. An item may be a single piece of equipment, a bag (or bags) containing different materials, or a group of materials that are similar or identical in nature.

As applicable, include the following in the item description:

- The name of the item
- Serial numbers, part numbers, or Property Control (PC) numbers associated with the item
- The function of the item or the process that generated the item
- The quantity of the item (for example, 2 bags, 3 pieces, or 6-foot length)

Note: *Do not use the term “Miscellaneous” to describe an item.*

For bagged items, ensure the description identifies the entire contents of the bag.

Example: *One bag containing floor sweepings consisting of dirt, plastic stay-ties, paint chips, and metal washers.*

The term *damp waste* may be used to describe an item if it meets the following definition:

“Damp waste is defined as water-dampened cloths/rags which have no visible freestanding water present, and which will not physically release any water when tightly squeezed by hand.

If waste contains more than a few drops of water, then an appropriate amount of an approved absorbent must be added to absorb any condensate that could form after initial packaging. Condensation formation can cause a disposal container to be rejected at the disposal facility. For questions regarding approved absorbents, see Chapter 5 of this Manual or contact RP RWM at **x2823**.

1. Generation Process

Check the box which identifies the process which generated the waste item. If “other” is checked, describe the process (e.g., routine maintenance, routine filter changeout, etc.).

2. Generation location and/or system

Identify the location where the item was generated, such as positron vault, north damping ring, or beam switchyard. If applicable, identify the system (such as the LCW system) or equipment from which the item was removed.

3. Destination

Identify the location where the item will be transferred.

Block B Waste Characteristics

1. Waste Volume

Enter an estimated volume of the item and circle the appropriate units (ft³ or liters).

2. Waste Constituents

Indicate the type of metal or other constituents present in the item by checking the appropriate boxes. If you check the “Other” box(es), use the space provided to identify the type of metal or constituent present.

If available, attach documentation (for example, manufacturer’s specifications or SDS) that further describes the item’s materials and the item’s function.

Block C Free-standing or Absorbed Liquid Present

Indicate if any free-standing or absorbed liquid is present in the item by checking the appropriate box. If *Yes* is checked, complete the following sections.

Note: *All free-standing liquid in solid waste items (excluding mixed waste items) must be absorbed, stabilized, or otherwise removed.*

Exception: *In cases where it is not practical to remove suspected free-standing liquids from solid waste items and it is impossible to determine if free-standing liquids are still present in the item, the following two actions must be performed:*

- The suspected free-standing liquids must be removed to the maximum extent possible (for example, by draining at low points or by removing with pressurized air or a vacuum)
- An appropriate amount of an approved absorbent must be added

The amount of suspected free-standing liquid remaining in a solid waste item must never exceed 1% of the volume of the item.

1. Type of liquid present

Identify the type of liquid present (free-standing and/or absorbed liquid) by checking the applicable box. If the “Other” box is checked, use the space provided to identify the type of liquid present in the waste.

2. Estimated volume of liquid present

Provide an estimation of the total amount of free-standing liquid and the total amount of absorbed liquid present (for example, < 1 cup, or 2 liters). Be sure to circle the appropriate units of volume (ml, cup, liter, or gallon).

You do not have to estimate the amount of freestanding or absorbed liquid present in ion exchange resin, since the resin will be processed (de-watered) prior to packaging for disposal.

Note: *Estimation of absorbed water present in LCW filters may be obtained from Table 5-2 in Chapter 5 of this Manual.*

3. Sorbent Type

Identify if an approved absorbent is present by checking the applicable box. If the “Other” box is checked, use the space provided to identify the type of approved absorbent.

Note: Only approved absorbents may be used for liquid absorption. For questions regarding approved sorbents, contact the RP RWM Group at x2823.

4. Sorbent Amount

Indicate the amount of approved absorbent present in the item and circle the appropriate unit of measure (ml, cup, liter, gal). Ensure that the total amount of approved absorbent added to solid waste items with free-standing or absorbed liquid is sufficient to absorb twice the volume of liquid present.

Block D Hazardous Waste Classification

Check the appropriate box to indicate if the item is classified as a hazardous waste or non-hazardous waste.

For questions regarding the hazardous waste classification of an item, contact your ES&H Coordinator (Safety Officer) or complete a Hazardous Waste Determination Form and submit it to the RP RWM Group for evaluation.

If the item is marked hazardous waste, list the underlying hazards (for example, lead, mercury, or asbestos) in the space provided. Attach all applicable documentation describing the hazardous waste (for example, process knowledge statement, SDS, manufacturer's specifications, sample analysis, and Hazardous Waste Determination Form).

Note: The most common hazardous materials found at SLAC are listed in Appendix 3E of this Manual.

Block E Generator Certification

1. Generator Name/Signature

Print your name and sign the form. By signing the form, you are certifying that all the information is complete and accurate to the best of your knowledge. The generator is also certifying, based on process knowledge or certified records, that the hazardous classification of the item is accurate to the best of his or her knowledge, and that the waste meets the waste acceptance criteria of Chapter 5 of this Manual. By signing the form, the generator is also authorizing disposal of the waste item.

2. Dept/Group

Enter your SLAC department or group.

3. Date

Enter the date you completed the form.

4. Telephone

Enter your telephone extension.

Block F Radiological Data

The RPFO Group completes Block F of the form.

Prior to completing Block F, review Blocks A through E for completeness and accuracy. Ensure the item is properly described and the inventory is accurate. As applicable, ensure the following:

- The total amount of approved absorbent is adequate for liquid present in the waste item

- The waste has been classified as hazardous or non-hazardous and the underlying hazardous constituents have been identified
- As applicable, inspect the packaging to ensure the following:
- No holes, rips, or tears are present in plastic bags or wrappings of contaminated items. Also, ensure that sharp objects and edges are taped and padded to prevent damage to plastic bags and wraps.
- No free-standing liquid exists within the packaging of solid waste items (excluding mixed waste items).
- Container lids are installed and secured

Complete the Radiological Data section (Block F) of the form. After completing Block F, contact the RP RWM Group for an assigned Declaration Number. Enter the number (in the space provided) in the “*For RP use only*” box at the top right-hand corner of the form. Indicate if another declaration number had been previously assigned to the item by entering the *old declaration number* in the space provided. Check the *N/A* box if the item did not have a previously assigned declaration number.

1. Radiation exposure rate

Enter the maximum radiation exposure rate on contact with the item.

Enter the radiation exposure rate at 30 cm (one foot) away from the item.

2. Radioactive Contamination

If the item is activated only (in other words, if no removable and/or fixed radioactive contamination is present), check the “N/A” box.

If known, enter the internal contamination levels of the item. If levels are unknown, check the “Unknown” box.

All contaminated or potentially contaminated items must be managed in one of the two following manners:

Double-bagged or wrapped in plastic in such a manner that will prevent personnel exposure to the radioactive contamination.

Physically sealed to prevent the release of internal contamination (for example, internally contaminated pipe with flanges installed on both ends).

Note: *Opening bags or removing flanges to determine the internal contamination levels is not required.*

External contamination levels must always be < 1000 dpm/100 cm².

3. Instrument Information

For each instrument used, enter the instrument type, its serial number, and its calibration due date.

4. Remarks/Comments

Enter any information relevant to the radiological surveys of the item.

Examples:

“Item contains natural thorium and natural uranium. Internal and external alpha contamination levels are < 50 dpm/100cm². See attached lab report for activity levels.”

“Item contains an Am-241 source. Internal and external alpha contamination levels are < 50 dpm/100cm². The source strength is 1μCi.”

“The reported exposure rates were measured outside the shielding on the item. The highest exposure rate measured inside the shielding was 1.5 R/hr.”

5. RP HPT Name/Signature
Print your name and sign the form.
6. Date
Enter the date the surveys were completed.
7. Telephone
Enter your telephone extension.

Block G Receiver

The individual receiving the item completes Block G.

Prior to completing Block G, review Blocks A through F for completeness and accuracy. Ensure the item is properly described and the inventory is accurate. As applicable, ensure that:

The total amount of approved sorbent is adequate for liquid present in the waste item
The waste has been classified as hazardous or non-hazardous and the underlying hazardous constituents have been identified.

As applicable, inspect the packaging to ensure that:

- No holes, rips, or tears are present in plastic bags/wrappings of contaminated items. Also, ensure that sharp objects and edges are taped and padded to prevent damage to plastic bags/wrapping.
- No free-standing liquid exists within the packaging of solid waste items (excluding mixed waste items).

Receiver then:

1. Receiver Name/Signature
Print your name and sign the form.
2. Department/Group
Enter your SLAC department/group.
3. Date
Enter the date the item is received at your building/facility.
4. Telephone
Enter your telephone extension.

“For RP use only” Blocks

These blocks are reserved for RP use only.

1. Declaration Number

The RP RWM Group will assign a unique declaration number to each form. The declaration number will consist of the following:

AABBCC-XXX., where

AA = last 2 digits of the calendar year

BB = month of the year

CC = day of the month

XXX = a three-digit number that identifies the next available, chronological number for the day.

Example: *If two items were to be transferred from the positron vault to the RAMSY on June 1, 2003, the corresponding declaration numbers for these 2 items would be:*

- 030601-001
- 030601-002

The RP RWM Group is responsible for maintaining a log of the assigned declaration numbers to ensure numbers are not duplicated

2. Container #/Location

The RP RWM Group completes this block if the items are transferred to an RP storage area.

If possible, upon receipt of an item at an RP LLRW storage area, transfer it to a container for storage purposes. Enter the container number (for example, Drum # RWG001 or B-Box # 167892) where the item is being stored. The RP RWM Group is responsible for maintaining a log of assigned storage container numbers to ensure numbers are not duplicated. Enter the location within the RP LLRW storage area where the container or item is stored.

APPENDIX 3B Hazardous Waste Determination Form SLAC-I-760-2A08J-002

A copy of this form is available from the RP Department or from the *Forms* section of the ES&H Website at: <http://www-group.slac.stanford.edu/esh/forms/>

About the Hazardous Waste Determination Form

The Hazardous Waste Determination Form shall be completed prior to generating a potentially hazardous waste. This allows for non-hazardous alternative substitute use before commencing the project. The practice is known as *source reduction* and is the primary method for minimizing the amount of hazardous waste generated at SLAC as required by the SLAC "Waste Minimization and Pollution Prevention Plan."

How to Complete the Hazardous Waste Determination Form

The individual requesting the hazardous classification of a waste completes Blocks A, B, C, and D of the form.

Block A Waste Description

Provide a detailed description of the waste. As applicable, include the following in the waste description:

- The name of the waste and a brief description of the waste's physical and chemical characteristics.
- Any serial numbers, part numbers, or Property Control (PC) numbers associated with the waste.
- Any manufacturer product name or chemical name associated with the waste.
- The original function or intended use of the item prior to becoming a waste.

Note: Do not use the term "Miscellaneous" to describe the waste.

Attach all documentation describing the waste's composition, original function, or intended use, such as manufacturer's specifications, or SDS.

1. Generation Process
Enter a description of the process that generates the waste, such as degreasing of accelerator components, or paint stripping from the positron vault walls and floor.
2. Generation location and/or system
Identify the location where the waste is generated, the system, or equipment from which the waste is removed (e.g., positron vault, the LCW system).
3. Total Quantity and/or Estimated Generation rate
Enter the total quantity of the waste currently generated and the estimated rate of generation including the correct units of measure (e.g., 5 lbs., 200 lbs./yr.).

Block B Waste Properties, Characteristics, and Constituents

1. Physical State:
Indicate, by checking the applicable box, whether the waste is a:
 - Solid

- Solid with freestanding or absorbed liquid
- Liquid
- Gas

If the waste is a liquid, indicate if the liquid is a single layer or multi-layer liquid by checking the applicable box.

2. pH:

If known, identify the pH of the waste by checking the appropriate box.

3. Flashpoint:

If known, identify the flashpoint of the waste by checking the appropriate box.

4. Characteristics:

If known, indicate (by checking the appropriate boxes) if the waste exhibits one or more of the following characteristics:

Corrosive:

- It is aqueous and has a pH less than or equal to 2.
- It is aqueous and has a pH greater than or equal to 12.5.
- It is a liquid and corrodes steel at a rate greater than 0.25 inches per year.
- It is not aqueous and, when mixed with an equivalent weight of water, produces a solution having a pH less than or equal to 2.
- It is not aqueous and, when mixed with an equivalent weight of water, produces a solution having a pH greater than or equal to 12.5.
- It is not a liquid and, when mixed with an equivalent weight of water, produces a liquid that corrodes steel at a rate greater than 0.25 inches per year.

Ignitable:

- It is a liquid (other than an aqueous solution containing less than 24 percent alcohol by volume) and has a flashpoint less than 140 °F.
- It is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard.
- It is an ignitable compressed gas as defined in 49 CFR 173.115.
- It is an oxidizer as defined in 49 CFR 173.127.

Reactive:

- It is normally unstable and readily undergoes violent change without detonating.
- It reacts violently with water.
- It forms potentially explosive mixtures with water.
- When mixed with water, it generates toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment.
- It is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health or the environment.
- It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.
- It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

- It is a forbidden explosive as defined in 49 CFR 173.54, or a Class A or B explosive as defined in 49 CFR 173.50 (Division 1.1, 1.2, and 1.3 explosives).

Radioactive

- As determined by RP.

Toxic

- If a representative sample of waste is found to contain the contaminants found in Table 1 of 40 CFR Subpart C 261.24 in quantities equal to or greater than those listed when extracted using test method 1311 “Characteristic Leaching procedure.”

5. Asbestos Content

If known, indicate if the waste contains friable and/or non-friable asbestos material by checking the appropriate boxes. Friable asbestos material means any material containing more than one percent asbestos (by weight), that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

If known, identify in the “Remarks” section the type of asbestos present in the waste (for example, chrysotile [serpentine], crocidolite [riebeckite], or amosite [cummingtonite-grunerite], anthophyllite, tremolite, and actinolite).

6. PCB Content:

If known, indicate if the waste contains Polychlorinated Biphenyl (PCBs) by checking the appropriate box.

If known, list the waste’s PCB levels (for example, 2 ppm or 10 ppm) in the “Remarks” section.

7. Metal Content:

If known, indicate the types of metal (metal compounds) in the waste by checking the appropriate boxes. If antimony, beryllium, cobalt, copper, molybdenum, nickel, thallium, vanadium, or zinc is present, these metals (or metal compounds) need to be checked only if in a friable, powdered, or finely divided state.

8. Composition:

List each constituent in the waste. Ensure to include any absorbent, free-standing liquid, or absorbed liquid.

Estimate the range (such as 10-25%) of each constituent’s volume percentage in the waste and enter it into the space provided. For example, if the waste stream consists of a mixture of trichloroethane 1,1,1, ethyl alcohol, and metal impurities, enter the following:

Table 5C-1 Example of Waste Stream Composition

Constituent	Volume % (range)
Trichloroethane 1,1,1	30 - 50%
Ethyl Alcohol	50 - 70%
Suspended solids (metal impurities)	0 - 1%

The total volume% (maximum range) of all the constituents must add up to at least 100%. For the example above, the total volume % (maximum range) is 121%.

Block C Remarks

Provide any additional information regarding the waste that may assist with its hazardous classification. Attach all applicable documentation describing the waste (for example, process knowledge statement, SDS, manufacturer's specifications, or sample analysis).

Block D Requestor Information

Upon completing Block D, forward the completed form to the RP RWM Group.

1. Requestor Name/Signature
Print your name and sign the form. By signing the form, an individual certifies (based on process knowledge or certified records) that all information is complete and accurate to the best of his/her knowledge.
2. Department/Group
Enter your SLAC department or group.
3. Telephone
Enter your telephone extension.
4. Date
Enter the date the form was completed.

For RP Use Only

The RP RWM Group will assign a unique serial number to each hazardous waste determination form. The serial number will consist of the following:

MW-AABBCC-XXX., where:

- AA = last 2 digits of the calendar year
- BB = month of the year
- CC = day of the month
- XXX = a three-digit number that identifies the next available, chronological number for the day.

Example: *If two forms were submitted on June 1, 2003, the corresponding hazardous waste determination form numbers would be:*

- MW-030601-001
- MW-030601-002

The RP RWM Group is responsible for maintaining a log of the assigned serial numbers to ensure numbers are not duplicated. Upon assigning a serial number to the form, RP RWM Group will forward the Form to WM Group for evaluation.

For Waste Management Use Only

SLAC WM Group completes this block of the form. Upon completion, forward the form to the RP RWM Group. The RP RWM Group will then forward a copy of the completed Form to the requestor and maintain the original Form on file.

1. Sample Analysis Required
Based on the information provided, indicate if sampling of the waste is required prior to waste classification. If sampling is required, specify the required tests in the space provided (for

example, CAM 17 [metals], TCLP [metals], volatiles [8240], semi-volatiles [8270], or reactive cyanide).

2. Hazardous Classification

Indicate (by checking the appropriate boxes) if the waste is any of the following:

- Non-hazardous
- Hazardous under the Resource Conservation, and Recovery Act
- Hazardous under Title 22, Division 4.5 California Code of Regulations
- Regulated under the Toxic Substances Control Act

If sampling was performed, attach a copy of the sample results to the form. If the waste is classified as hazardous, list the applicable federal EPA and California waste codes.

3. Remarks

Provide any additional information regarding the waste classification.

Examples:

- “This waste classification is applicable only to the virgin lubricant product manufactured by the X Chemical Company. If the product is contaminated during work operations with other lubricants/oils or metal impurities, a separate Hazardous Waste Determination Form must be submitted to the WM Group for evaluation.”
- “This waste classification is applicable only to the specific generation process listed above. If the generation process is modified, then a separate Hazardous Waste Determination Form must be submitted to the WM Group for evaluation.”
- “Due to the variables associated with the generation process, this waste stream must be sampled annually to validate the waste classification.”

4. WM Name/Signature

Enter your name and sign the form.

5. Telephone

Enter your telephone extension.

6. Date

Enter the date the form was completed.

APPENDIX 3C **Mixed Waste Generation Request Form** **SLAC-I-760-2A08J-003**

About the Mixed Waste Generation Request Form

Because of the lack of available treatment technology/disposal capacity and the high costs associated with the treatment/disposal of mixed waste, generation of mixed waste shall be avoided to the maximum extent practicable.

Individuals proposing to generate a mixed waste must complete a Mixed Waste Generation Request and submit it to the RP RWM Group as soon as possible to allow RP time to investigate available treatment/disposal options for the mixed waste, along with the potential costs.

How to Complete the Mixed Waste Generation Request Form

The requestor completes Blocks A through D and then forwards the form to the RP RWM Group to determine if the mixed waste has an identifiable treatment/disposal path.

If the proposed mixed waste stream has an identifiable treatment/disposal path, then the RP RWM Group will notify the generator and will identify any special conditions for generating the mixed waste.

If the proposed mixed waste stream does not have an identifiable treatment/disposal path, then the RP RWM Group will return the request form to the requestor. The requestor must then obtain his/her Associate Director's approval to generate the waste prior to the RP RWM Group submitting the request to the ES&H Division Director and the DOE/BASO for approval.

Block A. Proposed Mixed Waste Description

Provide a detailed description of the waste. Describe the physical, chemical, and expected radiological characteristics of the mixed waste. As applicable, include the following in the waste description:

- The name of the waste and a brief description of the waste's physical and chemical characteristics.
- Any serial numbers, property control number, or part numbers associated with the waste.
- Any manufacturer product name or chemical name associated with the waste.
- The original function or intended use of the item prior to becoming a waste.

Note: *Do not use the term "Miscellaneous" to describe the waste.*

Attach all documentation which further describes the waste's physical and chemical composition and function or intended use. These will include but are not limited to SDS, Manufacturer's specifications, sample analytical, process-knowledge statement.

1. **Generation Process**
Enter a description of the process that will generate the waste such as degreasing of accelerator components, paint stripping, or removal from the positron vault walls/floor.
2. **Generation location/system**
Identify the location where the waste is generated, the system, or equipment from which the waste is removed (e.g., positron vault, the LCW system).
3. **Total Quantity and/or Estimated Generation rate**

Enter the total quantity of the waste currently generated and the estimated rate of generation including the correct units of measure (e.g., 5 lbs., 200 lbs./yr.).

4. Duration of Generation:

Indicate if the generation of the waste will be:

- A one-time generation
- A continuous generation
- Other. If this block is checked, describe the expected duration of generation (for example, six weeks or six months)

Block B. Reason for Generating the Mixed Waste

Describe the reason the generation of the mixed waste is necessary.

Note: *Generation of a mixed waste without an identifiable treatment/disposal path must achieve a critical program element/mission and must be shown to be unavoidable.*

Block C. Alternate Methods/Materials Considered and Reason for Rejection

Describe the alternate methods/materials (for example, different processes or a substitution of materials) that were considered to accomplish the work and the reasons why these methods or materials were rejected.

Block D. Requestor's Certification

1. Requestor Name/Signature
Print your name and sign the form. By signing the form, the requestor certifies that all information is complete and accurate to the best of his/her knowledge based on process knowledge or certified records.
2. Dept/Group
Enter your SLAC Department or Group.
3. Date
Enter the date the form is completed.
4. Telephone
Enter your telephone extension.
5. Submit the Mixed Waste Generation Request Form
Submit the form to the RP RWM Group Leader for review and evaluation.

Block E. RP Review/Evaluation

The RP RWM Group will review the request and perform an evaluation to determine the following:

- The proposed mixed waste has an identifiable path to treatment/disposal
- The proposed mixed waste can be safely and effectively managed at RP LLMW storage facilities in accordance with the requirements of the governing documents and references listed in Chapter 1 of this Manual.

