Department of Ener
Carlsbad Area Office
P. O. Box 3090
Carlsbad, New Mexico 88221

ENTERED

March 1, 1999

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NM ENVIRONMENT DEPARTMENT
OFFICE OF THE SECRETARY

Ms. Mary Kruger
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

Dear Ms. Kruger:

This letter is to notify you that the Carlsbad Area Office (CAO) is conducting an audit at Rocky Flats Environmental Technology Site (RFETS) for waste characterization and certification processes associated with, but not limited to, the Rocky Flats Salt Residue Stabilization and LECO Crucibles Repackaging processes during the week of April 12, 1999. The purpose of this audit is to verify that RFETS has met all the requirements necessary for CAO to grant authorization to characterize any applicable wastes and certify the wastes for shipment to the Waste Isolation Pilot Plant facility in New Mexico.

On behalf of CAO, I would like to request that you conduct an approval inspection at the same time. Attached, for your review, are the RFETS site specific Quality Assurance Project Plan, Transuranic Waste Management Manual, and Process Control Qualification Plan.

If you have any questions you can contact me at (505)-234-7488.

Sincerely,

George T. Basabilvazo

George T. Basabilvazo
Compliance Team Leader
Office of Regulatory Compliance and Assurance

cc: w/attachments:
B. Neill, EEG
P. Maggoire, NMED

→ TRU Waste QAPjP
TRU Waste Mgmt Manual
Salt Residue Process Control Qual Plan
in WIPP Library

cc w/o attachments:
M. McFadden, CAO
K. Hunter, CAO
C. Wayman, CAO
L. Xuam, RFETS
C&C File, WID

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CAO:ORCA:GTB 99-0460 (UFC 5486.00)

Rocky Flats
Environmental Technology Site

95-QAPjP-0050

REVISION 3

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE TRU WASTE CHARACTERIZATION PROGRAM QUALITY ASSURANCE PROJECT PLAN

APPROVED BY: [signature] / A.D. Rodgers / 2-24-99
Responsible Manager, Kaiser-Hill Waste & Remediation Operations — Print Name — Date

Responsible Organization: RMRS TRU Waste Projects

Effective Date: 2/26/99

CONCURRENCE BY THE FOLLOWING DISCIPLINES IS DOCUMENTED IN THE DOCUMENT HISTORY FILE:

SSOC Organic Laboratories
SSOC WIPP Residue Compliance
CSS Nondestructive Testing
Horne Engineering Waste Certification & Oversight

USE CATEGORY 3

This plan SHALL be available at a known location for reference.

This plan supersedes 95-QAPjP-0050, Revision 2.

The following has been incorporated into this revision:
98-RMRS-DCF-018

Periodic review frequency: 1 year from the effective date.

Reviewed for Classification/UCNI
By: B. M. Huffman
Date: 2-25-99

Rocky Flats
Environmental Technology Site

1-MAN-008-WM-001

REVISION 2

TRANSURANIC (TRU) WASTE MANAGEMENT MANUAL

APPROVED BY: Alan Rodgers / 2-24-99
Date

Responsible Organization: RMRS TRU Waste Projects

Effective Date: 2/26/99

CONCURRENCE BY THE FOLLOWING DISCIPLINES IS DOCUMENTED IN THE DOCUMENT HISTORY FILE:

TRU Site Project Manager
TRU Quality Assurance Officer
TRU Waste Certification Official
Traffic Management
RMRS
Kaiser-Hill
SSOC
Rocky Flats Closure Site Services

ORC review not required

This manual supersedes 1-MAN-008-WM-001, Revision 1.

The following DCFs are active for this document:
98-RMRS-DCF-023, 98-RMRS-DCF-051, 98-RMRS-DCF-082

Periodic review frequency: 1 year from the effective date

Reviewed for Classification/UCNI
By B. M. Hoffman
Date 2-25-99 (U/NU)

Rocky Flats
Environmental Technology Site

RS-020-006
REVISION 1

SALT RESIDUE STABILIZATION, BUILDING 707
PROCESS CONTROL/QUALIFICATION PLAN

APPROVED BY: /s/ David Del Vecchio / D. C. Del Vecchio / 12/7/98
SSOC 707 Project Manager — Print Name — Date

APPROVED BY: /s/ R. H. Getty for R. D. Cantwell/R. H. Getty for Rob Cantwell/ 12/7/98
Manager, Salt Residue Stabilization Project — Print Name — Date

Responsible Organization: SSOC, Salt Residue Stabilization Project — Effective Date: 02/26/98

CONCURRENCE BY THE FOLLOWING DISCIPLINES IS DOCUMENTED IN THE DOCUMENT HISTORY FILE:

Home Engineering/TRU Waste Certification Official
K-H Analytical Services
SSOC Non-Destructive Assay
SSOC Nuclear Materials Safeguards
SSOC Quality Assurance
SSOC Radiological Laboratories
SSOC Training
SSOC WIPP Residue Compliance
Transportation Certification Official

ORC Review not required

This document supersedes RS-020-006, Revision 0
Periodic review frequency: 4 years from the effective date

Reviewed for Classification/UCNI
By V. S. Sendelweck (u/nu)
Date 03 Dec. 98

DOE/WIPP 90-045
Rev. 1

REMOTE-HANDLED TRANSURANIC CONTENT CODES (RH-TRUCON)

MARCH 1999

REMOTE-HANDLED TRANSURANIC CONTENT CODES DOCUMENT

(RH-TRUCON)

1.0 INTRODUCTION

The Remote-Handled Transuranic (RH-TRU) Content Codes document (RH-TRUCON) represents the development of a uniform content code system for RH-TRU waste to be transported in the 72-B cask. It will be used to convert existing waste form numbers, content codes, and site-specific identification codes into a system that is uniform across the U.S. Department of Energy (DOE) sites.

