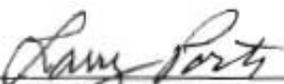


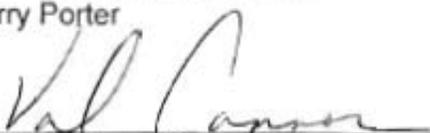
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Revision 0

Waste-Specific Data Package TRAMPAC for Shipment of CH-TRU Waste from LANL Plutonium Isentropic Compression Experiments

Approved by: 
CCP Site Project Manager
Larry Porter

Date: 12/9/10

Approved by: 
CCP Quality Assurance
Val Cannon

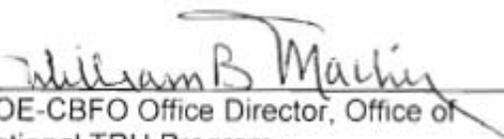
Date: 12/9/10

Approved by:  For DK Ploetz
CCP Manager
David Ploetz

Date: 12/9/10

Approved by: 
DOE-CBFO Office Director,
Office of Quality Assurance
Dennis Miehl

Date: 12-9-10

Approved by: 
for DOE-CBFO Office Director, Office of
National TRU Program
J.R. Stroble

Date: 12-13-10

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1.0 INTRODUCTION

1.1 Purpose

The purpose of this *Waste-Specific Data Package TRAMPAC for Shipment of CH-TRU Waste from LANL Plutonium Isentropic Compression Experiments* is to describe and document how each of the requirements for TRUPACT-II transportation is met for drums containing waste from the Los Alamos National Laboratory (LANL) Plutonium Isentropic Compression Experiments (Pu-ICE) to be transported from Sandia National Laboratories/New Mexico (SNL/NM) in Albuquerque, New Mexico. The TRUPACT-II transportation requirements are defined in the *Contact-Handled Transuranic Waste Authorized Methods for Payload Control (CH-TRAMPAC)* (Reference 1). As specified in Section 1.4 of the CH-TRAMPAC, a waste-specific data TRAMPAC may be written by the shipper and approved by the U.S. Department of Energy (DOE) Carlsbad Field Office for small quantity shipments. This *Waste-Specific Data Package TRAMPAC for Shipment of CH-TRU Waste from LANL Plutonium Isentropic Compression Experiments* documents the evaluation of the source data against the requirements of the CH-TRAMPAC. The data evaluation and the documentation of compliance results in this document were completed in accordance with the quality assurance (QA) program under the Central Characterization Project (CCP) Waste Isolation Pilot Plant certification program (Reference 2).

This document presents the information necessary for TRUPACT-II shipment of one standard waste box (SWB) overpacking three 55-gallon drums of contact-handled transuranic (CH-TRU) waste from the LANL Pu-ICE conducted at SNL/NM.

1.2 Scope

This *Waste-Specific Data Package TRAMPAC for Shipment of CH-TRU Waste from LANL Plutonium Isentropic Compression Experiments* applies to Drum Nos. LA00000066100, LA00000066101, and LA00000066102, each of which will be overpacked in SWB No. LA00000066104.

1.3 Background

Each of the 55-gallon drums described by this document consists of one Pu-ICE post-shot containment system, including plutonium (Pu) targets, generated from the Z machine experiments requested by LANL and conducted at SNL/NM. SNL/NM fabricated the containment systems. The containment system consisted of three parts: an ultra-fast closure valve (UCV) and vent tank, an upper containment chamber (UCC), and a load assembly (LA). The plutonium targets, fabricated by LANL under QA and quality control procedures with certified isotopic compositions, were placed in the LA. The containment systems were loaded into the SNL/NM Z machine (Reference 3).

The SNL/NM Z machine was developed by DOE to support its science-based approach to stockpile stewardship. In 1992, the U.S. Congress passed legislation to discontinue above- and below-ground testing of nuclear weapons. Because of this, DOE relies on laboratory experiments, such as those conducted with the Z machine, and computer-based calculations to verify the reliability of the nation's nuclear stockpile (Reference 3).

As part of the Pu-ICE, detonators with high explosive (HE) were used to close the UCV. After an experiment was concluded, SNL/NM personnel verified that all detonators were fired and that all contained HE was expended. The entire Pu-ICE post-shot containment system was removed from the Z machine and was placed in a 55-gallon drum. SNL/NM temporarily stored this waste under an established and documented waste management program (Reference 4). The completion of SNL/NM activities with respect to this waste were conducted in accordance with PLA 96-15, *Regulated Waste/Nuclear Material Disposition Department Quality Assurance Plan (QAP)* (Reference 5).

While additional Pu-ICE post-shot containment systems will be generated from the ongoing Z machine experiments, this document describes CH-TRAMPAC compliance of the first three 55-gallon drums packaging Pu-ICE post-shot containment systems.

A Generator Knowledge Report for the Plutonium Isentropic Compression Experiments Containment Systems (Reference 3) was prepared by LANL to systematically organize, evaluate, and summarize detailed generator knowledge information about the Pu-ICE post-shot containment systems. The report provides detailed information about processes at both LANL and SNL/NM associated with the waste. In addition to the generator knowledge report (Reference 3), this document references CCP plans and procedures that have been or will be used to qualify SWB No. LA00000066104 overpacking Drum Nos. LA00000066100, LA00000066101, and LA00000066102 that contain the Pu-ICE post-shot containment systems for TRUPACT-II shipment. The following CCP documents will be implemented for the certification of SWB No. LA00000066104 and Drum Nos. LA00000066100, LA00000066101, and LA00000066102 based on the compliance data documented herein:

- CCP-PO-401, *CCP Contact-Handled Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPAC) for Intersite Shipments* (Reference 6)
- CCP-TP-404, *CCP Contact-Handled Transuranic Waste Certification and Intersite Shipping Module Data Entry for Intersite Shipments* (Reference 7)
- CCP-TP-405, *CCP Intersite Shipments of Contact-Handled Transuranic Waste* (Reference 8)

2.0 CONTAINER AND PHYSICAL PROPERTIES REQUIREMENTS

2.1 Authorized Payload Containers

2.1.1 Requirements

As specified by Section 2.1.1 of the CH-TRAMPAC, 55-gallon drums and SWBs are authorized payload containers for transport in the TRUPACT-II, provided they meet the specifications of Section 2.9.1 and Section 2.9.8 of the CH-TRAMPAC. As specified in Section 2.9.8 of the CH-TRAMPAC, CH-TRU waste may be loaded into up to four 55-gallon drums and overpacked in an SWB (i.e., "SWB overpack") (Reference 1).

Section 2.1.2 of the CH-TRAMPAC requires the inspection of the integrity of the payload containers prior to shipment (Reference 1).

2.1.2 Methods of Compliance and Verification

Three Pu-ICE post-shot containment systems will be packaged in three 55-gallon drums and overpacked in one SWB all of which meet the applicable specifications. The 55-gallon drums and SWB for the packaging of the Pu-ICE post-shot containment systems are procured by CCP personnel in accordance with CCP-QP-015, *CCP Procurement* (Reference 9). Upon receipt at SNL/NM, the 55-gallon drums and SWB are inspected by SNL/NM personnel in accordance with FOP 00-02, *Waste Handling* (Reference 10), to ensure that the containers are compliant with procurement requirements.

Prior to transport, the integrity of SWB No. LA00000066104 (overpacking the drums) will be visually inspected by CCP personnel in accordance with CCP-TP-405 (Reference 8).

