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Prepped by Ollie Stewart

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DOCUMENT CHANGE FORM (DCF)

DCF #: DC-01

① DCF Originator: Sue Sherman /s/ 4/16/02
 Print Sign Date

Organization: Measurements, Operations Support

Phone/Pager/Location: 5046/212-3720/T115A

② (Authorizes processing of request.)

Responsible Manager: David Dreher /s/ 4/19/02
 Print Sign Date

Organization: NDA Operations

Phone/Pager/Location: 5265/212-4131/750

③ Assigned SME: Bart Morales/s/ 4/18/02
 Print Name

Organization: Measurements, Operations Support

Phone/Pager/Location: 2981/T115A

④ Operating the Multipurpose Crate Counter (MPCC) at B664
 Document Title

PRO-1433-MPCC-664, Rev. 0
 Existing Document Number and Revision
 NA
 New Document Number and Revision (if Applicable)

⑤ Type of Document

☐ Policy ☒ Procedure (indicate type) ☐ Instruction

☐ Mgt Directive ☒ Technical ☐ Alarm ☐ Job Aid

☐ Manual ☐ Administrative ☐ Other ☐ Other

If "Other" is checked, please specify type: _____

⑥ Type of Modification

☐ New ☒ Change ☐ Minor

☐ One Time Use Only ☒ Major

☐ Revision ☐ Cancellation

⑧ Proposed Modification	⑨ Justification
LOEP. Pages 3-39, Header changed for page number increase. Pg 5. 11th bullet. DELETE. "NDA Operations personnel SHALL load all waste packages and matrix standards." Pg 6. 6th bullet. Change HALT to STOP. Page 7. 11th bullet. Delete that. Pg 8. Add 664 Supervisor to NDA Supervisor as responsible party. Pg 10.. Add step [3.5] Ensure the connection fittings are secure before opening the liquid valve. Pg 11. Change first sentence to "The following steps SHALL be performed in the order they are listed when starting up the MPCC system. DELETE 2nd sentence "These steps are listed in the order they are to be performed." Pg 13. Add step [7] Select "Parameters" from the menu bar. Select "Gamma Search" from the drop down menu. Ensure the following settings: "3" Sensitivity (Sigma) (or as directed by SME), "120" Deviation (%) (or as directed by SME), "1500" Max. Energy (KEV) (or as directed by SME), "100" Min. Energy (KEV) (or as directed by SME), "0.8" Tolerance (KEV) (or as directed by SME), Click "OK". Move NOTE before [7] and change step numbers. Pg 14-15. New step [14]. Add (e.g., (B25/crate) ** Neutron Calibration Sequence (10 grabs) **, or as directed by SME. Add WARNING Radiation, rotating machinery, and laser hazards exist when the MAN door is locked and people are inside. "To prevent personal injury, all personnel MUST exit the MPCC crate counting area prior to the door being locked." Renumber steps. New step [23] Add Raw to Passive Totals Rate. New step [25] change to 7.2 [17]-[24]. Add step "[28] NDA Supervisor Review measurement control results and verify acceptability."	SDRM Not needed. Editorial. Add responsibility. Safety concern. Editorial. Add step. Per Foreman.

External (Technical) Review:

⑩ Reviewing Organization	⑪ Signature or Name of Reviewer	⑫ Date	⑬ Reviewing Organization	⑭ Signature or Name of Reviewer	⑮ Date
664 Fac Man/CCA	Disalle /s/	4/18/02	Meas. Ops Support	Dye	NR
MS Crit Safety	Peacock/s/	4/17/02	MS QA	Dahl/s/	4/17/02
MS NS	Conyers /s/	4/18/02	NDA QA	Stewart/s/	4/17/02
MS IH&S	Bates/s/	4/18/02	TWCP	Carson/s/	4/18/02
MSRad Eng	Stewart	NR	TWCP QAO	Ferrera/s/	4/17/02
MS Rad Ops	Murphy/Byble	NR	WRC	Wolfe	NR
MS Training	Beck	NR	LLW QA	Digregorio/s/	4/18/02
MC&A	Doty/s/	4/17/02	Traffic	Ament/Swenson	NR
Measure MC&A Comp	Hyman/s/	4/17/02	Foreman	Hodgson/s/	4/18/02

⑬ Special Reviews: (NOTE: Other Special Reviews may be required. See PRO-815-DM-01 for more information.)

ISR (Number or "Not Required"): EY02-23

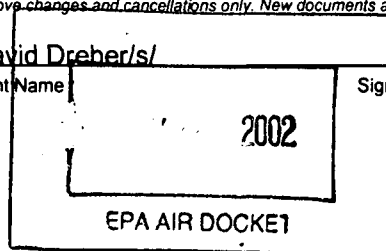
TI Alignment (signature or N/A): NA
 Sign Date

Reviewed for Classification
 (If Required, "N/A" if not)

By: L. Kayler /s/ "U/NU"
 Date: 4/18/02

⑭ Approval (Completed to approve changes and cancellations only. New documents and revisions are approved by signature on the document cover page.)

Approval Authority: David Dreher/s/ 4/19/02 Effective Date: 4/19/02
 Print Name Sign Date



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DCF (continuation sheet)

DCF#: DC-01

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Operating the MPCC at B664

PRO-1433-MPCC-664

Document Title

Existing Document Number and Revision

9

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Proposed Modification

Justification

Page 16-20. NOTE 1. Delete "This assay is performed at the beginning (and within 24 hours of the last beginning measurement control standard assay) of an operating day." Add "The daily standard MUST be counted at the beginning and end of each batch, not to exceed 24 hours." Move WARNING from after [1] to after [4]. Add after [5] WARNING Operation of the neutron generator while the MPCC crate counting area is occupied can result in excessive radiation exposure to personnel. Personnel entering the crate counting area SHALL maintain the Neutron Generator Lock Out Switch Key in their possession to prevent inadvertent neutron generator operation. NDA Operator [6] Obtain and maintain control of the Neutron Generator Lock Out Switch Key. [7] Verify that the amber and white warning beacons are NOT illuminated prior to entry in the MPCC crate counting area. WARNING FM-200 fire suppression chemical is present in the fire suppression system for the MPCC. Release of the chemical occurs 30 seconds after the activation of the fire alarm. To prevent personal injury, all personnel MUST immediately exit the MPCC crate counting area upon activation of the fire alarm. [8] Enter the MPCC MAN door AND open the bay door, as necessary. [9] Raise the floor panel, as necessary. [10] Ensure that the turntable inserts are the correct inserts for the standard, as necessary. PIT Operator/Spotter [11] Place the standard on the MPCC turntable. NDA Operator [12] When the PIT operator places the standard on the turntable AND exits from the MPCC crate counting area, Then lower the floor panel AND verify the floor panel is in the full down position. [13] Close the bay door. WARNING Radiation, rotating machinery, and laser hazards exist when the MAN door is locked and people are inside. To prevent personal injury, all personnel MUST exit the MPCC crate counting area prior to the door being locked. [14] Verify that NO personnel are in the MPCC crate counting area. [15] Exit the MAN door AND lock the door to prevent unauthorized access during assay. [16] When in the MPCC crate counting area, Then: [A] Look through the window and use the curved mirror to ensure that no one is in the counting area. [B] Insert the Neutron Generator Lock Out Switch Key into the key switch AND turn ON. Delete old [6] Ensure that the key is in the Neutron Generator Lock Out Switch Key into the key switch AND is ON. Renumber remaining steps. Old [16] Delete last bullet "Weight: Enter the gross/tare weight (kg) in the "Gross/Tare Weight" field." Add first bullet "Weight: Enter the gross/tare weight (kg) in the "Gross/Tare Weight" field or click "Read Scale", as required." Add [21] Select "Parameters" from the menu bar, Select "Gamma Search" from the drop down menu, AND verify the following settings: "3" Sensitivity (Sigma) (or as directed by SME), "120" Deviation (%) (or as directed by SME), "1500" Max. Energy (KEV) (or as directed by SME), "100" Min Energy (KEV) (or as directed by SME), "0.8" Tolerance (KEV) (or as directed by SME) Click "OK". [27]. Add first bullet "Weight: Enter the gross/tare weight (kg) in the "Gross/Tare Weight" field or click "Read Scale", as required. Delete last bullet on Weight. Add Tare Weights table. Step [35] last bullet, change correct IDC to selected IDC. Step [36] Change reported 240Pu mass and 239Pu mass to Imaged Act mass and Passive Coinc. Step [37] change 7.3[19] to [15].]. Change "If preliminary Pu assay plus 2x the one sigma TMU to If preliminary Total Pu mass plus TMU (95%)." Step [39] add "...for independent review of results." Step [45] first bullet delete "lower the floor panel", second bullet change verify to ensure add last bullet "Lock Man Door".

Clarification.

Page 21, add second NOTE Unmeasured waste packages received from Building 371 MAA MUST be segregated from other materials and under constant surveillance by one Q-cleared PSAP employee OR two non-PSAP employees of any clearance level.

MC&A requirement.

Page 22-24. NOTE to [17], update step number. Add [21] Select "Parameter" from the menu bar. Select "Gamma Search" from the drop down menu. Verify the following settings: "3" Sensitivity (sigma) (or as directed by SME), "120" Deviation (%) (or as directed by SME), "1500" Max. Energy (KEV) (or as directed by SME), "100" Min. Energy (KEV) (or as directed by SME), "0.8" Tolerance (KEV) (or as directed by SME). Click OK. Step [26] Change "Click on "Assay" in the Menu Bar. Select "Local Mode Assay." To "Select LOCAL MODE ASSAY from the ASSAY menu." Step [27] Add first bullet "Weight: enter the gross/tare weight (KG) in the "Gross/Tare Weight" field or click "Read Scale", as required. Delete "TAB to the next field in the remaining bullets. Delete last bullet "Weight: enter the gross/tare weight (kg) in the "Gross/Tare Weight" field. Add Tare Weights table. Step [33] Add "...2 copies of the..." before file. Step [34] Change Correct IDC to Selected IDC. Step [35] change us to is. Step [37] change If preliminary Pu assay plus two times the one-sigma TMU exceeds... to If preliminary Total Pu Mass plus TMU(95%) exceeds...". Step [45] change to "If assays are complete for the day, Then perform 7.3 Daily Measurement Control Standard Assay

Add specific steps for clarification of equipment operation.

Page 26-27. Section 7.5, 7.6 and 7.7. Make a stand alone sections.

Clarification.

Page 34 step [4]. Change "Correct IDC" to "Selected IDC."

Clarification.

Page 36. Appendix 3. Update step numbers.

Update.

Per the RM, not all reviewers are required on this DCF. See page 1.