The existing waste codes at the sites can be grouped under uniform content codes without any loss of waste characterization information. The RH-TRUCON document provides a parametric description for each content code and compiles this information for all DOE sites. Compliance with waste generation, processing, and certification procedures at the sites (outlined in this document for each content code) ensures that prohibited waste forms are not present in the waste. The content code gives a description of the RH-TRU waste material in terms of processes and packaging, as well as the generation location. This helps to provide cradle-to-grave traceability of the waste material so that the various actions required to assess its qualification as payload for the 72-B cask can be performed. The content codes also impose restrictions and requirements on the manner in which a payload can be assembled.

The RH-TRU Waste Authorized Methods for Payload Control (RH-TRAMPAC), Appendix 1.3.7 of the 72-B Cask Safety Analysis Report for Packaging (SARP), describes the current governing procedures applicable for the qualification of waste as payload for the 72-B cask. The assignment of content codes for RH-TRU waste is described in this document. The logic for this classification is presented in Section 1.2.3 of the 72-B Cask SARP. Together, these documents (RH-TRUCON, RH-TRAMPAC, and relevant sections of the 72-B Cask SARP) present the foundation and justification for classifying RH-TRU waste into content codes. Only content codes described in this document can be considered for transport in the 72-B cask. Revisions to this document will be made as additional waste qualifies for transport.

Each DOE site has an established waste identification system. These existing systems provide a ready source of information about the waste material, in the form of internal item description codes (IDC) or content codes. For the purposes of simplicity, all previous identification codes will be referred to as "IDCs," and the RH-TRUCON codes will be referred to as "content codes." The correlation of the RH-TRUCON codes to the old IDCs is provided in Table 1.

TABLE 1

CROSS CORRELATION TABLE

SHIPPING SITE	GENERATING SITE	IDC	CONTENT CODE
LANL	LANL	007	LA 325A
LANL	LANL	007	LA 325B
LANL	LANL	007	LA 325C
ORNL	ORNL	N/A	OR 311A
ORNL	ORNL	N/A	OR 325A

Each content code uniquely identifies the generated waste and provides a system for tracking the process and packaging history. Each content code begins with a two-letter site abbreviation that designates the physical location of the RH-TRU waste. The site-specific letter designations for each of the DOE sites are provided in Table 2. All TRU waste generating/storage sites are included in Table 2 for completeness. Not all of the sites listed in Table 2 have generated/stored RH-TRU waste.

Following the site abbreviation is a three-digit numerical code that categorizes the RH-TRU waste materials. These three-digit codes are based on a system used to characterize contact-handled (CH)-TRU waste. For RH-TRU waste, the first number of the content code is either a "3" or "4," which provides a distinction between newly generated and retrievably stored waste. For example, a content code "3XX" is newly generated RH-TRU waste, and a content code "4XX" is retrievably stored RH-TRU waste. Newly generated waste is defined as waste generated after the WIPP waste certification program had been implemented at each site. Retrievably stored waste is that which was generated before the implementation of the certification program. The CH-TRU waste system uses "1" and "2" as the first number of the three-digit code to segregate the waste in a similar manner. The last two digits of the three digit code are used to categorize the waste into content codes based on its physical and chemical characteristics. Tables 3 and 4 list potential content codes and a short description of each content code for newly generated waste and retrievably stored waste, respectively. All of the content codes in Tables 3 and 4 may not be used but are included for completeness. These content codes can be grouped into three basic waste types that encompass all of the RH-TRU waste in the system. The waste types are indicated along with the corresponding content codes in Tables 3 and 4. The waste types are:

I — Solidified Inorganics
II — Solid Inorganics
III — Solid Organics

At the end of each content code is an alpha code. This alpha code is used to accommodate different packaging configurations that may exist within a content code. These alpha codes identify the combination of external packaging (e.g., RH-TRU waste canister) and internal packaging configuration used (e.g., use of plastic buckets and bags, metal cans, and overpacking 55-gallon drums in the RH-TRU waste canister). Identification by packaging configuration is necessary to characterize the release rate of any generated gases from the waste. Because packaging techniques are unique to a generator/storage site, there is no standard definition for the alpha codes. The alpha codes are simply indicative of different packaging configurations within a content code. This content code-specific information is provided in this document.

TABLE 2

WASTE SHIPPER SITE IDENTIFICATION CODES

SITE NAME	SITE IDENTIFICATION CODE
Argonne National Laboratory - East (ANL-E)	AE
Argonne National Laboratory - West (ANL-W)	AW
Battelle Columbus Laboratory (BCL)	BC
Battelle - Pacific Northwest Laboratory (PNL)	BP
Bettis Atomic Power Laboratory (BET)	BE
Idaho National Engineering Laboratory (INEL)	ID
Los Alamos National Laboratory (LANL)	LA
Lawrence Livermore National Laboratory (LLNL)	LL
Mound	MD
Nevada Test Site (NTS)	NT
Oak Ridge National Laboratory (ORNL)	OR
Rocky Flats Environmental Technology Site (RFETS)	RF
Richland Hanford (RH)	RH
Savannah River Site (SRS)	SR