2.2 Dunnage

2.2.1 Requirements

As specified in Section 2.2.1 of the CH-TRAMPAC, a shipper shall use an empty SWB as dunnage to complete a payload configuration if too few loaded payload containers are available. An empty SWB used as dunnage to complete a TRUPACT-II payload of two SWBs must meet the specifications presented in Section 2.9.8 of the CH-TRAMPAC with the exception that the dunnage SWB shall have at least one open vent port (i.e., not filtered or plugged) (Reference 1).

2.2.2 Methods of Compliance and Verification

One empty SWB will be used to complete the TRUPACT-II payload containing the Pu-ICE post-shot containment systems. The dunnage SWB will meet the specifications of Section 2.9.8 of the CH-TRAMPAC, except as required by Section 2.2.1 of the CH-TRAMPAC the dunnage SWB will have at least one open vent port (i.e., not filtered or plugged). One empty SWB procured by CCP in accordance with CCP-QP-015 (Reference 9) will be used to complete the TRUPACT-II payload. CCP personnel will ensure that the dunnage SWB meets all applicable requirements in accordance with CCP-TP-405 (Reference 8).

2.3 Container/Assembly Weight and Center of Gravity

2.3.1 Requirements

As specified by Section 6.2.1.1.1 of the CH-TRAMPAC, if payload containers are overpacked, the limit for the maximum allowable weight applies only to the outermost payload container of the overpacked configuration. As specified by Section 2.3.1 of the CH-TRAMPAC, the applicable weight limit for the SWB overpacking the drums containing the Pu-ICE post-shot containment systems is 4,000 pounds per SWB. For transportation in the TRUPACT-II, the following additional weight limits apply (as specified in Section 2.3.1 of the CH-TRAMPAC) (Reference 1):

- 7,265 pounds per TRUPACT-II payload assembly, including pallets, spacers, guide tubes, slip sheets, reinforcing plates, and banding material
- 19,250 pounds per loaded TRUPACT-II.

Compliance shall be by measurement. As specified by Section 2.3.2.1 of the CH-TRAMPAC, the weight of each loaded payload container shall be determined using a calibrated scale. The scale calibrations shall be in accordance with the National Institute of Standards and Technology (NIST) Handbook 44 or an equivalent standard. The measured weight and measurement error of each payload container shall be recorded in the Payload Container Transportation Certification Document (PCTCD) and Overpack Payload Container Transportation Certification Document (OPCTCD). The measurement error is determined from the scale calibration tolerance. If multiple scales are used, a bounding value based on the highest scale calibration tolerance may be used to determine the measurement error (Reference 1).

2.3.2 Methods of Compliance and Verification

Compliance shall be by measurement. The Pu-ICE post-shot containment systems and 55-gallon drums were weighed by SNL/NM personnel in accordance with *Loading and Unloading of SNM/Explosive Hardware* (Reference 11). Pursuant to Section 2.3.2.1 of the CH-TRAMPAC, the scale calibrations shall be in accordance with the NIST Handbook 44 or an equivalent standard (Reference 1). The SNL/NM scale was calibrated in accordance with Eilon Engineering Calibration Procedure #10.2 (Reference 12), which required compliance with American National Standards Institute (ANSI) ANSI.NCSL Z540-1 (Reference 12). Based on the calibration tolerance of the scale used to measure the weights of the Pu-ICE post-shot containment systems and drums, the measurement error associated with the weight values is +/- 3 lbs (Reference 13). Table 1, Weights of Loaded Drum Nos. LA00000066100, LA00000066101, and LA00000066102, provides the weights (including error) of each loaded 55-gallon drum (References 3, 14):

Table 1. Weights of Loaded Drum Nos. LA00000066100, LA00000066101, and LA00000066102

55-Gallon Drum No.	Weight (lbs)	Measurement Error (+/-3 lbs)	Total Weight (lbs)
LA00000066100	895.0	3	898.0
LA00000066101	912.2	3	915.2
LA00000066102	885.0	3	888.0

Based on the weights summarized in Table 1, the loaded weight of SWB No. LA00000066104 overpacking the three drums (with one dunnage 55-gallon drum used for blocking and bracing within the SWB [see Section 2.8]) will be less than 4,000 lbs. As such, SWB No. LA00000066104 will comply with the applicable maximum allowable gross weight limit of 4,000 pounds per SWB following the addition of the measurement error, as specified in Section 2.3.1.1 of the CH-TRAMPAC. In accordance with CCP-TP-404 (Reference 7) and CCP-TP-405 (Reference 8) and using the weight measurement data collected by SNL/NM as summarized above (i.e., measured drum weights, error determination, and evidence of use of a calibrated scale), CCP personnel will evaluate compliance of SWB No. LA00000066104 with the CH-TRAMPAC limit as specified in Section 2.3.1.1 of the CH-TRAMPAC. The CCP Transportation Certification Official (TCO) will verify compliance with the SWB weight requirement and document on the OPCTCD.

In accordance with CCP-TP-405 (Reference 8), CCP personnel will calculate the total weight of the payload assembly and evaluate compliance with the maximum payload assembly and loaded TRUPACT-II limits as specified above and in Section 2.3 of the CH-TRAMPAC. Based on the drum weights, the total payload weight (including a dunnage SWB and the payload assembly materials) will be less than the TRUPACT-II maximum payload assembly weight limit of 7,265 pounds. As such, the payload assembly weight limit will be met for the TRUPACT-II payload containing SWB No. LA00000066104 (overpacking Drum Nos. LA00000066100, LA00000066101, and LA00000066102). The CCP TCO will verify compliance with the payload weight requirement and document on the Payload Assembly Transportation Certification Document (PATCD).

2.4 Center of Gravity

2.4.1 Requirements

As required by Section 2.3.1.2 of the CH-TRAMPAC, the total weight of payload container(s) in the top layer of the payload assembly shall be less than or equal to the total weight of the payload container(s) in the bottom layer of the payload assembly (Reference 1).

2.4.2 Methods of Compliance and Verification

CCP personnel, in accordance with CCP-PO-401 (Reference 6), will complete the payload assembly and loading activities such that the total weight of the top SWB of the payload assembly is less than or equal to the total weight of the bottom SWB. This will be accomplished by loading SWB No. LA00000066104 as the bottom SWB. CCP personnel will document compliance with the center of gravity requirement on the PATCD for the TRUPACT-II in accordance with CCP-TP-405 (Reference 8).

2.5 Container Marking

2.5.1 Requirements

As specified by Section 2.4.1 of the CH-TRAMPAC, each payload container shall be labeled with a unique container identification number. As specified in Section 2.4.1 of the CH-TRAMPAC, if a dunnage container is used to complete a payload assembly, the dunnage container shall be labeled with a unique identification number and "EMPTY" or "DUNNAGE." If a dunnage SWB is used

in the TRUPACT-II, the SWB shall be labeled "EMPTY" or "DUNNAGE." The unique container identification number label is not required for the dunnage SWB (Reference 1).

