

# **Technical Safety Requirements for the Waste Storage Facilities**

**March 2010**

By D. T. Laycak



**Lawrence Livermore National Laboratory**  
**Lawrence Livermore National Security, LLC**

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# Weapons and Complex Integration

## Radioactive and Hazardous Waste Management Division

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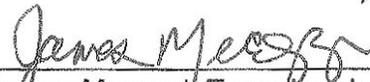
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# Technical Safety Requirements for the Waste Storage Facilities

March 2010



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# **Weapons and Complex Integration**

## **Radioactive and Hazardous Waste Management Division**

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## INTRODUCTION

This document contains Technical Safety Requirements (TSR) for the Radioactive and Hazardous Waste Management (RHWM) WASTE STORAGE FACILITIES, which include Area 625 (A625) and the Decontamination and Waste Treatment Facility (DWTF) Storage Area at Lawrence Livermore National Laboratory (LLNL). The TSRs constitute requirements regarding the safe operation of the WASTE STORAGE FACILITIES. These TSRs are derived from the *Documented Safety Analysis for the Waste Storage Facilities* (DSA) (LLNL 2009). The analysis presented therein determined that the WASTE STORAGE FACILITIES are low-chemical hazard, Hazard Category 2 non-reactor nuclear facilities. The TSRs consist primarily of inventory limits and controls to preserve the underlying assumptions in the hazard and accident analyses. Further, appropriate commitments to safety programs are presented in the administrative controls sections of the TSRs.

The WASTE STORAGE FACILITIES are used by RHWM to handle and store hazardous waste, TRANSURANIC (TRU) WASTE, LOW-LEVEL WASTE (LLW), mixed waste, California combined waste, nonhazardous industrial waste, and conditionally accepted waste generated at LLNL as well as small amounts from other U.S. Department of Energy (DOE) facilities, as described in the DSA. In addition, several minor treatments (e.g., size reduction and decontamination) are carried out in these facilities.

The WASTE STORAGE FACILITIES are located in two portions of the LLNL main site. A625 is located in the southeast quadrant of LLNL. The A625 fenceline is approximately 225 m west of Greenville Road. The DWTF Storage Area, which includes Building 693 (B693), Building 696 Radioactive Waste Storage Area (B696R), and associated yard areas and storage areas within the yard, is located in the northeast quadrant of LLNL in the DWTF complex. The DWTF Storage Area fenceline is approximately 90 m west of Greenville Road. A625 and the DWTF Storage Area are subdivided into various facilities and storage areas, consisting of buildings, tents, other structures, and open areas as described in Chapter 2 of the DSA. Section 2.4 of the DSA provides an overview of the buildings, structures, and areas in the WASTE STORAGE FACILITIES, including construction details such as basic floor plans, equipment layout, construction materials, controlling dimensions, and dimensions significant to the hazard and accident analysis.

Chapter 5 of the DSA documents the derivation of the TSRs and develops the operational limits that protect the safety envelope defined for the WASTE STORAGE FACILITIES. This TSR document is applicable to the handling, storage, and treatment of hazardous waste, TRU WASTE, LLW, mixed waste, California combined waste, nonhazardous industrial waste, and conditionally accepted waste received or generated in the WASTE STORAGE FACILITIES. Section 5, Administrative Controls, contains those Administrative Controls necessary to ensure safe operation of the WASTE STORAGE FACILITIES. Programmatic Administrative Controls are in Section 5.4.

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This Introduction to the WASTE STORAGE FACILITIES TSRs is not part of the TSR limits or conditions and contains no requirements related to WASTE STORAGE FACILITIES operations or to the safety analyses of the DSA.

**SECTION 1  
USE AND APPLICATION**

**1.1 DEFINITIONS**

**NOTE:** Terms defined in this list appear in uppercase type throughout these Technical Safety Requirements (TSRs).

<b>Term</b>	<b>Definition</b>
APPROVED TRU WASTE CONTAINER	<p>Following is a description of the containers satisfying the free drop test performance criteria for Type A packaging (see 49 CFR 173.465(c)(1) for the applicable package mass) used to store TRU WASTE in the WASTE STORAGE FACILITIES.</p> <p>DOT 17C, 17H or UN1A2 steel drums with vents (waste containers accepted as LLW and converted to TRU WASTE after assay are not required to have vents).</p> <p>Standard waste boxes (SWBs) refers to oval-shaped steel containers with vents, roughly 3-ft H × 6-ft L × 4.5-ft W, designed for efficient loading into TRUPACT II Type B shipping containers.</p> <p>TRU oversize boxes refers to unvented steel containers, rectangular in shape. Built to contain large pieces of contaminated equipment, the dimensions of each TRU oversize box are unique. Heights vary from approximately 53-in to 101-in, widths vary from approximately 47-in to 70-in, and lengths vary from approximately 78-in to 138-in.</p> <p>Other steel containers with vents satisfying the free drop test performance criteria for Type A packaging (e.g., ten drum overpacks, 85-gal drums).</p>
LOW-LEVEL WASTE (LLW)	Waste containing radioactive components that do not meet the definition of TRANSURANIC (TRU) WASTE.
MAY	Denotes an acceptable, but not required, way to maintain the requirements, assumptions, or conditions of the facility safety basis.
PLUTONIUM-239 EQUIVALENT CURIES (PE-Ci)	The Pu-239 equivalent activities of different radionuclides are determined using radionuclide-specific weighting factors as described in DOE/WIPP-02-3122, Appendix B (DOE 2005).
SHALL	Denotes a mandatory requirement that must be complied with.
SHOULD	Denotes the responsibility of either following the TSR as specified or in a manner that meets the intent of the TSR. The use of "should" recognizes that there may be site- or facility-specific attributes that warrant special treatment and that literal compliance with the TSR may not be required to maintain the requirements, assumptions, or conditions of the facility safety basis.