Review and Evaluation:

1. Does the proposed Mixed Waste have an identifiable treatment/disposal path?
Indicate if the proposed mixed waste has an identifiable path to treatment/disposal.

2. Special Conditions for Generation
List conditions, associated with the generation of the proposed mixed waste, required to ensure the waste is appropriately characterized, and packaged for safe and effective handling. These conditions may include but are not limited to sampling requirements, maximum volume allowance, special packaging, marking, or labeling requirements.
3. Reasons/issues preventing the treatment/disposal of the waste:
List the reasons or issues preventing treatment or disposal of the proposed waste.
4. Waste management post generation
Normally, the proposed mixed waste will be transferred to the RP RWM Group in accordance with the requirements of Chapter 4 of this Manual. Please identify any management methods that deviate from the requirements of Chapter 4 of this Manual.
5. Treatment and Disposal problem resolution
If the proposed mixed waste has no identifiable treatment/disposal path, indicate the proposed schedule for resolving the issues preventing the treatment/disposal of the waste.
6. RP Name/Signature
Print your name and sign the Form.
7. Date
Enter the date the Form is completed.
8. Telephone
Enter your telephone extension.

Block F. Mixed Waste Generation Approvals

If the proposed mixed waste stream has an identifiable treatment/disposal path, mark this block *N/A*. If the proposed mixed waste stream does not have an identifiable treatment/disposal path, return the Form to the requestor who must then obtain his/her Associate Director's (AD's) approval to generate the waste. After obtaining their AD approval, the requestor will then resubmit the form to the RP RWM Group. The RP RWM Group will then submit the request to the ES&H AD and DOE/BASO for approval.

The requestor's AD, the ES&H AD, and DOE/BASO will review the request and either approve or disapprove the generation of a mixed waste that has no identifiable treatment/disposal path.

“For RP use only” Blocks

These blocks are reserved for RP use only.

1. Mixed Waste Generation Request Number
The RP RWM Group will assign a unique request number to each form. The request number will consist of the following letters:
MWGR-AABB-XX, where:
MWGR = Mixed Waste Generation Request
AA = last 2 digits of the calendar year
BB = month of the year
XX = a 2-digit number which identifies the next available, chronological number for the month.
Example: *If two requests were made in September 2005, the corresponding request numbers for these two requests would be:*
 - MWGR-0509-01
 - MWGR-0509-02

APPENDIX 3D Mixed Waste Generation Checklist
SLAC-I-760-2A08J-004

About the Mixed Waste Generation Checklist

All SLAC personnel are responsible for the prevention and minimization of mixed waste generation. Use the following list to facilitate this goal:

Mixed Waste Challenges

Under the hazardous waste regulations, SLAC may only accumulate mixed waste on-site for a maximum of 90 days. The waste must then be shipped off-site to a permitted treatment, storage, or disposal facility (TSDF). Compliance with this 90-day accumulation limit presents a regulatory challenge to SLAC, since the treatment technology and disposal capacity for many mixed waste streams does not exist, either within DOE or at commercial facilities.

For those treatment or disposal options that are available, the TSDF waste acceptance criteria (for example, sample analyses, treatability studies, completion of characterization documentation, and contractual arrangements) is so rigorous that complying with the 90-day accumulation limit is often impossible.

In addition to this regulatory compliance issue, treatment/disposal of mixed waste is extremely expensive. In 1997, the incineration of only five gallons of radioactive trichloroethane cost SLAC nearly \$20K.

Our Best Option is Not Generating Mixed Waste

Because of the lack of available treatment technology and disposal capacity, and the high costs associated with the treatment and disposal of mixed waste, generation of mixed waste shall be avoided to the maximum extent practical.

For more information regarding waste minimization, see the SLAC *ES&H Manual*, Chapter 22, "Waste Minimization and Pollution Prevention" or contact the RP RWM Group.

APPENDIX 3E Additional Information

1 List of Hazardous Materials at SLAC

The following are common hazardous materials that may be found at SLAC. If these materials become radioactive (activated and/or radioactively contaminated) they may become a mixed waste. (This is not an all-inclusive list.)

- Acids and Bases
- Asbestos (floor/ceiling tiles, gaskets, insulation, sheet linoleum, shingles. See SLAC *ES&H Manual*, Chapter 27, “Asbestos”).
- http://www-group.slac.stanford.edu/esh/hazardous_substances/asbestos/policies.htm
- Batteries (dry cell, lead-acid, lithium, nickel-cadmium, wet cell)
- Brass and Bronze
- Carcinogens
- Cleaners, degreasers, and solvents (acetone, alcohol, Dynasolve[®], methylene chloride, toluene, trichloroethane)
- Corrosion Inhibitors
- Corrosive liquids (pH ≤ 2 or ≥ 12.5)
- Electronic Waste (e-waste) (Audio/visual equipment, cathode ray tubes (CRTs), computers, telephones)
- Flammable liquids (flashpoint < 140 degrees F)
- Fuels and fuel filters (diesel, gasoline)
- Laboratory Chemicals
- Lead (batteries, brass, bronze, circuit boards, E-waste, paint, shielding)
- Lubricants
- Mercury (batteries, fluorescent lamps, pressure-vacuum gauges, switches, thermometers, thermostats)
- Oil and Grease (bearings, capacitors, fluorescent lamp ballasts, motors, oil contaminated rags/cloths, oil filters, oily water)
- Paint, Paint Chips, Painted Items, Paint Remover, Paint Thinner
- Poly Chlorinated Biphenyls, PCBs (capacitors, fluorescent lamp ballasts, transformers)
- Solder and soldered items (circuit boards, compact fluorescent lamps, copper piping, E-waste, incandescent lamps)
- Reactive (sulfide or cyanide bearing waste, water reactive)
- Any item containing or exposed to hazardous materials (rags, absorbents, empty containers).
- Any item containing one or more of the following toxic metals:

Antimony*	Cobalt*	Selenium
Arsenic	Copper*	Silver
Barium	Lead	Thallium*
Beryllium*	Mercury	Vanadium*
Cadmium	Molybdenum*	Zinc*
Chromium	Nickel*	

*Potentially hazardous if in a friable, powdered, or finely divided state. For more information on what constitutes a hazardous waste, see SLAC *ES&H Manual*, Chapter 17 “Hazardous Waste” at the following SLAC Website:

http://www-group.slac.stanford.edu/esh/environment/hazardous_waste/policies.htm

2 Mixed Waste Streams at SLAC

2.1 Ion Exchange Resins from the Low Conductivity Water System

Radioactive resin removed from the LCW system is the only recurring mixed waste stream generated by SLAC. Due to its copper levels, the resin is regulated by the State of California as hazardous waste although not regulated by Federal regulations. Waste in this regulatory category is termed “non-RCRA hazardous waste,” or “California only hazardous waste.” The water is removed from the resin prior to shipment for disposal.

Note: *The de-watering process is not considered “treatment,” since the water is not hazardous and since the physical, chemical, or biological characteristics of the hazardous constituents (the copper adhering to the resin) is not changed, removed, or reduced.*

2.2 Other Mixed Waste

Other mixed waste streams have previously generated at SLAC on an infrequent and unplanned basis include:

- Asbestos pipe insulation
- Brass valves, fittings, etc. (lead)
- Compact fluorescent lamps (lead)
- Elemental lead, lead-contaminated debris, and lead-soldered items (circuit boards, copper piping, etc.)
- Fluorescent lamps (mercury)
- Fluorescent lamp ballasts (Oil, PCB, DEHP)
- Incandescent lamps (lead)
- Solvents (Trichloroethane, Dynasolve[®])
- Temperature sensor with elemental mercury
- Used vacuum pump oil

Such waste will be managed on a case-by-case basis.

3 SLAC is not permitted to treat Mixed Waste

Techniques or processes designed to change the physical, chemical, or biological character or composition of a hazardous or mixed waste are considered treatment. Performing such activities on waste for any purpose is not permitted at SLAC. Treatment techniques include but are not limited to:

- Neutralization
- Precipitation
- Evaporation

- Incineration
- Filtration
- Ion Exchange
- Absorption or Solidification

3 MOVING RADIOACTIVE WASTE ON SITE

3.1 Purpose and Scope

The purpose of this Chapter is to provide the requirements for transporting radioactive waste on-site between Radiologically Controlled Areas. Transportation of radioactive waste off-site, which is regulated by Department of Transportation (DOT) requirements under 49 CFR 170-179, is discussed in Chapter 8 of this Manual.

3.2 General Transport Requirements and Authorization

3.2.1 Vehicles

The use of personal vehicles to transport radioactive or mixed waste is prohibited. Only DOE or SLAC equipment shall be used to transport radioactive and mixed waste.

3.2.2 Personnel

Personnel performing transport of radioactive or mixed waste shall be, at a minimum, GERT qualified and wear personal dosimetry. GERT personnel must receive supervisor pre-approval and must determine that their annual cumulative dose will not exceed 100 mrem.

Persons operating hoisting and rigging equipment such as forklifts and cranes must be trained, certified operators in accordance with the requirements specified in *ES&H Manual*, Chapter 41, "Hoisting and Rigging."

http://www-group.slac.stanford.edu/esh/hazardous_activities/hoisting_rigging/policies.htm

3.2.3 RP and Receiving Facility Authorization

Transport of radioactive and mixed waste on-site at SLAC must be authorized by RP and the receiving facility such as RWM.

Exception: *During off-hours when an RP HPT may not be available, an accelerator operator who is a qualified LRCA may survey radioactive waste for removal from an RMMA and then authorize the transport of the waste to a posted Radioactive Material Storage Area for temporary storage. However, all waste shall be controlled as radioactive material (marked and labeled as radioactive material) and the movement must be conducted according to the requirements specified in this Chapter. The accelerator operator will inform the RPF0 Group of the waste movement on the next working day.*

After receiving authorization, contact the destination location to ensure that qualified personnel will be present to receive the waste when it is transported.

3.2.4 Survey of Contaminated Waste Items

Prior to handling or loading on a vehicle for transportation, the packaging of contaminated or potentially contaminated waste must be surveyed by a qualified HPT to verify that the external removable contamination level is less than the limits specified in Table 2-2 of the *SLAC Radiological Control Manual*.

If the radiation levels at 30 cm from the surface of the waste exceed 5 mR/hr., then the destination location must be properly posted as a Radiation Area or High Radiation Area in accordance with Article 234 of the *SLAC Radiological Control Manual*.

If the destination location is a High Radiation Area, the administrative and access controls of Articles 332, 334, and Appendix 3B of the *SLAC Radiological Control Manual* must be in effect prior to transporting the waste.

Additionally, the movement shall be accompanied by a qualified HPT.

3.3 Packaging, Marking, and Labeling

Package, mark, and label radioactive and mixed waste in accordance with Chapter 4 of this Manual. Complete a Radioactive Material Declaration Form, and if necessary, a Hazardous Waste Determination Form. Notify RPFO Group (x4299) that the waste is ready to be transferred to an RP LLRW or LLMW storage area as appropriate.

Note: The requirements of Chapter 5 of this Manual do not apply to radiological samples transported by RP personnel. To ensure the samples are packaged properly, contact RPFO Group (x4299). Hazardous samples must be marked and labeled to identify the applicable precautions, hazards, and warnings associated with the safe handling of the sample.

3.4 Containerization

Ensure that the container used to package the radioactive or mixed waste is compatible with the waste so that no significant degradation to the container is caused by chemical or galvanic reactions, radiation effects, microbial activity, or moisture. Visually inspect the containers for holes, cracks, bulges, or significant corrosion, prior to use to ensure the container is not compromised. Do not exceed the rated weight or fill capacity of the container. After filling, secure the lid in accordance with the container closure instructions and weigh the container (document the weight and update the database).

3.5 On-Site Transportation of Radioactive or Mixed Waste

3.5.1 Secure the Load

Secure the radioactive or mixed waste item or container on the vehicle by strapping, blocking, or bracing as appropriate to prevent movement during transport. Only use

equipment such as forklifts, cranes, straps, and slings with the appropriate rated load capacity for the items being lifted.

Periodically re-examine the load and its load-securing devices and make any adjustments needed to keep load securely in place.

3.5.2 Minimize Exposures to the Vehicle Operator and Others

To minimize exposure to personnel, maximize the distance between the vehicle operator and the waste or the highest radiation level on the waste. Consider using temporary shielding lead blankets or sheets when the radiation levels at 30 cm from the waste or container surface exceed 100 mR/hr. Minimize time of exposure to the dose, select the most direct route to the destination considering personnel along the route, road, and traffic conditions. Do not transport waste through established dining areas. If transport is delayed due to work operations along the route, distance the waste from buildings and personnel as practicable. These steps are all in keeping with the ALARA principle, of reducing exposure time and increasing distance to maintain exposure as low as reasonably achievable.

3.5.3 Maintain Safety and Security Controls

The radioactive or mixed waste must be always in the control of a qualified individual with current RWT I or GERT training, and with supervisor approval.

3.6 Spills, Accidents, and Injuries in Transportation

3.6.1 Spill

In the event of a radioactive or mixed waste spill during transport, perform the following activities as listed in Article 346 of the *SLAC Radiological Control Manual*.

- If you are trained in radioactive contamination spill response, stop, or secure the operation causing the spill (if it is safe to do so)
- Warn others in the area (for example, yell “**SPILL**”)
- Isolate the affected area (if possible).
- Minimize your radiation and contamination exposure by increasing your distance from the radiation source.
- If RP is not accompanying the transport, notify the RPFO Group at **x4299** immediately or have a bystander call. Remain in the area to direct them to the spill scene

3.6.2 Injury

If a serious personal injury occurs during an accident while transporting radioactive or mixed waste, first aid takes precedence. The radiological hazards associated with radioactive waste are secondary to first aid responses.

- Notify emergency response personnel (or have a bystander do so) by calling **9-911**.
- If trained, render first aid to the victim if comfortable doing so. Do not move the victim unless he or she is in imminent danger of greater injury or loss of life.
- If RP is not accompanying the transport, notify RPFO Group at **x4299** or have a bystander call.

4 RADIOACTIVE AND MIXED WASTE ACCEPTANCE CRITERIA

4.1 Purpose and Scope

The purpose of this Chapter is to provide the requirements for transferring radioactive and mixed waste to RP RWM. Collectively these requirements are known as the Waste Acceptance Criteria (WAC). The WAC ensures that radioactive and mixed waste can be safely and effectively managed at RP LLRW and LLMW storage facilities in accordance with the requirements of the governing documents and references listed in Chapter 1 of this Manual.

4.2 Exceptions to the Waste Acceptance Criteria

Exceptions to the WAC specified in this Chapter must be approved by RP. Generators requesting an exception to the Waste Acceptance Criteria or generators who generate a radioactive or mixed waste that is not addressed by the Waste Acceptance Criteria must complete a WAC Exception Request Form (see Appendix 5A in this Manual) and submit it to the RP RWM Group Leader for review and approval.

4.3 Unacceptable Waste

The following waste types are unacceptable for storage and processing at RP LLRW and LLMW storage areas. The collaborative effort by all workers at SLAC can avoid generation of these unacceptable waste types.

- Waste capable of detonation or of explosive decomposition or reaction at normal pressures and temperature or of explosive reaction with water.
- Waste capable of generating toxic gases, vapors, or fumes harmful to personnel transporting or handling the waste.
- Waste containing pyrophoric materials.
- Gaseous waste at a pressure more than 1.5 atmospheres at 20°C (or capable of generating a pressure more than 1.5 atmospheres at 20°C during its life).
- Waste containing biological, pathogenic, or infectious material.
- Waste capable of generating internal heat more than 3.5 watts/m³ (0.1 watt/ft³)

4.4 Conditional Waste

The following waste types are **conditional**, which means that they require special processing prior to being transferred to an RP LLRW and LLMW storage area:

4.4.1 Waste containing Chelating Agents

Waste containing more than 1% chelating agents or compounds must be solidified or stabilized prior to being transferred to an RP LLRW or LLMW storage area.

Chelating agents or compounds are the following classes of compounds:

- Amine polycarboxylic acids, such as EDTA and DPTA
- Hydroxyl-carboxylic acids
- Polycarboxylic acids, such as citric acid, carboic acid, and gluconic acid.

Contact the RP RWM Group at **x2823** for assistance in solidifying or stabilizing this waste.

4.4.2 Waste Containing Fissile Material

Perform criticality safety calculations and submit them to the RP RWM Group prior to transferring waste containing fissile material to an RP LLRW or LLMW storage area. Fissile material consists of the following nuclides: U-233, U-235, Pu-238, Pu-239, and Pu-241. These nuclides will sustain a chain reaction by thermal (slow) neutron induced fission. Fissile material does not include natural or depleted uranium (uranium containing less than 0.72% U-235 by weight).

4.4.3 Waste Classified for Security Reasons

Waste that is classified for security reasons must be declassified. Contact the RP RWM Group at **x2823** for assistance in declassifying waste.

4.5 Packaging Requirements

If you use a container such as a plastic bag, poly can, or steel drum to transfer waste to RP, ensure that:

- Each container is free of holes, cracks, bulges, or significant corrosion.
- The waste items are compatible with the container material so that the container's integrity is not degraded by a chemical or galvanic reaction, radiation effects, microbial activity, or moisture.
- Plastic Bagged waste is rendered free of all readily removable air.
- Container lids are installed and secured.

4.5.1 Packaging Contaminated Waste

Contaminated or potentially contaminated items must meet one of the following criteria:

4.5.1.1 Double-bagged or wrapped in clear uncolored plastic to prevent personnel exposure and spread of radioactive contamination. No opaque, translucent, or colored plastic bags are allowed.

4.5.1.2 Physically sealed to prevent the release of contamination. The internal contamination in pipes may be sealed by installing caps or flanges at both ends.

4.5.1.3 Tape and pad sharp objects and the edges of contaminated items to prevent damage to the plastic wrapping or bags.

4.5.1.4 Packaging Solid Waste with Free-Standing Liquid

Free-standing liquids must be absorbed, stabilized, or removed from solid radioactive waste items.

Note: This section *excludes* mixed waste items.

4.5.1.5 Drain Free-standing Liquid

Drain free-standing liquid to the maximum extent possible.

4.5.1.6 Add an Approved Absorbent

Add a compatible approved absorbent from Table 5-1 ensuring it is in direct contact with the liquid. Amount of absorbent shall be sufficient to absorb twice the volume of liquid present.

4.5.1.7 Package

After draining and adding absorbent, perform Steps 5.1.1.1 to 5.1.1.4 above as appropriate.

Table 5-1: Approved Absorbent

Trade Name (Absorbent Type)	Vendor	Volume Ratio (Absorbent to Water) ²
Chemsorb (Expanded Amorphous Silicate)	Precision Lab Co. 1-800-323-6280	4:1
UltraSorb (Diatomaceous Earth)	Moltan Company 1-901-755-5666	5:1
Floor Dry, Superfine, Diasorb (Diatomaceous Earth)	Eagle-Picher Minerals, Inc. 1-800-228-3865	5:1
Waste lock 770 (Polyacrylate Superabsorbent Polymer)	M2 Polymer Technologies (847) 836-1393	Free Swell in DI Water: 400 – 500 X

1. To use an absorbent not identified in this table, contact the RP RWM Group at x2823. Provide the absorbent's SDS and manufacturer's specifications. The absorbent must be non-biodegradable, non-hazardous, and compatible with the intended waste
2. The provided volume ratios comply with the requirement for adding a minimum of twice the amount of absorbent needed to absorb water. Use of the absorbent volume ratios is restricted to the following conditions:
 - Table absorption ratios applicable only to the absorption of water.
 - Amount of absorbent added must be for total volume of both freestanding and absorbed water.
 - Absorbent must be in direct contact with the water.

Note: *If the free-standing liquid in the waste is not water, contact RP RWM at x2823 for assistance in determining the appropriate amount of absorbent to add.*

4.6 Additional guidance for damp waste

4.6.1 Packaging Damp Waste

Damp waste is defined as a water-dampened cloth which has no visible free-standing water, and which will not physically release any water under hand pressure.

Because of the presence of water in damp waste, condensation can form after the initial packaging process at the point of generation. The condensation can result in freestanding water in the package. This free-standing water is detectable by the LLW disposal facility and can result in the rejection of the disposal container.

Therefore, if a damp waste contains more than a few drops of water, then the formation of condensation is likely, and the addition of an approved absorbent is necessary. Add an appropriate amount of an approved absorbent to the waste.

4.6.2 Packaging Low Conductivity Water Filters

Physically remove all water from the LCW system filters to the extent practicable. Hand wring until no further water is released.

Table 5-2 provides the estimated amount of water retained in the filters after hand wringing. This estimate is based on the measured weight differences between dry and hand wrung LCW filters.

Table 5-2: Estimated Amount of Water Retained in LCW Filters

Filter Size (height)	Estimated Amount of Retained Water (ml)
10"	250
19.5"	500
20"	500
30"	750
40"	1,000

Add an appropriate amount of an approved absorbent to the filters (consult Table 5-3 to determine how much to add).