2.5.2 Methods of Compliance and Verification

In accordance with FFS-DOP-004, *Inspecting, Packaging, and Remediation Transuranic Waste for WIPP and TA-54 Safe Storage* (Reference 15), and EP-DIV-DOP-0103, *WDP TRU Waste Container Labeling* (Reference 16), the three 55-gallon drums packaging the Pu-ICE post-shot containment systems are labeled with the following unique container identification numbers:

- LA00000066100
- LA00000066101
- LA00000066102

In accordance with FOP 00-02 (Reference 10), each drum was identified with an SNL/NM identifier (i.e., barcode) at the time of packaging under which the data for the drum has been tracked at SNL/NM (Reference 3). Table 2, SNL/NM Identification Numbers for Drum Nos. LA00000066100, LA00000066101, and LA00000066102, summarizes the SNL/NM drum identification numbers corresponding to the LANL identification numbers (Reference 17):

Table 2. SNL/NM Identification Numbers for Drum Nos. LA00000066100, LA00000066101, and LA00000066102

Drum Identification No.	Corresponding SNL/NM Identification No.
LA00000066100	SNL/NM 005789
LA00000066101	SNL/NM 005790
LA00000066102	SNL/NM 005791

In accordance with FFS-DOP-004 (Reference 15) and EP-DIV-DOP-0103 (Reference 16), the SWB overpacking the 55-gallon drums will be identified with the following unique numerical identifier (Reference 17):

- LA00000066104

For tracking purposes, in accordance with FFS-DOP-004 (Reference 15) and EP-DIV-DOP-0103 (Reference 16), the dunnage SWB will be labeled "LA00000066105" (Reference 17). SWB No. LA00000066105 will also be labeled with "DUNNAGE" or

“EMPTY” prior to shipment. Also for tracking purposes, the empty drum used to block and brace the drums (see Section 2.8) within SWB No. LA00000066104 will be labeled “LA00000066103” (References 16, 17). In accordance with CCP-TP-405 (Reference 8), the CCP TCO will verify that the identification numbers for the loaded drums and SWB listed in the PCTCDs and OPCTCD match the number listed on the container label.

2.6 Filter Vents

2.6.1 Requirements

As specified by Section 2.5.1 of the CH-TRAMPAC, each payload container to be transported in the TRUPACT-II shall have one or more filter vents that meet the specifications of Section 2.5.1 of the CH-TRAMPAC (Reference 1).

2.6.2 Methods of Compliance and Verification

The filter vents on Drum Nos. LA00000066100, LA00000066101, and LA00000066102 were procured with the 55-gallon drums by CCP personnel in accordance with CCP-QP-015 (Reference 9). Upon receipt at SNL/NM, the 55-gallon drums with the filter vents installed were inspected by SNL/NM personnel in accordance with FOP 00-02 (Reference 10), to ensure that the filters were compliant with procurement requirements. Drum Nos. LA00000066100, LA00000066101, and LA00000066102 are each vented with one Nuclear Filter Technologies, Inc., Model No. NFT-019DS filter with a hydrogen diffusivity value of 1.85E-05 moles/second/mole fraction. Table 3, Serial Numbers for Filter Vents Used on Drum Nos. LA00000066100, LA00000066101, and LA00000066102, summarizes the filter vent identification numbers used on each drum (Reference 17).

Table 3. Serial Numbers for Filter Vents Used on Drum Nos. LA00000066100, LA00000066101, and LA00000066102

Drum No.	NFT-019DS Filter Vent Serial No.
LA00000066100	ISF-402
LA00000066101	KF-411
LA00000066102	KF-471

In accordance with CCP-QP-015 (Reference 9), CCP personnel procured the filters for the SWB overpacking the drums. Upon receipt at SNL/NM, the filter vents were inspected by SNL/NM personnel in accordance with FOP 00-02 (Reference 10) to ensure that the filters were compliant with procurement requirements. SWB No. LA00000066104 will be vented with two Nuclear Filter Technologies, Inc., Model No. NFT-019DS filters each with a hydrogen diffusivity value of $1.85E-05$ moles/second/mole fraction. Table 4, Serial Numbers for Filter Vents Used on SWB No. LA00000066104, summarizes the filter vent identification numbers used on the SWB (Reference 17).

Table 4. Serial Numbers for Filter Vents Used on SWB No. LA00000066104

SWB No.	NFT-019DS Filter Vent Serial No.
LA00000066104	DK-540
	DK-543

In accordance with CCP-TP-405 (Reference 8), CCP personnel will visually verify that the drum and SWB filter vents have been installed properly and will compare filter numbers to the numbers listed on the PCTCDs and OPCTCD.

As stated in Section 2.2, the dunnage SWB used to complete the TRUPACT-II payload will have at least one open vent port (i.e., not filtered or plugged) as required by Section 2.2.1 of the CH-TRAMPAC.

2.7 Liquids

2.7.1 Requirements

As required by Section 2.6.1 of the CH-TRAMPAC, liquid waste is prohibited in payload containers, except for residual amounts in well-drained containers. The total volume of residual liquid in a payload container shall be less than 1 percent (by volume) of the payload container (Reference 1).

2.7.2 Methods of Compliance and Verification

The Pu-ICE post-shot containment systems are primarily (~99% by weight) ferrous and nonferrous metals and include minor amounts of other materials such as plastic, epoxy, rubber, glass, vacuum grease, carbon, and piezoelectric actuators. As stated in the GK Report for the Pu-ICE Containment System (Reference 3), "there are no free liquids in this waste stream based on a review of manufacturing documentation, waste generating process

documentation, and videotape documentation.” In addition, SNL/NM procedures for waste managed and stored by the SNL/NM Radioactive Waste/Nuclear Material Disposition Department prohibit certain items in waste managed and stored on site, including free liquids (Reference 3). Based on this evaluation, Drum Nos. LA00000066100, LA00000066101, and LA00000066102, and SWB No. LA00000066104 comply with the restriction on residual liquids of less than 1 percent (by volume).

2.8 Sharp or Heavy Objects

2.8.1 Requirements

As required by Section 2.7.1 of the CH-TRAMPAC, sharp or heavy objects in the waste shall be blocked, braced, or suitably packaged as necessary to provide puncture protection for the payload containers packaging these objects (Reference 1).

2.8.2 Methods of Compliance and Verification

The Pu-ICE post-shot containment systems contents of Drum Nos. LA00000066100, LA00000066101, and LA00000066102 are considered to be heavy objects (see Section 2.3.2). Each 55-gallon drum contains one Pu-ICE post-shot containment system, which fits closely in the drum. Upon loading of the containment system in a 55-gallon drum, approximately one to two inches of clear headspace exists between the top of the containment system and the drum lid. Because three heavy loaded drums are overpacked in an SWB, a fourth empty 55-gallon drum will be used to block and brace the loaded drums so as to prevent any potential impact to the integrity of the SWB overpacking the drums. As such, SWB No. LA00000066104 will comply with the requirement to block or brace heavy objects within the SWB.

2.9 Sealed Containers

2.9.1 Requirements

Sealed containers greater than 4 liters (nominal) are prohibited by Section 2.8.1 of the CH-TRAMPAC except for Waste Material Type II.2 packaged in a metal container; Waste Material Type II.2 in metal cans does not generate any flammable gas (Reference 1).

2.9.2 Methods of Compliance and Verification

As stated in the GK Report for the Pu-ICE Containment System (Reference 3), "there are no sealed containers greater than four liters in volume in this waste stream." This waste stream consists of 55-gallon drums each packaging one large waste item (i.e., the Pu-ICE post-shot containment system) per drum. Two components of the containment systems, the vent tank and the UCC, are greater than four liters in volume. Gases are captured in the vent tank during the experiments, but the vent tank is open to the atmosphere before packaging in the 55-gallon drum (Reference 3). Two valve/pressure gauge components are part of the containment system. One is on the UCC (valve and vacuum/pressure gauge) and the other is on the vent tank (valve and pressure gauge). These valves are opened to allow free release of gas and the gauges are verified to read zero pressure before placing the containment system in the 55-gallon drum as documented with videotapes (Reference 3). SNL/NM procedures for waste managed and stored by the SNL/NM Radioactive Waste/Nuclear Material Disposition Department prohibit certain items in waste managed and stored on site, including sealed containers (Reference 3). Based on this evaluation, sealed containers are not present in Drum Nos. LA00000066100, LA00000066101, and LA00000066102, and SWB No. LA00000066104.