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

PRO-1433-MPCC-664 REVISION 0

OPERATING THE MULTIPURPOSE CRATE COUNTER (MPCC) AT BUILDING 664

Responsible K-H Organization: Material Stewardship Effective Date: 4/1/02

Approved By: NDA, OPERATIONS / 2/27/02

Title

Date

David Dreher

/ /s/

Print Name

Approval Signature

N/A

Print Name of Responsible Manager (N/A if RM is Approval Authority)

The Responsible Manager determined that the following organizations' review is required. Review documentation is contained in the Document History File:

Building 664 Facility Manager

Measurements Operations Support

MS Criticality Safety

NDA Quality Assurance

MS AB

MS Quality Assurance

MS Industrial Hygiene and Safety

TWCP

MS Radiological Engineering

TWCP Site PQAQ

MS Radiological Operations

Waste Records Center

MS Training

LLW QA

Material Control and Accountability

Traffic and Transportation

Measurements MC&A Compliance Assurance

IMPORTANT NOTES

Periodic Review Frequency: 4 years from the effective date

SES/USQD review: PRE-664-02.1056-JNC/FY02-15

REVIEWED FOR CLASSIFICATION/ UCNI

By: Kayler /s/ "U'NU"

Date: 2/22/01

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4. LIMITATIONS AND PRECAUTIONS

- All fissionable material **SHALL** be handled in accordance with applicable NMSLs to ensure that criticality events do **NOT** occur. NMSLs posted at each operation are provided to limit the amount of fissionable materials that can be handled.
- The operators **SHALL** read, understand and comply with the posted NMSL applicable to the area.
- Building 664 personnel and NDA Operations personnel handling standard matrix box **SHALL** read, understand and follow the Building 664 Nuclear Material Safety Limits (NMSLs).
- NMSL violations **SHALL** result in immediate termination of all operations within 10 ft. of the affected package and notification of the Building 664 Configuration Control Authority (CCA).
- Suspected NMSL violations **SHALL** be corrected with written instructions from Criticality Safety per PRO-T44-SWCSI-140, Management of Nuclear Criticality Safety Program Noncompliances.
- Personnel protective equipment (PPE) **SHALL** be worn as required by Radiological Engineering, Occupational Safety and Industrial Hygiene (OS&IH), and the Radiological Work Permit (RWP), if applicable.
- All personnel **SHALL** apply the principles of time, distance, and shielding when working with radioactive material to comply with the intent of the As Low As Reasonably Achievable (ALARA) Program.
- All personnel **SHALL** adhere to the requirements of the RWP and the ALARA job review precautions, as applicable.
- Suspected radiological contamination **SHALL** result in immediate termination of operations and notification to Building 664 CCA, NDA supervision and Radiological Operations.
- Any spill of potentially radioactive material **SHALL** result in stop work, warn workers, area evacuation, notification of Building 664 CCA **AND** call 2911 **OR** 2914, if required.
- All personnel using the Special Nuclear Material Sealed Radioactive Sources (SNM-SRS) sources **SHALL** be qualified in accordance with PRO-448-RSP-10.04, Operational Use of Sealed Radioactive Sources.
- Building 664 or NDA Operations personnel **SHALL** transport the standard matrix box to the MPCC and load the standard matrix box on the turntable per PRO-1411-WO-WASTE, Waste, Receiving, Transfer and Handling.
- The waste boxes **SHALL** be attended at all times when the package(s) is (are) open and there are sources present in the package.
- NDA Operations personnel **SHALL** configure all matrix standard boxes by placing specified sources into selected matrix boxes.

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4. LIMITATIONS AND PRECAUTIONS (continued)

- Quantities of flammable/combustible liquids in excess of 2 gallons **SHALL NOT** be located within 5 ft of the MPCC crate counting area without proper containment/confinement (e.g., dike, secondary containment, etc.). The diesel- or gasoline- fueled industrial trucks in use to move TRU waste to the MPCC crate counting area are an exception to this requirement (Waste Management TSR, AOL 6.2).
- Smoking **SHALL NOT** be allowed within 5 ft of the MPCC crate counting area (Waste Management TSR, AOL 6.9).
- Powered Industrial Trucks (PITs) and attachments **SHALL** be inspected, maintained, and operated in accordance with MAN-072-OS&IH PM, Occupational Safety & Industrial Hygiene Program Manual, Chapter 11, including Appendix 3, Standard Hand Signals for PIT Operations.
- A minimum of one PIT licensed operator to operate the PIT and one knowledgeable spotter **SHALL** be present when transporting waste packages to and from the MPCC.
- Exposure of waste packages to adverse weather **SHALL** be minimized.
- The quantity of NUCLEAR MATERIAL in or staged near mobile NDA trailers at the WASTE MANAGEMENT FACILITY **SHALL NOT** exceed 820 grams Weapons Grade Plutonium equivalent per mobile NDA trailer (Waste Management TSR, AOL 3.7).
- All nuclear material handling **SHALL** be performed in accordance with MAN-010-MCA, Material Control and Accountability Manual.
- Personnel entering the MPCC crate counting area **SHALL** maintain the Neutron Generator Lock Out Switch Key in their possession to prevent inadvertent operation of the neutron generator.
- Prior to entering the MPCC crate counting area, personnel **SHALL** verify that the amber and white warning beacons are **NOT** illuminated.
- MC&A limit of less than 400 g attractiveness level C Pu **SHALL** be met at all times in accordance with MAN-010-MCA.
- Supervision **SHALL** be notified if any step Cannot be performed as written.
- Measurement control **SHALL** be performed in accordance with PRO-731-MC-002, NDA Measurement Control Program.
- A Class 2 Laser is only considered a hazard if one stares into the beam. Eye protection is normally achieved by a person's natural aversion to bright light to protect the eye. The natural aversion time is considered to be 0.25 seconds for such actions as blinking, tearing, and looking away with rapid eye movement. Avoid accidental ocular exposure by ensuring that the laser is not operating at eye level and by capping the laser. Class 2 Lasers are not capable of causing injury to the skin. Radiant power is limited to 1 mW.

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NDA Supervisor

- [14] Ensure that the required NDA Operations personnel and Measurements Operations Support personnel, trained in the use of this procedure, are available to perform the work.

NDA Personnel/Building 664 Personnel

- [15] Ensure that Appendix 4 and Appendix 5 of Chapter 11, Powered Industrial Trucks, of MAN-072-OS&IH PM, Occupational Safety & Industrial Hygiene Program Manual are complete.
- [16] Ensure that a hand-held radio monitored to the hazardous waste channel, used to maintain constant communication with Building 664 CCA/Shift Superintendent, is obtained.
- [17] **IF** moving standard matrix box from Building 664,
THEN stage the appropriate standard matrix box and the 55-gallon sealed source storage drum in the designated storage area.

NDA Personnel

- [18] If applicable, obtain the current sealed source/matrix specification for configuration to be assayed from the Measurements Operations Support personnel.
- [19] Obtain the cargo container and 55-gallon sealed source drum **OR** standard matrix box key(s) from NDA Operations supervision, as necessary.

5.2 Measuring and Test Equipment**NDA Operator**

- [1] Ensure that the following materials and test equipment are available:
- MPCC (released by the Measurements Operations Support personnel for use)
 - Certified standards (identified by Measurements Operations Support personnel)
- [2] Ensure that the SNM-SRSs are tagged in accordance with PRO-448-RSP-10.04, Operational Use of Sealed Radioactive Sources, and document the expiration dates on Appendix 1, MPCC Prerequisite/Post Performance Checklist.
- [3] Verify that the MPCC scale has a current calibration control number **AND** Document on Appendix 1, MPCC Prerequisite/Post Performance Checklist, by recording the control number and the expiration date of the scale.

7. INSTRUCTIONS—MPCC OPERATION

7.1 MPCC Power-up

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The following steps **SHALL** be performed in the order they are listed when starting up the MPCC system.. Skipping any step **may** result in the improper functionality of this system and/or misinterpreted or false data acquisitions.

This section is a stand-alone section and **may** be performed independently or in conjunction with other Instruction sections within this procedure.

NDA Operator

WARNING

Radiation, rotating machinery, and laser hazards exist when the man door is locked and people are inside. To prevent personal injury, all personnel MUST exit the MPCC crate counting area prior to the door being locked.

NOTE *During normal operation, system and component power remains on at all times. The following steps **SHALL** be followed when powering up the assay system. These steps are listed in the order they are to be performed. Any deviation could result in damage to the system.*

- [1] Verify that all prerequisites in Section 5, Prerequisite Actions, are completed and document on Appendix 1, MPCC Prerequisite/Post Performance Checklist.
- [2] Ensure that the MAN door is locked and no one is in the counting area by looking through the window using the curved mirror.
- [3] Ensure that the **PLC** cabinet is **ON**.
- [4] Ensure that both **Pulizzi** power distribution units are set in the **ON** position
- [5] Ensure that both **Pulizzi** power distribution units are set to **LOCAL**.
- [6] Ensure that the **CAMAC CRATE** unit is set to **ON** position.
- [7] Ensure that the **NEUTRON GENERATOR LOCKOUT SWITCH** is set to the **ON** position.

NOTE *Changes to the voltage settings, as directed by the Measurements Operations Support personnel are entered into the System Log Book.*

- [8] Ensure that both **Sorensen** power supply switches are set to the **ON** position
- [9] Ensure that the **Sorensen source** power supply (lower unit) is set to **500 volts OR** as directed by the Measurements Operations Support personnel.
- [10] Ensure that the **Sorensen target** power supply (upper unit) is set to **375 volts OR** as directed by the Measurements Operations Support personnel.

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7.1 MPCC Power-up (continued)

This section is a stand-alone section and **may** be performed independently or in conjunction with other Instruction sections within this procedure.

NOTE 1 *A new, empty chamber, daily background is taken each day that the counting system is used for measurement. A daily background is to be taken at the beginning of each operating day.*

NOTE 2 *System faults are diagnosed/correct in accordance with Section 7.5, Diagnosing/Correcting System Faults.*

NDA Operator

- [1] Verify that all prerequisites in Section 5, Prerequisite Actions, are complete **AND** document on Appendix 1, MPCC Prerequisite/Post Performance Checklist.
- [2] Ensure that the key is in the Neutron Generator Lockout Switch and is ON.
- [3] Double click **MPCC** icon to open **MPCC** program.
- [4] Select the **USER** pull down menu from the main menu.
- [5] Select **LOGIN** from the User pull down menu.
- [6] Enter user name and password.

NOTE *Steps 7.2[7] through 7.2[11] may NOT be required if previous operations already created the file for the day.*

- [7] Select "**Parameters**" from the menu bar,
Select "**Gamma Search**" from the drop down menu, **AND**
Ensure the following settings:
 - "3" Sensitivity (Sigma) (or as directed by SME)
 - "120" Deviation (%) (or as directed by SME)
 - "1500" Max. Energy (KEV) (or as directed by SME)
 - "100" Min Energy (KEV) (or as directed by SME)
 - "0.8" Tolerance (KEV) (or as directed by SME)
 Click "**OK**".
- [8] From the Menu Bar, Select "**File**", as necessary.
- [9] From the drop down menu, select "**Save**". The "Save" box will appear, as necessary.
- [10] Under "File Name" in the "Save" box, enter the new file number as year/month/day as follows (as necessary): **YYMMDD** (e.g., **021210**)
- [11] Click on the "**Save**" button on the lower right corner of the box, as necessary.