Table 5-3: Guidelines for Adding Absorbent to LCW Filters¹

Absorbent Type	Minimum Absorbent Volume Needed per LCW Filter, (liters)				
	10" LCW Filter	19.5" LCW Filter	20" LCW Filter	30" LCW Filter	40" LCW Filter
Chemsorb	1	2	2	3	4
UltraSorb (DE)	1.25	2.5	2.5	3.75	5
Floor Dry, Superfine, Diasorb (DE)	1.25	2.5	2.5	3.75	5

¹ These guidelines are restricted to the following conditions:

- Only applies to absorption of water.
- Only applies to poly wound 10-micron filters.
- Absorbent must be placed in direct contact with filters.
- Maximum dimensions of the filters are as follows:
 - 10" Filter: 10.0" (H) x 2.5" (OD) (1" ID)
 - 19.5" Filter: 19.5" (H) x 2.5" (OD) (1" ID)
 - 20" Filter: 20.0" (H) x 2.5" (OD) (1" ID)
 - 30" Filter: 30.0" (H) x 2.5" (OD) (1" ID)
 - 40" Filter: 40.0" (H) x 2.5" (OD) (1" ID)

4.6.3 Large, Bulky Items

All free-standing liquids in large, bulky items must be removed to the maximum extent possible. Drain at low points, absorb residual liquid with cloth, or remove liquid with pressurized air or vacuum. In cases where it is not practical to determine if all the free-standing liquid has been removed, add an appropriate amount of an approved absorbent. Liquid remaining in the item must remain below 1% of the volume of the waste.

Note: Consult Table 5-1 to determine how much absorbent to add.

4.6.4 Packaging Mixed Waste

In addition to other packaging requirements specified in this Chapter, package individual mixed waste items according to the instructions of this Section. For questions regarding the hazardous waste classification of an item, contact your ES&H

Coordinator, Safety Officer, or complete a Hazardous Waste Determination Form (SLAC-I-760-2A08J-002) and submit it to the RP RWM Group (MS 84) for evaluation. The most common hazardous materials found at SLAC are listed in Appendix 3E of this Manual.

Mixed waste must be transferred to the RP Mixed Waste Accumulation Area (MWAA) on the generation date or placed into accumulation containers, provided by RP, at the generation location called a Satellite Accumulation Area (SAA). Maximum container residency at a SAA is limited to filling the container or 9 months whichever comes first.

Once the time or volume limit is reached, the waste must be moved to a MWAA within three working days. Additionally, it must be shipped off-site for disposal within 90 days of closure. Accumulation of mixed waste in a MWAA is limited by the requirement to ship within the 90 days also.

4.6.4.1 Segregation

When packaging mixed waste items, segregate the waste according to:

- The hazardous characteristics of the waste, such as toxicity, reactivity, corrosivity, and ignitability.
- The constituents of the waste, such as lead, copper, silver, toluene, or acetone.
- The physical form of the waste; separate the liquids from solids.

Note: *Many hazardous constituents are incompatible with each other. When segregating mixed waste for packaging, ensure the waste is compatible. For more information regarding incompatible wastes, see Title 22 CCR, Division 4.5, Chapter 15, Appendix V, or contact RP RWM at x2823.*

This high level of segregation is mandated the varied regulatory treatment standards for the waste constituents, characteristics, and physical forms.

4.6.4.2 Packaging

- Each container must be free of holes, cracks, bulges, significant corrosion, or anything that may compromise its integrity.
- Container material must be compatible with the waste it is to contain so that moisture, microbial activity, radiation effects, chemical, and galvanic reactions do not degrade its integrity.
- Use a container authorized under 49 CFR packaging requirements for the hazard classes exhibited by the waste. Use of an authorized container will help prevent any need to repackage the waste prior to transport to a treatment and disposal facility. Contact the RP RWM Group (x2823) for assistance in selecting and procuring the appropriate accumulation container.
- Subsequent waste is compatible with any waste previously placed in the container.
- Each container remains sealed except when adding or removing waste.

Note: *LCW resins may be accepted in their existing bottles. Resin bottles must be securely plugged to preclude release of resin.*

4.6.5 Packaging Waste that Contains Asbestos

For asbestos containing waste, contact the RP RWM (x2823) for specific packaging instructions.

4.7 Radioactive Waste Labels

Label each uncontainerized radioactive waste item and each radioactive waste container with a 'radioactive material' label in accordance with Article 412 of the SLAC *Radiological Control Manual*.

If the radioactive waste being labeled is mixed waste, notify RP RWM.

4.8 Additional Labeling for Mixed Waste Accumulation Containers

Mark each mixed waste accumulation container with the following:

- The words "Hazardous Waste."
- The start date of accumulation. (This date is one during which the waste was generated, as identified on the waste item's Radioactive Material Declaration Form. This date should not change when additional mixed waste items are added to the container.)
- The waste composition and physical state.
- The hazardous properties of the waste.
- The name and address of SLAC.
- Name and telephone extension of the waste contact.

Note: *Customized labels are available from RP. For assistance with completing labels, contact RP RWM at x2823.*

Labels must be readily visible for inspection purposes. Since the labels will be replaced with the appropriate transportation labels as required by 49CFR and Title 22 CCR, Division 4.5, first apply duct tape to the outside of the container and then place label on the tape. This practice will ease subsequent label replacement.

As applicable, attach to the Radioactive Material Declaration Form the following items regarding the mixed waste: the manufacturer's SDS, process knowledge statement, manufacturer's specifications, sample analysis, and Hazardous Waste Determination Form, associated with the mixed waste being addressed.

4.9 Characterization Documents

Certify that waste meets the Waste Acceptance Criteria of this Chapter by completing a Radioactive Material Declaration Form (see SLAC-I-760-2A08J-001) for all radioactive waste items transferred to RP.

If the hazardous waste classification of a radioactive waste item is unknown, complete a Hazardous Waste Determination Form (see SLAC-I-760-2A08J-003). Attach the completed form to the Radioactive Material Declaration Form.

For mixed wastes, attach the manufacturer's SDS, process knowledge statement, manufacturer's specifications, sample analysis, Hazardous Waste Determination Form, and Mixed Waste Generation Request form to the Radioactive Material Declaration Form as necessary.

APPENDIX 5A Waste Acceptance Criteria (WAC) Exception Request Form SLAC-I-760-2A08J-005

Purpose of the WAC Exception Request Form

Generators requesting an exception to the waste acceptance criteria or who generate a radioactive waste that is not addressed by the waste acceptance criteria must complete a WAC Exception Request Form (see SLAC-I-760-2A08J-005).

How to Complete the WAC Exception Request Form

The requestor completes Blocks A through C and then forwards the form to the RP RWM Group Leader or his/her designee for review and approval.

Block A. Waste Description

Provide a detailed description of the waste. As applicable, include the following in the waste description:

- The name of the waste and a brief description of the waste's physical and chemical characteristics
- Serial numbers, part numbers, or Property Control (PC) numbers associated with the waste
- Manufacturer product name or chemical name associated with the waste
- The original function or intended use of the item prior to becoming a waste

Note: Do not use the term "Miscellaneous" to describe the waste.

Attach the documentation (for example, process knowledge statement, SDS, manufacturer's specifications, sample analysis, and Hazardous Waste Determination Form) that further describes the waste's composition and its original function or intended use.

1. Generation Process
Enter a description of the process that generated the waste (for example, degreasing of accelerator components or paint stripping and removal from the positron vault walls and floor).
2. Generation location and/or system
Identify the location (for example, positron vault, north damping ring, or beam switchyard) where the waste was generated and, if applicable, the system (such as the LCW system) or equipment from which the waste was removed.
3. Total Quantity and/or Estimated Generation rate
Enter the total quantity of the waste (for example, 5 ft³ or 10 gallons) and the estimated rate of generation (for example, 100 ft³/yr. or 10 gallons/month). Be sure to include the correct unit of measure for each quantity.
4. Destination
Identify the location to where the item will be transferred for storage.

Block B. Exception Request

Describe the reason you are requesting an exception to the waste acceptance criteria (WAC).

Block C. Requestor's Certification

1. Requestor Name/Signature
Print your name and sign the form. By signing the form, you are certifying (based on process knowledge or certified records) that all the information is complete and accurate to the best of your knowledge.
2. Dept/Group
Enter your SLAC Department or Group.
3. Date
Enter the date you completed the form.
4. Telephone
Enter your telephone extension.

Block D. WAC Exception Request Review/Approval

The RP RWM Group Leader or his/her designee will review the WAC request and will determine (approve or disapprove the request) if the radioactive waste can be safely and effectively managed at RP LLRW or LLMW storage facilities. If approved, the RP RWM Group Leader or his/her designee will specify, in Block E, the processing instructions that must be performed prior to transferring the waste to RP.

1. RP RWM Group Leader Name/Signature
Print your name and sign the form.
2. Date
Enter the date you completed the review.
3. Telephone
Enter your telephone extension.

Block E. Processing Instructions

The RP RWM Group Leader or his/her designee will specify the processing instructions that must be performed prior to transferring the waste to an RP LLRW or LLMW storage area. The processing instructions ensure that the radioactive waste can be safely and effectively managed at these facilities.

Block F. Processing Certification

1. Requestor Name/Signature
Print your name and sign the form. By signing the form, you are certifying (based on process knowledge or certified records) that all the indicated processing instructions have been completed. Attach all documentation (for example, Radioactive Material Declaration Form, and Hazardous Waste Determination Form) verifying the completion of the instructions.
2. Dept/Group
Enter your SLAC department or group.
3. Date
Enter the date the form is completed.
4. Telephone
Enter your telephone extension.

Block G. RP RWM Group Leader Final Review/Approval

The RP RWM Group Leader or his/her designee will review the completed processing instructions and indicate by checking the appropriate box whether the waste is now acceptable for transfer to an RP LLRW, or LLMW storage area. If the waste requires further processing, the Group Leader will specify the additional processing instructions in Block E. These additional instructions must be performed prior to transferring the waste to RP. This will initiate the waste processing and review cycle specified in Blocks E through G again.

1. RP RWM Group Leader Name/Signature
Print your name and sign the form.
2. Date
Enter the date you completed the review.
3. Telephone
Enter your telephone extension.

“For RP use only” Blocks

These blocks are for RP use only.

1. WAC Exception Request Number
The RP RWM Group will assign a unique request number to each form. The request number will consist of the following:
WAC-AA BB-XX, where:
WAC = Waste Acceptance Criteria
AA =last 2 digits of the calendar year
BB = month of the year
XX= a two-digit number that identifies the next available, chronological number for the month

Example: If two requests were made in June 2003, the corresponding request numbers for these two requests would be:

WAC-0306-01
WAC-0306-02

RP RWM Group is responsible for maintaining a log of the assigned request numbers to ensure numbers are not duplicated.

2. Page ____ of ____.
Enter the page number of the form.
Example: Page 2 of 3

5 RADIOACTIVE WASTE STORAGE AREAS

5.1 Purpose and Scope

This Chapter describes the facilities used by the RP Department RWMG to store, sort, process, and prepare radioactive wastes for shipment. It also outlines the general controls applicable to these areas.

As per DOE M 435.1-1, low-level waste that has an identified path for disposal shall not be stored longer than one year prior to disposal, except for storage or decay, or as otherwise authorized by the Field Element Manager (BASO). At SLAC, newly generated radioactive waste (newer than July 11, 2000) may be stored for up to 12 months. If SLAC deems that some of this waste requires storage longer than 12 months, SLAC will document the reason(s) and submit such documentation to the DOE Field Element Manager, or designee, for approval.

5.2 The Radioactive Waste Processing Areas

The following areas are used at SLAC in the management of Radioactive and mixed wastes:

- Building 480 (The Radioactive Material Storage Yard, RAMSY)
- Building 009A (MSY tent), and the
- B 478 Radioactive Waste Storage Area (RWSA)

The RAMSY is an outdoor, bermed area that contains a partially enclosed building (Building 480), and an area that is secured by a perimeter fence. The MSY tent is located in the former MSY parking lot next to the BSY entrance fire lane. The tent is a 5000 square-foot enclosure with two roll up doors on opposite sides of the tent. The tent has three-man doors, two in the back and one in the front. In addition to the tent, there is an outdoor laydown area of 5000 square feet, which is roped off as an RMA/RCA. The RWSA (Building 478) is an enclosed building with large rollup doors to allow easy movement of large items. A Mixed Waste Accumulation Area (MWAA) is present within the RAMSY for storing mixed waste.

5.3 General Radiological Controls

The activities at the RAMSY, and the RWSA, shall be managed in such a manner that radiation exposure to radiological workers, the public, and the environment are as low as reasonably achievable (ALARA). “There should not be any occupational exposure of workers to ionizing radiation without the expectation of an overall benefit from the activity causing the exposure.” This quote from Article 111 of the SLAC Radiological Control Manual reflects the dose versus benefit frame of thinking that personnel working in these areas are trained to exercise.

5.3.1 RAMSY Posting

The RAMSY fence is posted with Radioactive Material Area / Radiologically Controlled Area (RMA/RCA) signs that are placed in strategic viewing locations based on FO-30, so that approaching personnel can identify the hazard in the area.

The RAMSY has two entrances that are attended by personnel during normal working hours and locked when personnel are not present.

The RAMSY has a Radiation Area, in the Alcove, that is posted with “Caution, Radiation Area” signs. When applicable, the RAMSY can also have a posted Mixed Waste Storage Area within Building 480 and/or the Alcove. When appropriate, portions of the RAMSY can also be posted as Contamination Areas (See Article 234 and 235 of the Radiological Control Manual for more details), or High Radiation Areas. Furthermore, Radiation Areas can be de-posted as needed when radiological conditions warrant it.

5.3.2 RWSA Posting

Radioactive Material Area signs are posted at all entrances (when it contains radioactive material). When appropriate, it can also be posted as a Radiation Area or a High Radiation Area (See Article 234 and 235 of the Radiological Control Manual for more details).

5.3.3 Radioactive Waste Marking, Labeling, and Accountability

5.3.3.1 Marking

Whenever practicable, all radioactive waste should be packaged in fifty-five-gallon drums and marked with RWG XXXX (where RWG is Radioactive Waste Group and XXXX is a unique sequential number, such as RWG 0001 or RWG 0002). When filled, RWG drums shall also be marked with the weight in kilograms.

Should RP receive a waste with partial physical and/or chemical characteristics, the waste shall be packaged in fifty-five-gallon drums and marked as SWG (Suspect Waste Group) with a sequential number. See Section 1 of Chapter 7 in this Manual for details on how to receive radioactive waste.

Waste that cannot fit into fifty-five-gallon drums and is not contaminated may be stored on pallets until radiological characterization is completed, or may be disassembled, if safe to do, so that the parts can fit into fifty-five-gallon drums. All containers that contain radioactively contaminated items shall be marked as:

“RADIOACTIVELY CONTAMINATED ITEMS”

Other markings may include the following:

ASBESTOS
DEPLETED URANIUM
LEAD FOR RE-USE
PCB
RESIN
RESIN H2O
SMOKE DETECTORS
SOURCES
TRASH

5.3.3.2 Labeling

Title 10 Code of Federal Regulations Part 835, Subpart G, 835.606 (a)(1), states: “Items and containers may be excepted from the radioactive material labeling requirements of 835.605 when: used, handled, or stored in areas posted and controlled in accordance with this subpart and sufficient information is provided to permit individuals to take precautions to avoid or control exposures.”

Both the RAMSY and the RWSA are posted and controlled so that individual labeling of containers is not required. Containers with mixed waste shall be properly labeled according to Chapter 5 of this Manual and shall be visible for inspection purposes.

Ensure there is sufficient aisle space between containers/pallets to allow unobstructed movement of personnel and access for inspections.

5.3.3.3 Accountability

For issues relating to accountability, see Chapter 7, “Receipt of Radioactive Waste.”

5.3.4 Radiological Surveys

Routine radiological surveys (for radiation levels and contamination) are performed by qualified RP personnel. A detailed survey map and results of each survey performed is posted on the south entrance of the RAMSY. This map is visible to any person entering the RAMSY.

Note: *All radioactive material stored inside the RAMSY that is not in a Radiation Area has exposure rates of less than five milliRoentgen (mR) per hour at thirty centimeters (<5mR/hr. @ 30 cm), and usually less than 2 mR/hr. at 30 cm.*

All material to be released from the RAMSY shall be surveyed, prior to release, by qualified RP personnel. Any loose radioactive contamination measured outside established Contamination Areas shall be reported to the RPFO Group.

5.4 Conduct of Work Operations

5.4.1 Storage

Waste items and wastes containers shall be stored inside an appropriately posted area on pallets. Liquid wastes shall have secondary containment within the bermed area of the RAMSY or inside the RWSA. Full containers shall not be double stacked. Whenever practical, full, and empty containers will be stored indoors to prevent or limit degradation and corrosion. Drums shall be stored in groups of up to four to a pallet, without exceeding the rated weight capacity of the pallets. Empty containers may be double stacked when stored away from work areas generally occupied by personnel, drums must be secured with nylon straps when double stacked.

5.4.2 Establishing a MWAA

5.4.2.1 Choosing the Location

Locate the MWAA away from other work operations, in a low-traffic area, and away from drains and sumps. Ensure the area is protected from the weather, to prevent rainwater infiltration, degradation of the container. Protection from weather is especially important and applicable when storing ignitable or reactive mixed wastes.

5.4.2.2 Identifying the MWAA

Post the MWAA with the following:

- Mixed Waste Accumulation Area
- Area Contact: (Contact's Name and Telephone Extension)
- Emergency: **9-911**
- If ignitable or reactive mixed waste is stored in the area, post the MWAA or the entrances and perimeter to the RAMSY fenced area with the following: "Ignition Sources". The RAMSY perimeter is already posted as a "No Eating or Smoking Area".

5.4.2.3 Knowing the Hazards

The RP RWM Group is responsible for maintaining an SDS file at the RAMSY for all mixed waste stored at the MWAA and shall ensure that the file is available to all personnel.

5.4.2.4 Supplies and Equipment

Stage the following equipment within (or proximity to) the MWAA:

- An adequate supply of appropriate spill response material (for example, absorbent, bags, PPE)
- A telephone or other communication device
- If warranted by the hazardous characteristics of the mixed waste, a portable eyewash and shower station
- If warranted by the hazardous characteristics of the mixed waste, an appropriate portable fire extinguisher

5.4.2.5 Segregating the Waste

Ensure that the waste is compatible with other containers being stored in the MWAA. Physically isolate containers with incompatible wastes from each other.

Note: *For more information regarding incompatible wastes, see Title 22 CCR, Chapter 15, Appendix V, or contact the WM Group.*

5.4.2.6 Providing Secondary Containment

Provide secondary containment for containers with liquid mixed wastes or finely divided solid waste. Secondary containment must be able to collect and confine the entire volume of the container if a leak develops. If the secondary containment completely encloses the container, apply a second hazardous waste label to the

outside of the secondary containment. Customized labels are available from the WM Group.

Note: *Prefabricated drum pallets with a built-in secondary containment are commercially available.*

5.4.2.7 Internal Notification

Contact WM as needed to support and local, state, and federal hazardous waste compliance requirements.

5.4.3 Daily Log

A daily logbook is maintained, and contains the daily occurrences as described below. The daily log shall also list all personnel present.

1. The log shall describe the specific task performed, the time it was done, and who performed the task.

Example: *“Took water sample from the RAMSY sump at 7:30. Delivered the water sample to the counting lab at 8:00. Packaged waste containers and performed housekeeping 8:15 to 12:00 (signed by personnel completing entry).”*

2. The log shall list all official visitors and their purpose.
3. The log shall list any unusual occurrences.
4. The logbook is an official record. Entries and management of the logbook must follow the guidelines and requirements in Chapter 10 of this Manual, “Documentation.”

5.4.4 Area Inspections

Both the RAMSY and the RWSA are inspected weekly (every seven days). See the Radioactive Storage Area Weekly Inspection Form (SLAC-I-760-2A08J-006).

5.4.5 Radioactivity Limit for RWSA

Because of its classification as “Other Industrial Building,” the RWSA is subject to limits on maximum amounts of radioactivity that it can contain. If radioactive waste beyond what SLAC has encountered in the past is to be stored in the RWSA, an estimate of the radioactive contents shall be performed prior to storing the waste in the building (to ensure that the radioactivity limits will not be exceeded).

5.4.6 Hazardous Materials and Waste

Other than lead bricks and sheets which are used for shielding, the only potentially hazardous materials used at the RAMSY or the RWSA are touchup spray paint, spray glue, machining and lubricating oil used in machinery, and diesel fuel. These materials are stored outside the posted Contamination and Radiation Areas to prevent contamination with radioactive material.

5.4.7 Combustible Material

Generally, combustible material shall not be stored in the storage areas unless it is the containment for materials received at the areas. All combustible materials that can be disposed before being deposited into the areas shall be disposed before arrival into these areas.

The RAMSY also collects a large amount of potentially combustible vegetative material such as leaves and pine needles from the surrounding trees. This material shall be removed without including any waste material from the RAMSY. Personnel sweeping the floors or grounds shall assure that no radioactive waste material is included in the sweepings.

Qualified RP personnel shall survey suspect sweepings before removing them from RAMSY. All combustible material discarded shall be properly packaged and deposited at the designated waste pick-up area.

5.4.8 Rainwater Management

The RAMSY is a fenced area with an asphalt berm that surrounds the entire yard. It has a forty by sixty-foot partially enclosed building (Building 480). The yard area is sloped so that rainwater drains to the southeast corner. A sump installed in that corner aids in the collection of water. All water that collects in this corner sump is sampled and analyzed for radionuclide identification and concentration.