3.0 NUCLEAR PROPERTIES REQUIREMENTS

3.1 Nuclear Criticality

3.1.1 Requirements

As specified by Section 6.2.1.1.1 of the CH-TRAMPAC, if payload containers are overpacked, the limit for maximum allowable fissile mass applies only to the outermost payload container of the overpacked configuration. As specified by Section 3.1.1 of the CH-TRAMPAC, an SWB shall be acceptable for transport only if the Pu-239 fissile gram equivalent (FGE) plus two times the measurement error (i.e., two standard deviations) is less than or equal to the following limits (Reference 1):

- 325 grams for an SWB, except for SWBs containing greater than 1% by weight beryllium (Be) or beryllium oxide (BeO) or machine-compacted waste.
- 100 grams for an SWB containing greater than 1% by weight Be or BeO.
- 250 grams for an SWB containing machine-compacted waste.

As specified by Section 3.1.1 of the CH-TRAMPAC, a TRUPACT-II shall be acceptable for transport only if the Pu-239 FGE plus two times the measurement error (i.e., two standard deviations) is less than or equal to 325 grams for a payload of SWBs, except for payloads containing greater than 1% by weight Be or BeO (Reference 1).

For payloads without machine-compacted waste containing less than or equal to 1% by weight Be or BeO and greater than 5 grams of Pu-240 content per payload (as determined after the subtraction of two times the error), the package limits specified in Table 3.1-1 of the CH-TRAMPAC apply (Reference 1).

3.1.2 Methods of Compliance and Verification

As described in the GK Report for the Pu-ICE Containment System (Reference 3), the Z machine has conducted beryllium experiments after which beryllium contamination was observed. Because of the potential for beryllium contamination, Pu-ICE post-shot containment systems could theoretically contain external surface contamination levels of 0.2 micrograms Be per 100 square centimeters. Therefore, beryllium swipes are taken before the containment

systems are removed from the Z machine. Based on the swipes taken from Drum Nos. LA00000066100, LA00000066101, and LA00000066102, a maximum beryllium mass was calculated based on the results of the swipes and the known internal and external surface areas of the containment systems. Using this information, a conservative beryllium concentration was calculated using the lowest mass for a containment system. This beryllium concentration is well below 1% Be per 55-gallon drum (Reference 3).

The Pu-ICE post-shot containment system contents of each 55-gallon drum are not machine-compacted.

Because the SWB does not contain Be or BeO greater than 1% by weight or machine-compacted waste, the 325-gram FGE limit is applicable to SWB No. LA00000066104.

In accordance with Section 3.1.2 of the CH-TRAMPAC, the isotopic composition of the Pu-ICE post-shot containment system waste is determined from existing records. Records for each Pu-ICE experiment include certified isotopic information provided by LANL, which provides the plutonium targets (primarily Pu, with traces of americium isotopes) for the Pu-ICE. These records report that the uncertainty is bound by 0.1% (Reference 3).

Table 5, Pu-239 Fissile Gram Equivalent Values for Drum Nos. LA00000066100, LA00000066101, and LA00000066102, and SWB No. LA00000066104, summarizes the FGE values calculated for Drum Nos. LA00000066100, LA00000066101, and LA00000066102 and for SWB No. LA00000066104 (Reference 18).

Table 5. Pu-239 Fissile Gram Equivalent Values for Drum Nos. LA00000066100, LA00000066101, and LA00000066102, and SWB No. LA00000066104

Container Identification No.	FGE (grams)	Error (0.1%) (grams)	Value + 2X Error (grams)
Drum No. LA00000066100	1.2253	0.0012253	1.2278
Drum No. LA00000066101	1.184	0.001184	1.186
Drum No. LA00000066102	2.9799	0.0029799	2.9859
SWB No. LA00000066104	5.3892	0.0053892	5.4000

Per the data summarized in Table 5, the FGE plus two times the error for SWB No. LA00000066104 is 5.400 FGE. As such, the SWB complies with the 325-gram FGE SWB limit (specified in Section 3.1 of the CH-TRAMPAC (Reference 1)).

As SWB No. LA00000066104 (overpacking Drum Nos. LA00000066100, LA00000066101, and LA00000066102) does not contain Be or BeO greater than 1% by weight, machine-compacted waste, or a significant quantity of Pu-240, the 325-gram FGE limit is applicable to the payload. In accordance with CCP-PO-401 (Reference 6), CCP personnel will calculate the total fissile mass (FGE) plus the total root sum of squares fissile mass error for the assembled payload and evaluate compliance with the maximum allowable FGE limit of 325 grams per payload. The CCP TCO will review and verify compliance of the SWB and payload FGE data that is listed on the OPCTCD and PATCD in accordance with CCP-TP-405 (Reference 8).

3.2 Radiation Dose Rates

3.2.1 Requirements

As specified by Section 3.2.1 of the CH-TRAMPAC, the external radiation surface dose rate of an SWB shall be less than or equal to 200 millirem per hour (mrem/hour) (Reference 1).

As specified by Section 3.2.1 of the CH-TRAMPAC, the external radiation dose rates of the loaded TRUPACT-II shall be less than or equal to 200 mrem/hour at the surface and less than or equal to 10 mrem/hour at 2 meters (Reference 1).

Additional payload container shielding shall not be used to meet the above requirements. However, payload containers that meet the above radiation dose rate requirements without shielding may be shielded to levels that are as low as reasonably achievable (ALARA) (Reference 1).

3.2.2 Methods of Compliance and Verification

Prior to shipment, the surface radiation dose rate of SWB No. LA00000066104 will be surveyed in accordance with RPO-04-01, *Radiological Surveys* (Reference 19). As specified by Section 3.2.2 of the CH-TRAMPAC, the measurements shall be made with instruments traceable to a national standard. RPO-04-01 (Reference 19) requires the dose rate measurements to be made with instruments whose calibration standards are traceable to ANSI N323, and 10 CFR 835.401(b)(2) and (4). CCP personnel will use the data collected in accordance with this SNL/NM procedure to evaluate compliance with the 200-mrem/hour limit for SWB No. LA00000066104.

Once the TRUPACT-II is loaded, SNL/NM personnel will measure the surface dose rate and the dose rate at 2 meters of the individual TRUPACT-II in accordance with RPO-04-01 (Reference 19) and document the survey information on the loaded shipment survey report. This report will be provided to the CCP TCO. The CCP TCO verifies that the exterior TRUPACT-II dose rates are less than or equal to 200 mrem/hour at the surface and less than or equal to 10 mrem/hour at 2 meters.

The implementation of RPO-04-01 (Reference 19) ensures that no payload container shielding is used in the SWB.

3.3 Activity Limits

3.3.1 Requirements

As stated in Section 3.3.1 of the CH-TRAMPAC, no activity limits exist for SWBs (Reference 1).