TABLE 3

CONTENT CODES FOR NEWLY GENERATED WASTE

WASTE TYPE		
I	311	TRU Solidified Aqueous or Homogeneous Inorganic Solids - cemented or dewatered sludge precipitated from aqueous waste treatment process. Soils which are not contaminated with organic chemicals are classified as homogeneous solids.
I	314	TRU Solidified Inorganic Process Solids - cemented inorganic particulate or sludge-like (not chemically precipitated) wastes from plutonium recovery operations.
II	315	TRU Graphite Waste - discarded graphite molds, laboratory equipment and furnace equipment (whole or pieces) from plutonium casting or laboratory operations.
III	316	TRU Solid Organic - cellulosic, plastic or cloth waste from various processes.
II	317	TRU Metal Waste - discarded metal (e.g., tantalum, aluminum, stainless steel) from production or maintenance operations.
II	318	TRU Glass Waste - discarded labware, windows, containers or raschig rings from various processes.
III	319	TRU Filter Waste - HEPA filters or processed filter media from filter change operations. (Most filters or the housings for filters are made of organic material.)
II	320	TRU Isotopic Source Waste.
III	321	TRU Organic Solid Waste - solid organic waste such as methyl methacrylate (Plexiglas) and Benelex.

TABLE 3

CONTENT CODES FOR NEWLY GENERATED WASTE

(CONTINUED)

WASTE TYPE		
II	322	TRU Inorganic Solid Waste - solid inorganic waste such as insulation, firebrick, concrete.
III	323	TRU Leaded Rubber - discarded leaded glovebox gloves and leaded aprons.
II	324	TRU Pyrochemical Salt Waste - used chloride salts from pyrochemical processes such as electrorefining, molten salt extraction or direct oxide reduction.
III	325	TRU Solid Organic and Solid Inorganic Waste - mixture of paper, plastic, metal and glass waste.
III	326	TRU Cemented Organic Process Solids - cemented organic particulate, sludge-like (not chemically precipitated) waste or resins.

TABLE 4

CONTENT CODES FOR RETRIEVABLY STORED WASTE

WASTE TYPE		
I	411	TRU Solidified Aqueous or Homogeneous Inorganic Solids - cemented or dewatered sludge precipitated from aqueous waste treatment process. Soils which are not contaminated with organic chemicals are classified as homogeneous solids.
I	414	TRU Solidified Inorganic Process Solids - cemented inorganic particulate or sludge-like (not chemically precipitated) wastes from plutonium recovery operations.
II	415	TRU Graphite Waste - discarded graphite molds, laboratory equipment and furnace equipment (whole or pieces) from plutonium casting or laboratory operations.
III	416	TRU Solid Organic - cellulosic, plastic or cloth waste from various processes.
II	417	TRU Metal Waste - discarded metal (e.g., tantalum, aluminum, stainless steel) from production or maintenance operations.
II	418	TRU Glass Waste - discarded labware, windows, containers or raschig rings from various processes.
III	419	TRU Filter Waste - HEPA filters or processed filter media from filter change operations. (Most filters or the housings for filters are made of organic material.)
II	420	TRU Isotopic Source Waste.
III	421	TRU Organic Solid Waste - solid organic waste such as methyl methacrylate (Plexiglas) and Benelex.

TABLE 4

CONTENT CODES FOR RETRIEVABLY STORED WASTE

(CONTINUED)

WASTE TYPE		
II	422	<u>TRU Inorganic Solid Waste</u> - solid inorganic waste such as insulation, firebrick, concrete.
III	423	<u>TRU Leaded Rubber</u> - discarded leaded glovebox gloves and leaded aprons.
II	424	<u>TRU Pyrochemical Salt Waste</u> - used chloride salts from pyrochemical processes such as electrorefining, molten salt extraction or direct oxide reduction.
III	425	<u>TRU Solid Organic and Solid Inorganic</u> - mixture of paper, plastic, metal and glass waste.
III	426	<u>TRU Cemented Organic Process Solids</u> - cemented organic particulate, sludge-like (not chemically precipitated) waste or resins.

Each of the content codes for RH-TRU materials has a 5% (by volume) limit on the hydrogen concentration that can be present in any confinement layer of a waste container. The sites have two options to comply with these limits:

Option 1: Convert the 5% restriction on hydrogen concentration to a limit on the allowable hydrogen generation rate for each content code (as described in Appendix 3.6.9 of the 72-B Cask SARP). If it can be shown for a given waste container that this limit can be met, the hydrogen concentration will remain at or below 5% under transportation conditions. Attachment 2 of Appendix 1.3.7 of the 72-B Cask SARP provides procedures to be used for the determination of hydrogen generation rates. Maximum allowable hydrogen generation rates for the RH-TRU content codes are summarized in Table 5.

Option 2: Convert the 5% restriction on hydrogen concentration to a limit on the allowable decay heat per waste container (as described in Appendix 3.6.9 of the 72-B Cask SARP). Since radiolysis of the waste materials is the primary mechanism by which hydrogen can be generated, the 5% limit on hydrogen concentration imposes a limit on the allowable decay heat per waste container. If it can be shown for a given waste container that this limit can be met, the hydrogen concentration will remain at or below 5% under transportation conditions. Procedures for determining the decay heat values for waste containers are described in Section 10.0 of Appendix 1.3.7 of the 72-B Cask SARP. Maximum allowable decay heat limits for the RH-TRU content codes are also summarized in Table 5.