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Term	Definition
SPECIFIC ADMINISTRATIVE CONTROL (SAC)	An AC that provides a specific preventive or mitigative function for accident scenarios identified in the DSA where the safety function has importance similar to, or the same as, the safety function of a safety SSC (e.g., discrete operator actions, combustible loading program limits, hazardous material limits protecting hazard analyses or facility categorization).
TRANSURANIC (TRU) WASTE	Without regard to source or form, waste that is contaminated with alpha-emitting transuranic radionuclides (elements above uranium in the periodic table [i.e., atomic number greater than 92]) with half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time of assay.
WASTE STORAGE FACILITIES	A collective term referring to Area 625 (A625) and the Decontamination and Waste Treatment Facility (DWTF) Storage Area of Lawrence Livermore National Laboratory.

### 1.2 OPERATIONAL MODES

Facility modes are not required since there are no Limiting Conditions for Operation. The facilities will be performing their mission throughout the operational life of the facility. RHWM has determined that this section is not applicable to the WASTE STORAGE FACILITIES. This section was retained for consistency with the TSR numbering system.

### 1.3 FREQUENCY NOTATION

No Surveillance Requirements have been identified as necessary to support the safety analysis for the facility; therefore, no frequency notations have been included in this TSR. This section was retained for consistency with the TSR numbering system.

### 1.4 ABBREVIATIONS AND ACRONYMS

The following abbreviations and acronyms are used in this document.

Abbreviation or Acronym	Definition
AC Administrative	Control
CFR	Code of Federal Regulations
Ci Curi	es
CM Config	uration Management
DBE De	sign Basis Earthquake
DBW De	sign Basis Wind
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DSA Do	ocumented Safety Analysis
DWTF	Decontamination and Waste Treatment Facility

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Abbreviation or Acronym	Definition
ES&H	Environment, Safety, and Health
FGE Fissile	Gram Equivalent
FPOC	Facility Point of Contact
FSP	Facility Safety Plan
ISMS	Integrated Safety Management System
LCO	Limiting condition for operation
LLNL	Lawrence Livermore National Laboratory
LLW Low-level	waste
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
PC-2 Perform	ance Category 2
PE-Ci	Plutonium equivalent Curie
PrHA	Process Hazard Analysis
QA Quality	Assurance
RHWM	Radioactive and Hazardous Waste Management
SCIL	Single Container Inventory Limit
SL Safety	limit
SR Surveillan	ce requirement
SSCs	Structures, systems, and components
TRU Tran	suranic
TSR	Technical Safety Requirement
USQ Unreviewed	Safety Question
W&CI	Weapons and Complex Integration

### 1.5 SAFETY LIMITS

No safety limits (SL) have been identified as necessary to support the safety analysis for the WASTE STORAGE FACILITIES; therefore, none has been included in this TSR document. Although SLs are not applicable, the section has been retained for consistency with the TSR section numbering system.

### 1.6 LIMITING CONTROL SETTINGS

Operation of the WASTE STORAGE FACILITIES includes no SLs; therefore, limiting control settings are not applicable. However, this section was retained for consistency with the TSR section numbering system.

### 1.7 LIMITING CONDITIONS FOR OPERATION

No limiting conditions for operation (LCO) have been identified as necessary to support the safety analysis of the WASTE STORAGE FACILITIES DSA; therefore, none have been included in this TSR document. However, this section was retained for consistency with the TSR section numbering system.

### 1.8 SURVEILLANCE REQUIREMENTS

No surveillance requirements (SRs) have been identified as necessary to support the safety analysis of the WASTE STORAGE FACILITIES DSA; therefore, none have been included in this TSR document. However, this section was retained for consistency with the TSR section numbering system.

## SECTION 2 SAFETY LIMITS

### 2.1 SAFETY LIMITS

There are no safety limits.

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**SECTION 3/4**  
**LIMITING CONDITIONS FOR OPERATION AND**  
**SURVEILLANCE REQUIREMENTS**

**3/4.1 GENERAL APPLICATION**

There are no limiting conditions for operations (LCOs) or related surveillance requirements (SRs).

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## **SECTION 5 ADMINISTRATIVE CONTROLS**

### **5.1 CONTRACTOR RESPONSIBILITY**

The Facility Manager is responsible for the following:

- Overseeing and assuring that all activities in the Waste Storage Facilities are conducted safely.
- Ensuring personnel working in the facility follow the requirements in the facility safety basis documents (e.g., DSA, TSR, SER).
- Preparing the Facility Safety Plan (FSP) for the Waste Storage Facilities. The FSP governs the ES&H controls for all work performed in the Waste Storage Facilities and provides for the Facility Manager's approval of operations as specified.
- Assuring that procedures are prepared and implemented in accordance with the LLNL ES&H Manual, and concurring with these procedures.
- Implementing a document control system that ensures documents essential to continued safe operation are prepared, reviewed, approved (if necessary), and maintained in a retrievable manner.
- Ensuring WASTE STORAGE FACILITIES personnel have completed their required training.
- Approving and releasing proposed operations and experiments with all forms of radioactive and hazardous materials.