Per Section 3.3.1 of the CH-TRAMPAC, a payload shall be acceptable for transport only if the activity plus error (i.e., one standard deviation) is less than or equal to $10^5 A_2$ curies. A_2 values are defined in Title 10, Code of Federal Regulations, Part 71, *Packaging and Transportation of Radioactive Material* (Reference 1).

3.3.2 Methods of Compliance and Verification

As stated in Section 3.3.1 of the CH-TRAMPAC, no activity limits exist for SWBs.

The isotopic composition of the Pu-ICE post-shot containment system waste is determined from existing records. Records for each Pu-ICE experiment include certified isotopic information provided by LANL, which provides the plutonium targets (primarily Pu, with traces of americium isotopes) for the Pu-ICE (Reference 3).

Table 6, Determination of TRUPACT-II Payload Total A_2 Value for Drum Nos. LA00000066100, LA00000066101, and LA00000066102, and SWB No. LA00000066104, summarizes the total A_2 value for Drum Nos. LA00000066100, LA00000066101, and LA00000066102 and SWB No. LA00000066104 (Reference 18).

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Table 6. Determination of TRUPACT-II Payload Total A₂ Value for Drum Nos. LA00000066100, LA00000066101, and LA00000066102, and SWB No. LA00000066104

Container Identification No.	A ₂ Value (Curies)
Drum No. LA00000066100	4.314
Drum No. LA00000066101	3.859
Drum No. LA00000066102	11.043
SWB No. LA00000066104 (TOTAL)	19.216
TRUPACT-II Payload Total	19.216

Per the data summarized in Table 6, the total A₂ value for SWB No. LA00000066104 (comprising the entire TRUPACT-II payload) is 19.216 Ci, which is well below the 10⁵ A₂ curie limit per TRUPACT-II payload.

4.0 CHEMICAL PROPERTIES REQUIREMENTS

4.1 Pyrophoric Materials

4.1.1 Requirements

As specified by Section 4.1.1 of the CH-TRAMPAC, radioactive pyrophoric materials shall be present only in small residual amounts (≤ 1 percent [weight]) in payload containers. Radioactive pyrophorics in concentrations greater than 1 percent by weight and all nonradioactive pyrophorics shall be reacted (or oxidized) and/or otherwise rendered nonreactive prior to placement in payload containers (Reference 1).

4.1.2 Methods of Compliance and Verification

As stated in the GK Report for the Pu-ICE Containment System (Reference 3), there are no pyrophoric materials in this waste stream based on a review of manufacturing documentation and waste generating process documentation. During the conduct of the experiments, the Pu targets are vaporized and alloyed to the metal matrix of the containment system. Therefore, it is no longer pure plutonium metal (Reference 3). In addition, SNL/NM procedures for waste managed and stored by the SNL/NM Radioactive Waste/Nuclear Material Disposition Department prohibit certain items in waste managed and stored on site, including pyrophoric materials (Reference 3). Based on this evaluation, Drum Nos. LA00000066100, LA00000066101, and LA00000066102, and SWB No. LA00000066104 comply with the prohibition on nonradioactive pyrophoric materials and the restriction on radioactive pyrophoric materials of less than 1 percent (by weight).

4.2 Explosives, Corrosives, and Compressed Gases

4.2.1 Requirements

As specified by Section 4.2.1 of the CH-TRAMPAC, explosives, corrosives, and compressed gases (pressurized containers) are prohibited from the payload. Used (i.e., empty) aerosol cans are allowed as they do not affect the package internal pressure or flammability. Verification that any aerosol cans are empty shall be by radiography and/or process knowledge (Reference 1).

4.2.2 Methods of Compliance and Verification

Explosives

Based on a review of manufacturing documentation and knowledge of the waste generation process, there are no explosives in this waste stream (Reference 3). As fabricated, the Pu-ICE containment systems contain detonators and high explosives; however, these materials are expended during the Pu-ICE and are not considered part of the waste (Reference 3). All high explosives in the detonators are verified to be expended based on the following post-test signals conducted on previous non-TRU experiments (Reference 3):

- UCV function sensor signal
- Fireset output signal
- UCV vent line temperature sensor signal
- Detonator change in resistance
- Negative detection from air samples in center section and radiological survey of UCV base
- Vent tank pressure
- Upper containment chamber vacuum.

To address the possibility that one or more detonators may not initiate during an experiment, SNL/NM performed a series of tests on similar containment systems used in a previous experiment. In these tests, it was demonstrated that if at least one detonator initiates, all high explosives are consumed (Reference 3). If one detonator initiates, the high explosives in that detonator would in turn cause the other detonators to fire, thereby consuming all high explosives in the UCV (Reference 3). As documented in the GK Report for the Pu-ICE Containment Systems (Reference 3), SNL/NM personnel verify that all detonators have fired as part of post-shot operations, as specified in the Z machine operating procedure (Reference 20). Based on this evaluation, Drum Nos. LA00000066100, LA00000066101, and LA00000066102, and SWB No. LA00000066104 comply with the prohibition on explosives.

Corrosives

The LANL Waste Profile Form completed for the Pu-ICE waste includes a statement that must be authenticated by the waste

generator that the waste is not ignitable, reactive or corrosive (Reference 3). As described in Section 2.6.2 and in the GK Report for the Pu-ICE Containment System (Reference 3), "there are no free liquids in this waste stream . . .," which corroborates the absence of corrosives in the waste. Based on this evaluation, Drum Nos. LA00000066100, LA00000066101, and LA00000066102, and SWB No. LA00000066104 comply with the prohibition on corrosives.

Compressed Gases

As stated in the GK Report for the Pu-ICE Containment System (Reference 3), there are no compressed gases or pressurized vessels that may contain compressed gases in this waste stream based on a review of manufacturing documentation, knowledge of the waste generating process, and videotapes. After the Z machine experiments, the vent tank is purged with nitrogen and both the UCC and vent tank are opened to atmosphere. This ensures no compressed gases remain in the containment system after removal from the Z machine and prior to packaging in a 55-gallon drum. This is verified after removing the containment systems from the Z machine by inspecting the gauges and valves on the containment systems. Gauges are verified to read "0," and valves are verified to be in the open position (Reference 3).

Based on this evaluation, Drum Nos. LA00000066100, LA00000066101, and LA00000066102, and SWB No. LA00000066104 comply with the prohibition on compressed gases.

4.3 Chemical Composition

4.3.1 Requirements

As specified by Section 4.3.1 of the CH-TRAMPAC, chemical constituents in a payload shall conform to the lists of allowable materials in Tables 4.3-1 through 4.3-8 of the CH-TRAMPAC (Reference 1). The total quantity of chemicals/materials not listed as allowed materials for a given waste material type in any payload container is restricted to less than 5 weight percent total (Reference 1).

4.3.2 Methods of Compliance and Verification

As stated in the GK Report for the Pu-ICE Containment System (Reference 3), the Pu-ICE post-shot containment systems waste are primarily ($\approx 97\%$ by weight) ferrous metal and contain actinide

isotopes. Feed materials for the waste include actinide metals, alloys, and compounds, with no chemicals used in processing. Although greater than 99% of the materials in the containment system are ferrous and non-ferrous metals, there are minor amounts of other materials, such as plastic, epoxy, rubber, glass, vacuum grease, carbon, and piezoelectric actuators, as well as cellulose and other organic materials. The Pu-ICE post-shot containment systems waste contains radioactive targets (Pu, americium, and uranium isotopes). Administrative controls are in place at both SNL/NM and LANL that prohibit incompatible chemicals in the waste (Reference 3).