The content codes defined in this document are fully characterized with respect to the following parameters:

- Content Description
- Storage Site (if applicable)
- Generating Site
- Waste Description
- Generating Source(s)
- Waste Form
- Waste Packaging
- Assay
- Explosives/Compressed Gases
- Pyrophorics
- Corrosives
- Chemical Compatibility
- Venting and Aspiration (if applicable)
- Additional Criteria
- Option 1 -Maximum Allowable Hydrogen Generation Rate
- Option 2 - Maximum Allowable Decay Heat Limit
- Correlation Table for Content Codes

TABLE 5

MAXIMUM ALLOWABLE HYDROGEN GAS GENERATION RATES AND DECAY HEAT LIMITS BY OPTION

Content Code	Option 1			Option 2			
	Hydrogen Gas Generation Rate Limit per RH-TRU Can (mole/sec)	Hydrogen Gas Generation Rate Limit per Drum (mole/sec)	Hydrogen Gas Generation Rate Limit per Canister and Package (mole/sec)	Decay Heat Limit per RH-TRU Can (W)	Decay Heat Limit per Drum (W)	Decay Heat Limit per Canister and Package[a] (W)	Decay Heat Limit per Canister from Thermal Analysis[a] (W)
LA 325A	6.446×10^{-9}	6.446×10^{-8}	1.934×10^{-7}	0.02422	0.2422	0.7266	50
LA 325B	N/A	6.988×10^{-8}	2.096×10^{-7}	N/A	0.3314	0.9942	50
LA 325C	N/A	N/A	4.150×10^{-7}	N/A	N/A	1.2268	50
OR 311A	N/A	5.002×10^{-8}	1.501×10^{-7}	N/A	60.0	180.0	50
OR 325A	N/A	4.814×10^{-8}	1.444×10^{-7}	N/A	0.1326	0.3978	50

N/A = Not applicable.
[a] The lower of the two limits is the applicable decay heat limit.

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Each of these parameters is discussed below.

CONTENT DESCRIPTIONS: Identifies the physical form of the waste, describing whether it is inorganic or organic, solidified, or solid.

GENERATING SITE: Provides the location of waste generation.

STORAGE SITE: Provides the location of retrievably stored waste, if the location is different than the generating site.

WASTE DESCRIPTION: Provides basic information on the nature and main components of the waste.

GENERATING SOURCE(S): Lists process(es) and/or building(s) at each site that generate(s) the waste in each content code.

WASTE FORM: Provides more detailed information on the waste contents, how the waste is processed, and specific information about the chemistry of constituents.

WASTE PACKAGING: Describes, in detail, techniques necessary for waste packaging in a given content code. This includes a description of the type and configuration of the internal waste packaging.

METHODS FOR DETERMINATION OF ISOTOPIC CHARACTERIZATION: Describes the methods utilized to obtain fissile material content and decay heat values (if applicable) for a particular content code. Acceptable methods are described in the RH-TRAMPAC.

EXPLOSIVES/COMPRESSED GASES: Identifies the methods used to preclude the presence of explosives or compressed gases and the method for secondary verification of this requirement.

PYROPHORICS: Describes the controls in place at each site to ensure that pyrophoric materials in RH-TRU waste are not present in quantities greater than 1% by weight.

CORROSIVES: Describes the controls in place to ensure that corrosive materials in RH-TRU waste are either not present or are neutralized or immobilized prior to placement in a waste container.

CHEMICAL COMPATIBILITY: Describes the controls in place to ensure chemical compatibility for the waste contents and the 72-B cask. Trace chemicals/materials are components present in the waste in less than 1% quantities by weight. The total quantity of trace chemicals/materials in the waste shall not exceed 5% by weight.

VENTING AND ASPIRATION (IF APPLICABLE): Drums which have been stored in the nonvented condition (no filter) must be aspirated for a specific length of time to ensure equilibration of any gases that may have accumulated in a closed container. Where applicable, the procedures used for aspiration are identified in the specific content code section of this document.

ADDITIONAL CRITERIA: Provides details on how the waste qualifies for shipment by meeting additional transport requirements (e.g., ensuring bags are slashed or punctured, filtering of drums).

MAXIMUM ALLOWABLE HYDROGEN GENERATION LIMIT - OPTION 1: This section provides the maximum allowable hydrogen generation rates for each content code. Maximum allowable hydrogen generation rates are provided (where applicable) for an RH-TRU waste canister or for each drum or can in an RH-TRU waste canister.

MAXIMUM ALLOWABLE DECAY HEAT LIMIT - OPTION 2: This section provides the maximum allowable decay heat limit for each content code. Maximum decay heat limits are provided (where applicable) for an RH-TRU waste canister or for each drum or can in an RH-TRU waste canister.

CORRELATION TABLE: This table provides reference to the site-specific IDCs used for that particular content code. These correlations are represented in their entirety in the comprehensive correlation table attached as Table 1.

With the information listed in this RH-TRUCON document and applicable physical measurements specified by the 72-B Cask SARP, waste can be properly qualified for transport in the 72-B cask. The waste form must have been pre-assigned a content code which is listed in this document in order to qualify for shipment. The Nuclear Regulatory Commission (NRC) will be notified of any revisions made to this document.

CONTENT CODE: LA 325A

CONTENT DESCRIPTION: RH-TRU Solid Inorganic and Solid Organic Waste

GENERATING SITE: Los Alamos National Laboratory

STORAGE SITE: Los Alamos National Laboratory

WASTE DESCRIPTION: Process waste from the examination of irradiated fuel pins consisting mainly of cladding and hardware from the fuel pins. Included in this waste is fuel remnants from the preparation and examination of the fuel pins. The remaining waste is from the decommissioning of the hot cell facility. This waste includes experiment components, in-cell equipment, and decontamination residue.