This will create a new file that will now appear in the upper left corner of the menu box. All assays, including daily background, daily measurement-control, and routine assays are completed during the day, will be saved to this file.

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NOTE *The background **SHALL NOT** be measured more than two times.*

DC-01

[25] **IF** any background result exceeds the + 2-sigma limit, but not the + 3-sigma limit,
THEN re-measure the background by performing Steps 7.2[17] through 7.2[24].

[26] **IF** any background result exceeds the + 2-sigma limit after the second attempt,
OR
IF the background result exceeds the + 3-sigma limit,
THEN:

[A] Stop this procedure.

[B] Notify the NDA Supervisor and/or Measurements Operations Support personnel.

[C] Document in the system log.

[27] Forward the background control paperwork to the NDA supervisor.

NDA Supervisor

[28] Review measurement control results **AND** verify acceptability.

7.3 Daily Measurement Control Standard Assay (continued)

- [9] Raise the floor panel, as necessary.
- [10] Ensure that the turntable inserts are the correct inserts for the standard, as necessary.

PIT Operator/Spotter

- [11] Place the standard on the MPCC turntable.

NDA Operator

- [12] **WHEN** the PIT operator places the standard on the turntable **AND** exits the MPCC crate counting area,
THEN lower the floor panel **AND** verify the floor panel is in the full down position.
- [13] Close the bay door.

WARNING

Radiation, rotating machinery, and laser hazards exist when the MAN door is locked and people are inside. To prevent personal injury, all personnel MUST exit the MPCC crate counting area prior to the door being locked.

- [14] Verify that **NO** personnel are in the MPCC crate counting area.
- [15] Exit the MAN door **AND** lock the door to prevent unauthorized access during assay.
- [16] **WHEN** in the MPCC crate counting area,
THEN:
 - [A] Look through the window **AND** use the curved mirror to ensure that no one is in the counting area.
 - [B] Insert the Neutron Generator Lock Out Switch Key into the key switch **AND** is **ON**.

NOTE Steps 7.3[17] through 7.3[25] may **NOT** be required if previous operations already created the file for the day.

- [17] Double click **MPCC** icon to open **MPCC** program, as necessary.
- [18] Select the **USER** pull down menu from the main menu, as necessary.
- [19] Select **LOGIN** from the User pull down menu, as necessary.
- [20] Enter user name and password, as necessary.

7.3 Daily Measurement Control Standard Assay(continued)

- [28] Select the grab sequence appropriate for daily measurement control from the pull down menu.
- [29] Ensure that the **MAN/EXT START** switch on the neutron controller is set to **EXT START**.
- [30] Select and click on "**Begin Assay**".
- [31] **WHEN** "Operator Instruction" dialog box appears with the correct grab sequence, **THEN** press "**OK**" to begin the assay.
- [32] **WHEN** the assay has completed, **THEN** select **OK** in both pop-up dialog boxes.
- [33] Wait for computer to calculate data.
- [34] **WHEN** the calculation is complete, **THEN** select **SAVE** as necessary **AND** print file.
- [35] The printed assay sheet **SHALL** contain:
- Operator signature and date
 - Operator employee number
 - Correct database name
 - Selected IDC
- [36] Plot the Imaged Act mass (Pu^{239} eff) **AND** Passive Coinc mass (Pu^{240} eff) assay values on the applicable daily standard measurement control charts in the measurement control log book **AND** record the measurement's acceptability on Appendix 3, MPCC Measurement Log Sheet.

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NOTE The daily measurement control standard **SHALL NOT** be measured more than two times.

- [37] **IF** the daily measurement control standard result is outside of the ± 2 -sigma limits, but within the ± 3 -sigma limits, **THEN** re-measure the daily measurement control standard by performing Steps 7.3 [15] through 7.3[36].
- [38] **IF** the daily measurement control standard result is outside of the ± 2 -sigma limit after the second attempt,
OR
IF the daily measurement control standard is outside of the ± 3 -sigma limit,
THEN:
- [A] Stop this procedure.
- [B] Notify the NDA Supervisor and/or Measurements Operations Support personnel.
- [C] Document in the system log.
- [39] Forward the daily measurement control paperwork to the NDA supervisor for independent review of results

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7.4 Waste Package Assay

This section is a stand-alone section and **May** be performed independently or in conjunction with other Instruction sections within this procedure.

NOTE *System faults are diagnosed/correct in accordance with Section 7.5, Diagnosing/Correcting System Faults.*

NDA Operator

- [1] Verify that all prerequisites in Section 5, Prerequisites Actions, are complete **AND** document on Appendix 1, MPCC Prerequisite/Post Performance Checklist.
- [2] Ensure that the background measurement and the daily measurement controls are run and are satisfactory prior to waste package assays.
- [3] Request B664 personnel to stage the waste packages in the designated staging area in accordance with PRO-1411-WO-WASTE; Waste Receiving, Transfer and Handling.

NOTE *Unmeasured waste packages received from Building 371 MAA **MUST** be segregated from other materials and under constant surveillance by one Q-cleared PSAP employee **OR** two non-PSAP employees of any clearance level.*

PIT Operator/Spotter

- [4] Ensure no more than two SWBs are within 5 feet of the MPCC crate counting area.

WARNING

A PIT spotter is present when handling packages to prevent injury to personnel.

- [5] Move the waste package to the MPCC crate counting area.

WARNING

Operation of the neutron generator while the MPCC crate counting area is occupied can result in excessive radiation exposure to personnel. Personnel entering the crate counting area **SHALL maintain the Neutron Generator Lock Out Switch Key in their possession to prevent inadvertent neutron generator operation.**

NDA Operator

- [6] Obtain and maintain control of the Neutron Generator Lock Out Switch Key.
- [7] Verify that the amber and white warning beacons are **NOT** illuminated prior to entry in the MPCC crate counting area.

WARNING

FM-200 fire suppression chemical is present in the fire suppression system for the MPCC. Release of the chemical occurs 30 seconds after the activation of the fire alarm. To prevent personal injury, all personnel must immediately exit the MPCC crate counting area upon activation of fire alarm.

- [8] Enter the MPCC MAN door and open the bay door, as necessary.
- [9] Raise the floor panel, as necessary.
- [10] Ensure that the turntable inserts are the correct inserts for the waste package.

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7.4 Waste Package Assay (continued)

- [23] From the drop down menu, select **"Save"**. The **"Save"** box will appear, as necessary.
- [24] Under **"File Name"** in the **"Save"** box, enter the new file number as year/month/day as follows (as necessary): **YYMMDD (e.g., 021210)**
- [25] Click on the **"Save"** button on the lower right corner of the box, as necessary.

This will create a new file that will now appear in the upper left corner of the menu box. As assays, including daily background, daily measurement control, and routine assays are completed during the day, they will be saved to this file.

- [26] Select **LOCAL MODE ASSAY** from the **ASSAY** menu.
- [27] In the **LOCAL MODE ASSAY** dialog window, enter the appropriate identification information:
 - Weight: enter the gross/tare weight (kg) in the **"Gross/Tare Weight"** field or click **"Read Scale"**, as required.
 - Primary Identification (ID#): **(e.g., enter the complete package numberSecondary Identification: (e.g., enter the primary TID#).**
 - Tertiary Identification: **(e.g., enter secondary TID #)**
 - Content Code: **(e.g., select IDC# from drop-down menu. If the IDC# is not in the drop down menu, STOP and contact NDA Supervision for further instructions.)**
 - RCRA Hazardous: **Check the "RCRA Hazardous Box"**.
 - **"Retrieve Bar Codes"**: click on , if applicable:
 - **"Grab Sequence"**: Use the pull down menu to select the appropriate waste assay grab sequence

Tare Weights

Waste Package Type	Tare Weight (kg)
Plywood-Full	230.4
Plywood-Half	171.46
RF80	247.2
IP2-Full	421.9
IP2-Half	322.1
CAB-Full	326.6
CAB-Half	217.7
SWB	291

- [28] Ensure that the **MAN/EXT START** switch on the neutron controller is set to **EXT START**.
- [29] Select and click on **"Begin Assay"**.
- [30] **WHEN** "Operator Instruction" dialog box appears with the correct grab sequence, **THEN** press **"OK"** to begin the assay.

7.4 WASTE PACKAGE ASSAY (continued)

NDA Personnel

[F] Arrange for expedited technical review support.

[G] Request permission to move waste package, as determined to be necessary.

[38] **WHEN** assay is complete and the beacon lights are no longer illuminated,
THEN:

[A] Obtain and maintain control of the Neutron Generator Lock Out Switch Key.

[B] Unlock the MPCC MAN door and enter the MPCC crate counting area.

[39] Open the bay door.

[40] Raise the floor panel.

NDA Supervisor

[41] Perform the following prior to returning a waste package to Building 664:

[A] Ensure a copy of the preliminary assay result is provided to the Building 664 CCA.

[B] Obtain concurrence from the Building 664 CCA to return the waste package to Building 664.

[C] Authorize the PIT operator to return the waste package to Building 664 and/or staging area.

PIT Operator/Spotter

[42] Remove the package from the turntable.

[43] Return the waste package to the designated staging area.

[44] **IF** additional waste containers require assay
THEN get another waste package from Building 664 **AND** go to Step 7.4 [4].

[45] **IF** assays are complete for the day, then perform 7.3 Daily Measurement Control Standard Assay **AND** .

[A] Verify no personnel are in the MPCC crate counting area.

[B] Perform the following, as necessary:

- Verify floor panel in full down position
- Close roll-up door
- Lock MAN door

This section is a stand-alone section and may be performed independently.

NDA Personnel

- [1] Close **MPCC.EXE** Program.
- [2] Log off Windows NT.
- [3] Ensure the power to the computer, printer, monitor and bar code writer are **OFF**, if applicable.
- [4] Ensure that both **DSpec** units are set to the **OFF**.
- [5] Ensure that the HV power supply is set to **OFF**.
- [6] Ensure the oscilloscope is **OFF**.
- [7] Ensure that the **Sorensen target** power supply (upper unit) is set to **OFF**.
- [8] Ensure that the **Sorensen source** power supply (lower unit) is set to **OFF**.
- [9] Ensure that the **NEUTRON GENERATOR LOCKOUT SWITCH** is set to **OFF**.
- [10] Ensure that the **CAMAC CRATE** unit is set to **OFF**.
- [11] Ensure that both **Pulizzi** power distribution units are set to **OFF**.
- [12] Ensure that the **PLC** cabinet is **OFF**, if applicable.

7.7 Emergency Shut Down

This section is a stand-alone section and may be performed independently or in conjunction with other Instruction sections within this procedure.