Note: *Several years of sampling, radioactive surveying of the Radioactive Materials Storage Yard, and process knowledge of the material in the area have shown no radioactive material in rainwater. The environmental engineer responsible for rainwater has advised that the water can be discharged immediately after it is sampled. The sequence of starting the discharge pump verses when the sample is taken is not critical.*

The following procedure shall be used to sample water collected in the sump inside the RAMSY bermed area:

1. Wear waterproof gloves to take the sample.
2. Fill a 500-milliliter plastic bottle with the sump water. Dry the outside of the bottle with paper towels.
3. Swipe the outside of the bottle and count the swipe to assure that it is not radioactively contaminated. Log the results in the daily logbook.
4. Label the sample.
5. Place the next sequential sample label on the bottle.
6. Start pumping the water out into the storm drain.
7. Deliver the sample to the RP counting lab for radionuclide analysis.
8. Retrieve the sample.

If radioactivity is detected in any of the water samples, notify the RWM Group leader immediately and stop pumping activity. Otherwise continue as follows:

1. Log the results in the RAMSY Rainwater Logbook.
2. Pour sample into sump
3. Shut off and secure the pump after sump is emptied
4. Secure the pump hose.

5.4.9 Mop Water Management at the RWSA

When mopping the floor at Building 478, use only water (no chemicals, soap, or other cleaning agents). The water shall be analyzed for radionuclide content before disposal if process knowledge cannot assure that it does not contain radionuclides above background levels.

5.4.10 Security

Keep the RWSA and RAMSY locked when personnel responsible for the area are not present. Personnel working in the area must remain in sight of any unlocked gate. Only authorized personnel may access the area when the RP RWM personnel are not present but must obtain a key from the RP key box or ask site security for access.

5.4.11 Eyewash Stations

One portable eyewash station is located inside both the RAMSY and RWSA. Flush the water in the portable eyewash stations each week. Record the date of the eyewash station flushing in the logbook.

5.4.12 Radioactive Material Spills

If unexpected radioactive contamination occurs, initiate the “SWIMM” steps highlighted below:

- **S--Stop the spill** - Stop the spill only if the source of the contamination can be identified and can be corrected safely and quickly (for example, up-right a fallen container and put absorbent material on spreading liquid)
- **W--Warn Others and Notify RP** - Warn people in the vicinity by yelling “Spill” and notify RPFO Group by telephone or radio.
- **I--Isolate the spill area** - Use ropes or tape if necessary.
- **M--Measure the spill** - Take radiation reading and swipes to assess the radiation hazards before attempting to clean up the spill.
- **M--Minimize your exposure** - Keep your exposure to a minimum when going through these steps. Use protective equipment as appropriate.

Note: *Also notify the RWM Group Leader.*

5.4.13 Emergency Procedures

See Appendix 6B, “Emergency Procedure for RAMSY” and “Facility Emergency Plan - Centralized Waste Management Area.”

APPENDIX 6A RP Waste Storage Areas Weekly Inspection Form
SLAC-I-760-2A08J-006

About the RP Waste Storage Area Weekly Inspection Form

Use this form to document weekly inspection of RP Waste Storage Areas (for example, the RAMSY or RWSA).

As needed, the RP RWM Group will establish a temporary MWAA within the fenced area at the RAMSY for the purposes of accumulating and storing mixed waste. When a MWAA is established, include the MWAA in the weekly inspection and fill out the applicable parts of this form.

An RP Supervisor will review the completed forms and maintain a file at the RAMSY of all completed inspections.

APPENDIX 6B Emergency Procedure for RAMSY

Personnel Injury

All injuries at SLAC must be reported immediately or as soon as possible to the SLAC Medical Department. In addition, all injuries at the RAMSY must be reported to the RAMSY Supervisor, the Radioactive Waste Management Group Leader, or the next available person in the management line.

If a person is seriously injured, the nearest available person must alert emergency response personnel by calling **9-911** and staying on the phone or radio for instructions from the emergency responders. Seriously injured personnel should not be disturbed unless the witness has the proper training to assist the injured or if inaction could result in other imminent harm.

The decision whether to assist is left to the discretion of the witness.

Personnel must work in pairs when using the forklift or any heavy machinery such as the shear at RAMSY. This “buddy system” is intended to assure that one person will be available to call for emergency response if necessary.

Note: *Within the RAMSY, forklifts pose the largest potential risk to health and safety. Maintaining forklift training and the forklift maintenance program is a mandatory part of avoiding personnel injury in the RAMSY.*

Emergency Equipment

Telephone

1. State your name and location.
2. Say “I have an emergency.”
3. Describe the emergency (for example, fire or injury)
4. Ask for instructions if the situation warrants it (for example: If a person is not breathing or is bleeding, immediate action is necessary)
5. Stay on the phone until the responder instructs otherwise.

Emergency Fire Alarms

If an evacuation fire alarm is activated, stand by the fire alarm box until the Fire Department arrives. It may be necessary to give directions or instructions to the responders.

Fire at a radioactive waste processing area

Unless a fire is small and manageable *and* you have been trained in the operation of portable fire extinguisher, do not attempt to control the fire. Evacuate the area and call **9-911** (or activate the evacuation fire alarm). Remain at the fire alarm box and wait for the Fire Department responders.

Note: *Do not attempt to control or suppress a fire if you have any doubts about the type of fire or your ability to suppress it.*

Earthquake at a radioactive waste processing area

Occupants should exit Building 480, Building 478, and the MSY Tent in the event of an earthquake. If you are in another building, remain indoors and seek refuge under a sturdy table or desk. Stay away from glass windows and doors and tall shelves.

If you are outdoors, go to an area free of tall trees, racks, stacked objects, and power lines. If you are in a vehicle, stay in the vehicle. There are two routes of exit from RAMSY, the North and South gates. These gates must be open whenever there are personnel working inside RAMSY. The preferable exit from inside the MSY tent is through the south man door towards the front of the structure. The preferable exit from inside RWSA is through the main man door.

After an earthquake, and if it is deemed safe, all RWM personnel should gather at the east side of the road entrance to the magnet storage yard and remain there until a headcount has been completed. If you are at building 478 / RWSA go to the Waste Management muster point for a head count. Immediately report in by cell phone to the Radwaste Group Leader.

Radiological Emergency

The RAMSY, RWSA, and the MSY Tent are maintained to be a low-risk facility for radiological hazards. The only conceivable radiological emergency that can occur at the RAMSY is the spilling of radioactively contaminated resins. The resins are contained in fifty-five-gallon drums or specialized containers ("bottles"). If any of these containers is accidentally turned over, the radioactive resin and water might leak out.

If there is a spill:

1. Take actions to control the spill (if you are trained to do so)
2. Notify the RAMSY supervisor or the RWM Group Leader
3. Call the RP emergency line (Telephone Extension **4299**)
4. Remain in the Controlled Area of the RAMSY until RP survey personnel arrive. RP survey personnel will direct spill cleanup and decontamination actions.

6 RADIOACTIVE WASTE PROCESSING

6.1 Receipt of Radioactive Waste

Only wastes that have been determined to be radioactive by the RPFO Group can be accepted by the RWM Group. When accepting radioactive and mixed waste, the receiving procedure below shall be followed.

6.1.1 Receive the completed Radioactive Waste Declaration Form and assure that it is completed properly.

6.1.2 Complete Block G of the form (“Receiver” Block).

See SLAC-I-760-2A08J-001 for detailed instructions for completing the Declaration Form.

6.1.3 Issue a Radioactive Waste Declaration Form identification number (ID number).

The ID number is a combination of the year (two digits), month (two digits), day (two digits), and the item number (three digits, 001, 012, etc.) in sequential order, with a hyphen before the item number, starting with the number one (001) for each day. Example: The first waste sample for May 20, 2003, is numbered 030520-001.

6.1.4 Write the ID number on the waste item with a weatherproof marker.

6.1.5 Determine if the waste is in the Suspect Waste Group (SWG) or the Radioactive Waste Group (RWG).

Under most circumstances, RP should not receive any waste that has not been properly identified, characterized, or that has not been determined to have a path to disposal. Deviation from this rule needs the approval of the RP RWM Group leader (see Chapter 5 of this Manual, “Radioactive Waste Acceptance Criteria”). If the waste is in the SWG, a Deficiency Report may be required (see Appendix B for details).

6.1.6 Deposit the waste into the appropriate container and put the container number in the appropriate space of the Declaration Form.

For items that do not fit into drums, store on pallets, deposit into ‘B boxes’, or for very large items, block the item off the floor in an isolated area. Update the container type on the Declaration Form to describe the storage location.

- 6.1.7 Have the Declaration Form reviewed by a RP Supervisor.
- 6.1.8 Write the ID number onto the container inventory sheet.
- 6.1.9 Scan the Declaration Form into the RAM declaration folder in the appropriate month/year folder.
- 6.1.10 Enter the information into the Radioactive Low-level Waste (RLLW) or Mixed Low-Level Waste (MLLW) database as appropriate.

6.2 Inventory

All radioactive and mixed waste and material at SLAC must be accounted for. Log declared items for disposal and storage at the RAMSY and at the RWSA onto a Declaration Form. The purpose of the Declaration Form is to account for and track waste and material (see SLAC-I-760-2A08J-001).

6.3 Waste Segregation

Segregate items as they are accepted into the RAMSY or the RWSA. Segregate waste according to the following categories:

- Resins
- Small, activated metals by material (for example, Cu, Al, and Fe)
- Large, activated components
- Filters
- Activated cables and tubing
- Contaminated items

6.4 Radioactive Material Container Marking and Labeling

Before you deposit material or waste into a container, mark and label the container with the type of waste it will hold. Mark each container with a unique Radioactive Waste Group Number (RWG Number, such as RWG 0030, RWG 0200). If the waste is a mixed waste, make sure the proper hazardous label is attached to the container, according to Chapter 5 of this Manual, and see Chapter 3 for more information and instructions. Use stencils and yellow paint to mark the containers as indicated in Table 7-1.

Table 7-1: Marking Abbreviations for Radioactive Material

Material Type	Marking Abbreviation
Aluminum	Al
Copper	Cu
Iron	Fe
Stainless Steel	SS
Concrete	CON
LCW Filters	Fl
Cable/tubing	Cb
Resin	R
Compactible Waste (for example, paper, plastic, rubber, and anti-contamination clothing.)	CW

6.5 Volume Reduction and Minimization

6.5.1 Large or Bulky Items

RPFO Group will survey large, activated components and label them before they are accepted at the RAMSY, MSY Tent, or RWSA.

Note: *Items that exhibit high radiation levels or those that are too large to store at the RAMSY, MSY Tent, or RWSA may need to be stored at their original locations.*

At the RAMSY, MSY Tent, or RWSA, large or bulky items will be disassembled into smaller parts if it can be done safely and without subjecting personnel to excessive exposure to radiation. Once disassembled, the parts will be surveyed and non-radioactive items will be segregated, surveyed, and released. The RPFO Group will conduct a final release survey prior to releasing the items.

6.5.2 Cutting and Reducing the Size of Waste Materials

Cutting is another means to reduce the volume of radioactive waste.

6.5.3 Release Survey

Prior to releasing items to uncontrolled areas, they must be surveyed in accordance with Article 422 of the *SLAC Radiological Control Manual*.

6.6 Radiological Characterization

See Chapter 8 of this Manual.

6.7 Radioactively Contaminated Solids

Contaminated waste items are normally packaged in a way that stops contamination from spreading to other items when it comes to the RAMSY or the RWSA. Bags or other types of

cover are used for this purpose. Segregate contaminated waste and use additional care when handling it. These measures are designed to prevent or limit the spread of contamination.

6.8 Unacceptable and Conditional Waste Items

Waste items that are identified as unacceptable or conditional, as described in Chapter 5 of this Manual will be handled on a case-by-case basis. Complete a Radioactive Waste Deficiency Report (Appendix A to this Manual) for each of these wastes.

6.9 Suspect Waste Items

Suspect waste items are usually wastes whose characteristics have not been determined fully and therefore, a path to disposal could not yet be identified. Every effort shall be made to analyze these wastes to ensure timely disposal according to local, state, and federal laws.

6.10 Waste Storage Containers

All waste containers shall be free of holes, be waterproof, and capable of receiving a sealed lid. They shall also have the maximum payload recorded. These containers shall also be marked and labeled according to Section 4 of this Chapter.

6.11 Ion Exchange Resins

Ion exchange resin will be de-watered at the RAMSY or RWSA before the resin is packaged for transport and disposal. While resin is not a federal hazardous waste, past data showed levels of copper exceeding the California's limits thereby making it a California hazardous waste. It is therefore treated as a mixed waste.

While at SLAC, resin bottles are managed in accordance with RP's "LCW Resin Bottle Servicing" procedure (SLAC-I-760-2A30C-007).

6.11.1 Resin De-watering

See the procedures "Transfer and Gross De-Watering of Ion Exchange Resin" (SLAC-I-760-2A30C-005-R) and "Dewatering Bead Resin to Less Than 0.5% Drainable Liquid" (SLAC-I-760-2A30C-002).

6.11.2 Resin Sampling and Characterization

See Chapter 8 of this Manual.

6.11.3 Resin Packaging

See Chapter 9 of this Manual.

6.11.4 Resin Water Filtering

Water from resin de-watering will be filtered to remove insoluble particles before the water is released to the sanitary sewer system. See procedure RW-009, "Filtering of Radioactive Water" (SLAC-I-760-2A30C-009).

6.12 Waste Container Inventory Sheets

Waste container inventory sheets are maintained for each waste container. The sheets are updated each time waste is added to the container. The start date and closure date are included on the sheets. Inventory sheets are stored as permanent records.

6.13 Documentation Review

The Radioactive Waste & Radioactive Material Coordinator or the Radioactive Waste Management Group Leader performs a documentation review to ensure that the documentation is complete and accurate. This review is typically done before each waste shipment, while data are being prepared for submission to the selected disposal facility.

6.14 Packaging of Waste for Shipment

See Chapter 9 of this Manual.

7 RADIOLOGICAL CHARACTERIZATION

7.1 About Radiological Characterization

In addition to knowing the physical and chemical characteristics of the waste, which is accomplished during the steps of filling out the Declaration Form (as described in Chapters 3, 5 and Appendix 5A of this Manual), it is also necessary to know the radioactive components of the waste and their radioactivity levels. Depending on the waste stream, differing methods can be used to characterize the radiological components of the waste.

7.2 Activated and/or Contaminated Solids

7.2.1 About this Waste Stream

The *activated or contaminated solids* waste stream typically includes:

- Accelerator equipment, piping, building and structural materials (for example, metal, concrete, glass, and wood)
- Electrical cables and wires
- Filters removed from the LCW system
- Paper, plastic, rubber, cloth, and miscellaneous debris (for example, floor sweepings and tape)

7.2.2 Method for Radiological Characterization

Method 1: Peak Identification and Dose Rate Modeling

Gamma spectroscopy is used to identify the radionuclide inventory of activated or contaminated solid. The waste or representative samples of the waste is typically analyzed with a hyper pure germanium (HPGe) or sodium iodide (NaI) detector. The resulting gamma spectrum is then analyzed to determine the presence of specific gamma emitting radionuclides. Based on the gamma spectroscopy results, the relative percentages of each gamma emitting radionuclide in the waste can then be calculated. For more details, see the Gamma Spectroscopy Analysis Procedure [SLAC-I-760-2A39C-009].

Once the waste's gamma emitting radionuclides (and their relative percentages) have been identified, the individual radionuclide activities are calculated based on the maximum exposure rate of the waste. Exposure rates of waste are measured with a portable ion chamber outside of the waste container. The exposure rates are then used to calculate the waste radioactivity. The use of computer source term modeling software (for example, MicroShield[®]) is the preferred way to calculate the total activity and the individual radionuclide activities of waste. The calculations are based on input parameters typically consisting of the following:

- The physical dimensions and constituents of the waste and their estimated percentages.
- The maximum exposure rate of the waste.
- Relative percentages of the radionuclides present in the waste. These are based on gamma spectroscopy results of the waste stream, swipe survey results of the waste (if it is contaminated), and the scaling factors (discussed below). While the relative percentage of each radionuclide present in the waste can be used, the exposure rate is often assumed to come from each of the nuclides detected. This results in conservative estimates (overestimates) of the radioactivity.

Method 2: Ortec Isotopic

This method uses Ortec software's built-in point kernel modeling to determine the activity within an object, after measurement with a portable HpGe field spectrometer. This method produces a more accurate (and less conservative) result than Method 1. The procedure for performing this analysis is as follows:

- Position the instrument with respect to the object to obtain a dead time less than 10%.
- Perform a 5-minute count
- Transfer the spectrum to a folder which is accessible to the Ortec software and open it.
- Perform a custom analysis of the spectrum, and enter parameters required for the analysis. A data sheet is provided in form SLAC-I-760XXX, "Ortec Isotopic Custom Analysis". Parameters include detector height, standoff and offset from origin; unit conversion and activity units; detector information; material size and density, etc.

- Perform review and QC of the analysis report including:
 - Rejection of ambiguous or flagged peaks, or peaks which could not be produced within the material under investigation.
 - Rejection of peaks with high uncertainty (typically > 30%)
 - Verification that measurement input parameters are correct.
 - Verification that detector information, dead time, calibration information and other header block data are correct.

The resulting activity, typically in units of pCi/g or $\mu\text{Ci/g}$, may be directly transferred to the DOT Determination spreadsheet.

In some cases, objects will have concentrated radioactivity levels which are higher within a fraction of the object or container's total volume. To obtain a more accurate representation of average activity, activities within sub-volumes of the object or container may be weighted.

7.2.3 Using Representative Samples for Analysis

Radiological characterization of waste may also be conducted by taking representative samples. Representative samples are collected from waste with a known size and composition. They are in forms and shapes that allow direct qualitative and quantitative analysis without the need for exposure rates.

Example: *A soil sample can be analyzed directly using a germanium detector system with known and calibrated sample geometry. The radionuclides and their associated activity concentrations can be identified and calculated directly by the counting system. The total activity of each radionuclide in the waste can then be calculated based on its concentration within the sample (for example, pCi/gm, pCi/cm³, and pCi/ml) and the total mass, surface area, or volume of the waste.*

The typical radionuclides detected in this waste stream are Na-22, Mn-54, Co-57, and Co-60. Other radionuclides detected in past characterizations of the waste stream include: Be-7, Al-26, K-40, Ti44/Sc44, Sc-46, Co-56, Co-58, Zn-65, Ag-108m, Ag-110m, Sb-124, Cs-134, Eu-152, and Eu-154.

7.3 Ion Exchange Resins

7.3.1 About this Waste Stream

The waste stream consists of (de-watered) ion exchange resin and secondary processing waste generated by resin de-watering operations (for example, anti-contamination (anti-C) clothing, wipes, plastic wrappings, and transfer hoses and piping).

The resin removes activated erosion/corrosion products from the accelerator's primary Low-Conductivity Water cooling systems (LCW systems). The LCW system

components are typically made of copper, stainless steel, and aluminum. The erosion/corrosion products become activated prior to or during circulation through the LCW systems. Entrapment of the erosion and corrosion products by the resin generates radioactively contaminated resin.

In addition to the activated erosion and corrosion products, the (de-watered) resin can also contain a small amount of tritium, which results from activation of the water as it circulates through the LCW systems.

7.3.2 Method for Radiological Characterization

Gamma spectroscopy and liquid scintillation analysis are used to identify the radionuclide inventory of this waste stream. Either the filled resin waste container or representative samples of the resin are analyzed with a HPGe detector or a NaI detector. The resulting gamma spectrum is then analyzed to determine the specific gamma emitting radionuclides present. The gamma spectroscopy results provide both the specific gamma emitting radionuclides present and their respective activity concentrations. Alternatively, exposure rates can be used in conjunction with appropriate computer modeling software to estimate the activities.

Representative samples of the resin or of the resin water can also be analyzed with a liquid scintillation counter to determine the presence of beta emitting radionuclides (such as tritium). The total activity of each radionuclide in the waste stream is then calculated based on its concentration within the representative samples (for example, pCi/gm and pCi/ml) and the total mass or volume of the waste.

The primary radionuclides detected in the waste stream are Na-22, Co-57, and Co-60. Other radionuclides detected in past characterizations of this waste stream include: H-3, Be-7, Sc-46, Mn-54, and Co-58.

7.4 Liquid Wastes

Liquid wastes are usually characterized through use of the representative sample analysis method such as that described in Section 3, "Ion Exchange Resin."

7.5 Scaling Factor Application

The induced radioactivity in SLAC radioactive waste is predominantly produced by photonuclear reactions with the waste material. The amount of radioactivity induced is a function of, among other things, the accelerator's beam energy, proximity of the material to the beam, the type of material, and the duration of the material's exposure to the high-energy radiation.

Some of the induced activity may be composed of radionuclides that decay by low energy photon emissions or beta emissions. Normal field or laboratory techniques may not easily detect these radiations. Therefore, a theoretical evaluation was performed to estimate whether

such radionuclides could be present at significant levels in the waste streams. Proxy radionuclide evaluation may also be used (see RPD-010).

Based on an average irradiation time of one year and photon energy of 35 GeV, SLAC developed scaling factors to estimate the activity of radionuclides that cannot be detected by normal field or lab instruments but are potentially present in significant quantities. For more information, see Reference 8 or contact Radiation Physics.

The scaling factors are related to the activity of a measurable radionuclide (such as those identifiable by gamma spectroscopy) in the waste material and are applied after the completion of the gamma spectroscopy.

Example: *For items primarily composed of activated copper or stainless steel, the measurable radionuclide is Co-60; for items primarily composed of activated aluminum or plastic, the measurable radionuclide is Na-22.*

To estimate the activity of radionuclides that decay by low energy photon emissions or beta emissions in the waste material, the activity of the measurable radionuclide (for example, Co-60 and Na-22) is multiplied by a scaling factor that is appropriate for the type of activated material.