Based on the evaluation of the contents and packaging materials, Drum Nos. LA00000066100, LA00000066101, and LA00000066102 and SWB No. LA00000066104 have been conservatively assigned to Waste Material Type II.1, Solid Inorganic Materials Packaged in Plastic, and CH-TRUCON Code LA 117G/217G, TRU Inorganic Waste, in the *CH-TRU Waste Content Codes (CH-TRUCON)* (Reference 21). The chemicals and materials packaged in the Pu-ICE post-shot containment systems waste conform to the CH-TRUCON LA 117G/217G chemical list, which complies with the list of allowable materials for Waste Material Type II.1 (Table 4.3-4 of the CH-TRAMPAC) (Reference 1). CH-TRUCON Code LA 117G/217G and its chemical list are provided in Attachment 1.

4.4 Chemical Compatibility

4.4.1 Requirements

As specified by Section 4.4.1 of the CH-TRAMPAC, chemical compatibility of the payload materials shall be ensured. As specified in Section 4.4.2 of the CH-TRAMPAC, chemical compatibility of all waste material types has been demonstrated for transport in the TRUPACT-II using the chemicals in the allowable materials lists (Tables 4.3-1 through 4.3-8 of the CH-TRAMPAC). The restrictions imposed on the chemical constituents of the content codes ensure compliance with the compatibility requirements (Reference 1).

4.4.2 Methods of Compliance and Verification

Because Drum Nos. LA00000066100, LA00000066101, and LA00000066102 and SWB No. LA00000066104 contain only chemicals and materials that conform to the CH-TRUCON Code LA 117G/217G chemical list, the chemical compatibility requirement is met.

5.0 GAS GENERATION REQUIREMENTS

5.1 Pressure Limits

5.1.1 Requirements

As specified by Section 5.0 of the CH-TRAMPAC, the gases generated in the payload containers and released into the packaging inner containment vessel (ICV) cavity shall be controlled to maintain the pressure within the ICV cavity below the acceptable design pressure of 50 pounds per square inch gauge (Reference 1). As described in Section 5.2.5.3.3 of the CH-TRAMPAC, compliance with the design pressure limit is ensured by the analysis presented in Chapter 3.0 of the TRUPACT-II Safety Analysis Report (Reference 22) for Waste Type II payload containers and payloads up to a decay heat of 40 watts in the TRUPACT-II (Reference 1).

5.1.2 Methods of Compliance and Verification

The decay heat values for Drum Nos. LA00000066100, LA00000066101, and LA00000066102 will result in a payload that is well below the TRUPACT-II design limit of 40 watts (see Section 5.4). As such, the package decay heat limit will be met for the TRUPACT-II payload containing Drum Nos. LA00000066100, LA00000066101, and LA00000066102 overpacked in SWB No. LA00000066104.

5.2 Payload Shipping Category

5.2.1 Requirements

As specified by Section 5.1.1 of the CH-TRAMPAC, each payload container shall be assigned to a payload shipping category that provides information on the waste type, waste material type, and resistance to gas release from the inner layers of confinement (Reference 1).

5.2.2 Methods of Compliance and Verification

As stated in the GK Report for the Pu-ICE Containment System (Reference 3), the Pu-ICE post-shot containment systems waste will be packaged using the following packaging configuration:

- The Pu-ICE post-shot containment systems waste will be placed directly into a 55-gallon drum without a rigid liner.

Based on the above packaging configuration description, Drum Nos. LA00000066100, LA00000066101, and LA00000066102 conservatively have been assigned to Content Code LA 117/217 under packaging configuration LA 117G/217G in the CH-TRUCON (Reference 21) (see Attachment 1). Table 7, Payload Shipping Category for Drum Nos. LA00000066100, LA00000066101, and LA00000066102, summarizes the payload shipping category determined from the packaging description documented for Drum Nos. LA00000066100, LA00000066101, and LA00000066102.

Table 7. Payload Shipping Category for Drum Nos. LA00000066100, LA00000066101, and LA00000066102

55-Gallon Drum No. (to be Overpacked in SWB No. LA00000066104)	Content Code	Packaging Configuration	Payload Shipping Category per Drum (Reference 21)
LA00000066100	LA 117G/217G	No layers of confinement within the 55-gallon drum. The 55-gallon drum is filtered with a filter with a hydrogen diffusivity value of 1.85E-05 m/s/mf. The 55-gallon drum is overpacked in an SWB that is filtered with two filters each with a hydrogen diffusivity value of 1.85E-05 m/s/mf.	20 0170 0076
LA00000066101			
LA00000066102			

5.3 Flammable (Gas/VOC) Concentration Limits

5.3.1 Requirements

As specified by Section 5.2 of the CH-TRAMPAC, wastes to be transported in the TRUPACT-II are restricted so that no flammable mixtures can occur in any layer of confinement during shipment (Reference 1).

5.3.2 Methods of Compliance and Verification

As stated in the GK Report for the Pu-ICE Containment System (Reference 3), the Pu-ICE post-shot containment systems waste are primarily ($\approx 97\%$ by weight) ferrous metal and contain actinide isotopes. Feed materials for the waste include actinide metals, alloys, and compounds, with no chemicals used in processing. The Pu-ICE post-shot containment systems waste contains radioactive targets (Pu, americium, and uranium isotopes). Based on this description, >500 parts per million (ppm) flammable volatile organic compounds (FVOCs) are not present in Drum

Nos. LA00000066100, LA00000066101, and LA00000066102. Per CH-TRAMPAC Section 5.2, for containers with total FVOCs less than or equal to 500 ppm, compliance with the flammable (gas/volatile organic compound [VOC]) limits may be demonstrated by compliance with the analytical category decay heat limit (see Section 5.4).

5.4 Decay Heat

5.4.1 Requirements

As specified by Section 5.2 of the CH-TRAMPAC, compliance with flammable (gas/VOC) limits per payload container may be demonstrated under the analytical category by meeting a decay heat limit per payload container based on the assigned payload shipping category (Reference 1). The decay heat limit for Payload Shipping Category 20 0170 0076 is 0.3734 watt per 55-gallon drum overpacked in SWB No. LA00000066104 (see Section 5.1 of the CH-TRAMPAC [Reference 1]).

5.4.2 Methods of Compliance and Verification

The isotopic composition of the Pu-ICE post-shot containment system waste is determined from existing records. Records for each Pu-ICE experiment include certified isotopic information provided by LANL, which provides the plutonium targets (primarily Pu, with traces of americium isotopes) for the Pu-ICE. These records report that the uncertainty is bound by 0.1% (Reference 3).

Table 8, Decay Heat Values for Drum Nos. LA00000066100, LA00000066101, and LA00000066102, summarizes the decay heat values calculated for Drum Nos. LA00000066100, LA00000066101, and LA00000066102 (Reference 18).

Table 8. Decay Heat Values for Drum Nos. LA00000066100, LA00000066101, and LA00000066102

Drum Identification No.	Decay Heat (watts)	Error (0.1%) (watts)	Value + Error (watts)
LA00000066100	0.0036	3.6E-06	0.0036
LA00000066101	0.003	3.0E-06	0.003
LA00000066102	0.0093	9.3E-06	0.0093

Per the data summarized in Table 8, the decay heat plus error for each drum is less than the 0.3734-watt limit per 55-gallon drum overpacked in an SWB. SWB No. LA00000066104 (overpacking

Drum Nos. LA00000066100, LA00000066101, and LA00000066102) has a total decay heat value of 0.0159 watt, well below the TRUPACT-II design limit of 40 watts. Based on this evaluation, Drum Nos. LA00000066100, LA00000066101, and LA00000066102 comply with the 55-gallon drum decay heat limit, and the TRUPACT-II payload containing SWB No. LA00000066104 complies with the TRUPACT-II design limit.