GENERATING SOURCES: LANL solid inorganic and organic waste is generated in Wing 9, SM-29, CMR (LANL), with interim storage at LANL TA-54 (Area G). The waste is produced by the mechanical sectioning of reactor fuel, metallographic and destructive examination of that fuel, and analysis of irradiated materials. In addition, decommissioning and decontamination of the hot cells where that work was performed also generates this waste.

WASTE FORM: Metallographic examinations require small samples of fuel elements be cut, mounted, ground polished and etched, leaving some of the samples as solid and some as particulates. The main components of the fuel pin hardware are 304 and 316 stainless steel cladding cut into various length segments 8-inches and smaller. The additional fuel pin hardware components are 304 and 316 end fittings and other internal fuel pin components. The remnants of the fuel consists of segments, grindings, and stabilized particulate matter from the fuel pins. These are from uranium and plutonium oxides, carbides, and nitride fuels. Solidified inorganic process liquids from fuel pin sodium removal reaction, metallographic sample preparation, and wet chemical processes are also included in the waste. Process equipment and hardware consisting of carbon steel, stainless steel, aluminum, glass, and plastic, in various combinations, are present in this waste. The waste may also consist of decontamination residues including paint, rags, and aqueous based cleaning agents solidified in Portland cement.

WASTE PACKAGING: The waste will be placed in an optional one-gallon metal can placed inside an alpha transfer can with a lid that has been shown to leak gas freely. The alpha transfer can is then placed into a welded RH can which has a filter vent. A minimum of 10 RH cans will be placed into a vented drum. Combinations of loose waste and the welded RH cans may also be placed in the drum. Three drums will then be placed into the RH-TRU waste canister.

METHODS FOR DETERMINATION OF ISOTOPIC CHARACTERIZATION: The following methods will be used to determine necessary isotopic information for the fissile content and decay heat (if applicable):

1. Material Accountability and Tracking System
2. Gamma dose rate measurements
3. Passive-Active Neutron (PAN) Assay System.

The method used will depend on the type of waste, availability of the systems, and the system providing the most accurate results.

EXPLOSIVE/COMPRESSED GASES: Explosives and compressed gases are not used in the examination of irradiated fuel pins or in the decommissioning of the hot cell facility.

PYROPHORICS: Pyrophorics are reacted before packaging. Reaction and solidification of resulting liquid is verified by visual inspection.

CORROSIVES: Corrosives are reacted to neutralize before packaging.

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 listed and restricted to the tables found in Section 5.0 of Appendix 1.3.7 of the 72-B Cask SARP.

ADDITIONAL CRITERIA: The small welded RH cans contain a sintered bronze filter, the drums contain a filter, and the RH-TRU waste canister contains a filter.

MAXIMUM ALLOWABLE HYDROGEN GENERATION RATES - OPTION 1: The maximum allowable hydrogen generation rate limit is 6.446E-09 moles per second per RH-TRU can, 6.446E-08 moles per second per drum, and 1.934E-07 moles per second per RH-TRU waste canister.

MAXIMUM ALLOWABLE DECAY HEAT LIMITS - OPTION 2: The maximum allowable decay heat is 0.02422 watts per RH-TRU can, 0.2422 watts per drum, and 0.7266 watts per RH-TRU waste canister.

CORRELATION TABLE: This waste has previously been identified as the following IDCs:

IDC	DESCRIPTION	WASTE GENERATOR
007	Solid Inorganic and Solid Organic Waste	Los Alamos National Laboratory

CONTENT CODE: LA 325B

CONTENT DESCRIPTION: RH-TRU Solid Inorganic and Solid Organic Waste

GENERATING SITE: Los Alamos National Laboratory

STORAGE SITE: Los Alamos National Laboratory

WASTE DESCRIPTION: Process waste from the examination of irradiated fuel pins consisting mainly of cladding and hardware from the fuel pins. Included in this waste is fuel remnants from the preparation and examination of the fuel pins. The remaining waste is from the decommissioning of the hot cell facility. This waste includes experiment components, in-cell equipment, and decontamination residue.

GENERATING SOURCES: LANL solid inorganic and organic waste is generated in Wing 9, SM-29, CMR (LANL), with interim storage at LANL TA-54 (Area G). The waste is produced by the mechanical sectioning of reactor fuel, metallographic and destructive examination of that fuel, and analysis of irradiated materials. In addition, decommissioning and decontamination of the hot cells where that work was performed also generates this waste.

WASTE FORM: Metallographic examinations require small samples of fuel elements be cut, mounted, ground polished and etched, leaving some of the samples as solid and some as particulates. The main components of the fuel pin hardware are 304 and 316 stainless steel cladding cut into various length segments 8-inches and smaller. The additional fuel pin hardware components are 304 and 316 end fittings and other internal fuel pin components. The remnants of the fuel consists of segments, grindings, and stabilized particulate matter from the fuel pins. These are from uranium and plutonium oxides, carbides, and nitride fuels. Solidified inorganic process liquids from fuel pin sodium removal reaction, metallographic sample preparation, and wet chemical processes are also included in the waste. Process equipment and hardware consisting of carbon steel, stainless steel, aluminum, glass, and plastic, in various combinations, are present in this waste. The waste may also consist of decontamination residues including paint, rags, and aqueous based cleaning agents solidified in Portland cement.