Theoretical evaluations indicate that the following radionuclides may be present due to photonuclear reactions with materials primarily found in the waste stream: H-3, Si-32, Ar-39, Ar-42, Ca-45, V-49, Fe-55, Ni-63, Sr-90, Nb-91, Nb-93m, and Mo-93.

8 RADIOACTIVE AND MIXED WASTE DISPOSAL

8.1 Purpose and Scope

The purpose of this Chapter is to provide the requirements for packaging, storing, and transporting radioactive and mixed waste for treatment or disposal. Unless otherwise specified, this Chapter is applicable to operations performed by the RP RWM Group at RP designated SLAC LLW, MLLW and Combined LLW storage areas.

8.2 Commercial Facilities

RP will conduct an evaluation to ensure the following:

- The commercial facility (or facilities) has the necessary licenses and permits to receive, process, treat, or dispose of the waste (for example, Nuclear Regulatory Commission or an Agreement State radioactive material license, Resource Conservation and Recovery Act (RCRA), Part B permit, and an Environmental Protection Agency (EPA) Generator Number).
- The commercial facility (or facilities) has proven experience with handling and processing radioactive waste.
- The SLAC waste meets the commercial facility (or facilities) waste acceptance criteria

- Use of the commercial facility (or facilities) has been determined by DOE to be acceptable based on past reviews/audits conducted annually by DOE.
- Use of the commercial facility (or facilities) is cost effective and/or operationally advantageous.

If upon evaluation, the use of a commercial facility for the treatment or disposal of radioactive waste is justified, submit an “Exemption Request” (as outlined in Section 3 of this Chapter) to the DOE Field Element Manager (or designated representative) for approval.

8.3 DOE Approval: Exemption Request

Prior to transferring radioactive waste to a commercial facility for treatment or disposal, RP will submit a request to the DOE Field Element Manager or designee for approval. The following areas will be discussed in the request:

- A detailed description of the waste, including physical, chemical, and radiological characteristics along with the inventory and generation rate.
- An analysis of on-site and off-site DOE and commercial options considered for treatment or disposal of the waste along with the estimated costs of each option.
- The licenses, permits, and capabilities of the proposed commercial facility (or facilities) that will treat or dispose of the waste.
- Past DOE reviews and audits of the proposed commercial facility (or facilities).
- The actual treatment or disposal of the waste by the proposed commercial facility.
- The process for ensuring that the waste meets the proposed commercial facility’s waste acceptance criteria.
- Packaging and transportation of the waste to the proposed commercial facility.
- If applicable, any National Environmental Policy Act (NEPA) considerations regarding the use of the proposed commercial facility to treat or dispose of the waste.
- Notification to the proposed commercial facility’s State Agency responsible for regulating radioactive materials and, if applicable, to the proposed commercial disposal site’s low-level waste state compact.
- The contractual arrangements with the proposed commercial facility to treat or dispose of the waste.

Upon approval, the DOE Field Element Manager (or designated representative) may forward the request to DOE Headquarters (HQ) for final concurrence. Final approval of the request is granted if no response is received from DOE HQ within 15 working days.

In lieu of per-shipment approval requests, an annual request for approval can be made each year (“Annual DOE Blanket Exemption Request”). The request is made from the ESH Division Manager to the BASO Site Manager.

8.4 Preparing Disposal Containers

8.4.1 Disposal Container Requirements

Disposal containers will meet the applicable 49 CFR design and testing requirements for transport of radioactive and mixed waste.

Note: *A copy of the records documenting the container certification level or specifications must be retained with its shipping documents.*

8.4.2 Pre-Use Container Inspection Checklist

Prior to packaging any radioactive or mixed waste into a disposal container, complete a Pre-Use Container Inspection Checklist (Appendix 9A).

8.4.3 Compatibility

Ensure that the waste is compatible with the container.

8.4.4 Review of Characterization Documentation

Verify that the physical, radiological, and chemical properties of a radioactive or mixed waste item to be packaged into a disposal container are listed on the receiving facility's profile prior to packaging.

Submit a profile amendment to the disposal facility requesting addition of items as necessary, but do not package items until final approval is granted.

Upon completing characterization review and/or profile amendment approval, select items to be packaged together into a specific disposal container by completing a Disposal Container Packing List (Appendix 9B).

The completed package shall meet the Waste Acceptance Criteria of the facility for which it is destined, please refer to the site-specific appendices.

8.5 Unpacking a Radioactive or Mixed Waste Storage Container

Assemble containers identified on a completed Disposal Container Packing list (Appendix 9B), segregating those with contamination and absorbent, as they require additional precautions.

8.5.1 Precautions to Take Before Opening a Container

Prior to opening a radioactive waste storage container, check the RP RWM radioactive waste database for the radiation levels, the presence of contaminated items, and the presence of absorbent material which could indicate the presence of free-standing liquid.

When a container has waste with radiation levels exceeding 5 mR/hr. at 30 cm from the waste surface, the work area must be posted in accordance with Article 234 of the SLAC Radiological Control Manual and the appropriate administrative/access controls of Articles 322, 334, and Appendix 3B (as applicable) must be implemented prior to opening the container.

8.5.2 Additional Precautions to Take with Contaminated Waste

Although contaminated waste is physically sealed, double bagged, or wrapped to prevent the spread of contamination, care must be taken when opening these containers as the integrity of these measures may have been compromised during storage.

1. Don a pair of rubber gloves.
2. Prior to removing contaminated waste items from the container, carefully inspect the packaging (plastic bags and wrappings) to ensure it is free of holes.
3. If holes are present or the packaging is breached, do not remove the item from the container. Instead, protect yourself by following these precautions:
4. Survey the package, the adjacent waste items, and drum internal surfaces to ensure no removable surface contamination is present.
5. If removable surface contamination levels are less than those in Table 9-1:
 - Tape-over the holes or the breach in the packaging.
 - Remove the item from the container.
 - Continue unpacking the container.
6. If removable surface contamination levels are equal to or greater than those in Table 9-1:
 - Reinstall the container lid.
 - Survey the exterior of the container and the adjacent area to ensure the removable surface contamination levels are less than those in Table 9-1. If removable surface contamination levels are equal to or greater than those in Table 9-1, contact RP/Field Operations for assistance.
 - Complete a Radioactive Waste Deficiency Report, RWDR, (Appendix A) and repackage the waste (under appropriate Radiological Work Permit Controls) to meet the requirements of Chapter 5 of this Manual.

Table 9-1 – Removable Contamination Values

Radionuclide	Removable Contamination (dpm/100 cm²)
U-Natural, U-235, U-238 and associated decay products	1,000 alphas
Transuranic, Ra-226, Ra-228, Th-228, Th-230, Pa-231, Ac-227, I-125, I129	20
Th-natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, , I-131, I-133	200
Beta-Gamma emitters (except Sr-90 and other noted above)	1,000
Tritium organic compounds, surfaces contaminated by HT, HTO, and metal tritide aerosols	10,000

8.5.3 Unpacking Containers with Waste that Contains Absorbent

Although the waste contains an absorbed liquid, and is physically sealed, double bagged, or wrapped to prevent the spread of contamination, care must be taken when opening these containers as the integrity of these measures may have been compromised during storage.

1. Don a pair of rubber gloves.
2. Prior to removing waste containing absorbent from the container, inspect the packaging (plastic bags and wraps) to ensure that no free-standing liquid is present and that the packaging is free of holes.
3. If freestanding liquid is present inside the packaging, follow the instructions of section 4.4, "Managing Unacceptable or Non-Conforming Waste," in this Chapter.
4. If holes are present or the packaging is breached, do not remove the item from the container. Instead, follow the instructions of section 3.2 in this Chapter.
5. If free-standing liquid is present outside the packaging (plastic bags and wrappings), do not remove the waste from the container. Instead, follow these precautions:
6. Reinstall the container lid.
7. Survey the exterior of the container and the adjacent area to ensure the removable surface contamination levels are less than those in Table 9-1. If removable surface contamination levels are equal to or greater than those in Table 9-1, contact RP/Field Operations for assistance.
8. Complete a RWDR (Appendix A) and repackage the waste (under appropriate Radiological Work Permit Controls) to meet the requirements of Chapter 5 of this Manual.

8.5.4 Storage Container Security

Both shipping containers and storage containers shall remain closed unless a transfer operation is in effect. Transfer activities will be scheduled to minimize the number of times a container is opened, and the time it remains unsealed. Prior to leaving the area, ensure all lids are appropriately secured on their containers. Use tamper seals to identify unauthorized access to sealed containers.

For steel drums:

- Install the locking ring and ring bolt,
- Torque the ring bolt to secure the lid, and
- Install a jam-nut to prevent unintentional loosening.

Investigate any anomalies in container closures, reconciling container contents with RP RWM database. Container inventory anomalies may indicate tampering. Report all findings to the RP RWM Group Leader.

8.6 Packing Disposal Containers

Before packing waste into a disposal container, ensure that a Pre-Use Container Inspection Checklist and a Disposal Container Packing List have been completed in accordance with Appendix 9A. In addition, ensure that the waste is compatible with the disposal container, so that chemical or galvanic reactions, radiation effects, microbial activity, or moisture will not cause any significant degradation of the container integrity.

The empty storage containers generated in the transfer operation, as well as any filler material packages used shall be kept isolated and segregated until the closure inspection is performed on the disposal container. Also, all markings on the emptied storage container are to remain in place until the closure inspection is finalized.

8.6.1 Minimize Void Space

Minimize void spaces by packing smaller waste items between larger ones and stuffing them between the waste and the outer container. Most disposal sites have limits on the amount of void space allowed. Contact the disposal site representative for more information.

8.6.2 Packing Techniques

Pack the disposal container in layers, minimizing the void space as practicable. Do not exceed the maximum rated weight capacity of the container, or any weight limitation imposed by the receiving facility.

Pack heavier items on the bottom of the disposal container to promote stability of the package. Block and brace items within the container as necessary to prevent movement of the waste during transport. Be sure to list the type and amount of blocking and bracing material added to a disposal container on the Disposal Container Packing List.

Pack items containing absorbed liquids (for example, LCW filters and damp waste) near the top of the disposal container. Avoid packing metal or dense objects on top of such items.

Minimize the radiation level on the disposal container's external surface by packing items with higher radiation levels in the middle of the container and surrounding it with other waste items.

8.6.3 Performing Visual inspection

When packing waste into a disposal container, perform a visual inspection of each waste item as it is transferred to the disposal container to ensure no unacceptable or non-conforming waste items are present. As necessary, refer to the RP RWM radioactive waste database to determine the identity and characteristics of suspect waste items.

Refer to Chapter five for waste acceptance criteria and a list of unacceptable items as necessary.

8.6.4 Managing Unacceptable or Non-Conforming Waste

Do not package unacceptable or non-conforming waste items into disposal containers. If an unacceptable or non-conforming waste item is identified, do the following:

- Mark the item with the radioactive waste storage container number from which it was removed.
- Segregate the item from other waste items by placing it in a separate container. Ensure the item is compatible with the container (and, if present, with other unacceptable or non-conforming waste items in the container).
- Label the container “Unacceptable/Non-Conforming Waste”.
- Complete a RWDR (see Appendix A).
- In the RP RWM radioactive waste database, indicate that the item was not packaged by doing the following:
 - Change the storage container number previously associated with the item to the new container number into which it was transferred for storage.
 - In the “comments” column, identify the reason the item was not packaged and include the associated RWDR number.

8.6.5 Disposal Container Security

To minimize time during which a disposal container is not sealed, schedule packing of containers during uninterrupted parts of the day.

Before leaving the packing area, install disposal container lids to prevent the removal or addition of radioactive waste items.

8.6.6 Steel Drums

Install the locking ring and ring bolt, using a calibrated torque wrench, torque the bolt in accordance with the manufacturer instructions (typically 60 lbs.) to secure the lid, and Install a jam-nut to prevent unintentional loosening.

8.6.7 Steel Boxes

Install a bolt at each corner of the box and Torque the bolts (30 lbs.) to secure the lid.

If the security of a disposal container is suspected of being breached, investigate to determine if any radioactive waste has been removed or added to the container. As necessary, reconcile the disposal container inventory with the RP RWM radioactive waste database to accurately reflect the contents of the container. Report all findings to the RP RWM Group Leader.

8.6.8 Closing Disposal Containers

Complete a Container Closure Inspection Checklist (Appendix 9C). If the gross weight exceeds 3175 kg (7000 lbs.), notify the RP RWM Group Leader.

Enter the information from the checklist and the Disposal Container Packing List into the RP/ RWM radioactive waste database

8.6.9 Storage of Filled Disposal Containers

Store filled disposal containers in an area that is:

- A low-traffic area (to preclude movement of the container and to prevent accidental damage to the container by other work operations)
- Protected from the weather elements, whenever practical, to prevent rainwater infiltration and degradation of the containers' integrity.

8.7 Completing Container Documentation

8.7.1 Disposal Container Checklist

Complete a Disposal Container Checklist (Appendix 9D) to ensure that all pre-shipment preparations pertaining to the packing of radioactive waste into a disposal container have been completed.

8.7.2 Disposal Container Inventory Record

Using the RP RWM radioactive waste database and the Disposal Container Packing List, complete a Disposal Container Inventory Record for each disposal container.

8.7.3 Complete these additional forms as needed:

- Radioactive Decay Worksheet
- Total Activity Worksheet
- Waste Class Worksheet
- Mobile Radionuclide Worksheet
- Combustible Radionuclide Worksheet
- Waste Type Worksheet
- Thermal Power Worksheet
- Fissile gram equivalent worksheet

8.7.4 Radioactive Material Shipment Spreadsheets

Prior to completing radioactive material shipment spreadsheets, ensure a Total Activity Worksheet has been completed for each disposal container.

Using the information from the Total Activity Worksheets, complete the following radioactive material shipment spreadsheets (as appropriate):

- Limited Quantity (LQ) Worksheet.

- Low Specific Activity, LSA, Worksheet.
- Type A Worksheet.
- Reportable Quantity (RQ) Worksheet.

8.8 Shipment Preparations

8.8.1 Marking and Labeling Disposal Containers

Mark and label the containers in accordance with the applicable requirements of 49 Code of Federal Regulations (CFR), 40CFR, Title 22 California Code of Regulations (CCR), and the receiving facility's waste acceptance criteria. Markings and labels must be durable and fade resistant. Prior to applying markings and labels, remove any dirt or dust from the area of the container where the markings and labels will be applied.

Markings and labels must remain intact and legible from the time applied through shipment to the receiving facility. When marking and labeling containers, ensure that adequate spacing between markings and labels exists to ensure the effectiveness of each mark and label.

Note: *Disposal facility markings size specification requirements must also be met.*

8.8.2 Blocking, Bracing, and Placard Materials

Ensure that the necessary blocking, bracing, and placard materials for the disposal containers are pre-staged.

Typical blocking and bracing materials consist of wood blocks (such as 2" x 4", and 2" x 6") and nails. Pre-measure and cut the wood blocks to extend along the entire length of the disposal container sides and ends. Pre-drill the wood blocks for easier nail installation and to prevent cracking and splitting of the wood.

8.8.3 Rigging Support

As needed, ensure that rigging support is available for the day of shipment.

8.8.4 Transportation Services

Contract transportation services to ship the disposal containers to the disposal facility. As appropriate, ensure the transportation contract specifies the following:

1. The shipping contractor will provide the following documentation:
 - Current Department of Transportation (DOT) Hazardous Materials Transporter Registration.
 - Current California Highway Patrol (CHP) Hazardous Materials Transportation License.
 - Current California Department of Toxic Substances Control (CA DTSC) Hazardous Waste Transporter Registration.

- Current Certificate of Liability Insurance.
- 2. The contractor (i.e., “transporter”) will be responsible for operating the transport vehicle in accordance with all applicable federal (e.g., Title 49, Code of Federal Regulations), state, and local laws.
- 3. If transport will be conducted under “Exclusive Use” control (i.e., the vehicle is exclusively for SLAC use; no other material, freight, cargo, etc. shall be loaded onto the transport vehicle).
- 4. The contractor’s vehicle shall be currently registered for the states it must travel through to transport the radioactive waste from SLAC to the disposal facility.
- 5. The general operating condition of the contractor’s vehicle shall follow the requirements of Title 49 Code of Federal Regulations applicable to a commercial vehicle transporting Department of Transportation (DOT) Class 7 (radioactive material) hazardous material.
- 6. The SLAC National Accelerator Laboratory (SLAC) is expecting a vehicle that is in full compliance with all applicable laws and regulations. There shall be no radioactive contamination on the vehicle above the limits set forth in 49 CFR parts 173.443 and 177.843. All vehicles will be surveyed by SLAC upon arrival. If such contamination is detected, the vehicle driver(s) and the transport company will be notified. SLAC will then offer a staging area so that the vehicle can be parked until the transport company can correct the non-compliant situation. SLAC reserves the right to recover any costs it may incur. The transport company is solely responsible for correcting any non-compliance and will hold SLAC harmless of any liability that may arise.
- 7. The contractor is responsible for ensuring that their drivers are properly trained and qualified to operate the commercial vehicle and to perform all assigned duties. Driver(s) shall have a current Commercial Driver's License (CDL) applicable for the group of commercial motor vehicle to be operated and shall have appropriate endorsement for materials hauled.
- 8. As practical, flat-bed trailers provided by the contractor should have front, side, and back rub-rails/spacers for placard installation.
- 9. Vehicle drivers should not have pets (e.g., dogs) present in the vehicle.

8.8.5 Pre-Shipment Notifications

Once the disposal facility issues the authorization to ship form, schedule an in-date for the shipment with the facility. Notify the following groups of the *scheduled* shipment date:

- RPFO Group.
- Security (Main Gate).
- Bay Area Site Office (BASO) unless an Annual DOE Blanket Exemption Request is in place (see Section 9.3).

8.8.6 Radiological Surveys of the Disposal Containers

All disposal containers must be surveyed by qualified personnel to ensure radiation, and contamination levels are below the limits set in 49 CFR Parts 173.441 and

173.443. A copy of the results must be forwarded to the RP RWM Group. As practical, conduct and document the surveys within 5 (five) working days of the *scheduled* shipment date.

- Report the radiation survey results in mR/hr.
- Report the contamination survey results in dpm/cm² or $\mu\text{Ci}/\text{cm}^2$

8.8.7 Pre-shipment Container Inspection Checklist

As practical, complete a Pre-Shipment Container Inspection Checklist (Appendix 9F) within 7 (seven) working days of the scheduled shipment date.

8.9 Shipment of Radioactive or Mixed Waste

Efforts shall be made to reduce the number of shipments by ensuring there are sufficient containers ready for disposal when shipments are scheduled. Having sufficiently available containers also minimizes duplication of certain work operations. Shipments are conducted and documentation is prepared in accordance with the requirements of 49 CFR.

8.9.1 Radioactive Waste Shipment Checklist

Complete a Radioactive Waste Shipment Checklist (Appendix 9G). The checklist documents the completion of Department of Transportation (DOT), DOE, and the accepting facility requirements associated with the transport and disposal of radioactive and mixed waste. The checklist also documents the completion of RP RWM Group best management practices (BMPs) based on lessons learned from previous shipments.

8.9.2 Transport Vehicle Arrival Survey

For 'Exclusive Use' shipments, a contamination survey (both alpha and beta-gamma) of the transport vehicle must be performed by authorized personnel to ensure the transport vehicle has not been contaminated from previous transport activities. Contamination levels must be below the limits of 49 CFR 173.443.

Report contamination survey results in dpm/cm² or $\mu\text{Ci}/\text{cm}^2$.

Provide a copy of the survey results to the RP RWM Group.

If fixed and/or removable contamination is identified on the transport vehicle, follow the policy outlined in RP Department Document, RW #002, "RP Policy on Contamination Found on Trucks/Other Vehicles Used to Transport Radioactive Materials/Wastes".

8.9.3 Loading Transport Vehicle

With the driver's authorization, load the disposal containers onto the transport vehicle.

As practicable, load the containers so that the weight is distributed equally over the width and length of the vehicle and equally over the vehicle's axles.

As practicable, load containers with the highest external radiation dose rate towards the back of the vehicle away from the truck cab to minimize the dose rate in normally occupied spaces of the vehicle (such as the truck cab and sleeper compartment).

Block and brace the containers to prevent movement during transportation (install the pre-staged wood blocks around the perimeter of each disposal container).

8.9.4 Loaded Vehicle Radiation Survey

For 'Exclusive Use' shipments, a radiation survey of the loaded transport vehicle must be performed by authorized personnel to ensure radiation levels are below the limits of 49 CFR 173.441. Report radiation survey results in mR/hr. and provide a copy of the survey results to the RP RWM Group. If the container is a single sea/land container, a loaded vehicle survey is not required. The container radiation survey may be used, as it is the conveyance.

8.9.5 Transport Vehicle Placarding

As appropriate, placard the transport vehicle in accordance with the requirements of 49 CFR 172.500. Radioactive placards are required for:

- Shipments of packages containing a Radioactive Yellow-III label.
- Exclusive use shipments of packages with the proper shipping name of Radioactive Material, LSA, n.o.s. or Radioactive Material, SCO, n.o.s., being transported domestically by highway in accordance with 49 CFR 173.427(a).

Affix a radioactive placard on each side and each end of the transport vehicle. If the tractor is separate from the trailer (such as a flatbed trailer with a tractor) affix the placards to the trailer.