### **5.2 CONTRACTOR ORGANIZATION**

The RHWM Storage and Disposal Group Leader is responsible for the operational functions in the WASTE STORAGE FACILITIES. The Facility Point of Contact (FPOC) for the WASTE STORAGE FACILITIES is the RHWM Storage and Disposal Nuclear Operations Supervisor. Some of the FPOC responsibilities include concurring that work can be safely performed in the facilities, and working with Responsible Individuals to identify hazards associated with the work location. The FPOC can also participate in pre-start review of work (when one is conducted), evaluate proposed operational or activity changes against the facility's existing environment, safety, and health (ES&H) documentation (e.g., the safety basis), and concur that work can proceed in the WASTE STORAGE FACILITIES, prior to the onset of work.

### **5.3 PROCEDURES**

Procedures and plans are prepared to provide direction and ensure that the facility is operated within its design basis and supports safe operation of the facility. Each major piece of processing equipment in the WASTE STORAGE FACILITIES will have a written operational

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procedure. Upset conditions will be included in the operational procedures. Individual tasks will be detailed in the work permit process and Processing Plans will be used to meet permit requirements. Procedures and plans include but are not limited to the following:

- Safety plans (e.g., Facility Safety Plan).
- Maintenance procedures.
- Procedures for programs identified in Section 5.4, as required or as applicable.

These procedures/plans and revisions are reviewed by technical support personnel and approved by facility management. Procedures/plans enter the USQ review process as required.

Temporary changes to procedures/plans may be made provided the changes are documented and reviewed, enter the USQ process, and are approved.

Document control is implemented through the Quality Assurance and Configuration Management programs.

### 5.4 ADMINISTRATIVE PROGRAMS

This section establishes programmatic administrative controls committed to in the WASTE STORAGE FACILITIES DSA.

#### 5.4.1 RADIATION PROTECTION PROGRAM

A radiation protection program SHALL be established, implemented, and maintained to ensure that radiation exposure to employees, subcontractors, visitors, and members of the general public is controlled at levels specified in applicable DOE regulations and standards (10 CFR 835) and adhere to the as-low-as-reasonably-achievable (ALARA) principle. The program includes the following key elements:

- As Low As Reasonably Achievable (ALARA) program.
- Dosimetry program.
- Radiological monitoring procedures.

#### 5.4.2 CRITICALITY SAFETY PROGRAM

A criticality safety program SHALL BE established, implemented, and maintained to ensure that all WASTE STORAGE FACILITIES operations and activities are reviewed, evaluated, and documented by LLNL criticality safety engineers in accordance with all contractor-applicable provisions of DOE Order 420.1B (DOE 2005b). This program includes the following key elements:

- Fissile material inventory control.
- Nuclear Criticality safety training.

#### 5.4.3 UNREVIEWED SAFETY QUESTION PROCESS

A process SHALL be established, implemented, and maintained to evaluate potential Unreviewed Safety Questions (USQs). Key elements of the process include the following:

- A USQ process that permits facility management to make physical and procedural changes and conduct tests and experiments without prior DOE approval as long as these changes and tests do not explicitly or implicitly affect the safety basis of the WASTE STORAGE FACILITIES or result in a change to a TSR.
- A USQ process that ensures conditions or potential conditions outside the safety basis are identified.

Section 5.6.1 of the DSA lists equipment important to safety.

### 5.4.4 CONFIGURATION MANAGEMENT PROGRAM

A configuration management program SHALL be established, implemented, and maintained in accordance with the NMTP Nuclear Facility Configuration Management Plan (LLNL latest revision-f). This program includes the following key elements:

- Program management.
- Design requirements.
- Document control.
- Change control.
- Assessments.

### 5.4.5 FIRE PROTECTION PROGRAM

A fire protection program SHALL be established, implemented, and maintained to reduce threats to the public, worker, and the environment resulting from a fire. This program is in accordance with DOE order 420.1B (DOE 2005b). This program includes the following key elements:

- A 20-ft exclusion zone marked in the DWTF yard between the WASTE STORAGE FACILITIES and the B695 Segment.
- Routine fire protection assessments are conducted to identify fire hazards.
- Inspection, testing, and maintenance of fire protection systems (e.g., fire suppression, fire detection).
- No trucks allowed in TRU storage areas.
- No flammable fueled forklifts stored in TRU storage areas.

### 5.4.6 EMERGENCY PREPAREDNESS PROGRAM

An emergency preparedness program SHALL be established, implemented, and maintained to ensure that RHWM personnel are trained (in accordance with the RHWM Training Implementation Matrix) to react appropriately to emergencies, whether local or site-wide. This program is implemented by the applicable elements of Document 22.1, "Emergency Preparedness and Response," in the *ES&H Manual* (LLNL latest version-a), in the RHWM Contingency Plan (LLNL latest revision-b), and in the FSPs. This program includes personnel response procedures and evacuation routes. The *LLNL Emergency Plan* (LLNL latest revision-c) describes the system's organizational elements, interfaces, authorities, responsibilities, resources, and actions to be taken in response to emergencies.

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### 5.4.7 IN-SERVICE INSPECTION & TEST, AND MAINTENANCE PROGRAMS

An in-service inspection & test program and maintenance program SHALL be established, implemented, and maintained to ensure the integrity of the Design Features in Section 6. The In-service Inspection & Test Program includes the APPROVED TRU WASTE CONTAINER maintenance program and building inspection program as described below. Inspections and tests SHALL be performed by qualified personnel.