WASTE PACKAGING: The waste will be placed directly into a vented drum. No layers of confinement will be present in the drums; all plastic bags acting to confine gases will be slashed or punctured. Three drums will then be placed into the RH-TRU waste canister.

METHOD FOR DETERMINATION OF ISOTOPIC CHARACTERIZATION: The following methods will be used to determine necessary isotopic information for the fissile content and decay heat (if applicable):

1. Material Accountability and Tracking System
2. Gamma dose rate measurements
3. Passive-Active Neutron (PAN) Assay System.

The method used will depend on the type of waste, availability of the systems, and the system providing the most accurate results.

EXPLOSIVE/COMPRESSED GASES: Explosives and compressed gases are not used in the examination of irradiated fuel pins or in the decommissioning of the hot cell facility.

PYROPHORICS: Pyrophorics are reacted before packaging. Reaction and solidification of resulting liquid is verified by visual inspection.

CORROSIVES: Corrosives are reacted to neutralize before packaging.

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 listed and restricted to the tables found in Section 5.0 of Appendix 1.3.7 of the 72-B Cask SARP.

ADDITIONAL CRITERIA: The drums contain a filter and the RH-TRU waste canister contains a filter.

MAXIMUM ALLOWABLE HYDROGEN GENERATION RATES - OPTION 1: The maximum allowable hydrogen generation rate limit is 6.988E-08 moles per second per drum and 2.096E-07 moles per second per RH-TRU waste canister.

MAXIMUM ALLOWABLE DECAY HEAT LIMITS - OPTION 2: The maximum allowable decay heat is 0.3314 watts per drum and 0.9942 watts per RH-TRU waste canister.

CORRELATION TABLE: This waste has previously been identified as the following IDCs:

IDC	DESCRIPTION	WASTE GENERATOR
007	Solid Inorganic and Solid Organic Waste	Los Alamos National Laboratory

CONTENT CODE: LA 325C

CONTENT DESCRIPTION: RH-TRU Solid Inorganic And Solid Organic Solids

GENERATING SITE: Los Alamos National Laboratory

STORAGE SITE: Los Alamos National Laboratory

WASTE DESCRIPTION: Process waste from the examination of irradiated fuel pins consisting mainly of cladding and hardware from the fuel pins. Included in this waste is fuel remnants from the preparation and examination of the fuel pins. The remaining waste is from the decommissioning of the hot cell facility. This waste includes experiment components, in-cell equipment, and decontamination residue.

GENERATING SOURCES: LANL solid inorganic and organic waste is generated in Wing 9, SM-29, CMR (LANL), with interim storage at LANL TA-54 (Area G). The waste is produced by the mechanical sectioning of reactor fuel, metallographic and destructive examination of that fuel, and analysis of irradiated materials. In addition, decommissioning and decontamination of the hot cells where that work was performed also generates this waste.

WASTE FORM: Metallographic examinations require small samples of fuel elements be cut, mounted, ground polished and etched, leaving some of the samples as solid and some as particulates. The main components of the fuel pin hardware are 304 and 316 stainless steel cladding cut into various length segments 8-inches and smaller. The additional fuel pin hardware components are 304 and 316 end fittings and other internal fuel pin components. The remnants of the fuel consists of segments, grindings, and stabilized particulate matter from the fuel pins. These are from uranium and plutonium oxides, carbides, and nitride fuels. Solidified inorganic process liquids from fuel pin sodium removal reaction, metallographic sample preparation, and wet chemical processes are also included in the waste. Process equipment and hardware consisting of carbon steel, stainless steel, aluminum, glass, and plastic, in various combinations are present in this waste. The waste may also consist of decontamination residues including paint, rags, and aqueous based cleaning agents solidified in Portland cement.

WASTE PACKAGING: The waste will be placed directly into the RH-TRU waste canister. No layers of confinement will be present in the RH-TRU waste canister; all plastic bags acting to confine gases will be slashed or punctured.

METHODS FOR DETERMINATION OF ISOTOPIC CHARACTERIZATION: The following methods will be used to determine necessary isotopic information for the fissile content and, if needed, decay heat:

1. Material Accountability and Tracking System
2. Gamma dose rate measurements
3. Passive-Active Neutron (PAN) Assay System.

The method used will depend on the type of waste, availability of the systems, and the system providing the most accurate results.

EXPLOSIVE/COMPRESSED GASES: Explosives and compressed gases are not used in the examination of irradiated fuel pins or in the decommissioning of the hot cell facility.

PYROPHORICS: Pyrophorics are reacted before packaging. Reaction and solidification of resulting liquid is verified by visual inspection.

CORROSIVES: Corrosives are reacted to neutralize before packaging.

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 listed and restricted to the tables found in Section 5.0 of Appendix 1.3.7 of the 72-B Cask SARP.

ADDITIONAL CRITERIA: The RH-TRU waste canister contains a filter.

MAXIMUM ALLOWABLE HYDROGEN GENERATION RATES - OPTION 1: The maximum allowable hydrogen generation rate limit is 4.150E-07 moles per second per RH-TRU waste canister.

MAXIMUM ALLOWABLE DECAY HEAT LIMITS - OPTION 2: The maximum allowable decay heat is 1.2268 watts per RH-TRU waste canister.