Note: *Remember to placard for subsidiary hazards for mixed wastes.*

8.9.6 Driver Documentation

Provide the following documentation to the driver as applicable.

- DOT Shipping Papers (such as the Bill of Lading)
- Nuclear Regulatory Commission (NRC) Uniform Low-Level Radioactive Waste Manifests
- Hazardous Waste Manifest
- Land Disposal Restriction Notification or Certification (LDR)
- Underlying Hazardous Constituent Form
- Exclusive Use Instructions (Appendix 9G)
- North American Emergency Response Guidebook (ERG) (or applicable pages thereof)

Note: *As applicable, ensure that the driver reads, understands, and signs the shipping papers, Hazardous Waste Manifest, and the exclusive use instructions (Appendix 9G). Retain a signed copy of all documentation.*

8.9.7 Documents

For mixed and combined waste shipments, provide a copy of the hazardous waste manifest to the WM Group for reporting purposes.

Refer to Chapter 10 of this Manual for document retention requirements.

8.9.8 Shipment Notification

- Notify the TSDF that the transport vehicle has departed SLAC and is in route.
- Notify BASO that the transport vehicle has departed SLAC and is in route, if required (see Section 9.3)
- Upon confirmation that the shipment has arrived at the facility, notify BASO if required (see Section 9.3).

8.9.9 Post-Shipment Debrief

In keeping with the Integrated Safety and Environmental Management System (IS/EMS) conduct a post-shipment debrief to discuss any areas of concern relating to the shipment and to recommend improvements to the shipment process. As applicable, track all assigned actions through completion

APPENDIX 9A Pre-Use Container Inspection Checklist SLAC-I-760-2A08J-007

About the Pre-Use Container Inspection Checklist

Prior to loading any radioactive waste into a disposal container, complete a Pre-use Container Inspection Checklist.

How to Complete the Pre-Use Container Inspection Checklist

Container Type

Check the appropriate box for the container used. If “Other” is checked, then enter the container description (e.g., 30gallon steel drum, lift liner bag, transport container).

- Only DOT containers authorized for the material are approved for use.

Serial

- Enter the serial # of the container. Use the manufacturer’s serial number marked/stamped on the container if present. If the container does not have a manufacturer’s serial number on it, then obtain a unique alphanumeric number from the container serial number log and issue it to the container
- Maintain the log of serial numbers issued to ensure numbers are not duplicated.

Tare Weight (kg)

Weigh the empty disposal container with lid and enter its Tare Weight (in kilograms).

Container Outer Surface Condition

Inspect the outer surface of the container (lid included) for conditions that could compromise the integrity of the container (for example, holes, cracks, bulges, deformations, dents, and evidence of severe corrosion). Check the applicable response for each condition

- If present, inspect the lid lifting rings (for example, on CPC steel boxes) and attachment points for damage and signs of fatigue.
- Install lid lifting rings (if needed). Torque the fastening bolts to the manufacturer’s specifications (for example, 7 ft-lbs. for CPC steel boxes).

***Note:** Lifting rings should only be used to remove and install the container lid. Never use the lifting rings to lift the container.*

Container Inner Surface Condition

Inspect the inner surface of the container (lid included). Inspect for holes, cracks, bulges, deformations/dents, and evidence of severe corrosion, which could compromise the integrity of the container. Check the applicable response for each condition.

Note: For both outer and inner surface conditions, minor corrosion and paint flaking is acceptable. However, note these conditions and their locations under the “Other” category. Such conditions shall be corrected prior to loading waste into the container (i.e., remove the minor corrosion/loose paint and repaint the affected areas). Annotate the “Remarks/Corrective Actions” section that these conditions have been corrected and the affected areas repainted.

Container Closure

Inspect the lid gasket for deformations, cracks, bulges, and other conditions which could compromise the sealing of the container. Check the applicable condition.

Inspect the gasket-seating surface of the container for cleanliness and debris. Remove any foreign debris and clean the seating surface (as necessary) to ensure proper sealing of the lid. Check the applicable condition.

If present, inspect lid closure bolts (such as CPC steel boxes) for damage and/or signs of fatigue. Check the applicable condition.

If present, inspect the Locking Ring/Ring Bolt/Jam Nut (such as steel drums) for damage and or signs of fatigue. Check the applicable condition.

Remarks/Corrective Actions

Identify any remarks pertinent to the container's condition and any corrective actions performed or needed because of the inspection of the container.

Examples:

1. "The minor corrosion and loose paint identified in Section A.6 was removed and the affected areas repainted. Container Outer Surface condition is satisfactory."
2. "The defective gasket identified in Section C.1 was severely deformed and replaced. Gasket condition is now satisfactory."

Container Status

Indicate whether the container integrity is satisfactory based on the inspection results and the corrective actions performed.

Inspector's Name/Signature/Date

The individual performing the inspection shall print their name, sign, and date the inspection form.

RP RWM Group Supervisor Review

The RP RWM Group Supervisor will review the completed inspection checklist. After satisfactory review, he/she will print their name, sign, and date the inspection checklist, verifying both of the following:

- Inspection checklist is complete and accurate.
- All identified corrective actions have been completed.

APPENDIX 9B Disposal Container Packing List SLAC-I-760-2A08J-008

About the Disposal Container Packing List

The Disposal Container Packing List serves as an inventory list of the items packed into the container.

Upon reviewing the characterization documentation of the individual waste items or storage containers, select the storage containers or items to be packed into a specific disposal container by completing a Disposal Container Packing List.

How to Complete the Disposal Container Packing List

1. Page ___ of.
Enter the page number of the packing list (for example, 1 of 3).
2. Container Type
Check the applicable container type. If “Other”, enter a description of the container (such as lift liner).
3. Serial #
Enter the serial # for the container. If the container has a manufacturer’s serial number marked/stamped on it, use this number. If the container does not have a manufacturer’s serial number on it, then enter the unique alphanumeric number assigned to the container.
Note: *The serial number assignment for a container is identified on its Pre-Use Container Inspection Checklist.*
4. Tare Weight (kg)
Enter the disposal container tare weight in kilograms.
Note: *The tare weight of a disposal container is identified on its Pre-Use Container Inspection Checklist.*
5. Storage Container or Waste Item Serial #
Review the Waste Characterization documentation and enter the serial number of the waste item or storage container authorized to be packed in each disposal container (for example, RWG0001 or RWG0044).
Note: *Not all the storage containers or individual waste items designated on the packing list are required to be packed into the disposal container. The packing list may contain more volume than will fit in the container. This margin allows flexibility in the packing process yet ensures that the review goals of Chapter 9 of this Manual are met. RWM Group personnel will place a check mark or N/A in the Waste Packing Verification column of the form to identify the actual items packed.*
6. Estimated Weight (Kg)
Enter the estimated weight (in kg) of each waste item or storage container packed. Monitor the weight to ensure the maximum weight capacity of the container, as specified by the manufacturer, will not be exceeded.
7. RP RWM Group Name/Signature/Date
The RP RWM Group individual completing the packing list will print his or her name, sign, and date the form verifying that the waste items or container contents may be packaged in the disposal container.
8. Waste Packing Verification: Initials/Date

Personnel packing the waste into the disposal container will initial and date each line item on the packing list verifying the following:

- The identity of the specific items packed into the disposal container; items not packed marked “N/A”.
- The date which the contents or items were packed.

9. Filler Material Type, Blocking/Bracing, Container Liners

Personnel packing the disposal container will specify all non-waste materials added to the container, such as blocking, bracing material, liners, or type of filler material.

10. Weight/Volume

Enter the weight and volume of all non-waste materials added to the container.

11. Non-Waste Packing Verification: Initials/Date

Personnel adding non-waste materials into the disposal container will initial and date each line item verifying the following:

- The non-waste material added into the disposal container.
- The weight and volume of the non-waste material.
- The date which the non-waste material was added into the disposal container.

12. RP RWM Group Supervisor Review

The RP RWM Group Supervisor will review the completed packing list for completeness and accuracy. After satisfactory review, he/she will print their name, sign, and date the packing list, verifying that:

- Packing operations for the disposal container are complete.
- The packing list is complete and accurate.
- The information on the completed packing list has been entered into the RP RWM radioactive waste database.

APPENDIX 9C Container Closure Inspection Checklist SLAC-I-760-2A08J-009

About the Container Closure Inspection Checklist

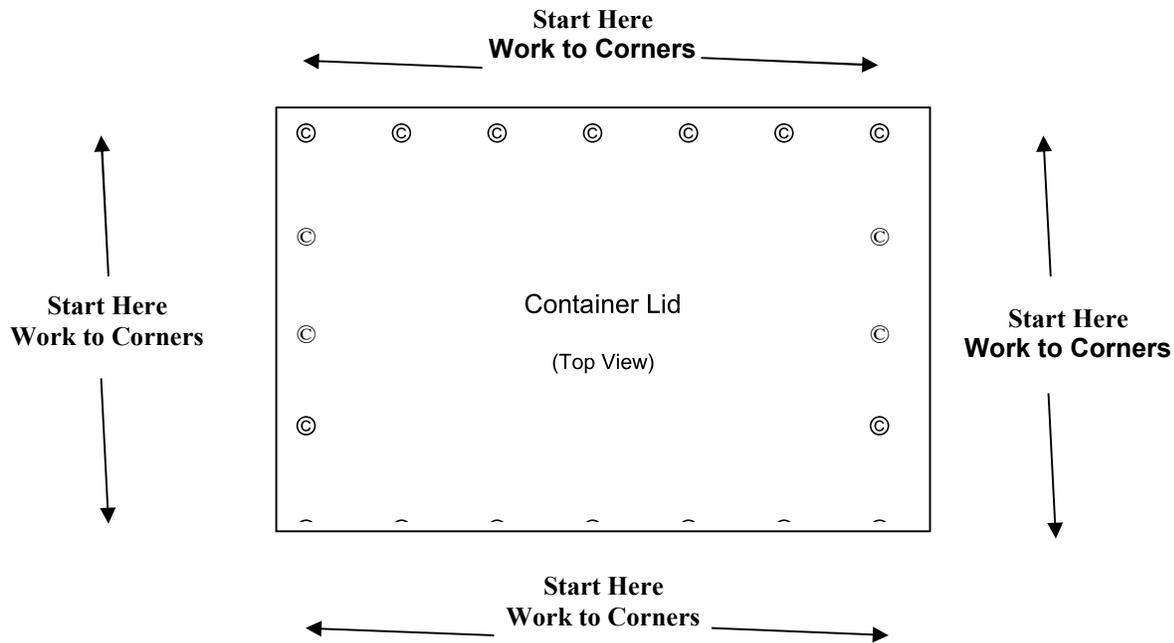
Complete this document for final closure of each disposal container.

How to Complete the Container Closure Inspection Checklist

1. Container Type
Check the applicable type. If “Other”, enter a description of the container.
2. Serial #
Enter the serial # of the container. This identifier is the manufacturer’s serial number marked/stamped on the container or the serial # identified on the container’s (Pre-Use) Container Inspection Checklist.
3. Gross Weight (kg)
After installing the container lid, weigh the loaded container and enter the Gross Weight (in kilograms).
4. Maximum Radiation Level (mR/hr.)
After installing the container lid, the loaded container must be surveyed, by authorized personnel, with a gamma survey meter and label the container with a Radioactive Material Label in accordance with Article 412 of the *SLAC Radioactive Control Manual*. Attach a copy of the survey form to the checklist and enter the maximum radiation level on contact with the container and at 30 cm from the container in mR/hr.
5. Container Closure (Steel Boxes Only).
 - If the disposal container is not a steel box, then check the ‘N/A’ box and skip this section
 - Prior to installing the container lid, inspect:
 - The lid gasket.
 - The gasket seating surface of the container.
 - The lid closure bolts.
 - Inspect the gasket for deformations, cracks, bulges, and other conditions which would compromise the sealing of the container. Check the applicable condition.
 - Inspect the gasket seating surface for cleanliness and debris. Remove any foreign debris and clean the seating surface (as necessary) to ensure proper sealing of the lid. Check the applicable condition.
 - Inspect the lid closure bolts for damage and/or signs of fatigue. Check the applicable condition.
 - When all inspection points are satisfactory, install the container lid and the lid bolts according to the manufacturer’s closure instructions.
 - Closure Process for CPC Steel Boxes:
 - Install all lid bolts/nuts and hand-tighten. Torque the lid bolts to 40-50 ft-lbs., using the sequence illustrated below. Torque bolts working from the center out. Work from one side first, then opposite side, then one end, followed by opposite end.
 - Indicate the satisfactory completion of lid bolts installation and enter the torque wrench serial number/calibration due date.
 - Remove the lid lifting rings and attachment points from the lid.
 - Remove any minor corrosion and loose paint from the newly exposed areas and repaint the affected areas.

- Indicate the completion of lid lifting rings removal.

Torque Sequence for CPC Steel Boxes:



Note: The quantity and location of the lid bolts (signified by the symbol "©") may vary depending upon the design of the steel box. However, in all cases, the same torque sequence will be used to secure the lid.

1. Container Closure (Steel Drums Only).

- If the disposal container is not a steel drum, then check the N/A box and skip this section.
- Prior to installing the container lid, inspect:
 - The lid gasket,
 - The gasket seating surface of the container
 - The locking ring/ring bolt/jam nut
- Inspect the gasket for deformations, cracks, bulges, and other conditions which would compromise the sealing of the container. Check the applicable condition.
- Inspect the gasket seating surface for cleanliness and debris. Remove any foreign debris and clean the seating surface (as necessary) to ensure proper sealing of the lid. Check the applicable condition.
- Inspect the Locking Ring/Ring Bolt/Jam Nut for damage and or signs of fatigue. Check the applicable condition.
- When all inspection points are satisfactory, install the drum lid, locking ring, ring bolt, and jam nut according to the manufacturer's closure instructions.
- Closure Process for Meyers Container 55-gallon Steel Drums:
 - Install the locking ring and ring bolt.
 - Torque the ring bolt to 60 ft-lbs. Tap the locking ring during the tightening of the ring bolt.
 - Install a jam nut to prevent unintentional loosening of the ring bolt during transportation.

- Indicate the satisfactory completion of the locking ring/ring bolt/jam nut installation and enter the torque wrench serial number/calibration due date.
2. Container Outer Surface Condition (All Containers).
Inspect the outer surface of the container (lid included). Inspect for holes, cracks, bulges, deformations/dents, and evidence of severe corrosion that could compromise the integrity of the container. Check the applicable response for each condition.

Note: *Minor corrosion and paint flaking is acceptable; however, note these conditions and their locations under the "Other" category. Such conditions shall be corrected prior to transport of the container (i.e., remove the minor corrosion/loose paint and repaint the affected areas). In the "Remarks/Corrective Actions" section, indicate that these conditions have been corrected and the affected areas repainted.*

3. Remarks/Corrective Actions
Identify any remarks pertinent to the container's condition and any corrective actions performed or needed because of the closure and inspection of the container.

Examples:

"The minor corrosion and loose paint identified in Section C.6 was removed and the affected areas repainted. Container Outer Surface condition is satisfactory."

"The defective gasket identified in Section A.1 was severely deformed and replaced. Gasket condition is now satisfactory."

4. Container Status
Indicate whether the container integrity is satisfactory based on the inspection results and the corrective actions performed.
5. Inspector's Name/Signature/Date
The individual performing the inspection shall print their name, sign, and date the inspection checklist.
6. RP RWM Group Supervisor Review
The RP RWM Group Supervisor will review the completed inspection checklist. After satisfactory review, he/she will print their name, sign, and date the inspection checklist, verifying the following:

Inspection checklist is complete and accurate

All identified corrective actions have been completed

The information on the inspection checklist has been entered into the RP RWM radioactive waste database.

APPENDIX 9D Disposal Container Checklist
SLAC-I-760-2A08J-010

About the Disposal Container Checklist

Complete this checklist to ensure that all pre-shipment preparations pertaining to the packaging of radioactive waste have been completed.

How to Complete the Disposal Container Checklist

1. Container Type
Check the applicable type. If “Other”, enter a description of the container.
2. Serial #
Enter the serial # of the container. The serial # is the manufacturer’s serial number marked/stamped on the container or the serial # identified on the container’s (Pre-Use) Container Inspection Checklist.
3. Status
Check if the line item has been completed. Enter “N/A” for those line items that are not applicable.
4. Initial/Date
When all applicable line items have been completed (i.e., the Disposal Container Checklist is complete), check the box and enter your initials and date.

APPENDIX 9E Disposal Container Markings, Labels, and Placards Checklist SLAC-I-760-2A08J-011

About the Disposal Container Markings, Labels, and Placards Checklist

Complete this checklist to identify/verify the applicable markings and labels have been applied to the disposal container. In addition, use this checklist to identify if placards will be required.

How to Complete the Checklist

1. Container Type

Check the applicable type. If “Other”, enter a description of the container.

2. Serial #

Enter the serial # (or serial numbers) of the container for which the checklist is applicable.

The serial # of a container is the manufacturer's serial number marked/stamped on the

container the serial # identified on the container's (Pre-Use) Container Inspection Checklist.

3. Markings

As appropriate, check or enter “N/A” each line item in the table to indicate which markings are to be applied to the disposal container(s).

If “Other” is checked, provide a description of the marking to be applied to the container.

For those markings required to be applied, identify the number and location of each marking.

4. Labels

As appropriate, check or N/A each line item in the table to indicate which labels are to be applied to the disposal container(s).

If “Other” is checked, provide a description of the label to be applied to the container.

For those labels required to be applied, identify the number and location of each label.

Note: *If radioactive White-I, Yellow-II, or Yellow-III labels are required, indicate the radionuclides that must be listed on the labels along with the total activity (in SI units) of the package. For Radioactive Yellow-II or Yellow-III labels, also list the transport index of the package. If radioactive labels are not required, then check the N/A box.*

5. Placards

Indicate if radioactive placards are required for the transport vehicle.

6. Person Determining the Requirements

The person determining the marking, label, and placard requirements for the container(s) shall print their name, sign, and date the form.

7. Marking Applied

Apply the required markings at the indicated locations. The Container Marker/Labeler will check or N/A each line item in the table to indicate which markings have been applied to the disposal container(s).

8. Label Applied

Apply the required labels at the indicated locations. The Container Marker/Labeler will check or N/A each line item in the table to indicate which labels have been applied to the disposal container(s).

Note: *If radioactive White-I, Yellow-II, or Yellow-III labels are required, list the indicated radionuclides and the total activity (in SI units) of the package on the labels. For Radioactive Yellow-II or Yellow-III labels, also list the indicated transport index on the labels.*

9. Container Marker/Labeler

The individual applying the markings and labels to the disposal container(s) shall print their name, sign, and date the form.

10. RP RWM Group Leader Review

The RP RWM Group Leader will review the completed checklist and inspect the markings/labels applied to the disposal container(s). After satisfactory review, he/she will print their name, sign, and date the checklist, verifying that the checklist is complete, accurate and that the applicable markings/labels have been applied to the disposal container(s).

11. Remarks

Identify any remarks relevant to the markings and labels applied to the disposal container.

APPENDIX 9F Pre-Shipment Container Inspection Checklist
SLAC-I-760-2A08J-012

About the Pre-Shipment Container Inspection Checklist

This checklist is used to help ensure that the container is ready for shipment. As practical, complete a Pre-shipment Container Inspection Checklist within ten working days of the scheduled shipment date.

How to Complete the Pre-Shipment Container Inspection Checklist

1. Container Type

Check the applicable type. If “Other”, enter a description of the container.

2. Serial #

Enter the serial # of the container. The serial # is the manufacturer’s serial number marked/stamped on the container or the serial # identified on the container’s (Pre-Use) Container Inspection Checklist.

3. Container Closure Condition (Steel Boxes Only).

If the disposal container is not a steel box, then check the N/A box and skip this section.

Ensure all lid closure bolts are installed and torqued to the manufacturer’s specifications. Inspect the bolts for damage and/or signs of fatigue. Check the applicable condition.

Ensure the lid lifting rings have been removed. Remove any minor corrosion and loose paint from the newly exposed areas and repaint the affected areas. Indicate the completion of lid lifting rings removal.

4. Container Closure Condition (Steel Drums Only).

Ensure the Locking Ring/Ring Bolt/Jam Nut are installed and torqued to the manufacturer's specifications. Inspect the locking ring/ring bolt/ jam nut for damage and/or signs of fatigue. Mark the applicable condition.

5. Container Outer Surface Condition (All containers)

Inspect the outer surface of the container including the lid. Inspect for holes, cracks, bulges, deformations/dents, and evidence of severe corrosion that could compromise the integrity of the container.

Mark the applicable response for each condition.

Note: *Minor corrosion and paint flaking is acceptable. However, note these conditions and their locations under the “Other” category. Such conditions shall be corrected prior to transport of the container (i.e., remove the minor corrosion/loose paint and repaint the affected areas). In the “Remarks/Corrective Actions” section, indicate that these conditions have been corrected and the affected areas repainted.*

6. Remarks/Corrective Actions

Identify any remarks pertinent to the container’s condition and any corrective actions performed or needed because of the inspection of the container.

Example: *“The minor corrosion and loose paint identified in Section C.6 was removed and the affected areas repainted. Container Outer Surface condition is satisfactory.”*

7. Container Status

Indicate whether the container integrity is satisfactory based on the inspection results and the corrective actions performed.

8. Inspector's Name/Signature/Date

The individual performing the inspection shall print their name, sign, and date the inspection checklist.

9. RP RWM Group Leader Review

Inspection checklist is complete and accurate.

All identified corrective actions have been completed.