NOTE 1 *The "Emergency Stop" button stops the generator and mechanics and is located (1) on the control room wall, (2) by the south MAN door, and (3) on the PLC cabinet.*

NOTE 2 *Generation of neutrons will terminate when the Emergency Stop button is pressed.*

NDA Operator

- [1] **IF** the operator suspects that any personnel are located in the crate counter while the neutron generator is producing neutrons,
THEN:
Press the **EMERGENCY STOP** button.
- [2] **IF** there is a situation affecting the electronics systems integrity,
THEN notify the supervisor of the problems encountered and document in the System Log Book.

8. INSTRUCTIONS-NON-ROUTINE OPERATIONS

8.1 Source Transfer

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[13] Close and secure the 55-gallon sealed source storage drum or standard matrix box.

[A] Apply TIDs or locks, as necessary.

PIT Operator/Spotter

WARNING

To prevent injury to personnel, a PIT spotter is present when handling drums and SWBs.

[14] Move the standard matrix box to the MPCC crate counting area.

WARNING

Operation of the neutron generator while the MPCC crate counting area is occupied can result in excessive radiation exposure to personnel. Personnel entering the crate counting area SHALL maintain the Neutron Generator Lock Out Switch Key in their possession to prevent inadvertent neutron generator operation.

NDA Operator

[15] Obtain and maintain control of the Neutron Generator Lock Out Switch Key.

[16] Verify that the amber and white warning beacons are **NOT** illuminated prior to entry in the MPCC crate counting area.

WARNING

FM-200 fire suppression chemical is present in the fire suppression system for the MPCC. Release of the chemical occurs 30 seconds after the activation of the fire alarm. To prevent personal injury, all personnel MUST immediately exit the MPCC crate counting area upon activation of the fire alarm.

[17] Enter the MPCC MAN door and open the bay door, as necessary.

[18] Raise the floor panel, as necessary.

[19] Ensure that the turntable inserts are the correct inserts for the matrix standard box.

PIT Operator/Spotter

[20] Place the matrix standard box on the MPCC turntable.

NDA Operator

[21] **WHEN** the PIT operator has placed the package on the turntable,
AND has exited from the MPCC crate counting area,
THEN lower the floor panel and verify the floor panel is in the full down position.

[22] Close the bay door.

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8.1 Source Transfer (continued)

[23] Verify that **NO** personnel are in the MPCC crate counting area.

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- [36] IF assaying additional matrix standard boxes,
THEN repeat Steps 8.1[2] through 8.1[35].
- [37] Close and secure the sealed source storage drum(s) or standard matrix box(es).
- [38] IF the sealed source storage drum or standard matrix box had a TID,
THEN apply a TID in accordance with 4-P16-SA-TID-001, Tamper Indicating
Devices (TIDs) and complete the TID Application and Removal Form.
- [39] Lock the drum, as necessary.
- [40] Place the sealed source storage drum in the storage area, as necessary.
- [41] Replace the matrix standard box lid AND secure with a minimum of four bolts.
- [42] Perform a sealed source drum inventory, and verify that the drums have a TID or are
locked.
- [43] Return the cargo container key, the sealed source drum key AND the MPCC door key
to the NDA Supervisor or CCA.

NDA Supervisor

- [44] Notify the Building 664 CCA/Shift Superintendent of the evolution completion.

CCA

- [45] Log in the CCA Logbook that the sealed source drum inventory is complete, and that
the drums have a TID or are locked.

NDA Personnel

- [46] Submit the TID application and removal forms to NMC as soon as possible, but no
later than by the end of the shift during which the activity was completed.

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9. Data Disposition

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10. POST-PERFORMANCE ACTIVITY

10.1 Completion of Appendices

NOTE *Appendix 1, MPCC Prerequisite/Post Performance Checklist, is completed at least once per operating day of operation.*

NDA Operator

- [1] Complete Appendix 1, MPCC Prerequisite/Post Performance Checklist.
 - [A] Check (✓) the appropriate box on Appendix 1, MPCC Prerequisite/Post Performance Checklist, to indicate if deficiencies have been identified.
 - [B] Sign and date Appendix 1.
 - [C] Forward Appendix 1 to the NDA supervisor.

NDA Supervisor

- [D] Check (✓) the appropriate box to indicate if deficiencies have been submitted in accordance with MAN-071-IWCP, Integrated Work Control Program Manual, Chapter 2, Work Initiation and Screening.
 - [E] Check (✓) the appropriate box for successful or **NOT** successful completion of this procedure.
 - [F] **IF** the procedure could **NOT** be successfully completed, **THEN** document the failure in the Comments Section of Appendix 1.
 - [G] Sign and date Appendix 1.
 - [H] Forward a copy of Appendix 1 to the applicable building CCA for records review and disposition in accordance with 1-V41-RM-001, Records Management Guidance for Records Sources.
- [2] **IF** any of the following criteria are applicable (in accordance with MAN-071-IWCP, Integrated Work Control Program Manual) to the performance of this procedure:
 - A worker was injured during the performance of this procedure.
 - The job task resulted in a recordable or other significant incident.
 - Personnel involved in the procedure performance wish to provide process improvement feedback.

THEN perform a formal Post-Job Review (PJR) in accordance with MAN-071-IWCP, Integrated Work Control Program Manual.
- [3] Verify that the following information required for a batch report for MPCC is included:
 - Background Assay and Control Chart
 - Working Standard Assays (pre-and post-assay) and Control Chart
 - Assay Runs
 - Appendix 1 (original)

11. RECORDS PROCESSING

The following documents are initiated, processed, or maintained as a result of this procedure and **SHALL** be processed as follows:

Table 1. Records Matrix.

Record Identification	Record Type Determination	Protection / Storage Method	Processing Instruction
Appendix 1, MPCC Prerequisite/Post Performance Checklist	Site QA Record	NDA supervisor SHALL implement a reasonable level of protection to prevent loss and/or degradation. Records SHALL be protected utilizing standard office filing equipment and methods when not in use and kept in a known location during the work shift.	Forward copy to Building 664 CCA for disposition in accordance with MAN-006-COOP, Site Conduct of Operations Manual.
Radioassay Data Sheet (MPCC Data Sheets)	In-Process WIPP/LL/LLM QA Document	While in process, the NDA supervisor SHALL implement a reasonable level of protection to prevent loss and/or degradation. Documents SHALL be protected utilizing standard office filing equipment and methods when not in use and kept in a known location during the work shift.	Continue processing in accordance with PRO-845-NDA-008, Data Review, Verification, and Validation for Nondestructive Assay (NDA) Measurement Systems or in accordance with PRO-Q22-NDA-3000, Review of Non-TWCP NDA Assay Sheets.
Check Source Assays, Background Assays (MPCC) and Control Charts Appendix 3, MPCC Measurement Log Sheet	In-Process WIPP QA Document	While in process, the NDA supervisor SHALL implement a reasonable level of protection to prevent loss and/or degradation. Documents SHALL be protected utilizing standard office filing equipment and methods when not in use and kept in a known location during the work shift.	Continue processing in accordance with PRO-845-NDA-008, Data Review, Verification, and Validation for Nondestructive Assay (NDA) Measurement Systems.
Appendix 2, Dewar Fill Log Sheet System Log Book	Site Record	While in process, the NDA supervisor SHALL implement a reasonable level of protection to prevent loss and/or degradation. Documents SHALL be protected utilizing standard office filing equipment and methods when not in use and kept in a known location during the work shift.	Disposition in accordance with 1-V41-RM-001, Records Management Guidance for Records Sources.

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APPENDIX 1

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MPCC PREREQUISITE/POST PERFORMANCE CHECKLIST

NDA Operator

5.2[2] SNM-SRS Source registry tag expiration date: _____

Print Name Sign Date

5.2[3] Scale Calibration Control Number: _____
Scale Calibration Expiration Date: _____

Print Name Sign Date

7.1[1] Prerequisites in Section 5 are complete.

Print Name Sign Date

7.2[1] Prerequisites in Section 5 are complete.

Print Name Sign Date

7.3[1] Prerequisites in Section 5 are complete.

Print Name Sign Date

7.4[1] Prerequisites in Section 5 are complete.

Print Name Sign Date

8.1[1] Prerequisites in Section 5 are complete.

Print Name Sign Date

10.1[1][A] ☐ Deficiencies identified.
☐ No deficiencies identified.

10.1[1][B] Performed By: _____

Print Name Sign Date

NDA Supervisor

10.1[1][D] ☐ Deficiencies submitted in accordance with MAN-071-IWCP.
☐ No deficiencies identified.

10.1[1][E] ☐ Procedure successfully completed.
☐ Procedure NOT successfully completed.

Comments: _____

10.1[1][G] Reviewed By: _____

Print Name Sign Date

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MPCC MEASUREMENT LOG SHEET

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7.2 [24] Background Measurement

Background was within limits: YES ☐ NO ☐

Date _____

YES ☐ NO ☐

Date _____

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7.3[36] Daily Measurement Control Standard Assay

Daily Measurement Control Standard was within limits:

Beginning of Operating Day YES ☐ NO ☐

Date _____

YES ☐ NO ☐

Date _____

End of Operating Day YES ☐ NO ☐

Date _____

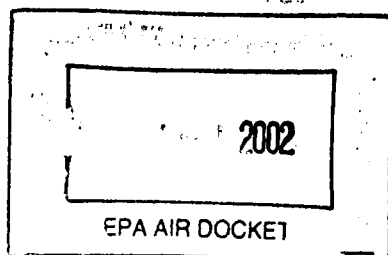
YES ☐ NO ☐

Date _____

DC-01

7.4[35]

[illegible]



Rocky Flats
Environmental Technology Site
1-MAN-008-WM-001

REVISION 5

**TRANSURANIC (TRU) WASTE
MANAGEMENT MANUAL**

APPROVED BY: G. A. O'Leary /S/ / G. A. O'Leary 4/19/02
Print Name Date

Responsible Organization: TRU Waste Programs

Effective Date: 05/17/2002

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

TWCP Site PM
TWCP Site PQAO
TRU Waste Certification Official
Traffic and Transportation
Measurements Data Quality
Project Data Control Officer
KH MS Technical Operations

KH MS Waste Operations
KH MS Waste Operations, NDT
KH Quality Assurance
Document Control
KH Procurement Systems
Remediation, Industrial D&D, & Site Services

ISR review not required.
SES review not required.

Exempt from Classification Review
Exemption Number: CEX-032-00

This manual supersedes 1-MAN-008-WM-001, Revision 4.

Periodic review frequency: 1 year from the effective date

Page 1 of ____

DOCUMENT CHANGE FORM (DCF)

DCF #: N/A

① DCF Originator: S. M. Smith /SI/ 3/27/02
 Print Sign Date

Organization: TRU Waste Programs

Phone/Pager/Location: 7869 / na / T130J, Cube 6

② (Authorizes processing of request.)