CORRELATION TABLE: This waste has previously been identified as the following IDCs:

IDC	DESCRIPTION	WASTE GENERATOR
007	Solid Inorganic and Solid Organic Waste	Los Alamos National Laboratory

LOS ALAMOS NATIONAL LABORATORY CONTENT CODES 325A, 325B AND 325C
IDC 007
SOLID ORGANICS AND SOLID INORGANICS

MATERIALS AND CHEMICALS >1 %

ALUMINUM
CARBON STEEL
COPPER
CONCRETE
NEOPRENE
POLYVINYL CHLORIDE
RAGS/CLOTH
STAINLESS STEEL

MATERIALS AND CHEMICALS <1 %

ALCOHOLS AND GLYCOLS
CAUSTICS
COMBUSTIBLE AND FLAMMABLE MATERIALS, MISCELLANEOUS
GLASS, LABWARE
HALOGENATED ORGANICS

CONTENT CODE: OR 311A

CONTENT DESCRIPTION: Solidified Aqueous Waste

GENERATING SITE: Oak Ridge National Laboratory

STORAGE SITE: Oak Ridge National Laboratory

WASTE DESCRIPTION: Aqueous solutions, as generated, are primarily nitric acid contaminated with radionuclides and minor concentrations of organic liquids and hazardous metals as defined by the Resource Conservation and Recovery Act. This waste is collected in tanks, neutralized with sodium hydroxide, concentrated by evaporation, and stored. Upon cooling, the concentrated waste separates into sludge and supernate phases. The supernate is approximately 4-5 M sodium nitrate contaminated with soluble radionuclides, primarily Cs-137 and Sr-90, while the sludge consists of precipitated metal carbonates and hydroxides, primarily calcium carbonate and magnesium hydroxide. Since radioactive actinides are insoluble in alkaline liquid waste, these and hazardous metal constituents also precipitate. Limited samples of waste stored in the Melton Valley Storage Tanks (MVSTs) indicate that the waste has a pH in the 9-13 range and is less than 0.3 volume percent organic carbon. Waste generated by cleaning out inactive liquid radioactive waste storage tanks has been transferred to the MVSTs. Bentonite clay was added to the inactive tanks to act as a suspending agent, and the clay is seen in MVST sludge samples. Sand was used during slotting operations of hydrofracture and is also present in the sludge.

GENERATING SOURCES: Liquid radioactive waste has been generated at ORNL since the inception of Oak Ridge National Laboratory (ORNL) operation. Waste has been generated due to research and development on the nuclear fuel cycle, isotope production, reactor operations, and hot cell decontamination activities. The ORNL waste treatment facility generates significant quantities of waste.

The radioactive liquid currently generated at the Laboratory can be broken down into several types of waste: (1) those wastes which result form air and water treatment facility operation, (2) those wastes which result from decontamination of hot cells and various areas, and (3) research and development activities. Of these types of liquid low-level waste (LLLW), air and water treatment facility operations have accounted for approximately 34% of the LLLW wastes generated since 1986. Decontamination activities have generated about 45% of the waste, and other activities, including R&D activities and rainwater infiltration, account for the other 21%.

WASTE FORM: The slurry processing steps included in the Waste Handling & Packaging Plant (WHPP) are as follows: (1) sludge mobilization; (2) decontamination; (3) evaporation; and (4) solidification. First, the sodium nitrate supernate and insoluble solids sludge will be removed from storage tanks and transferred to the WHPP. Cesium and strontium isotopes will be precipitated from excess supernate; thus, reducing the radioactivity of the bulk of the waste so that it can be disposed with less risk and expense. The insoluble species will be combined with a minimum sodium nitrate (supernate) required to produce a salt cake. A thin-film evaporator will then concentrate the slurry and will operate at approximately 125 °C. Finally, the concentrated slurry will be fed to a 50-gallon drum liner that is coupled to a microwave system. Microwave energy will be used to evaporate residual wastes and melt the sodium nitrate salt at approximately 350 °C. Upon cooling, the salt/insoluble solids mixture forms a solid monolith.

WASTE PACKAGING: Drum liners (50-gallon, no lid) will be transferred from the processing cell through double-lid transfer to clean 55-gallon drums. These drums will be loaded in a RH-TRU waste canister that is placed in a 72-B cask for shipment to WIPP. No sealed plastic containers will be placed in the solidified waste drum liners. Three 55-gallon drums will be packaged in a RH-TRU waste canister. The drums and waste canister will be fitted with a filter.

METHODS FOR DETERMINATION OF ISOTOPIC CHARACTERIZATION: A sample of the processed sludge from each batch is taken to determine the amount and identity of the radionuclides present in the waste. The assay results for each batch are equally divided among all the drums of waste produced from each batch. Process controls will be used to ensure homogeneity of the sludge. The sludge sample is analyzed using radiochemical assays. Assay results will provide information to calculate Pu-239 fissile gram equivalents and total decay heat (if applicable).

EXPLOSIVE/COMPRESSED GASES: The waste is produced in a closed system, which precludes the introduction of extraneous materials such as pressure vessels or explosives. No explosives, explosive mixtures or compressed gases have been identified to be in this waste.

PYROPHORICS: No pyrophoric material is present in the solidified waste.

CORROSIVES: The pH of the waste will be adjusted during treatment, prior to solidification, so that the final waste form is not corrosive.

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 listed and restricted to the tables found in Section 5.0 of Appendix 1.3.7 of the 72-B Cask SARP.

MAXIMUM ALLOWABLE HYDROGEN GENERATION RATES - OPTION 1: The maximum allowable hydrogen generation rate limit is 5.002E-08 moles per second per drum and 1.501E-07 moles per RH-TRU waste canister.