APPENDIX 9G Radioactive Waste Shipment Checklist SLAC-I-760-2A08J-013

About the Radioactive Waste Shipment Checklist

Complete a Radioactive Waste Shipment Checklist for each waste shipment. The checklist documents the completion of Department of Transportation (DOT), Department of Energy (DOE), and receiving facility Waste Acceptance requirements associated with the transport, treatment, and disposal of radioactive and mixed waste. The checklist also documents the completion of RP RWM Group best management practices (BMPs) based on lessons learned from previous shipments.

How to Complete the Radioactive Waste Shipment Checklist

1. Shipment Number

Assign a unique shipment number for each waste shipment. The shipment number format may be dictated by the treatment or disposal facility, or be an 8-digit alphanumeric number consisting of the following:

- The letters "SLA".
- Last 2 digits of the current calendar year in which the shipment takes place.
- A 3-digit number which identifies the next available chronological number for shipments in the current calendar year.

Example: *The first shipment to the TSDF in calendar year 2006 would be SLA-06-001. The shipment number for the tenth shipment in calendar year 2006 would be SLA-06-010.*

2. Container Serial #'s and Container Types

Enter the serial number and container type of each disposal container in the shipment.

3. Status.

Check or enter "N/A" each line item to indicate whether the line item has been completed or is not applicable.

4. Carrier Name

Enter the name of the transporter/carrier.

5. Transport Vehicle Type

Identify the type of transport vehicle being used.

6. Truck/Tractor Number.

Enter the truck/tractor number of the transport vehicle.

7. Trailer Number.

If a trailer is being used, enter the trailer number of the transport vehicle.

8. Checklist Status.

When all applicable line items have been completed (i.e., the Radioactive Waste Shipment Checklist is complete), check the box and enter your initials and date.

APPENDIX 9H Exclusive Use Instructions
SLAC-I-760-2A08S-001

About the Exclusive Use Instructions

When required by 49 CFR, prior to vehicle departure, provide exclusive use instructions to the driver. Ensure that the driver(s) reads and signs the instructions. Retain the signed copy of instructions.

The exclusive use instructions identify applicable Department of Transportation requirements applicable to the carrier for transporting radioactive and mixed material and for maintaining 'Exclusive Use' of the vehicle.

**INSTRUCTIONS FOR "EXCLUSIVE USE SHIPMENTS"
(Radioactive material, LSA, n.o.s.)**

Consignor: Consignee (example):

U. S. DOE
c/o SLAC National Accelerator Center
Radiation Protection Department
2575 Sand Hill Road, MS 84
Menlo Park, CA 94025
(650) 926-2823

U.S. DOE
c/o FDH
2355 Stevens Drive
1163 Building, 1100 Area
Richland, WA 99352
Solid Waste Management (509) 376-7493

1. Maintain Exclusive Use of this vehicle for the duration of the transport of the material. No other consignor's freight/cargo is to be loaded with this material. (49CFR173.403)
2. All loading and unloading of material in this shipment shall be done as directed by the consignor or consignee. (49CFR173.403 and 173.427)
3. The material shall be transported without unnecessary delay from the origin point (i.e., consignor) to the destination point (i.e., consignee). (49CFR173.441 and 177.800)
4. The carrier shall comply with the applicable regulations of 49CFR390-397 and 49CFR177 for the operation of a commercial motor vehicle transporting Class 7 (radioactive material) hazardous material.
5. (49CFR397.2 and 177.804)
6. The carrier shall operate the motor vehicle in compliance with the laws, ordinances, and regulations of the jurisdiction in which it is being operated, unless they are at variance with specific regulations of the Department of Transportation which are applicable to the operation of the vehicle and which impose a more stringent obligation or restraint. (49CFR397.3)
7. If located on a public street or highway (or the shoulder of a public highway), the motor vehicle must be always attended by the driver. The person in charge of the vehicle must be on the vehicle, awake, and not in a sleeper berth, or within 100 feet of the vehicle and have it within his/her unobstructed field of view. However, the vehicle need not be attended while the driver is performing duties which are incident and necessary to the driver's duties as the operator of the vehicle. (49CFR397.5)
8. The motor vehicle must not be parked on or within five feet of the traveled portion of a public street or highway except for brief periods when the necessities of operation require the vehicle to be parked and make it impracticable to park in any other place. (49CFR397.7)
9. The driver of the motor vehicle shall examine the vehicle's cargo and its load-securing devices within the first 25 miles after beginning a trip and cause any adjustments to be made to the cargo or load securing devices (other than steel strapping) as may be necessary to maintain the security of the vehicle's load. (49CFR392.9)

**DRIVER INSTRUCTIONS FOR "EXCLUSIVE USE SHIPMENTS"
(Radioactive material, LSA, n.o.s.)**

1. The driver of the vehicle shall re-examine the vehicle's cargo and its load-securing devices periodically during transportation and cause any adjustments to be made to the cargo or load-securing devices (other than steel strapping) as may be necessary to maintain the security of the vehicle's load. A periodic re-examination and any necessary adjustments must be made: (49 CFR 392.9)
 - When the driver makes a change of his/her duty status; or
 - After the vehicle has been driven for 3 hours; or
 - After the vehicle has been driven for 150 miles, whichever first occurs.
2. The driver must examine the vehicle's tires at the beginning of each trip and each time the vehicle is parked. (49 CFR 397.17)
3. The motor vehicle shall be operated on routes that minimize radiological risk in accordance with the requirements of 49 CFR Subpart D - Routing of Class 7 (Radioactive) Materials.
4. The driver shall take positive steps in route and during necessary stops to separate this shipment from other freight, buildings, and personnel. Drivers should not remain unnecessarily in the motor vehicle. (49 CFR 173.441 and 177.842)
5. If the tractor must be replaced because of an accident or because of any other questionable or unsafe operating condition of the vehicle, the replacement tractor must be surveyed to verify that radiation dose rates in any normally occupied spaces (including the sleeping berth of the tractor) do not exceed 0.02 mSv/h (2 mrem/h). (49 CFR 173.441 and 177.842)

Acknowledgement Statement

I have read and understand the preceding instructions for maintaining "Exclusive Use" control of this shipment. Furthermore, I understand that these instructions must be maintained with the shipping papers.

Driver's Signature Date

Driver's Signature Date

Carrier's Name

9 DOCUMENTATION

9.1 About Documentation

Documenting the activities performed is an integral part of the Radioactive Waste Management program. In addition to being often required by the regulations, good documentation effective reconstruction of past events. For example, it is not unusual for SLAC to be asked what happened to certain waste that was known to be onsite years ago. At other times, good documentation may allow identification of otherwise unknown wastes/waste components, a piece of information crucial to being able to dispose of that waste.

For the documentation to be useful, it must be accurate, complete, legible, comprehensible, easily retrievable, and durable. Examples of documentation normally encountered at SLAC are:

- Radioactive Waste/Material Declaration forms
- Container inventory records
- Survey records
- RP logs (hardcopy or computerized)
- Instrument calibration records
- Sample analysis records
- Certifications
- Training records
- Shipping papers/waste manifests
- Disposal records
- Internal memos and reports

9.2 General Considerations

9.2.1 Accuracy

Information documented shall be as accurate as possible. When in doubt, RP personnel are expected to research before documenting.

9.2.2 Completeness

Details should be included to the extent that would allow reconstruction of the events or the calculations. Names, places, results, etc. shall be included when applicable.

9.2.3 Legibility/Comprehensibility

Hand-written documentation shall be legible. Only black or blue ink will be used for handwritten records. Whenever practicable, use of electronic media is encouraged to help with legibility.

The person documenting should review his/her own documentation to make sure it is comprehensible. When applicable, references to supporting material shall be clearly noted.

9.2.4 Retrievability

Documentation shall be kept in an organized and logical manner to ensure retrievability. Cabinets, folders, logbooks, etc. shall be clearly labeled with the name of the records and the pertinent dates.

9.2.5 Useful Life

Useful life shall be considered when selecting the recording media. Certain electronic media (such as magnetic media) have limited life or require extensive preservation measures to help ensure their future viability. Such media are not recommended for documentation purposes. Basic care and precautions shall be employed to prevent inadvertent or accidental loss of data. These measures may include fireproofing, regular backing up of electronic data, and transferring records off site for archiving.

9.3 Record Media

While the traditional paper form will serve all purposes and will undoubtedly remain the main medium for documentation, use of other proven media or technologies are also encouraged where efficiency, accuracy, legibility and retrievability can be improved.

9.4 Length of Retention

No official records or documentation will be disposed without the approval of the RP Department Head or his/her designee.

All records shall be kept on site for three years. After that, it is encouraged that records be transferred to the Federal Archive and Records Center in San Bruno, CA, for safekeeping. The Records Manager in the SLAC Information Technology Division handles record transfers.

9.5 Storage Location

Current records will be stored at several locations at SLAC depending on the type of records. Among these locations are the RAMSY trailer (Building 482), individual offices in the ES&H building (Building 28) and assigned file cabinets in common RP areas in Building 28. Long term storage will be at the Federal Archive and Records Center in San Bruno, CA.

Alternatively, with the approval of the RP Department Head, optical electronic media (CD or DVD or current technology) may be stored on site instead of transferring them to the Federal Archive and Records Center. In either case, care shall be taken to ensure the records longevity and retrievability.

9.6 Responsibilities

9.6.1 Individual

Everyone who enters information in the records is responsible for ensuring that the information is accurate, complete, legible, and comprehensible. At the very least, the person entering information must review and initial the entry where the information was entered. Electronic data format must also provide a means for initialing.

9.6.2 Supervisor

Supervisors shall review each record, approve them by signing or initialing, and ensure the records are properly filed or backed up and stored. Supervisors are also responsible for keeping track of the records, knowing where they are stored, and how to retrieve them.

10 TRAINING REQUIREMENTS

10.1 Training for Generators

Most radioactive waste generators should have Radiological Worker I (RWT I) training or Radiological Worker II training (RWT II). This training typically addresses safe handling of radioactive material and is adequate in addressing the safety aspects of radioactive waste handling. In addition, "Introduction to Hazardous Waste Management" (SLAC course #105) may be required.

Radioactive waste generators should be familiar with all Chapters in this Manual that relate to waste generators. The waste generator is ultimately responsible for making sure the waste that is generated can be managed safely and in compliance with applicable laws and regulations.

Chapter 3, "Radioactive and Mixed Waste Generation" and Chapter 5, "Radioactive Waste Acceptance Criteria," in this Manual are particularly relevant to waste generators and are designed to help generators fulfill their responsibilities.

10.2 Training for RP Personnel

10.2.1 General Training

RP personnel involved in radioactive waste management will be trained to the extent equal to their responsibilities. At a minimum, RP personnel involved in radioactive waste management should be familiar with this Manual and all emergency procedures and general safety guidelines relating to their work areas.

The following training is also required:

- Hazard Communication General Training (HazCom), ES&H Course #103

- Introduction to Pollution Prevention and Hazardous Waste and Material Handling, ES&H Course #105
- General Employee Radiological Training (GERT), ES&H Course #115
- Employee Orientation to Environment, Safety, and Health (EOESH), ES&H Course #219
- It is the responsibility of the supervisor to ensure that personnel who report to him or her have adequate training and that all retraining requirements are also satisfied. Personnel who directly handle radioactive waste must also complete:
- Radiological Worker Training I (RWT I), ES&H Course #116.
- Radiological Worker Training II (RWT II), ES&H Course #250.

10.2.2 Additional Training

In addition, the following training and refresher training may be required or recommended:

- Hazardous waste generator training, California Title 22, and Department of Toxic Substances Control (DTSC) regulations. Initial training is to be completed within six months of hiring or assignment and every year thereafter. This training automatically would apply for personnel were handling mixed or combined waste.
- Hazardous Material employee training (49 CFR Subpart H - Department of Transportation). Initial training within 90 days of hiring or assignment and every three years thereafter. This training automatically would apply for personnel were involved in the shipments or preparation for shipments of waste.
- International Air Transport Association (IATA) training if shipments are made by air.
- Fire Extinguisher Training and Demonstration, Course #108.
- Cardiopulmonary Resuscitation (CPR)/First Aid (ES&H Course #138).
- Course 140, Certified Rad Waste Generator.
- Lock & Tag for the Control of Hazardous Energy (ES&H Course #157).
- Electrical Safety for Non-Electrical Workers (ES&H Course #239).
- Lead Safety (ES&H Course # 240).
- Forklift Operator Training (ES&H Course #283).
- Personal Protective Equipment (on-the-job training).
- Hazardous Waste Operator (HAZWOPER).
- Advanced Mixed Waste Shipper Training

10.2.3 Special Training

Before undertaking any new task, procedures must be discussed and approved by the RP Radioactive Waste Group Leader. Each person involved in a new task shall become familiar with the procedures prior to performing that task and are required to follow the procedures. Similarly, procedures for tasks that are performed infrequently should be reviewed and updated before performing the tasks.

If work involves new instruments or equipment, the safe and proper handling of the equipment must be determined before the work can begin. If specific training is required, the requirement must be satisfied (for example, forklift training)

APPENDIX A Radioactive Waste Deficiency Report SLAC-I-760-2A08H-001

Radioactive Waste Deficiency Report Purpose

The purpose of the Radioactive Waste Deficiency Report (RWDR) is to identify deficiencies with the processing of radioactive waste and to document the actions taken to correct these deficiencies. RWDRs can be used to identify a radioactive waste that is not compliant with the requirements of the Radioactive Waste Manual or to process radioactive waste that is outside the scope of this Manual.

Note: *A RWDR need not be issued for minor deficiencies that can be corrected immediately (for example, holes in bags with no release of radioactive contamination, faded/torn/missing labels or markings, unsecured lids on containers, missing signatures on a form).*

Use of the RWDR is reserved for:

- Identifying a radioactive waste that is not compliant with the requirements of the Radioactive Waste Manual (such as a deficiency that cannot be immediately corrected).
- Processing radioactive waste that is outside the scope of this Manual (such as nonconforming or unacceptable waste forms)
- A deficiency that presents an imminent danger to the safety of personnel.
- A deficiency that could result in an uncontrolled release of radioactive material to the environment.

RWDRs may also be used as an aide to identify trends to minimize deficiencies in the future.

Completion of the Radioactive Waste Deficiency Report

Block A. Type of Deficiency

Check the applicable type of deficiency.

Examples:

1. While performing the Pre-shipment Container Inspection, if a 1" hole is discovered in the bottom of the disposal container, mark "Container".
2. While packing waste items into a disposal container, if radioactive contamination is identified outside the plastic wrapping of a bagged item, mark "Packaging".
3. While packing waste items into a disposal container, if an unacceptable or non-conforming waste item (such as free-standing water) is discovered, mark "Waste Type"

Block B. Deficiency Description

Provide a brief description of the deficiency found and any corrective actions performed.

Examples:

1. If a 1" hole was discovered in the bottom of a disposal container, enter the following description (or words to such effect):
2. "While inspecting Box # 167787, a 1" hole was discovered in the bottom of the container. Swipes of the container and area were < 1000 dpm/100 cm². The hole in the container was taped over."

3. If holes are found in the packaging of contaminated items, enter the following description (or words to the effect):
4. “A bag of contaminated waste (Declaration Form # 000101-001) received at the RAMSY in a 55-gallon drum was full of holes. The bag was surveyed and removable surface contamination levels of 5000 dpm/100 cm² were identified outside the bag and inside the drum. The bag was placed back in the drum and the drum lid was reinstalled. Surveys of the drum and surrounding area identified removable surface contamination levels were < 1000 dpm/100 cm².”
5. While packing waste into a disposal container, if an unacceptable or non-conforming waste item is identified, enter the following description (or words to the effect):
6. “While packing waste into Box # 167778, a bag of LCW filters with free-standing water was identified (Declaration Form # 000101-001). The bag was marked with the storage drum number from which it was removed and placed in a separate drum marked “Unacceptable/Nonconforming Waste”.”
7. Name/Signature
Print your name and sign the form. By signing the form, the individual certifies (based on process knowledge or certified records) that all information is complete and accurate to the best of his/her knowledge.
8. Department/Group
Enter your SLAC Department or Group.
9. Telephone
Enter your SLAC telephone extension.
10. Date
Enter the date.

Forward the form to the RP RWM Group (MS 84)

Block C. Corrective Actions

The RP RWM Group will review the deficiency and then identify the corrective actions needed to properly manage/process the waste item.

1. Name/Signature
Print your name and sign the form.
2. Date
Enter the date.
3. Distribute the Form
Distribute the form to the responsible SLAC Department or Group for completion of the corrective actions.
Note: *The RP RWM Group will maintain a copy of the RWDR on file until the deficiency has been corrected, at which time the copy on file will be replaced by the original RWDR.*

Block D. Remarks

The responsible SLAC department or group completes the corrective actions and then enters any remarks/information regarding the completion of the corrective actions.

Block E. Processing Certification

1. Name/Signature

Print your name and sign the Form. By signing the form, the individual certifies (based on process knowledge or certified records) that all the indicated corrective actions have been completed. Attach all documentation verifying the completion of the corrective actions to the RWDR.

2. Department/Group

Enter your SLAC Department/Group.

3. Telephone

Enter your SLAC telephone extension.

4. Date

Enter the date.

5. Forward the Form to the RP RWM Group for review. The review and corrective action process in Blocks C and D will be repeated until all necessary actions have been completed and the waste item has been properly processed for disposal.

Block F. Deficiency Corrected

When all the corrective actions have been completed to correct the deficiency and the waste item has been properly processed for disposal, the RP RWM Group will check the “Deficiency Corrected” block.

1. Name/Signature

Print your name and sign the form.

2. Date

Enter the date.

3. The RP RWM Group will retain the original RWDR and distribute a copy to the appropriate SLAC Department/Group.

RWDR # (For RP Use Only)

The RP RWM Group will assign a unique serial number to each deficiency report. The serial number will be a 5-digit number consisting of the following:

- First 2-digits are the last two digits of the year in which the RWDR is issued
- The last 3-digits are the next available chronological number to be issued

Example: The RWDR # for the first RWDR issued in calendar year 2006 would be 06001; the RWDR # for the tenth RWDR issued in 2006 would be 06010.

The RP RWM Group is responsible for maintaining a log of the assigned serial numbers to help ensure numbers are not duplicated.

APPENDIX B Radioactive Low Level Waste Database

1 GENERAL DESCRIPTION AND PURPOSE

This electronic database is comprised of Excel workbooks with one or more worksheets; however, at the time of Revision 3 of this Manual a web-forms application was under development. The web-forms application is intended to replace the Excel versions of the database, using the following methodology:

- Continue entering data to the Excel database until the web-forms application is tested, released to production and staff are trained on its use.
- Transfer open (e.g., declared items not disposed) records in the Excel database to the web-forms application.

The purpose of the Radioactive Low-Level Waste (RLLW) Database is to:

- Provide an inventory and description of the radioactive waste in storage at RP (long-term) LLRW storage areas
- Document the completion of quality control checks that are performed to ensure that the physical, chemical, and radiological characteristics of waste items have been completely identified to support proper treatment/ disposal of the waste
- Provide a processing history of waste items from time of receipt through treatment and disposal (for example, radiological characterization, packaging, and shipment)
- Provide a tracking system from cradle to grave

The database was specifically designed to document the completion of RP LLRW program elements supporting disposal of radioactive and mixed wastes.

Unless otherwise specified, this appendix is applicable to operations performed by the RP RWM Group.

Excel Database:

In the Excel database, the first worksheet is named “RWG” which stands for radioactive waste group. The second worksheet is “SWG” for suspect waste group. This second sheet is used to track waste items that potentially have a hazardous component and may require further investigation. The third sheet is “Smoke Detectors”. The last worksheet is “Final Waste Disposition” which is used to store data for wastes that have been disposed, reused, or recycled.

Web-Forms Application:

The web-forms application has the following workflow:

- Radioactive waste items are declared in the items view. In this view, a container may be assigned to each item consistent with the layout of the Declaration Form
- Containers are setup in the containers view. The view shows a list of items packed in each container. Containers may be assigned to a shipment.
- Shipments are setup in the shipments view. The view shows a list of containers which are part of the shipment. Shipments may be assigned to a burial.
- Burials are setup in the burials view. The view shows a list of shipments which are part of the burial. Certificates of disposal may be assigned to a burial.

- Several views are also provided to setup lists used to pre-populate drop-down boxes, and to improve filtering and sorting.
- Several reports are provided to measure the quantities of waste disposed by time interval
- An attachment's view is provided as part of Containers, Shipments, and Burials views to upload documentation associated with each step.

2 DATABASE ACCESS/SECURITY

The database is an MS Excel spreadsheet and is accessed at the following location:

V:\Esh\Ram\RLLW Inventory Master

It is imperative that the security of the database is maintained to ensure that changes are only made by authorized personnel. Full access to the database is therefore restricted to the immediate members of the RP RWM Group and to the Environment, Safety, and Health (ES&H) Computer Administration Group. Access to all other personnel is limited to "Read-Only."

The web-forms application has built-in security to prevent deletion of records except by database administrators.

3 DATA ENTRY

Excel Database:

As described above, the information entered the database is primarily obtained from the following RP documentation sources:

- Radioactive Material Declaration Forms.
- Radioactive Waste Characterization Sheets.
- Disposal Container Packing Lists.
- Container Closure Inspection Checklists.