An APPROVED TRU WASTE CONTAINER maintenance program SHALL be established, implemented, and maintained to preserve container integrity. This program includes:

- Initial acceptance, weekly, and off-normal event inspections of APPROVED TRU WASTE CONTAINER visually verifying vents are present on all APPROVED TRU WASTE CONTAINERS, except TRU oversize boxes and LLW converted to TRU WASTE after assay as well as to evaluate the integrity, to include checks for rusting, corrosion, damage, denting, swelling, and damage to filter vents.

A building and partition inspection program SHALL be established, implemented, and maintained. This program includes:

- Inspections every five years or less by a qualified engineer (e.g., structural, civil, fire protection) to verify that significant physical deterioration or damage of the structural system has not occurred and the system meets applicable PC-2 requirements.

### 5.4.8 QUALITY ASSURANCE PROGRAM

A quality assurance (QA) program SHALL be established, implemented, and maintained in accordance with 10 CFR 830, Subpart A, "Quality Assurance Requirements" and DOE Order 414.1C, *Quality Assurance*. This program ensures that the design, construction, modification, configuration and operation of safety-class and safety-significant SSCs meet applicable DOE and LLNL engineering and safety standards and is integrated into the Configuration Management Program.

### 5.4.9 OCCURRENCE REPORTING

A program SHALL be established, implemented, and maintained for occurrence reporting of events and conditions that have safety, health, or environmental implications. This program ensures that both NNSA and LLNL management are informed of all events that could (1) impact the health and safety of the public, (2) seriously impact the intended purpose of NNSA facilities, (3) have a noticeably adverse effect on the environment; or (4) endanger the health and safety of workers. The program complies with DOE Order 231.1A, Change 1, including DOE Manual 231.1-2, Occurrence Reporting and Processing of Operations Information, and includes the following key elements:

- Preservation of the scene.
- DOE and management notification.

## Technical Safety Requirements for the Waste Storage Facilities

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- Incident and causal analysis.
- Development of action items.
- Event or condition categorization.

### 5.4.10 HAZARDOUS MATERIAL PROTECTION PROGRAM

A HAZARDOUS MATERIAL protection program SHALL BE established, implemented, and maintained to ensure that exposure of employees, subcontractors, visitors, and members of the general public to HAZARDOUS MATERIALS is controlled to safe levels consistent with the ALARA principle. The program includes the following key elements:

- Single Container Inventory Limit (SCIL) limits the quantity of a chemical that can be stored in any one container.

### 5.4.11 TRAFFIC CONTROL PROGRAM

A traffic control program SHALL be established, implemented, and maintained to provide protection from vehicular traffic for TRU waste in the yard. The traffic control program is intended to limit the speed of vehicles while in the yard and includes speed limits (15 mph) posted in the yard and vehicles required to stop at the yard gate before entering. This program is implemented through the FSPs.

## 5.5 MINIMUM STAFFING REQUIREMENTS

RHWM Facilities normally operate on a single day shift, Monday through Friday. There are no minimum staffing requirements for passive operations such as storage. The Facility Manager determines the minimum staffing requirements for operation of the facility.

**Table 5-1. Minimum Staffing Requirements**

Required Staffing	During normal working hours	After normal working hours
Health and safety (H&S) technician <sup>a</sup>	1 <sup>b</sup>	1 <sup>b</sup>
Facility Manager (or designee)	1 <sup>b</sup>	1 <sup>c</sup>

a The H&S technician or equivalent health and safety representative approved by the Facility manager.

b LLNL Onsite – not required to be in the Facility.

c On call.

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### 5.6 OPERATING SUPPORT

ES&H support organizations provide technical support for radiation safety, fire protection, industrial hygiene, industrial safety, and environmental analysis. The Nuclear Operations Directorate provides support to meet safety basis and criticality safety requirements. Health & safety technicians SHALL be on site when work is being performed and SHALL be on call at all other times. For emergencies (in case of accidents involving radioactive material) after normal working hours, emergency response personnel can be contacted by calling 911. In the event of an emergency, additional LLNL support can be provided as part of the Emergency Preparedness Program.

### 5.7 FACILITY STAFF QUALIFICATIONS AND TRAINING

A training program SHALL be established, implemented, and maintained to ensure that personnel responsible for RHWM operations are trained and qualified, as applicable, to perform their assigned responsibilities safely. This program includes forklift and crane operators who handle waste containers, or who operate a forklift or crane in the vicinity of waste containers; such personnel SHALL be trained and licensed in accordance with LLNL requirements, with specific reference to safe practices for lifting and handling waste containers. The *Training Implementation Matrix for the Radioactive and Hazardous Waste Management Division* (LLNL latest revision-d) addresses the requirements of DOE Order 5480.20A, Change Notice 1, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities* (DOE 2001).

### 5.8 RECORDKEEPING

A records retention program SHALL be established, implemented, and maintained as described in LLNL records management policies and procedures. The program includes retention of the following documents:

- Records and logs of operations.
- Records and logs of principal maintenance activities, inspections, repairs, and replacement of principal equipment items related to safety-significant SSCs.
- All reportable events/occurrences.
- Records of training and qualifications of WASTE STORAGE FACILITIES staff.
- Records of USQ documents.

### 5.9 REVIEWS AND AUDITS

Reviews are performed by facility staff to ensure that day-to-day activities are conducted in accordance with the safety basis. Some of these reviews are described in the *Inspection Schedule and Guidance* (LLNL latest revision-e). Technical review, audit, and self-assessment of facility activities and programs that affect safety are performed independent of the facility staff by ES&H personnel and Nuclear Operations Directorate analysts and engineers.