MAXIMUM ALLOWABLE DECAY HEAT LIMITS - OPTION 2: The maximum allowable decay heat is 16.67 watts per drum and 50.0 watts per RH-TRU waste canister.

CORRELATION TABLE: N/A

CONTENT CODE: OR 325A

CONTENT DESCRIPTION: RH-TRU Solid Organic And Inorganic Waste

GENERATING SITE: Oak Ridge National Laboratory

STORAGE SITE: Oak Ridge National Laboratory

WASTE DESCRIPTION: The waste consists of manipulator boots, miscellaneous glassware, polyethylene sample bottles, cloth wipes, radiation protection clothing, plastic bags, rubber gloves, stainless steel racks, filters and, among others, small tools, primarily generated from activities related to heavy-element research. In addition, small quantities of metal waste used as container, or lead shielding is included in the waste. This waste consists of currently generated waste and retrievably stored waste. All of this waste will be repackaged at the Waste Handling & Packaging Plant (WHPP).

GENERATING SOURCES: The majority of the waste originates form the Radiochemical Engineering Development Center, Building 7920. A smaller amount of waste originates from a number of facilities including the Thorium-Uranium Recycle Facility, Building 7930, Radiochemical Processing Plant, Building 3019, Chemical Technology Alpha Laboratory, Building 3508, High-Radiation Level Chemical Development Laboratory, Building 4507, High-Radiation-Level Examination Laboratory, Building 3525, Isotope Production Area, Buildings 3033 and 3038, Radioisotope Production Laboratory A, Building 3028, and Isotopes Separation Facility, Building 9204-3.

WASTE FORM: All the waste (retrievably stored and newly generated) will be repackaged at the WHPP. The waste will primarily be in an unconsolidated form, it may be shredded or compacted.

WASTE PACKAGING: Originally, the majority of the waste was placed in 1-gallon "paint cans" (a metal pail with a wire handle) which was in turn contained in a 3-gallon polyethylene bucket. A smaller amount of waste was packaged directly into plastic bags. The repackaging process will ensure that the polyethylene buckets will be breached, so as not to be considered a layer of confinement. Wastes which were previously packaged in polyethylene bags and any other sealed plastic containers will be slashed, punctured, and/or sent through a shredding process. The resulting waste will be placed directly into a 50-gallon drum liner (no lid) and then into a 55-gallon drum, vented with a filter. Three 55-gallon drums will be packaged in an RH-TRU waste canister. The waste canister will be fitted with a filter.

METHODS FOR DETERMINATION OF ISOTOPIC CHARACTERIZATION: A combination of Passive-Active Neutron (PAN) assay and information from the waste management database will be used to provide the necessary isotopic characterization.

EXPLOSIVE/COMPRESSED GASES: WHPP operating procedures will require that all containers placed into radioactive waste receptacles be free of explosives and intact cylinders of compressed gas, which is determined by visual inspection and verified by RTR.

PYROPHORICS: WHPP operating procedures will require that all containers placed into radioactive waste receptacles be free of pyrophorics, which is determined by visual inspection and administrative control.

CORROSIVES: WHPP operating procedures will require that all containers placed into radioactive waste receptacles be free of corrosives which is determined by visual inspection and administrative control.

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 listed and restricted to the tables found in Section 5.0 of Appendix 1.3.7 of the 72-B Cask SARP.

MAXIMUM ALLOWABLE HYDROGEN GENERATION RATES - OPTION 1: The maximum allowable hydrogen generation rate limit is 4.814E-08 moles per second per drum and 1.444E-07 moles per second per RH-TRU waste canister.

MAXIMUM ALLOWABLE DECAY HEAT LIMITS - OPTION 2: The maximum allowable decay heat is 0.1326 watts per drum and 0.3978 watts per RH-TRU waste canister.

CORRELATION TABLE: N/A

OAK RIDGE NATIONAL LABORATORY CONTENT CODE 311A
MATERIALS IN SOLIDIFIED AQUEOUS WASTE

MATERIALS AND CHEMICALS >1 %

ALUMINUM SALTS/OXIDES
CALCIUM SALTS/OXIDES
MAGNESIUM OXIDE
POTASSIUM NITRATE
SODIUM NITRATE
URANIUM SALTS/OXIDES

MATERIALS AND CHEMICALS <1 %

IRON OXIDE
METALS AND METAL COMPOUNDS, TOXIC
SAND
WATER AND MIXTURES CONTAINING WATER (<0.5 %)

OAK RIDGE NATIONAL LABORATORY CONTENT CODE 325A
SOLID ORGANICS AND SOLID INORGANICS

MATERIALS AND CHEMICALS >1 %

ALUMINUM
CARBON STEEL
GLASS, LABWARE
LEAD
METAL CANS
PAPER
PLEXIGLAS
POLYETHYLENE
RAGS/CLOTH
RUBBER GLOVES
STAINLESS STEEL
STEEL
WOOD

MATERIALS AND CHEMICALS <1 %

ASBESTOS
COMBUSTIBLE AND FLAMMABLE MATERIALS, MISCELLANEOUS
GLASS, RASCHIG RINGS
GRIT
HEPA FILTERS
HYDROCARBON, ALIPHATIC, SATURATED
INSULATION
LEADED GLASS
METALS, OTHER ELEMENTAL AND ALLOYS AS SHEETS, RODS, MOLDINGS, ETC.
METALS AND METAL COMPOUNDS, TOXIC
MOLDS AND CRUCIBLES, CERAMIC
OTHER FILTERS
SOLID ORGANICS