The following information is obtained from the waste item's Radioactive Material Declaration Form:

- Declaration Form #.
- Quantity.
- Item Description.
- "Routine operation waste" status.
- The location/system that generated the waste.
- Volume (ft³).
- Material Type.
- Absorbent Type.
- Absorbent Amount.
- Liquid Type.
- Liquid Amount.
- Hazardous Waste Classification.
- Surface Contamination (dpm/100 cm²).

- Radiation Level on Contact (mR/hr.).
- Radiation Level at 30 cm (mR/hr.).
- Volume (ft³).
- Absorbent Type.
- Absorbent Amount.
- Liquid Type.
- Liquid Amount.
- Hazardous Waste Classification.
- Storage Container Number/Storage Location (as applicable).

The Characterization Date is the “Data Collection Date” specified on the Radioactive Waste Characterization Sheets (provided by the RP DREP Group). The Disposal Container # is obtained from the Disposal Container Packing List. The following information is obtained from the Container Closure Inspection Checklist:

- Disposal Container Gross Weight (kg).
- Disposal Container Closure Date.
- Radiation Level on Contact (mR/hr.).
- Radiation Level at 30 cm (mR/hr.).

The information on the documentation sources and the database should be identical unless an explanation for any differences is provided in the *Comments* column.

Wastes that have one or more hazardous characteristics (indicated as “Hazardous waste” on the Declaration Form) or those that have not been fully characterized will be entered on the worksheet marked “SWG”.

A quality assurance check of the declaration form is performed in accordance with Section 8 of this Appendix prior to data entry. Enter information into the individual database columns according to the specific instructions given below. If a column does not apply to a waste item, enter “N/A”.

Remember to save the database after you have entered any information.

1. Declaration Form #

Enter the waste item’s Radioactive Material Declaration Form #.

2. Quantity

Enter the quantity of the waste item. If several items are received in a container, enter the size of the container.

Enter the quantity in units of:

Number present (for example, 4 each, 18 pieces, or 3 bags).

Volume (for example, one 55-gallon drum, two 5-gallon pails).

3. Item Description

Enter the description identified on the Radioactive Material Declaration Form. An item may be a single piece of equipment, a bag (or bags) containing assorted materials, or a container with a group of materials that are similar/identical in nature.

For bagged items or a container with a group of materials that are similar or identical in nature, ensure the description identifies the entire contents of the bag or the container.

Note: Do not use the term “Miscellaneous” to describe an item.

4. Routine Operation Waste

Enter “Y” if the description of the “Generation Process” is “other”. Enter “N” if any other “Generation Process” is marked on the Radioactive Material Declaration Form.

5. Generation Location/System

Enter the location or systems indicated on the Radioactive Material Declaration Form.

6. Volume

Enter the estimated waste volume (in units of ft³) identified on the Radioactive Material Declaration Form.

7. Material Type

List all the physical forms present in the waste “item” identified on the Radioactive Material Declaration Form (for example, metal type, rubber, paper, plastic, cardboard, absorbent, resin, cables, or cloth). The following abbreviations may be used:

- AL (aluminum)
- CU (copper)
- FE (iron)
- SS (stainless steel)
- ABS (absorbent)
- CARD (cardboard)
- CB (cables)
- CL (cloth)
- PA (paper)
- PL (plastic)
- RE (resin)
- RU (rubber)

8. Absorbent Type

Enter the type of absorbent (e.g., Chemsorb[®], etc.) identified on the Radioactive Material Declaration Form. If no absorbent is present in the waste item, enter “N/A”.

9. Absorbent Amount

Enter the amount of absorbent identified on the Radioactive Material Declaration Form. Be sure to include the units of measurement (for example, ml, cup, liter, lbs., or kg). If no absorbent is present in the waste item, enter “N/A”.

10. Liquid Type

Enter the type of liquid (for example, water or oil) identified on the Radioactive Material Declaration Form. If no liquid is present in the waste item, enter “N/A”.

11. Liquid Amount

Enter the total amount of liquid (both free-standing and absorbed) identified on the Radioactive Material Declaration Form. Be sure to include the units of measurement (for example, milliliter, cup, liter, or gallons). If no liquid is present in the waste item, enter "N/A".

Note: *If the waste item is a resin permutate, enter "N/A". Identification of the amount of water present in the resin is not required since the resin will be processed (de-watered) prior to packaging for disposal.*

12. Hazardous Waste (Y/N)

Enter the hazardous waste classification of the waste item (Y = Yes, N = No) as identified on the Radioactive Material Declaration Form. In the "Comments" column, list the underlying hazardous constituents of the waste item (for example, lead, mercury, oil, or ethyl alcohol) as identified on the Radioactive Material Declaration Form.

13. Surface Contamination

Enter the surface contamination levels (in units of dpm/100 cm²) identified on the Radioactive Material Declaration Form. If the waste item is activated only (and no surface contamination is present), then enter *N/A*.

14. Radiation Level on Contact

Enter the contact radiation level (in units of mR/hr.) identified on the Radioactive Material Declaration Form.

15. Radiation Level at 30 cm

Enter the radiation level (in units of mR/hr.) at 30 cm from the surface of the waste item as identified on the Radioactive Material Declaration Form.

16. Storage Container #/Storage Location

Enter the storage container # where the waste item is stored. If the waste item is not stored inside a storage container, enter the storage location of the item.

17. Storage Container Start Date

Enter the date that the first waste item was placed into the storage container. If the waste item is not stored inside a storage container, enter *N/A*.

18. Initials

The individual who enters this information for the waste item certifies, by entering his/her initials, that the information is correct and accurate.

19. Supervisor Review (Initials)

An RP RWM supervisor will review the database and certify, by entering his/her initials, that:

The information from the declaration forms has been transferred completely and accurately to the database,

That all suspect/hazardous waste items have been identified on the database, and

That all non-conforming waste items (in other words, waste items that do not meet the waste acceptance criteria as defined in Chapter 5 of this Manual or that are potentially unacceptable for disposal at the DOE disposal site) have been identified on the database.

20. Storage Container Fill Date

Enter the date that the storage container is filled (and sealed). If the waste item is not stored in a storage container, enter "N/A".

21. Storage Container Gross Weight (Kg)

Enter the gross weight of the container in Kg. If the waste item is not stored in a storage container, enter "N/A".

22. Storage Container (or RAM Item) Net Weight (Kg)

Enter the net weight of the storage container (or RAM item, if not stored in a container) in kilograms.

23. RP Review (Initials)

Review the contents of the sealed, storage containers or waste items to ensure that they conform to the TSDF WAC prior to radiological characterization.

If in conformance, the reviewer will enter his/her initials signifying that the waste item is acceptable for disposal at the licensed disposal facility.

For non-conforming items, provide the reason in the *Comments* column of the database and identify the necessary actions to progress the waste item towards disposal. To ensure non-conforming waste items are clearly identified, the color of the text in the cells may be changed to "Red".

As necessary, personnel will remove non-conforming items from the container and update the database accordingly (e.g., the waste item is transferred from the RWG sheet to the SWG sheet).

24. TSDF Pre-Approval (Y/N)

If necessary, generate a preliminary inventory list describing those waste items determined to be in conformance with the selected TSDF WAC. Submit the list to the TSDF for review/pre-approval.

Based on the facility's response, the database is then annotated (Y = Yes, N = No) as to whether each item is acceptable. If unacceptable, provide the reason in the "Comments" column of the database and identify the necessary actions to progress the waste item for disposal.

As necessary, personnel will remove unacceptable items from the storage container and update the database accordingly (e.g., the waste item is transferred from the RWG sheet to the SWG sheet).

25. Characterization Date

Enter the "Data Collection Date" specified on the Radioactive Waste Characterization Sheets (provided by the RP DREP Group).

26. Disposal Container #

Enter the Disposal Container # specified on the Disposal Container Packing List. If no container is used (in other words, the RAM item is being shipped "bulk"), enter "N/A".

27. Disposal Container Gross Weight (Kg)

Enter the gross weight of the disposal container identified on the Container Closure Inspection Checklist. If no container is used (in other words, the RAM item is being shipped "bulk"), enter "N/A".

28. Disposal Container Net Weight (Kg)

Enter the net weight of the disposal container. If no container is used (in other words, the RAM item is being shipped “bulk”), enter “N/A”.

29. Disposal Container Closure Date

Enter the date that the disposal container was closed/sealed as identified on the Container Closure Inspection Checklist. If no container is used (in other words, the RAM item is being shipped “bulk”), enter “N/A”.

30. Disposal Container Radiation Level on Contact

Enter the maximum contact radiation level (in units of mR/hr.) on the disposal container as identified on the Container Closure Inspection Checklist. If no container is used (in other words, the RAM item is being shipped “bulk”), enter “N/A”.

31. Disposal Container Radiation Level at 30 cm

Enter the maximum radiation level (in units of mR/hr.) at 30 cm from the surface of the disposal container as identified on the Container Closure Inspection Checklist. If no container is used (in other words, the RAM item is being shipped “bulk”), enter *N/A*.

32. Ship Date

Enter the date that the disposal container (or RAM item) was shipped from SLAC to a TSDF.

33. Comments

Use this column to provide additional information regarding a waste item, for example: Identify any differences between the database information and RP documentation sources (such as a Radioactive Material Declaration Forms).

List the underlying hazardous constituents of hazardous wastes.

Identify the reason waste items are not in non-conformance with the TSDF WAC along with necessary actions to properly process the waste item.

Identify the treatment/shipment destinations of waste items.

Web-Forms Application

The web-forms application has significantly reduced the amount of data needed for each item, container, shipment, and burial. Most data entered to a form described in this Manual will not be re-entered in the web-forms application. Rather, the final, QC-checked forms are uploaded as an attachment, with key data elements entered with strict data format controls enforced. For example, the length, width, height, and quantity of an item (as floating-point decimals in inches), as well as its status as hazardous or not (as a checkbox), is sufficient to meet end-of-year reporting requirements. Radiological data is stored in VSIDS. Cubic feet can be calculated from dimensional data and quantity.

4 TEXT COLOR

Excel Database:

The text color of the database information is initially entered as *Black*. Different font colors may be used to readily identify/highlight those waste items that may be hazardous, that are

unacceptable for disposal in present condition at the selected disposal facility, or that have high contamination or radiation levels.

To change the text color of cells, perform the following:

1. Click on the cell or cells to be changed
 - a. Click on the cell or cells to be changed, thereby highlighting all the cells, and blocking the data.
2. Click on the “Font Color” icon on the spreadsheet toolbar
 - a. Click on the “Font Color” icon on the spreadsheet toolbar (titled *A*). A palette of colors will come up.
 - b. Click on the desired color
 - c. Click on the desired color (black, green, red, etc.). Clicking on a desired color will change the text color in the cell (or cells) to the desired color.
3. Web-Forms Application:
 - a. Color formatting is not used in the web-forms application.

5 DATABASE PROTECTION

Excel Database:

To ensure database information is not inadvertently changed, the cells are “locked” and then the database is password protected.

How to Lock the Cells

To “lock” the information in cells, perform the following:

- Click on the upper-left rectangle of the worksheet where the row headings (1, 2, 3...) and the column headings (A, B, C...) intersect. This action will select the whole worksheet.
- Now, click on *Format* on the Excel program’s main toolbar.
- Click on *Cells*. A folder will come up with the headings: *Number*, *Alignment*, *Font*, *Border*, *Patterns*, and *Protection*.
- Click on *Protection*. Click the box entitled *Locked*. Then click *OK*, the worksheet is now locked and cannot be altered **when the database is protected**.

How to Protect the Database

To protect the database, perform the following:

- Click on *Tools* on the Excel program’s main toolbar.
- Go to *Protection* and then click on *Protect Sheet*.
- Enter the RP RWM Group password to protect the worksheet and click *OK*.
- Re-enter the password, when asked to confirm, and click *OK*.

Note: *This action only protects the worksheet that is active at the time. This protection effort should be applied to all the worksheets (RWG, SWG ...) by choosing each sheet (by clicking the sheet name tabs, on the bottom left) then go through steps 1 – 4 above. Cells that have been “locked” cannot be altered.*

Tips

Passwords are case sensitive, meaning that capital letters must be entered where appropriate.

You cannot sort the database when it is protected. To sort the data (for example, by Drum Number), you must first ‘unprotect’ the appropriate worksheet. When the database is unprotected, all cells can be altered, regardless of if the cell’s format is “locked.”

MAKE SURE YOU PROTECT THE DATABASE AFTER USE!

Web-Forms Application:

Security and protection are built in.

6 SAVING THE DATABASE

Excel Database:

After making data entries into the database, protect it (as described above) then save the database by simply clicking on the *Save* icon (floppy disk shape) on the Excel program’s toolbar.

Web-Forms Application:

Data is automatically saved after each transaction.

7 DATABASE MAINTENANCE

Excel Database:

Database Back-up

Each week, the RWM Group leader and the Radioactive Waste & Radioactive Material Coordinator perform a back-up of the database onto their respective local hard drives. To back up the database, perform the following:

- Access the database on the V: Drive (a network drive).
- Click *File* on the Excel program’s main toolbar.
- Click *Save As*. This will open a window for you to specify where the database is to be saved.
- Go to the local computer’s hard drive (C Drive) by clicking on the drop-down list (the arrow right of the Folder RAM). This provides a list of areas where the database can be saved.
- Click on C: (or the appropriate drive letter) to access the local computer’s hard drive.
- Open the folder where you want to save the file. It is recommended that you create a folder for this purpose. Give the folder a descriptive name such as “RLLW database backups.”
- Change the file name to add the current date, such as “RLLW Inventory Master 051001.”
- Click ‘Save’.

Web-Forms Application:

Database is automatically backed up on SLAC servers.

8 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

QA/QC Check #1 (Radioactive Material Declaration Forms Review)

An RP RWM supervisor reviews all Radioactive Material Declaration Forms received at the storage area. This review verifies that the information on the declaration form is complete and accurate and that the presence of any hazardous materials has been properly identified. As necessary, the generator is contacted to resolve any discrepancies. (Although this Quality Control (QC) check is not documented on the database, it ensures that the physical, chemical, and radiological characteristics of the waste item that will be transferred to the database are complete and accurate.)

Upon satisfactory completion of this supervisor review, the information from the Radioactive Material Declaration Forms is then transferred to the applicable spreadsheet of the database (e.g., RWG, SWG, or Smoke Detector sheet) or web-forms application. This information includes:

- A unique serial number assigned to the waste item (the Radioactive Material Declaration Form #).
- The quantity and description of the waste item.
- The determination of whether the waste is a “routine operation waste.”
- The location that generated the waste.
- The materials of composition (for example, aluminum, copper, iron/stainless steel, paper, plastic, or rubber).
- The radioactive contamination levels and radiation levels of the waste item.
- The volume of the waste item.
- The type and amount of absorbent present.
- The type and amount of liquid present.
- The hazardous waste classification of the waste item.
- The storage container serial number that the waste item was placed in or the storage location of the item (if too large to fit into a storage container).

The individual who enters this information into the database certifies, by entering his/her initials, that the information is correct.

QA/QC Check #2 (Database Review)

An RP RWM supervisor reviews the database and certifies, by entering his/ her initials, that:

- The information from the declaration forms has been transferred completely and accurately to the database.
- That all non-conforming waste items (such as waste items that do not meet the waste acceptance criteria as defined in Chapter 5 of this Manual or that are potentially unacceptable for disposal at the DOE disposal site) have been identified on the database.

The objectives of this review are:

- To ensure that the physical, chemical, and radiological characteristics of the waste items (as described on the declaration forms by the generator) are completely/accurately described on the database

- To ensure that all non-conforming waste items have been identified to preclude inadvertent disposal at the selected disposal facility.

When a storage container has been filled with waste items, it is sealed (in other words, the drum lid is installed and torqued) and then it is weighed. The date that the container is sealed, and its gross and net weight are then entered into the database. For waste items too large to fit into a storage container, the waste item itself is weighed and the weight entered the database as the net weight of the item. The gross weight and container fill date are not applicable for such items.

For the web-forms application, a “QC Performed” box is present on the Items view where a supervisor will check a box, and the time and date stamp will be added automatically.

QA/QC Check #3 (TSDF WAC Review)

Prior to radiological characterization, the contents of the sealed storage containers or individual waste items, if not stored in containers, is reviewed to ensure that the waste items conform to the TSDF Waste Acceptance Criteria (WAC). If in conformance, the reviewer will enter his/her initials signifying that the waste item is acceptable for disposal at the chosen facility. For non-conforming items, the RP Radioactive Waste & Radioactive Material Coordinator will identify in the *Comments* column of the database the reason for the non-conformance and will identify the necessary actions to properly process the waste item. As necessary, non-conforming items are removed from the storage container and the database is updated accordingly (e.g., the waste item is transferred from the RWG sheet to the SWG sheet).

For the web-forms application, a “QC Performed” box is present on the Burials view where a supervisor will check a box, and the time and date stamp will be added automatically.

QA/QC Check #4 (TSDF Preliminary Inventory List Review)

Using the database information, a preliminary inventory list (or manifest) is generated describing those waste items determined to be in conformance with the intended TSDF WAC. The list is submitted to the TSDF for review/pre-approval. Based on the disposal facility’s response, the database is updated as to whether each item is acceptable or unacceptable for disposal at the facility. If unacceptable, the reason why the waste item is not acceptable and the necessary actions to properly process the waste item are identified in the *Comments* column of the database. As necessary, unacceptable waste items are removed from the container and the database is updated accordingly (e.g., the waste item is transferred from the RWG sheet to the SWG sheet).

The objectives of this QC check are:

- To ensure that unacceptable waste items are not inadvertently packed for disposal.
- To preclude the need to open a sealed, disposal container and remove unacceptable items.

Upon satisfactory completion of the review, radiological characterization of the filled storage container waste item is performed. The date of “data collection” is logged on the database to ensure that appropriate decay calculations can be performed to estimate the final activity of the disposal containers. (Note: some facilities require the activity of a disposal container to be reported for a specific date. Since radiological characterization typically occurs weeks or months in advance of packaging disposal containers, the activity detected on the characterization date

may need to be decayed to the same date for all waste items packed into the disposal container (typically, the disposal container closure date is used for this purpose).

Upon completion of radiological characterization, the characterization documentation (such as the database and the Radioactive Waste Characterization Sheets) for each storage container (or RAM item) is again reviewed.

The purpose of this review is to achieve (if possible) the following factors when the waste items are packed into a disposal container:

- The packed disposal container will be classified as Class A.
- The radionuclide activity of the packed disposal container will be below the acceptable limits of the TSDF WAC.
- If fissionable material is present, the packed disposal container will require no criticality controls (natural and depleted uranium in any amount is exempt from criticality controls).
- The packed disposal container will meet the appropriate 49 CFR classification criteria for its packaging.

Based on this review, a Disposal Container Packing List (Appendix 9B of this Manual) is completed designating which storage containers (or RAM items) can be packed into a specific disposal container. The packing list typically contains more containers (or RAM items) than is needed to pack a disposal container. This allows flexibility in the packing process yet still ensures that the review goals are met. Personnel, who package the waste items into the disposal container, initial/date the packing list to identify which storage containers (or RAM items) were packed into the disposal container. This information is then transferred to the database.

Upon filling a disposal container, the container is sealed, and a closure inspection is conducted. Information logged on the Container Closure Inspection Checklist (Appendix 9C of this Manual) includes the date of closure, the container's gross weight, and the maximum radiation level on contact with the container and at 30 cm from the container. This information from the checklist is transferred to the database and is used to complete the shipping documentation for the disposal container.

The last piece of information entered the database is the date that the waste was shipped for treatment/disposal at a Treatment, Storage, and Disposal Facility (TSDF).

For the web-forms application, the ship date is entered on the Shipments view. The application is fluid in that items can be removed from a container by setting the container number to "null" (empty) and populating a comments box with a written history. Furthermore, containers can be removed from shipments, and shipments removed from burials. Each instance of items, containers, shipments, and burials has a comments box that can be populated with a written history.

Transferring Data to the Final Waste Disposition Worksheet

Upon disposal of a waste item, transfer the waste item data to the applicable *Final Waste Disposition* worksheet. *Final Waste Disposition* worksheets may be named according to the calendar year in which the waste items were disposed. For example, all waste items disposed in

calendar year 2006 could be transferred to the worksheet entitled *Final Waste Disposition – CY2006*.

Excel Database:

To transfer data from one worksheet to another worksheet, perform the following:

- First, unprotect both worksheets (i.e., the worksheet with the data to be moved, and the destination worksheet).
- Highlight all the cells to be moved.
- Click on *Edit* on the worksheet’s main toolbar.
- Click on *Copy*.
- Now click on the name of the destination worksheet (at the bottom left of the database) where the data is to be copied (e.g., *RWG*, *SWG*, *Smoke Detectors*, *Final Waste Disposition - CY2006*, etc.).
- On the destination worksheet, click on an open cell at the bottom of the worksheet. Note that the cell must be in the same column as that from which it was copied. For example, if a cell or cells were copied from the *RWG* worksheet, starting at the *Radioactive Material Declaration Form #* column, the click on an open cell in the *Radioactive Material Declaration Form #* column of the destination worksheet to paste.
- Click on *Edit* on the worksheet’s main toolbar.
- Click on *Paste*.
- After verifying that the data has been successfully moved to the destination worksheet, return to the worksheet from where the data was copied, and delete the data from this worksheet.
- Remember to electronically ‘protect’ both worksheets when done.

Web-Forms Database:

Further data entry in the database is not required when an item is assigned to a container, the container has been assigned to a shipment, and the shipment has been assigned to a burial. The list of items in the items view is sorted in a manner to easily identify which items are buried, and which items are on a clock representing the maximum holding time at SLAC.