Written records of facility reviews, technical reviews, audits, and assessments SHALL be maintained in accordance with the Quality Assurance (QA) Program. In conjunction with the QA Program and the Integrated Safety Management System (ISMS), Configuration Management (CM) ensures the Laboratory achieves its safety goal. The CM Program (LLNL latest revision-f), including the Unreviewed Safety Question (USQ) process, and QA Program provide a systematic process for assuring the status of facility safety basis requirements, and maintaining the appropriate descriptive documentation. The CM Program implements a graded approach, applying greatest rigor to management of configuration items whose failure poses the greatest risks.

### 5.10 DEVIATIONS FROM TECHNICAL SAFETY REQUIREMENTS

#### 5.10.1 GENERAL

The TSR document SHALL be prepared, reviewed independently, and approved in accordance with 10 CFR 830, Subpart B.

#### 5.10.2 COMPLIANCE

The TSRs SHALL be complied with, except for reasonable action taken in an emergency (see Section 5.10.6, below). RHWM management is responsible for ensuring that the requirements of these TSRs are met. Compliance SHALL be demonstrated by establishing, implementing, and maintaining the required SPECIFIC ADMINISTRATIVE CONTROLS (SACs) and Administrative Control (AC) Programs.

#### 5.10.3 VIOLATION OF TSRs

Violation of a TSR occurs as a result of failure to comply with an AC statement.

#### 5.10.4 VIOLATION OF AN ADMINISTRATIVE CONTROL

Failure to comply with the SACs in Section 5.11 constitutes a TSR violation. For the programmatic ACs listed in Section 5.4, violation occurs when the failure is of sufficient magnitude that the intent of the referenced program is not fulfilled. The U.S. Department of Energy (DOE) SHALL have the right, in consultation with RHWM facility management, to determine if a particular noncompliance will be considered a TSR violation.

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### 5.10.5 RESPONSE TO A TSR VIOLATION OF A SPECIFIC ADMINISTRATIVE CONTROL OR ADMINISTRATIVE PROGRAM

If a Specific Administrative Control or Administrative Program has been violated, proceed as follows:

- Evaluate and, if necessary, place the facility in a safe condition.
- Notify DOE of the violation in accordance with applicable LLNL procedures and DOE orders and regulations.
- Prepare an Occurrence Report in accordance with applicable LLNL procedures and DOE orders and regulations.
- Carry out the corrective actions to comply with the Specific Administrative Control or Administrative Program.

### 5.10.6 EMERGENCY ACTIONS

Emergency actions MAY be taken that depart from a requirement in the TSR provided that:

- An emergency situation exists;
- These actions are needed immediately to protect the public health and safety; and
- No action consistent with the TSR can provide adequate or equivalent protection.

Such emergency actions will be authorized by the facility manager, designee or incident commander and performed by personnel trained and qualified for the equipment or systems needed to perform the actions. If an emergency action is taken, both verbal notification and a written report will be made within 24 hours to the DOE Livermore Site Office Manager or designee.

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### 5.11 SPECIFIC ADMINISTRATIVE CONTROLS

This section establishes SPECIFIC ADMINISTRATIVE CONTROLS (SACs) committed to in the WASTE STORAGE FACILITIES DSA, which preserve critical assumptions in the safety analyses. Table 5-2 lists the SACs for the WASTE STORAGE FACILITIES.

**Table 5-2. Directive Action Specific Administrative Controls**

<b>Specific Inventory Limits</b>
<ul style="list-style-type: none"><li>For each approved TRU waste container in B696R or B625, the amount of radioactive material SHALL be no greater than 50 PE-Ci based on Acceptable Knowledge. Drum loading and configuration SHALL be administratively controlled to remain consistent with the National Environmental Policy Act (NEPA) bounding consequence calculations.</li></ul>
<ul style="list-style-type: none"><li>For each container, the fissile material inventory SHALL be no greater than 200 Pu-239 fissile gram equivalents (FGE).</li></ul>
<ul style="list-style-type: none"><li>The amount of tritium in a waste container SHALL be no greater than 2,000 Ci based on Acceptable Knowledge.</li></ul>
<ul style="list-style-type: none"><li>TRU WASTE arrays staged outside the building SHALL be limited to a maximum inventory of 200 PE-Ci and separated by a minimum of 10 feet.</li></ul>
<b>Specific Container Handling and Storage Provisions</b>
<ul style="list-style-type: none"><li>TRU WASTE storage SHALL be limited to B696R and B625.</li></ul>
<ul style="list-style-type: none"><li>All TRU WASTE SHALL be stored in APPROVED TRU WASTE CONTAINERS.</li></ul>
<ul style="list-style-type: none"><li>APPROVED TRU WASTE CONTAINERS SHALL not be stacked more than two levels high. Ten drum overpacks and other APPROVED TRU WASTE CONTAINERS exceeding a nominal height of 4 feet SHALL not be stacked.</li></ul>
<ul style="list-style-type: none"><li>The lids for APPROVED TRU WASTE CONTAINERS SHALL not be removed in the WASTE STORAGE FACILITIES.</li></ul>
<ul style="list-style-type: none"><li>APPROVED TRU WASTE CONTAINERS SHALL not be staged less than 130 m from the Greenville Road fenceline (i.e., east of the B693 structure).</li></ul>
<ul style="list-style-type: none"><li>Only waste in metal containers and on metal pallets SHALL be allowed in TRU WASTE storage areas.</li></ul>
<ul style="list-style-type: none"><li>Combustible loading shall be limited to an average of 7 pounds of equivalent ordinary combustibles per square foot, excluding waste containerized in metal packaging, in B625 and B696R.</li></ul>

## SECTION 6 DESIGN FEATURES

The following passive SSCs, as described in Chapter 4 of the WASTE STORAGE FACILITIES DSA, are designated as safety significant SSCs and specified as TSR design features:

- APPROVED TRU WASTE CONTAINERS (as defined in Section 1.1 of this TSR) are used to store TRU WASTE in the WASTE STORAGE FACILITIES.
- The B625 and B696R structural systems are maintained to meet applicable PC-2 criteria (i.e., seismic and wind).
- The B696S/B696R partition is a fire-resistive structure as described in Section 4.4.3.2 of the WASTE STORAGE FACILITIES DSA.