During payload assembly activities to be completed in accordance with CCP-PO-401 (Reference 6), CCP personnel will document compliance with the decay heat requirements on the PCTCDs, OPCTCD, and PATCD.

5.5 Venting and Aspiration

5.5.1 Requirements

As specified by Section 5.3.1 of the CH-TRAMPAC, payload containers that have been stored in an unvented condition (i.e., no filter and/or unpunctured liner) shall be aspirated for the specific length of time to ensure equilibration of any gases that may have accumulated in the closed container (Reference 1).

5.5.2 Methods of Compliance and Verification

In accordance with the GK Report for the Pu-ICE Containment System (Reference 3), the Pu-ICE post-shot containment systems waste will be newly packaged for transportation. The 55-gallon drums and SWB will be vented at the time of generation and will not require aspiration.

6.0 PAYLOAD ASSEMBLY REQUIREMENTS

6.1.1 Requirements

As specified by Sections 6.1 and 6.2 of the CH-TRAMPAC, a TRUPACT-II payload shall be authorized for shipment by the completion and signing of the PCTCD, OPCTCD, and PATCD after verification of compliance with all transportation requirements of the CH-TRAMPAC (Reference 1).

6.1.2 Methods of Compliance and Verification

The CH-TRAMPAC certification of the Pu-ICE post-shot containment systems waste will be completed by the CCP TCO in accordance with CCP-PO-401 (Reference 6) and CCP-TP-405 (Reference 8). CCP-TP-405 details the completion of required transportation certification documents (PCTCDs, OPCTCD, and PATCD). During the completion of these documents, compliance with the transportation parameter requirements as documented in the previous sections will be verified by the CCP TCO. The shipping records, whose generation is described in CCP-PO-401 (Reference 6), shall be maintained by the CCP for a minimum period of 3 years.

7.0 REFERENCES

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2. CCP-PO-001, *CCP Transuranic Waste Characterization Quality Assurance Project Plan*, current revision, Washington TRU Solutions LLC, Carlsbad, New Mexico
3. "Generator Knowledge Report for the Plutonium Isentropic Compression Experiments Containment Systems," Document No. FFS-RPT-001, as amended by e-mail from K. Goyal to Project Distribution (Including R. Lee), subject: Updated page 11 of 21 of GK report, dated December 6, 2010. Los Alamos National Laboratory, Los Alamos, New Mexico
4. *ES&H Manual*, "Section 19B – Radioactive Waste Management," MN471001 – SB19 – Radioactive Waste Management," Sandia National Laboratories/New Mexico, Albuquerque, New Mexico
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15. FFS-DOP-004, *Inspecting, Packaging, and Remediation Transuranic Waste for WIPP and TA-54 Safe Storage*, Revision 0, Los Alamos National Laboratories, Los Alamos, New Mexico
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18. E-mail from J. Harvill to J. Biedscheid, subject: Zpinch.xlsx (attached), dated October 18, 2010
19. RPO-04-01, *Radiological Surveys*, current revision, Sandia National Laboratories/New Mexico, Albuquerque, New Mexico
20. *Z Pinch Operations Manual*, Sandia National Laboratories/New Mexico, Albuquerque, New Mexico
21. U.S. Department of Energy, *CH-TRU Waste Content Codes (CH-TRUCON)*, current revision, U.S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico
22. U.S. Department of Energy, *Safety Analysis Report for the TRUPACT-II Shipping Package*, current revision, U.S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico

Attachment 1 – Content Code LA 117/217 and Chemical List

CONTENT CODE: LA 117, LA 217 (See Waste Packaging Description Table)

CONTENT DESCRIPTION: Metal Waste

GENERATING SITE: Los Alamos National Laboratory (LANL)

WASTE DESCRIPTION: TRU metal waste is generated from plutonium processing activities at the Los Alamos facilities.

GENERATING SOURCE: The waste originates from TAs 03-29 (CMR), 48, 50-1, and 55 at LANL.

WASTE FORM: TRU metal waste consists of process equipment, motors, pumps, tools, etc., and may contain some glass, ceramic, porcelain, etc., as well as some small fraction of combustible waste, such as plastics (mainly packaging), etc.

WASTE PACKAGING: Details of the waste packaging for each code are presented in the following table:

WASTE PACKAGING DESCRIPTION TABLE

Code	Description*
LA 117A LA 217A	The waste is packaged within a maximum of four layers of plastic bagging prior to placement in the unlined SWB. All bag closures are by either the twist and tape method, or the twist, tie, and tape method.
LA 117B LA 217B	Waste is packaged either in an unsealed metal can within a single plastic bag or directly into one plastic bag. All bag closures are by either the twist and tape method, or the twist, tie, and tape method. Bagged out items are placed into an unlined SWB, an unlined ten-drum overpack (TDOP), or a 55-gallon drum lined with a maximum of two 5-mil or greater plastic bags. Liner bags are folded over without closures.
LA 117C LA 217C	Waste is packaged either in an unsealed metal can within a single filtered plastic bag or directly into one filtered plastic bag. All bag closures are by either the twist and tape method, or the twist, tie, and tape method. Bagged out items are placed into an unlined SWB, an unlined TDOP, or a 55-gallon drum lined with a maximum of two 5-mil or greater plastic bags. Liner bags are folded over without closures.
LA 117D LA 217D	Waste is packaged within a maximum of two layers of plastic bags. The bags are closed by either the twist and tape method, or the twist, tie, and tape method. Bagged out items are placed into a 55-gallon drum lined with a maximum of two 5-mil or greater plastic bags. Liner bags are folded over without closures.

Attachment 1 – Content Code LA 117/217 and Chemical List (Continued)

WASTE PACKAGING DESCRIPTION TABLE (Continued)

Code	Description*
LA 117E LA 217E	Waste is packaged in a filtered metal can within a single plastic bag. All bag closures are by either the twist and tape method, or the twist, tie, and tape method. Bagged out items are placed into a 55-gallon drum lined with a maximum of two 5-mil or greater plastic bags. Liner bags are folded over without closures.
LA 117F LA 217F	Waste is packaged either in an unsealed metal can within a single filtered drum liner bag or directly into one filtered drum liner bag. The bag closure is by either the twist and tape method, or the twist, tie, and tape method. Bagged out items are placed into an unlined SWB, or a 55-gallon drum lined with a maximum of two 5-mil or greater plastic bags. The outer two liner bags are folded over without closures.
LA 117G LA 217G	Waste is packaged in a 55-gallon drum, an SWB, or a TDOP within plastic bags that have been breached upon repackaging. The punctured bags are not considered to be part of the packaging; therefore, there are no layers of confinement. Oversized waste items may be wrapped in plastic and placed in an SWB or in a TDOP. In this packaging configuration, no closed liner bags are used in the SWB or TDOP.
LA 117H LA 217H	Waste is packaged in a maximum of three layers of inner plastic bags. Bagged out items are placed in a 55-gallon drum lined with a maximum of two plastic liner bags. All bag closures are by the twist and tape method or the twist, tie, and tape method.
LA 117I LA 217I	Waste is packaged in a maximum of two inner plastic bags. Bagged out items are placed in an SWB lined with a maximum of two plastic liner bags or a 55-gallon drum lined with a maximum of two plastic liner bags. All bag closures are by either the twist and tape method, or the twist, tie, and tape method.
LA 117J LA 217J	Waste is packaged in a maximum of four layers of inner plastic bags. Bagged out items are placed in a 55-gallon drum lined with a maximum of two plastic liner bags. All bag closures are by the twist and tape method, or the twist, tie, and tape method.