Responsible
 Manager: G. A. O'Leary R.J. Ballenger for /SI/ 3/27/02
 Print Sign Date

Organization: TRU Waste Programs

Phone/Pager/Location: 3268 / 6557 / T130J

③ Assigned SME: Frank Grady /SI/ 3/27/02
 Print Name Sign Date

Organization: TRU Waste Programs

Phone/Pager/Location: 4627 / 6499 / T130J

④ Transuranic (TRU) Waste Management Manual
 Document Title

1-MAN-008-WM-001, Revision 4
 Existing Document Number and Revision

1-MAN-008-WM-001, Revision 5
 New Document Number and Revision (if Applicable)

⑤ Type of Document

☐ Policy	☐ Procedure (indicate type)	☐ Instruction
☐ Mgt Directive	☐ Technical ☐ Alarm	☐ Job Aid
☒ Manual	☐ Administrative ☐ Other	☐ Other

If "Other" is checked, please specify type: _____

⑥ Type of Modification

☐ New	☐ Change
☐ One Time Use Only	☐ Minor
☒ Revision	☐ Major
	☐ Cancellation

⑧ Proposed Modification

Revised Sections 3, 5 and 6 (associated appendices) and Appendix 4 to meet requirements of the new WIPP-WAC, DOE/WIPP-02-3122, and TRUPACT-II SAR (TRAMPAC), Rev. 19.

Revise document to incorporate DCF-CHG-01, DCF-02, DCF-03, DCF-04, DCF-05, DCF-06, DCF-07, and DCF-09. Removed change bars associated with these DCFs. Repaginated document.

⑨ Justification

Necessary to meet new WIPP requirements. These changes also incorporate resolution to CBFO comments received on Revision 4 of this document.

Document maintenance.

External (Technical) Review:

⑩ Reviewing Organization	⑪ Signature or Name of Reviewer	⑫ Date	⑩ Reviewing Organization	⑪ Signature or Name of Reviewer	⑫ Date
KH MS, TWCP Site PQAO	Carol Ferrera /SI/	3/28/02	KH MS, Measurements, Data Quality	Jeff Bradford /SI/	3/28/02
KH MS, ESH&Q, Quality Assurance	John Tressell Harley Kirschenmann for /SI/	3/28/02	DOE Rocky Flats Field Office	Lam Xuan /SI/	3/27/02
Traffic & Transportation	Barbara Swenson /SI/	3/21/02	CBFO Quality Assurance Team Leader	Ava Holland /SI/	4/19/02
Waste Certification & Oversight	Stephen Carpenter /SI/	3/28/02	CBFO Asst. Manager, National TRU Program	Kerry W. Watson /SI/	4/19/02

⑬ Special Reviews: (NOTE: Other Special Reviews may be required, See PRO-815-DM-01 for more information.)

ISR (Number or "Not Required"): _____

TI Alignment (signature or N/A): _____
 Sign Date

Reviewed for Classification
 (If Required, "N/A" if not)

By: _____

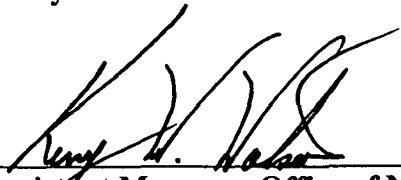
Date: _____

⑭ Approval (Completed to approve changes and cancellations only. New documents and revisions are approved by signature on the document cover page.)

Approval Authority: _____ Effective Date: _____
 6/1/2001 Print Name Sign Date

APPROVALS

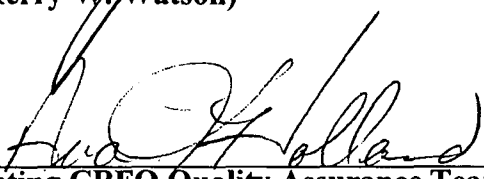
Approved by:



CBFO Assistant Manager, Office of National TRU Program
(Kerry W. Watson)

4/19/02
Date

Agred
4/19/02



Acting CBFO Quality Assurance Team Leader
(Ava Holland)

4/19/02
Date



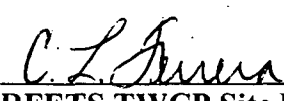
DOE Rocky Flats Field Office
(Lam Xuan)

3/27/02
Date



RFETS TWCP Site Project Manager
(G. A. O'Leary)

3/28/02
Date



RFETS TWCP Site Project Quality Assurance Officer
(C. L. Ferrera)

3/28/02
Date

APPROVALS

Approved by:

<u>Kerry W. Watson /S/</u>	<u>4/19/2002</u>
CBFO Assistant Manager, Office of National TRU Program	Date
(Kerry W. Watson)	

<u>Ava Holland /S/</u>	<u>4/19/2002</u>
CBFO Quality Assurance Team Leader	Date
(Ava Holland)	

<u>Lam Xuan /S/</u>	<u>3/27/2002</u>
DOE Rocky Flats Field Office	Date
(Lam Xuan)	

<u>Roger Ballenger for G.A. O'Leary /S/</u>	<u>3/28/2002</u>
RFETS TWCP Site Project Manager	Date
(G. A. O'Leary)	

<u>Carol L. Ferrera /S/</u>	<u>3/28/2002</u>
RFETS TWCP Site Project Quality Assurance Officer	Date
(C. L. Ferrera)	

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TRANSURANIC (TRU) WASTE
MANAGEMENT MANUAL

1-MAN-008-WM-001

REVISION 5

05/17/2002

PAGE 5

LIST OF EFFECTIVE PAGES

<u>Pages</u>	<u>Effective Date</u>	<u>Pages</u>	<u>Effective Date</u>
1 - 331	05/17/2002		

The following DCFs are active for this document:

NONE

05/17/2002

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05/17/2002

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1. OVERVIEW

1.1 Purpose

The purpose of the Rocky Flats Environmental Technology Site (RFETS) TRU Waste Management Manual (TWMM) is to describe how requirements to ship waste to the Waste Isolation Pilot Plant (WIPP) are met and to provide some of the site-specific program documents.

Section 2.4 of the Contact-Handled Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant (DOE/WIPP-02-3122; hereafter referred to as the WIPP-WAC) requires that each participating site develop and implement site-specific transuranic (TRU) waste program documents that address applicable requirements and criteria pertaining to packaging, characterization, and certification of each defense TRU waste package to be shipped to WIPP. The WIPP-WAC describes the site-specific program documents that must be prepared and approved in response to Carlsbad Field Office (CBFO) requirements. Section 2 of this document describes the site-specific program documents required and identifies RFETS documents that have been created to meet the requirements.

DOE Order 435.1, Radioactive Waste Management (U.S. DOE, 1999), requires that a TRU waste generator and/or storage site prepare certification plan(s) identifying how the site will ensure compliance with the waste transportation and disposal criteria/requirements applicable to the WIPP facility. The RFETS certification plan is the same as the Waste Certification Plan required by CBFO. Section 2 further describes compliance with this requirement.

1.2 TRU Waste Programs

All RFETS processes producing transuranic wastes are required to operate in accordance with the requirements and implementing procedures provided in this document and in 95-QAPjP-0050, Rocky Flats Environmental Technology Site TRU Waste Characterization Program Quality Assurance Project Plan (hereafter referred to in this document as the TWCP QAPjP). This TWMM addresses overall QA activities pertaining to the TWCP, WIPP-WAC requirements, TRUPAC-II Authorized Methods for Payload Control (TRAMPAC), and TRUPACT-II Safety Analysis Report (SAR) requirements (e.g., waste characterization using nondestructive assay, waste certification requirements, and shipping requirements). The TWCP QAPjP addresses the requirements of the WIPP RCRA Hazardous Waste Permit, Attachment B, Waste Analysis Plan (WIPP-WAP), such as RCRA waste characterization requirements, acceptable knowledge, and quality assurance records. The requirements of the CBFO Quality Assurance Program Document (known as the QAPD) are met jointly through the implementation of the requirements located in the TWMM and in the TWCP QAPjP.

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1.2 TRU Waste Programs (continued)

Process-specific controls, such as those for the Residues Projects, are referenced in applicable Process Control Plans (PCPs) and/or Process Qualification Plans (PQPs). These plans are prepared in accordance with 1-M60-WPC-001, Waste Process Control, and are referenced as applicable requirements documents in this document and the TWCP QAPjP.

Procedure 1-M60-WPC-001, Waste Process Control, directs all RFETS management responsible for the development of new TRU waste generation, packaging, or characterization operations to assess these operations to determine if additional controls are required. If additional controls are required, responsible management is required to characterize process attributes in order to define and document process parameter values that produce process outcomes in compliance with WIPP requirements. Operations are then required to comply with the stated process parameter settings and allowable values as stated in the PCP and/or the PQP and implemented in referenced operational procedures. The PCPs are typically directed at waste generation operations, while the PQPs are typically directed at waste characterization and waste treatment operations that produce data for waste certification. Responsible operations management may elect to prepare both plans if they deem they are necessary.

The PCPs/PQPs are prepared by organizations responsible to develop new processes and are reviewed and approved for adequacy and completeness against WIPP requirements by involved management, the TWCP Site Project Manager (TWCP Site PM), the TWCP Site Project Quality Assurance Officer (TWCP Site PQAO), and the TRU Waste Certification Official (WCO). The following PCPs provide controls for recently developed processes; this listing will be updated annually to indicate the new operations developed or in development. Refer to the TWCP QAPjP, Section A-4, Project Description, for a description of residue activities. Current PCPs include the following:

- RS-020-021, Salt Residue Repack, Buildings 371 and 707 Process Control Plan
- RS-020-006, Salt Residue Stabilization, Building 707 Process Control/Qualification Plan¹
- RS-020-012, Ash Residue Repack Process Control Plan
- RS-020-018, Combustible Residue Repackaging Process Control Plan
- RS-020-013, Dry Residue Repackaging Process Control Plan

¹ The Salt Residue stabilization/repack activity that utilized this PCP was completed in June 2000.

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2. REQUIREMENTS FOR CH-TRU WASTE CERTIFICATION AND TRANSPORTATION TO WIPP

2.1 CBFO Requirements Documents

Criteria and requirements that must be complied with by RFETS before TRU waste may be shipped to WIPP are derived from the following sources:

- The WIPP-WAC
- The WIPP-WAP
- The QAPD
- The TRAMPAC
- The WIPP Transportation Plan (DOE/CAO 98-3103)
- Performance Demonstration Program Plans

The flowdown of regulatory and DOE requirements to these documents and to site-specific program documents is shown in Figures 2-1, 2-2, and 2-3.

2.2 RFETS Program Documents

RFETS program documents have been developed and implemented in response to CBFO program requirements. The following sections (2.2.1 through 2.2.8) describe the documents required by CBFO and identify the RFETS document(s) that provide compliance. A summary of these documents and approval requirements is provided in Table 2-1.

2.2.1 Waste Certification Plan

The purpose of this plan is to identify how compliance with each requirement of the WIPP-WAC is accomplished. Section 5 of the TWMM provides the site-specific Waste Certification Plan. Section 5 identifies the implementing procedures that provide compliance with the waste acceptance criteria requirements of the WIPP-WAC. Appendix 4, of this document, addresses the procedures implemented to the Non-Destructive Assay requirements of the WIPP-WAC, Appendix 4.