These design features SHALL be controlled to maintain their design (as specified in applicable design drawings and specifications) as of the effective date of this TSR document. Modifications or replacements SHALL maintain the same design features and functions as the original, including materials, methods of construction, physical dimensions, and other parameters specified in applicable industry codes and standards, unless engineering analysis demonstrates equivalency.

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## SECTION 7 REFERENCES

- DOE (2001), *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities*. DOE Order 5480.20A, Department of Energy, Washington, DC (July 2001).
- DOE (2004), *Environment, Safety, and Health Reporting*, DOE Order 231.1A, U.S. Department of Energy, Washington, DC (August 2003).
- DOE (2005a), *Contact-Handled Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant*, DOE/WIPP-02-3122, U.S. Department of Energy, Carlsbad Field Office (April 25, 2005).
- DOE (2005b), *Facility Safety*. DOE Order 420.1B, U.S. Department of Energy, Washington, DC (December 2005).
- DOE (2005c). *Final Site-wide Environmental Impact Statement for Continued Operation of Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic Environmental Impact Statement*, DOE/EIS-0348, DOE/EIS-0236-S3, March 2005.
- HC/AB-B696-0301, "Fire involving flammable liquids and separation distances," Joong M. Yang, Lawrence Livermore National Laboratory, Livermore, CA, March 2003.
- FR (2005), *Record of Decision of the Final Site-Wide Environmental Impact Statement for Continued Operation of Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic Environmental Impact Statement*, November 29, 2005 (Federal Register/Vol. 70, No. 228).
- LLNL (latest revision-a), *Environment, Safety, and Health Manual*, Lawrence Livermore National Laboratory, Livermore, CA (UCRL-AM-133867).
- LLNL (latest revision-b), *Contingency Plan for Radioactive and Hazardous Waste Management Facilities: Area 612, Area 514, Building 233 CSU, and the Decontamination and Waste Treatment Facility*, Lawrence Livermore National Laboratory, Livermore, CA (UCRL-AR-127066).
- LLNL (latest revision-c), *LLNL Emergency Plan*, Lawrence Livermore National Laboratory, Livermore, CA (UCRL-MA-113311).
- LLNL (latest revision-d), *Training Implementation Matrix for the Radioactive and Hazardous Waste Management Division*, Lawrence Livermore National Laboratory, Livermore, CA (UCRL-AR-116655).
- LLNL (latest revision-e), *Inspection Schedule and Guidance*, Lawrence Livermore National Laboratory, Livermore, CA.
- LLNL (latest revision-f), *NMTP Nuclear Facility Configuration Management Plan*, Lawrence Livermore National Laboratory, CA

## Technical Safety Requirements for the Waste Storage Facilities

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LLNL (2003), CSM 1344, "Criticality Safety Evaluation On the Use of 200-gram Pu Drum Mass Limit for RHWM Waste Storage Operations," Lawrence Livermore National Laboratory, August 2003.

LLNL (2009), *Documented Safety Analysis for the Waste Storage Facilities*, Lawrence Livermore National Laboratory, Livermore, CA, March 2010 (LLNL-TR-404821).

WHC-SD-WM-TRP-246, "Solid Waste Drum Array Fire Performance," Rev. 0, Westinghouse Hanford Company, 1995.

## Appendix A SL AND LCO Bases

Because no safety limits (SLs) or limiting conditions for operation (LCOs) have been identified as necessary to support the safety analysis of the RHWM, no bases explaining the reasons for these requirements have been included in this TSR document. Appendix A was retained for consistency with the TSR section numbering system.

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## Appendix B Bases For Specific Administrative Controls

### BASES OF SACS

This appendix contains a summary of administrative controls for the WASTE STORAGE FACILITIES that perform a specific preventive or mitigative function for the accident scenarios in the DSA. The safety function of these administrative controls has importance similar to the safety function of a safety SSC. The SACs are judged to provide significant preventive or mitigative functions for potential accident scenarios or are identified as initial condition assumptions used in the unmitigated and mitigated consequence evaluation in the hazard analysis. This description is provided so that the WASTE STORAGE FACILITIES operations staff knows the exact conditions that have to be met and the associated basis.

This appendix is divided into two main sections, SACs related to inventory and SACs related to storage and handling and contains three sections for each SAC: Critical Safety Function, Control Description, and Basis.

### B.1 TRU WASTE INVENTORY LIMITS

#### B.1.1 CRITICAL SAFETY FUNCTION

A maximum inventory per container of 50 PE-Ci was used as the MAR for most hazard and accident analyses involving TRU WASTE. Thus, the container inventory limit is an assumed initial condition in the hazard and accident analyses in Sections 3.3 and 3.4 of the WASTE STORAGE FACILITIES DSA. The SAC protects this assumption and ensures that the consequences determined in the hazard and accident analyses remain bounding.