*If drums are overpacked in an SWB or in a TDOP, no closed liner bags are used in the SWB or TDOP.

Attachment 1 – Content Code LA 117/217 and Chemical List (Continued)

ASSAY: Drums are assayed by means of a neutron or gamma counter according to written procedures. Which instrument is used depends on the matrix and nuclide content of the drum. The results of the assay are expressed in terms of grams of each radionuclide present.

SWBs and TDOPs are assayed by means of a portable nondestructive assay hold-up system according to written procedures. The results of the assay are expressed in terms of grams of each radionuclide present. For LA 117A/217A, each SWB will then be assayed by a PAN assay system.

Assay results are used to calculate Pu-239 fissile gram equivalent (plus two times the error), plutonium equivalent curies (plus error), and decay heat (plus error).

FREE LIQUIDS: Visual inspections of each waste item for free liquids are performed in accordance with written procedures. Special emphasis during waste inspection is always applied to containers such as bottles and cans. In addition, special emphasis is always applied to motors and pumps to ensure that all liquids are properly drained and/or solidified. RTR examination of a sample of these drums may be performed to verify that free liquids are not present.

EXPLOSIVES/COMPRESSED GASES: Explosives are prohibited at TA-03-29, TA-48, and TA-50-1; and in TA-55 waste. Only used pressure vessels or spray cans could potentially contain gases under pressure and they are blocked open, punctured, completely flattened, or cut in half in accordance with written procedures.

PYROPHORICS: No pyrophoric materials will be present as determined by visual inspection of each waste item in accordance with written procedures.

CORROSIVES: Visual inspections of each waste item for corrosive materials are performed in accordance with written procedures. Corrosive materials identified during the inspection are either neutralized or diverted from the waste stream.

CHEMICAL COMPATIBILITY: A chemical compatibility study has been performed on this content code, and all waste is chemically compatible for materials in greater than trace (>1% weight) quantities. The chemicals found in this content code are restricted to the table of allowable materials for Waste Material Types II.1 and II.2 in the CH-TRAMPAC.

PAYLOAD CONTAINER VENTING AND ASPIRATION: Payload containers in this content code that have been stored in an unvented condition (i.e., no filter and unpunctured liner) will be aspirated using one of the three options described in the CH-TRAMPAC.

Attachment 1 – Content Code LA 117/217 and Chemical List (Continued)

ADDITIONAL CRITERIA: In accordance with the CH-TRAMPAC, each drum is fitted with a minimum of one filter, and the rigid liner (if present) will be punctured or used without a lid. Each SWB is fitted with at least two and up to four filters. Each TDOP is fitted with at least nine filters.

SHIPPING CATEGORY: See Table 2, Summary of Approved Content Codes and Corresponding Shipping Categories.

MAXIMUM ALLOWABLE WATTAGE: The maximum allowable wattages for analytical and test category waste are specified in the CH-TRAMPAC.

CCP-PO-039, Rev. 0
 Waste-Specific Data Package TRAMPAC for
 Shipment of CH-TRU Waste from LANL
 Plutonium Isentropic Compression Experiments

Effective Date: 12/13/2010

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Attachment 1 – Content Code LA 117/217 and Chemical List (Continued)

Los Alamos National Laboratory
 List of Chemicals and Materials
 in TRU Waste Content Codes

Content Code LA 117/217

METAL WASTE

GROUP 1:	ACIDS, MINERAL, NON-OXIDIZING (Constituents reacted prior to loading in payload containers). Hydrobromic acid Hydrochloric acid Hydrofluoric acid Phosphoric acid	T2 T2 T2 T2
GROUP 2:	ACIDS, MINERAL, OXIDIZING (Constituents reacted prior to loading in payload containers). Nitric acid Perchloric acid Sulfuric acid (<70%)	T2 T2 T2
GROUP 3:	ACIDS, ORGANIC (Constituents reacted prior to loading in payload containers). Acetic acid Oxalic acid	T2 T2
GROUP 4:	ALCOHOLS AND GLYCOLS Ethanol Isopropanol Methanol	T2 T2 T2
GROUP 10:	CAUSTICS (Constituents reacted prior to loading in payload containers). Ammonium hydroxide Barium hydroxide Calcium oxide Potassium hydroxide Sodium carbonate Sodium hydroxide Sodium hypochlorite	T2 T2 T2 T2 T2 T2 T2
GROUP 15:	FLUORIDES, INORGANIC (Constituents reacted prior to loading in payload containers). Calcium fluoride Hydrofluoric acid Potassium fluoride	T2 T2 T2
GROUP 17:	HALOGENATED ORGANICS Carbon tetrachloride	T2
GROUP 19:	KETONES Acetone Methyl isobutyl ketone	T2 T2

Attachment 1 – Content Code LA 117/217 and Chemical List (Continued)

Los Alamos National Laboratory
List of Chemicals and Materials
in TRU Waste Content Codes

Content Code LA 117/217

METAL WASTE

GROUP 23:	METALS, OTHER ELEMENTAL AND ALLOYS, AS SHEETS, RODS, MOLDINGS, DROPS, ETC. Aluminum Copper Iron Lead Stainless Steel	D T D T D
GROUP 24:	METALS AND METAL COMPOUNDS, TOXIC Barium chloride Barium hydroxide Copper Lead	T2 T2 T T
GROUP 32:	ORGANOPHOSPHATES, PHOSPHOTHIOATES AND PHOSPHODITHIOATES Tributyl phosphate	T2
GROUP 101:	COMBUSTIBLE AND FLAMMABLE MATERIALS, MISCELLANEOUS Bakelite Grease Oil Paper Polyethylene (Packaging material) Polypropylene Polystyrene Polyurethane Polyvinyl chloride (Packaging material) Resins Rubber gloves Synthetic rubber Waxes Wood	T2 T2 T2 T T T2 T2 T2 T T2 T2 T2 T2 T2
GROUP 104:	OXIDIZING AGENTS, STRONG (Constituents reacted prior to loading in payload containers). Ammonium perchlorate Bromine Sodium nitrate	T2 T2 T2
GROUP 106:	WATER AND MIXTURES CONTAINING WATER Aqueous solutions and mixtures Water	T2 T2

Attachment 1 – Content Code LA 117/217 and Chemical List (Continued)

Los Alamos National Laboratory
List of Chemicals and Materials
in TRU Waste Content Codes

Content Code LA 117/217

METAL WASTE

GROUP 107: WATER REACTIVE SUBSTANCES (Constituents reacted prior to loading in payload containers). Aluminum chloride Calcium oxide Hydrobromic acid Sulfuric acid (>70%)	T2 T2 T2 T2
OTHER INORGANICS Ceramic (Molds and Crucibles) Glass, labware	T D
OTHER SOLIDIFICATION MATERIAL/ABSORBENTS Portland Cement (Hydrated) Vermiculite	T1 T1

Refer to Introduction for a description of the designations used in this chemical list.