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2.2.2 Certification QA Plan

The purpose of the Certification QA Plan is to document site compliance with the QAPD requirements for the site certification program. Section 3 of the TWMM documents the QA program that has been implemented at RFETS to comply with certification QA requirements. Section 3 is supplemented by the QAPD Procedures Matrix (refer to Section 2.2.4), which provides additional and specific information on compliance with QAPD requirements.

2.2.3 Quality Assurance Project Plan (TWCP QAPjP)

A site-specific QAPjP is required to document the procedures and methods that are used for waste characterization. The RFETS site-specific QAPjP is the TWCP QAPjP. The TWCP QAPjP uses the same format as the WIPP-WAP and documents how RFETS complies with WIPP-WAP requirements. PCPs and/or PQPs implement CBFO requirements, as applicable, at the process level.

2.2.4 QAPD Procedures Matrix

The QAPD Procedures Matrix is required to identify all current applicable site documents, including specific references to section or paragraph numbers, of each project or organization that serve to implement each applicable requirement of the QAPD. INS-246, Transuranic Waste Characterization Project (TWCP) QAPD Procedures Matrix, has been developed to provide this required document.

2.2.5 Graded Approach Procedure

The QAPD requires that each site prepare a Graded Approach Procedure. The procedure is to be used to determine the appropriate controls necessary to manage the items, systems, and activities under the cognizance of CBFO. Procedure PRO-486-WIPP-006, TRU Waste Characterization Project QA Grading, has been developed and implemented at RFETS to comply with this requirement.

The steps leading to identifying realistic process controls are to: (1) identify the RFETS procedures that implement WIPP requirements, (2) designate each WIPP-related procedure as Quality Level (QL)-Major or QL-Minor, and 3) cross-correlate each WIPP-related procedure to a corresponding QAPD QA element. Procedure PRO-486-WIPP-006, TRU Waste Characterization Project QA Grading, contains this list of RFETS WIPP-related procedures that implement QAPD requirements.

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2.2.6 Sampling Plan

The document 95-WP/SAP-001, Transuranic (TRU/TRM) Waste Sampling Plan, supports the WIPP-WAP and the TRAMPAC sampling requirements. It outlines the strategy to be used by the site in the sampling of TRU waste that will be shipped to WIPP for disposal. The contents of 95-WP/SAP-001, Transuranic (TRU/TRM) Waste Sampling Plan, correspond to requirements given in the WIPP-WAP. Compliance with the WIPP-WAP is accomplished through the use of the TWCP QAPjP and the TWMM.

Individual Sampling Plans that support various processes are:

- RS-012-004, Grid Method - Repack Solid Sampling and Analysis Plan;
- RS-012-005, Cone and Quartering Method - Repack Solid Sampling and Analysis Plan;

2.2.7 TRAMPAC and Associated QA Plan

The site-specific TRAMPAC is required to describe, in technical detail, how compliance with requirements of the TRAMPAC and Certificate of Compliance will be met. Section 6 of the TWMM is the RFETS TRAMPAC. Section 6 references RFETS procedures that pertain to loading and unloading the TRUPACT-II and that provide compliance with the requirements of the TRAMPAC. Section 3 of the TWMM provides the QA Plan that is associated with the TRAMPAC.

2.2.8 Packaging QA Plan

The Packaging QA Plan describes the site QA program for TRU Waste Packaging. The requirements for packaging are contained in 10 CFR 71, Subpart H. Existing QA programs may be used if they meet the requirements of 10 CFR 71 requirements. Section 4.6 provides the Packaging QA Plan for the TRU Waste Characterization Project.

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Table 2-1, Summary of RFETS Program Documents

RFETS PROGRAM DOCUMENT	RFETS DOCUMENT PROVIDING COMPLIANCE	DOCUMENT REVIEW/APPROVAL
Waste Certification Plan	TWMM, Section 5.0	National TRU Waste Program Team Leader Approves CBFO QA Manager Approves CBFO Transportation Package Manager Reviews DOE Rocky Flats Field Office (RFFO) Approves RFETS Contractor Review and Approval according to MAN-001-SDRM, Site Document Requirements Manual; PRO-1329-DM-03, Site Document Control; and PRO-815-DM-01, Developing and Maintaining Documents
Certification QA Plan	TWMM, Section 3.0	Same review/approval as listed above for the Waste Certification Plan
TWCP Quality Assurance Project Plan (TWCP QAPjP)	TWCP QAPjP	National TRU Waste Program Team Leader Approves CBFO QA Manager Approves DOE RFFO Approves RFETS Contractor Review and Approval according to MAN-001-SDRM, Site Document Requirements Manual; PRO-1329-DM-03, Site Document Control; and PRO-815-DM-01, Developing and Maintaining Documents
QAPD Procedures Matrix	INS-246, Transuranic Waste Characterization Project (TWCP) QAPD Procedures Matrix	RFETS Contractor Review and Approval according to MAN-001-SDRM, Site Document Requirements Manual; PRO-1329-DM-03, Site Document Control; and PRO-815-DM-01, Developing and Maintaining Documents
Graded Approach Procedure	PRO-486-WIPP-006, TRU Waste Characterization Project QA Grading	CBFO QA Manager Approves DOE RFFO Approves RFETS Contractor Review and Approval according to MAN-001-SDRM, Site Document Requirements Manual; PRO-1329-DM-03, Site Document Control; and PRO-815-DM-01, Developing and Maintaining Documents
Sampling Plan (no longer a WIPP requirement)	95-WP/SAP-001, Transuranic (TRU/TRM) Waste Sampling Plan	RFETS Contractor Review and Approval according to MAN-001-SDRM, Site Document Requirements Manual; PRO-1329-DM-03, Site Document Control; and PRO-815-DM-01, Developing and Maintaining Documents
TRAMPAC & Associated QA Plan	The TRAMPAC is provided in the TWMM, Section 6; and the associated QA Plan is provided in the TWMM, Section 3.0.	Same review/approval as listed above for the Waste Certification Plan
Packaging QA Plan	TWMM, Section 4.6	Same review/approval as listed above for the Waste Certification Plan

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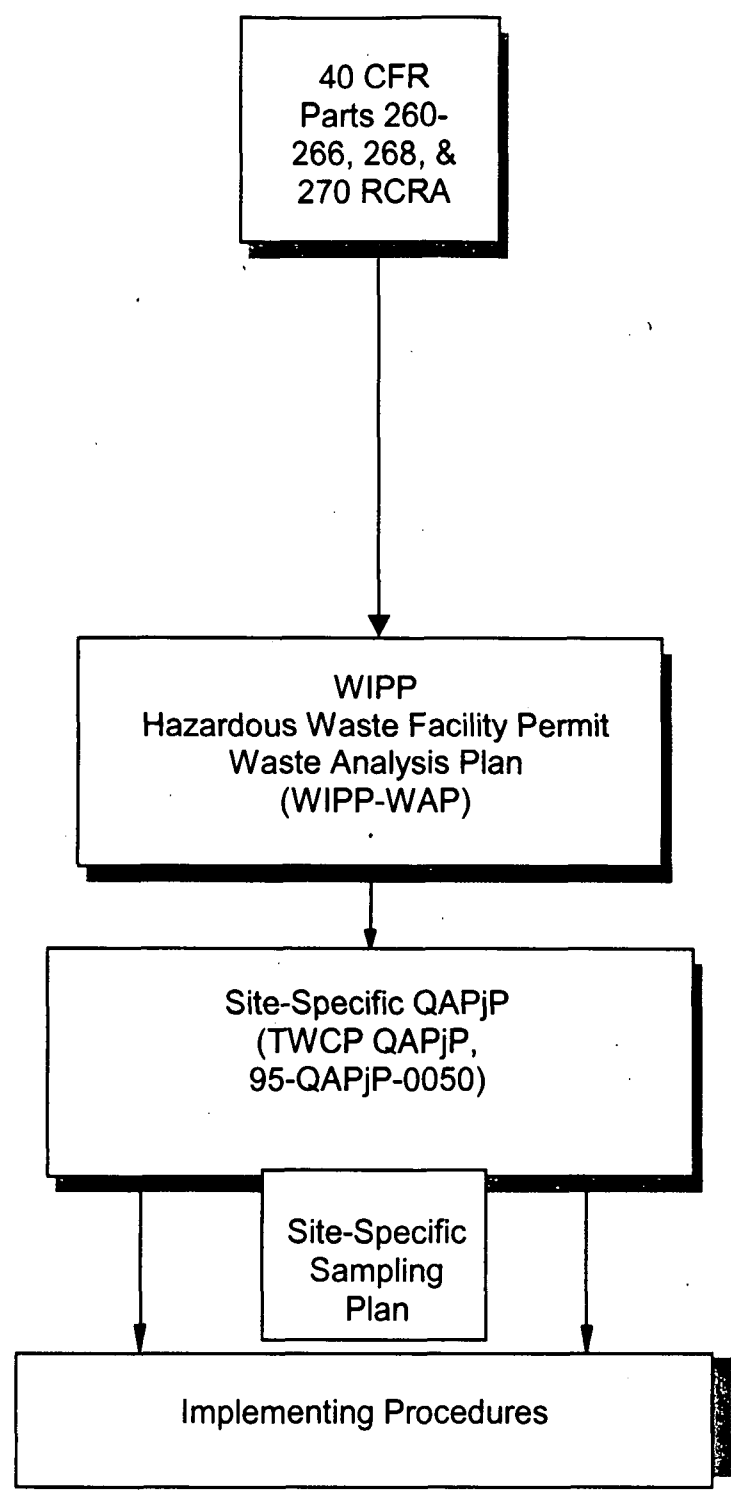