WASTE STORAGE FACILITIES are also required to comply with NEPA analysis in the current LLNL Environmental Impact Statement (EIS). The NEPA analysis establishes a bounding consequence based on overall facility inventory parameters. This SAC also requires that drum loading and configuration, remain within the NEPA bounding consequence calculations. This limit was specifically used for all air craft crash scenarios with fire evaluated in the hazard and accident analysis.

#### B.1.2 CONTROL DESCRIPTION

- For each approved TRU waste container in B696R or B625, the amount of radioactive material SHALL be no greater than 50 PE-Ci based on Acceptable Knowledge. Drum loading and configuration SHALL be administratively controlled to remain consistent with the National Environmental Policy Act (NEPA) bounding consequence calculations.

## Technical Safety Requirements for the Waste Storage Facilities

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### B.1.3 BASIS

This SAC limits the amount of radioactive material that can be impacted by postulated accidents involving TRU WASTE in the WASTE STORAGE FACILITIES and maintains consistency with the NEPA bounding consequence calculations.

## B.2 FISSILE MATERIAL CONTAINER LIMIT

### B.2.1 CRITICAL SAFETY FUNCTION

200 Pu-239 FGE was identified as an assumed condition in the hazard analysis criticality event scenarios. This control serves to limit the quantity of fissile material in each APPROVED TRU WASTE CONTAINER. The material form, packaging and segregation required by the Criticality Safety Program preclude the possibility of an inadvertent criticality for 200 grams of Pu-239. CSM 1344 (LLNL 2003), "Criticality Safety Evaluation" On the Use of 200-gram Pu Drum Mass Limit for RHWM Waste Storage Operations," provides the technical basis for the 200 Pu-239 FGE.

### B.2.2 CONTROL DESCRIPTION

- For each container, the fissile material inventory SHALL be no greater than 200 Pu-239 fissile gram equivalents (FGE).

### B.2.3 BASIS

This SAC limits the amount of fissile material in a container to preclude an inadvertent criticality.

## B.3 TRITIUM CONTAINER LIMIT

### B.3.1 CRITICAL SAFETY FUNCTION

A maximum inventory per container of 2,000 Ci of tritium was used as the MAR for the hazard and accident analyses. Thus, the container inventory limit for tritium is an assumed condition in the hazard and accident analyses in Sections 3.3 and 3.4 of the WASTE STORAGE FACILITIES DSA, and serves to limit the quantity of tritium that can be impacted in accident scenarios. The SAC protects this assumption and ensures that the consequences determined in the hazard and accident analyses remain bounding.

### B.3.2 CONTROL DESCRIPTION

- The amount of tritium in a waste container SHALL be no greater than 2,000 Ci based on Acceptable Knowledge.

### B.3.3 BASIS

This SAC limits the amount of radioactive material that can be impacted by postulated accidents involving LLW containing tritium in the WASTE STORAGE FACILITIES.

### B.4 TRU WASTE STAGING LIMITS

#### B.4.1 CRITICAL SAFETY FUNCTION

The MAR of 200 PE-Ci was used in the hazard and accident analyses as the maximum inventory for an impacted array of staged waste containers in the yard. Thus, the outdoor array limit is an assumed condition in the hazard and accident analyses in Sections 3.3 and 3.4 of the WASTE STORAGE FACILITIES DSA, and serves to limit the quantity of radioactive material that can be impacted in accident scenarios involving staged waste.

By separating arrays by 10 feet (HC/AB-B696-0301), drums in one array will not fail from exposure to the critical radiant heat flux of  $45 \text{ kW/m}^2$  (identified in WHC-SD-WM-TRP-246, 1995) from a fire in another array.

#### B.4.2 CONTROL DESCRIPTION

- TRU WASTE arrays staged outside the building SHALL be limited to a maximum inventory of 200 PE-Ci and separated by a minimum of 10 feet.

#### B.4.3 BASIS

This SAC limits the amount of radioactive material that can be impacted by accidents in the yard.

### B.5 AUTHORIZED TRU WASTE STORAGE LOCATIONS

#### B.5.1 CRITICAL SAFETY FUNCTION

The hazard analysis assumes that TRU WASTE is stored in building structures meeting PC-2 requirements. In addition, it assumes that TRU WASTE is not stored coincident with flammable liquid storage areas. This control serves to limit the locations that are authorized to store TRU WASTE to protect these assumptions.

#### B.5.2 CONTROL DESCRIPTION

- TRU WASTE storage SHALL be limited to B696R and B625.

#### B.5.3 BASIS

This SAC limits the locations that are authorized for TRU WASTE storage.

### **B.6 STORAGE IN APPROVED TRU WASTE CONTAINERS**

#### **B.6.1 CRITICAL SAFETY FUNCTION**

Containers provide a confinement function limiting worker exposures and radioactive waste vulnerability in accident scenarios involving containerized TRU WASTE. Accordingly, APPROVED TRU WASTE CONTAINERS meeting specified criteria were an assumed condition in the hazard and accident analyses for scenarios involving TRU WASTE. APPROVED TRU WASTE CONTAINERS typically have vents, which minimize the potential for buildup of gases.

#### **B.6.2 CONTROL DESCRIPTION**

- All TRU WASTE SHALL be stored in APPROVED TRU WASTE CONTAINERS.

#### **B.6.3 BASIS**

This SAC reduces the frequency of common spill and fire accidents during normal waste-container operations and reduces the probability of breaching of containers stored on either the first or second level during a natural phenomena event. Vents reduce the frequency of buildup of flammable gases from radiolysis which reduces the probability of a deflagration.