Figure 2-1, CBFO Requirements Flowdown Characterization

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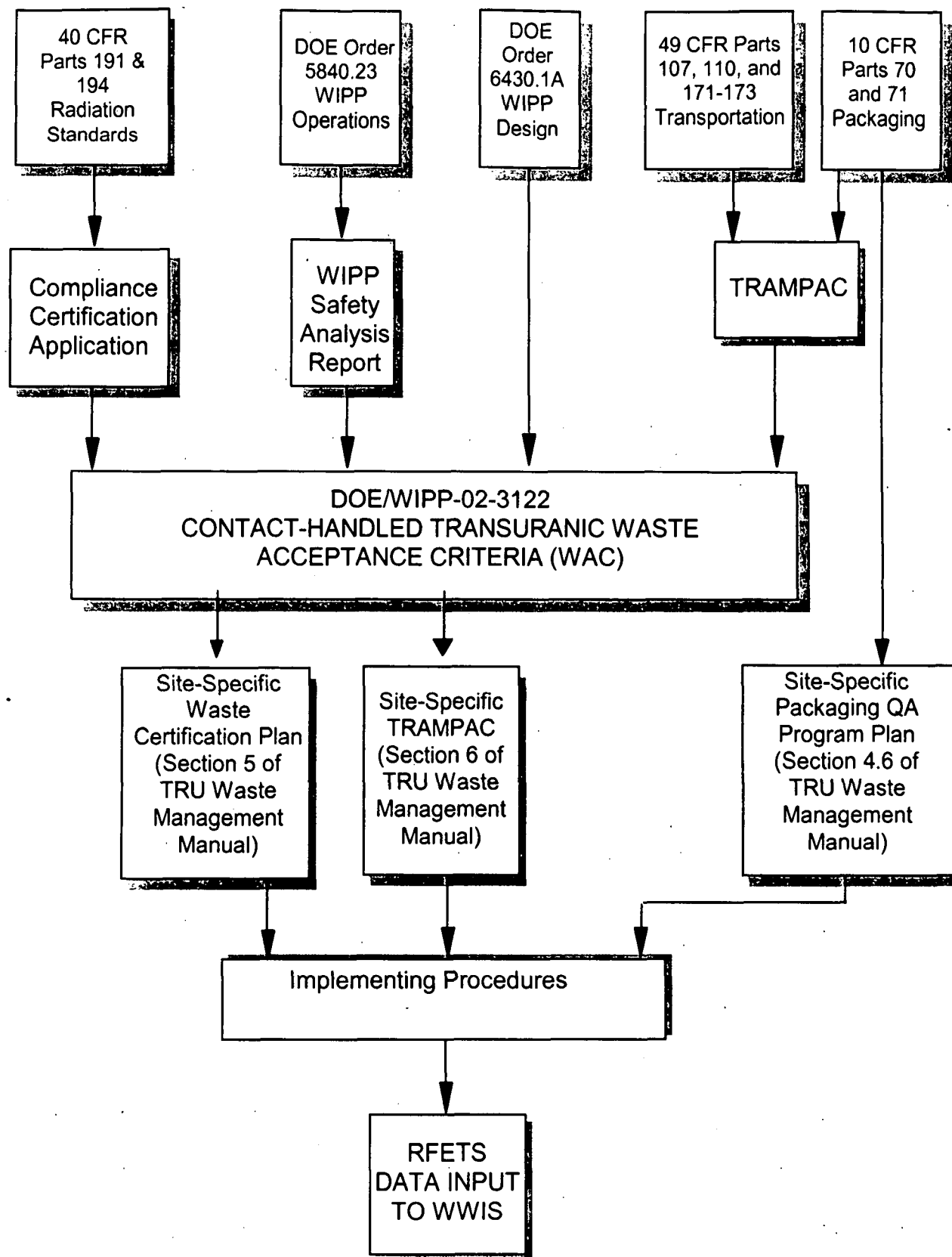


Figure 2-2, CBFO Requirements Flowdown Certification

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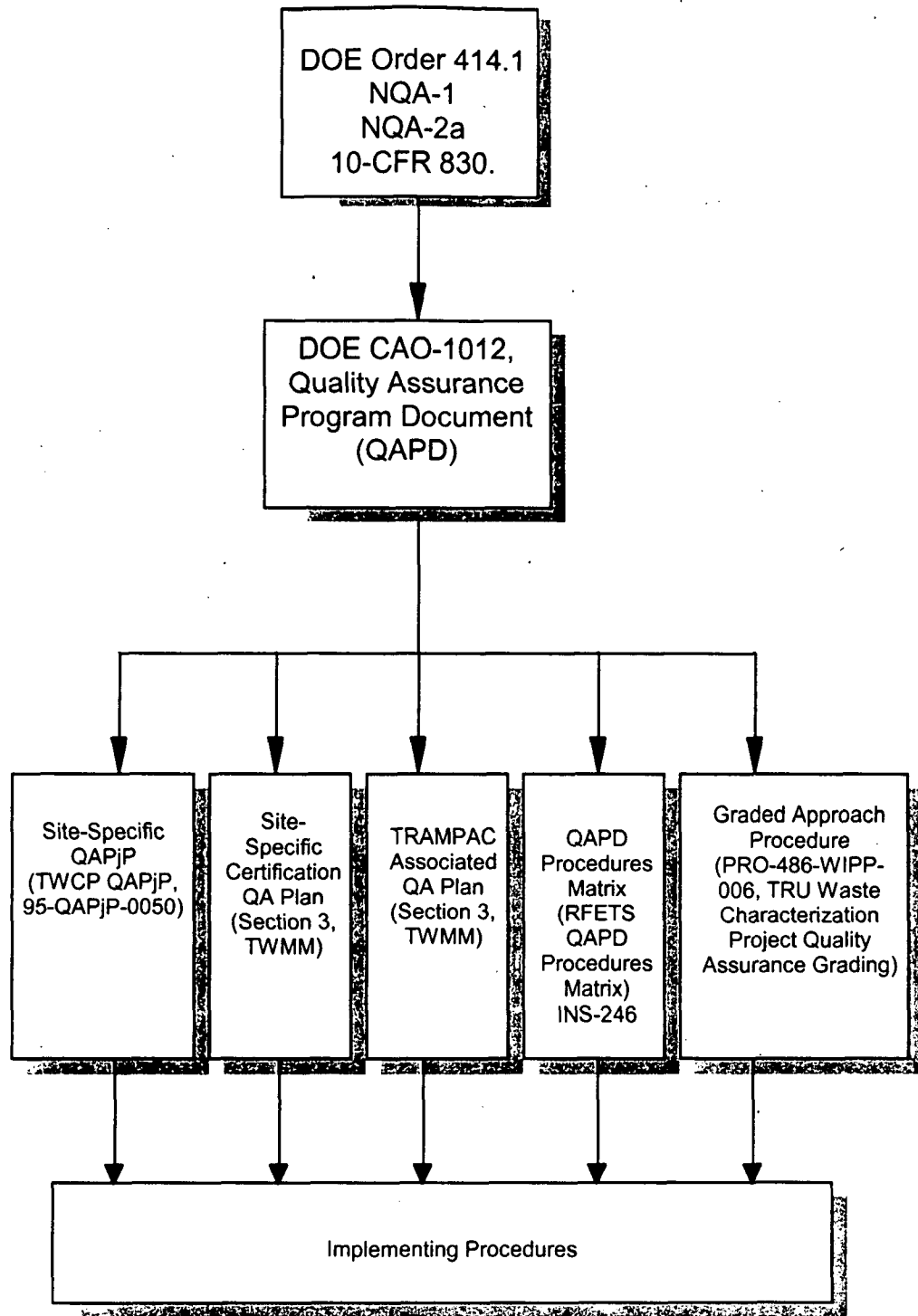


Figure 2-3, CBFO Requirements Flowdown Quality Assurance

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3.0 CERTIFICATION AND TRAMPAC QUALITY ASSURANCE PROGRAMS

This section describes the TRU Waste Characterization Project QA Program that provides compliance with the Quality Assurance requirements defined in the QAPD. The TRU Waste Characterization Project QA Program is also the QA Program associated with the TRAMPAC for the use, maintenance, and control of the TRUPACT-II. A matrix of the QAPD requirements and implementing procedures is submitted to the National TRU Waste Program Office. The document INS-246, Transuranic Waste Characterization Project (TWCP) QAPD Procedures Matrix, is maintained by the TWCP Site PQAO.

The RFETS QA requirements are identified in the Kaiser-Hill Quality Assurance Program Criteria. The QA Program implemented by the TRU Waste Characterization Project is directed towards CBFO QA requirements.

Any payload packages with unresolved discrepancies associated with hazardous waste characterization will not be shipped to WIPP until the discrepancies are resolved. Corrective action reports applicable to WIPP-WAP requirements shall be resolved prior to waste shipment.

3.1 MANAGEMENT REQUIREMENTS

3.1.1 Organization & QA Program

This section describes the organizational, managerial and quality assurance structure and responsibilities for the RFET TRU Waste Programs. Generator and originator are titles considered synonymous and used interchangeably throughout this plan.

3.1.1.1 Organization

The functional organization charts in Appendix 1, Organizational Charts show the RFETS TRU Waste Programs organizational breakdown and reporting hierarchy, which is updated commensurate with changes to the TWMM. The Kaiser-Hill (KH) Human Resources department maintains the official organizational charts for RFETS.

3.1.1.1.1 Management Responsibilities

The responsibilities listed here are the general responsibilities of the organizations. The specific tasks and responsibilities to be performed by these organizations are defined in the Rocky Flats Closure Project (RFCP), Project Management Plan (PMP), work packages, and in specific operating procedures.

3.1.1.1.1 Management Responsibilities (continued)

Kaiser-Hill (KH) is responsible for ensuring the development, implementation, and maintenance of plans, policies, and procedures necessary to assure compliance with all applicable regulations, U.S. Department of Energy (DOE) orders and requirements applicable to activities subject to the QAPD.

Material Stewardship, TRU Waste Project, provides program management of the TWCP. The Vice President, Material Stewardship, designates the TRU Waste Project Manager. The TRU Waste Project Manager fulfills the functional role of TWCP Site PM.

The TWCP Site PM is responsible for directing the TRU waste generation, characterization, certification and transportation activities across all organizations supporting the program. The TWCP Site PQAO identifies and achieves all management QA responsibilities by developing, implementing and maintaining the quality assurance programs and mechanisms to ensure compliance to specified quality assurance requirements. The following sections of this document describe the specific responsibilities of the Site PM and the Site PQAO.

3.1.1.1.2 Employee Responsibilities

The **TWCP Site PM** performs the following:

- Provides for project management of the RFETS TRU Waste Program. Defines project activities, authorizes work, and manages the budget for the project, and tracks progress.
- Performs oversight and/or management of TRU Waste Program characterization activities.
- Interfaces with KH, DOE, WIPP and other regulatory agencies on project-specific matters, and serves as the RFETS Point-of-Contact for WIPP-related activities.
- Manages CBFO and New Mexico Environmental Department (NMED) audit preparations for TRU Waste Program characterization and Residues processing.
- Ensures through the TWCP Site PQAO that surveillances are scheduled and performed.

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3.1.1.1.2 Employee Responsibilities (continued)

The TWCP Site PM (continued)

- Ensures development and maintenance of program documents, plans and procedures necessary to implement the TRU Waste Program:
 - Ensures preparation, issuance, control and maintenance of, and approves the TWMM, the TWCP QAPjP, and INS-246, TWCP QAPD Procedures Matrix;
 - Ensures annual review of the TWCP QAPjP and concurs on necessary changes or revisions;
 - Reviews and concurs on TRU Waste Program characterization plans and procedures [e.g., headspace gas, visual examination (VE), nondestructive assay (NDA), Real-Time Radiography (RTR)];
 - Ensures distribution of CBFO requirements document changes to affected organizations so that RFETS implementing procedures can be modified as necessary.
- Ensures that projects that support TRU Waste Program activities utilize processes that comply with TRU Waste Program requirements.
- Concurs with appointment of the TWCP Site PQAO and the Project Data Control Officer (PDCO).
- Designates the Project Training Officer.
- Ensures that applicable personnel are trained and qualified to TRU Waste Program requirements.
- Provides for waste selection and tracking.
- Provides for data validation and verification:
 - Approves Batch Data Reports;
 - Provides notification to the laboratory of data approval.
- Provides for data reconciliation with data quality objectives (DQOs):
 - Ensures that, as applicable, solid sampling and analysis, headspace gas sampling and analysis, visual examination, NDA, and RTR are performed, completed, and documented in accordance with TRU Waste Program requirements;
 - Provides direction to the TWCP Site PQAO, PDCO, and project staff regarding analytical data validation and reconciliation with quality assurance objectives (QAOs) as necessary.