### **B.7 APPROVED TRU WASTE CONTAINER STACKING LIMITS**

#### **B.7.1 CRITICAL SAFETY FUNCTION**

Stacking APPROVED TRU WASTE CONTAINERS no more than two high was identified in seismic hazard analysis scenarios as a credited control. Containers meeting the free drop test DOT Type A packaging performance criteria [49 CFR 173.465(c)(1)] are used to store TRU WASTE. These containers are designed to survive at least a 4-ft drop consistent with the performance criteria for Type A packaging. This SAC serves to ensure that stacked containers will not fall greater than 4-ft in the event of an earthquake, and hence will not breach. Ten drum overpacks are approximately 6-ft in height, and therefore, are not stacked.

#### **B.7.2 CONTROL DESCRIPTION**

- APPROVED TRU WASTE CONTAINERS SHALL not be stacked more than two levels high. Ten drum overpacks and other APPROVED TRU WASTE CONTAINERS exceeding a nominal height of 4 feet SHALL not be stacked.

#### **B.7.3 BASIS**

This SAC minimizes the potential for drum failure from toppling since APPROVED TRU WASTE CONTAINERS are designed to withstand a 4-ft drop.

## Technical Safety Requirements for the Waste Storage Facilities

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### B.8 APPROVED TRU WASTE CONTAINER LIDS

#### B.8.1 CRITICAL SAFETY FUNCTION

The hazard and accident analyses assume that TRU WASTE in the WASTE STORAGE FACILITIES is maintained in closed containers. The assumed condition in the WASTE STORAGE FACILITIES DSA for all TRU WASTE scenarios is that the waste is confined in APPROVED TRU WASTE CONTAINERS. Removing the lids of APPROVED TRU WASTE CONTAINERS is outside the scope of work at the WASTE STORAGE FACILITIES.

#### B.8.2 CONTROL DESCRIPTION

- The lids for APPROVED TRU WASTE CONTAINERS SHALL not be removed in the WASTE STORAGE FACILITIES.

Note: Lids may be removed for LLW that has been converted to TRU WASTE following acceptance by RHWM in order to replace the lid with one that has a filter vent.

Note: Removal of a filter vent for maintenance, replacement or sampling is not lid removal.

#### B.8.3 BASIS

The hazard and accident analyses assume that waste is maintained in metal containers with closed lids. Removing the lids of APPROVED TRU WASTE CONTAINERS is outside the scope of work at the WASTE STORAGE FACILITIES. Removing and replacing filter vents is allowed for maintenance, non-intrusive inspection, and sampling activities. Filter vents do not contribute to the overall structural integrity of a metal container; the removal of the filter vents does not affect the overall structural integrity of a metal container.

### B.9 APPROVED TRU WASTE STAGING LOCATIONS

#### B.9.1 CRITICAL SAFETY FUNCTION

The accident analysis in Section 3.4 of the WASTE STORAGE FACILITIES DSA assumed that releases of TRU waste occurred no less than 130 m from the site boundary (Greenville Road fence line). Thus, this distance is an assumed condition in the accident analysis in Section 3.4 of the WASTE STORAGE FACILITIES DSA, and serves to limit the consequences to the off-site public.

#### B.9.2 CONTROL DESCRIPTION

- APPROVED TRU WASTE CONTAINERS SHALL not be staged less than 130 m from the Greenville Road fenceline (i.e., east of the B693 structure).

#### B.9.3 BASIS

This SAC provides assumptions in the DSA since 130 m is the minimum distance to the fence line assumed for postulated TRU WASTE accidents involving staged waste in the hazard and accident analyses.

## Technical Safety Requirements for the Waste Storage Facilities

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### **B.10 USE OF METAL CONTAINERS AND PALLETS FOR WASTE IN TRU WASTE STORAGE AREAS**

#### **B.10.1 CRITICAL SAFETY FUNCTION**

The use of metal containers and pallets for waste stored in TRU WASTE storage areas limits the potential for fire initiation and propagation during operational or other events in TRU WASTE storage areas by limiting available combustibles. This is a credited control for waste handling and natural phenomena hazard scenarios in the hazard analysis. This control serves to ensure that LLW, hazardous, and other wastes that can be stored coincident with TRU WASTE are in non-combustible packaging and on non-combustible pallets.

#### **B.10.2 CONTROL DESCRIPTION**

- Only waste in metal containers and on metal pallets SHALL be allowed in TRU WASTE storage areas.

#### **B.10.3 BASIS**

This SAC limits the potential for fire initiation and propagation during operational or other events in TRU WASTE storage areas to mitigate consequences from fires involving TRU WASTE.

### **B.11 COMBUSTIBLE LOADING LIMITS**

#### **B.11.1 CRITICAL SAFETY FUNCTION**

The safety function of the SAC is to limit the size of a fire in B625 and B696R..

#### **B.11.2 CONTROL DESCRIPTION**

- Combustible loading shall be limited to an average of 7 pounds of equivalent ordinary combustibles per square foot, excluding waste containerized in metal packaging, in B625 and B696R.

#### **B.11.3 BASIS**

The 7-lb/ft<sup>2</sup> fire loading limit ensures that the amount of combustible material allowed in B625 and B696R is no more than assumed in the hazard analysis and accident analysis. The B696S/B696R fire-resistive partition is expected to maintain segmentation between B696S and B696R in the event of a 7-lb/ft<sup>2</sup> fire.