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3.1.1.1.2 Employee Responsibilities (continued)

The TWCP Site PM (continued)

- Provides for the assignment of U.S. Environmental Protection Agency (EPA) Hazardous Waste Codes:
 - Ensures that applicable sampling is performed (e.g., fingerprint analysis, headspace sampling, and Resource Conservation and Recovery Act (RCRA) solid sampling).
- Ensures that feedback from waste characterization activities is used to update Acceptable Knowledge (AK) documentation.
- Approves Waste Stream Profile Forms (WSPFs).
- Provides technical guidance for treatment and/or disposition of wastes.
- Reviews and provides for the transmission of QA/QC reports to the DOE Field Office.
- Provides for data transmission to CBFO:
 - Signs transmittal of the final Batch Data Reports;
 - Provides for submittal of the required Batch Data Reports [through Waste Environmental Management System (WEMS)] to the WIPP prior to each TRU waste shipment (contains complete package and shipping information).
- Manages facility operational aspects of the TRU Waste Program involving headspace gas sampling and VE for use in verifying RTR as follows:
 - Interfaces with Waste Operations and the TWCP Site PQAO on project activities affecting cost, schedule, and quality-related matters;
 - Ensures that operator training is conducted according to requirements;
 - Ensures that visual waste characterization data are obtained for appropriate waste containers used in the TRU Waste Program;
 - For VE activities used to verify radiography, ensures that activities are audio/videotaped and that audio/videotape equipment is checked prior to each day's use, to including recording and observation of test patterns;
 - Ensures that VE (to Confirm RTR) audio/videotapes are transmitted to the PDCO within 30 days of completion;
 - Ensures that data are recorded and complete;
 - Ensures that waste-characterization data forms and reports are transmitted to the PDCO as soon as possible after data generation; and
 - Ensures 100% validation of VE raw data.

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3.1.1.1.2 Employee Responsibilities (continued)

The **PDCO** performs the following:

- Manages and controls the TRU Waste Program records in accordance with PRO-767-WIPP-001, Waste Records Center Processing; and 1-PRO-077-WIPP-005, Management of Waste Information Prior to Transmittal to the Waste Records Center.
- Supports the TWCP Site PQAO in project quality surveillance, data coordination, and data acquisition as defined in PRO-767-WIPP-001, Waste Records Center Processing.
- Upon completion of the data generation level data validation and verification, receives the Batch Data Reports for inclusion in the project records management system.
- Upon request, transmits data generation level Batch Data Reports to the TWCP Site PQAO for project level data validation and verification.
- Upon completion of the project level data validation and verification, receives the approved Batch Data Reports for inclusion in the project records management system.
- Provides training to WIPP records custodians.

3.1.1.1.3 Quality Assurance Management & Responsibilities

The **KH Site Quality Assurance Manager** performs the following:

- Assures QA management has direct access to responsible management at a level where appropriate action can be effected, is sufficiently independent from cost and schedule considerations, has the organizational freedom to communicate with management, and, has no other assigned responsibilities unrelated to the QA program that would prevent full attention to QA matters.
- Identifies and reports quality problems to the TWCP Site PM or Site PQAO.
- Responsible for site corrective action program
- Initiates stop work orders according to 1-V10-ADM-15.02, Stop Work Action, when appropriate.
- Coordinates the identification, evaluation, and resolution of site-wide quality issues or quality issues that cross project boundaries.
- Provides an interface between senior management and project QA functions for site-wide issues or issues that cross project boundaries.

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3.1.1.1.3 Quality Assurance Management & Responsibilities (continued)

The **Material Stewardship QA Manager** performs the following:

- Designates and provides oversight of the TWCP Site PQAQO.
- Assures development and maintenance of the TRU Waste Program QA program in conjunction with the KH Quality Assurance program.
- Schedules and conducts assessments of the TRU Waste Program.
- Provides day-to-day guidance on quality-related matters to TRU Waste Program staff.
- Ensures that an independent assessment of the project is performed annually (this assessment may be comprised of several smaller scope assessments).
- Ensures that Waste Inspectors are trained and qualified to perform waste inspection.
- Ensures that waste inspection procedures and work instructions are developed and maintained.
- Provides for technical guidance for RFETS Waste Inspectors.
- Ensures that Waste Inspectors meet responsibilities identified in waste inspection procedures.

The **TWCP Site Project Quality Assurance Officer (TWCP Site PQAQO)** performs the following:

- Ensure that the TRU Waste Program QA program provides RFETS compliance with the QAPD.
- Schedules, performs, or directs, surveillance of TRU waste characterization, generation, packaging, control, and acceptance activities including assessments of labs and testing facilities.
- Tracks, reviews and approves the disposition of TRU Waste Program non-conformances.
- Assists the TWCP Site PM in responding to regulator identified deficiencies and non-conformances.
- Performs, or designates individuals to perform, data validation and verification activities on Batch Data Reports as defined through procedures identified in the TWCP QAPjP.
- Verifies data QA documentation through the data validation and verification of Batch Data Reports

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3.1.1.1.3 Quality Assurance Management & Responsibilities (continued)

The TWCP Site PQAQO (continued)

- Tracks, performs trend analysis, and reports on quality problem areas.
- Identifies and reports quality-related problems to the TWCP Site PM, initiates documentation to track the quality-related problem, recommends corrective action, and tracks corrective actions to closure.
- Performs verification of corrective actions in accordance with PRO-943-WIPP-007, TRU Waste Characterization Program Conditions Adverse to Quality Trending and Analysis.
- Submits QA/QC reports to the TWCP Site PM. for review, transmittal to CBFO, and distribution to the RFFO.
- Ensures continuing conformance to QA requirements through:
 - Review and approval of procedures that implement the TRU Waste Program QA program;
 - Review and concurrence on the TWCP QAPjP, the Gas Generation Testing Program (GGTP) QAPjP, the TWMM and the PRO-486-WIPP-006;
 - Review and concurrence on INS-246, TWCP QAPD Procedures Matrix, as required by the QAPD, and submittal of the document to CBFO;
 - Distribution, to affected organizations, of changes to CBFO requirement documents so that site implementing procedures can be modified as necessary.
- Provides a list of WIPP-related RFETS documents to Site Document Control.
- Provides day-to-day guidance on quality-related matters, as necessary, to TRU Waste Program staff.
- Initiating a stop work order in accordance with 1-V10-ADM-15.02, Stop Work Action, if quality work is not assured.
- Maintains liaison with the CBFO QA organization and sub-tier organizations.
- Interfaces with generators of TRU Waste Program data and quality-related records.

3.1.1.1.4 Communication and Organizational Interface Responsibilities

RFETS TRU Waste Programs has communications and interface responsibilities with Technical Operations; Waste Certification & Oversight; Traffic & Transportation; Measurements; and other supporting groups. The following paragraphs discuss the general responsibilities of each of these groups.

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3.1.1.1.4 Communication and Organizational Interface Responsibilities (continued)

Technical Operations

The Technical Operations organization is supported by Waste Systems and the Waste Requirements Group.

Waste Systems performs the following:

- Maintains the content and accuracy of the Waste Stream and Residue Identification and Characterization (WSRIC) Building Books when revision requests are received from generator organizations.
- Maintains the Waste and Environmental Management System (WEMS) computer database.
- Maintains the content and accuracy of the Backlog Waste Reassessment Baseline Book (BWRBB) and coordinates reassessment of characterization information for packaged waste.

Waste Requirements Group performs the following:

- Prepares, issues, controls, and maintains waste segregation guidance documents.
- Provides Independent Technical Reviewer, Technical Supervisor, and Quality Assurance Officer reviews of visual verification data generated by waste generators.
- Provides waste characterization, generation, and packaging assistance to waste generators.
- Prepares Waste Generating Instructions (WGIs) to communicate waste characterization and packaging requirements to waste generators at the floor level.
- Reviews the Waste/Residue Traveler (W/RT) for conformance to the Colorado Department of Public Health & Environment (CDPHE) RCRA Permit and on-site procedural requirements before the waste packages are sent to respective storage areas to ensure compliance with all applicable requirements.
- Prepares, issues, controls, and maintains waste packaging procedures.
- Specifies labeling and marking of waste packages according to U.S. Department of Transportation (DOT) and treatment, storage, and disposal facility (TSDF) requirements in accordance with the appropriate Labeling and Marking Procedures for Radioactive Waste Material Packages.
- Reviews requisitions and approves for WIPP-related commodities to ensure project requirements are included.

3.1.1.1.4 Communication and Organizational Interface Responsibilities (continued)

Waste Operations

The Waste Operations organization performs the following:

- Maintains storage area for off-site shipments.
- Stores RCRA regulated wastes in compliance with applicable regulations.
- Receives, inspects, logs, serializes, and tracks all spare parts associated with the TRUPACT-II package (PRO-1418-WO-TRUOP, TRUPACT-II Operations).
- Prepares waste packages and TRUPACT-II packages for off-site shipment.
- Labels and marks packages according to DOT and TSDF requirements (refer to Labeling and Marking Procedures for Radioactive Waste Material Packages):
- Performs loading operations of TRUPACT-II packages.

NDA Operations

NDA Operations performs the following:

- Operate NDA equipment located in Buildings 569, 664, and SuperHENC, located just outside Building 440
- Participate in NDA performance demonstration program (PDP).

Nondestructive Testing (NDT)

NDT performs the following:

- Responsible for performing helium leak test on the TRUPACT-II Type B vessel.
- Reviews and approves the TRUPACT-II leak test standard operating procedures (SOPs);
- Maintain and qualify TRUPACT-II leak test equipment to guidelines of ANSI, N14.5-1997, Radioactive Materials – Leakage Tests on Packages for Shipment;
- Responsible for performing RTR of waste packages.
- Responsible for the oversight of mobile RTR vendors.

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3.1.1.1.4 Communication and Organizational Interface Responsibilities (continued)

NDT (continued)

- Manages KH operated RTR processes of waste containers involving the TWCP as follows:
 - Interfaces with the TWCP Site PM and the TWCP Site PQAO on TRU Waste Program activities affecting cost, schedule, and quality-related matters;
 - Reviews and approves RTR data reports and forms;
 - Ensures that RTR data reports and forms are complete and receive an independent technical review;
 - Coordinates and schedules NDT work to support the TRU Waste Program;
 - Reviews and approves the NDT SOPs and forms and reports;
 - Verifies that TWCP QAPjP requirements are met;
 - Reviews and concurs with the TWCP QAPjP;
 - Perform QC checks of NDT equipment to applicable requirements and at specified frequencies;
 - Periodically reviews audio/videotape of accepted waste packages by personnel other than the operator who dispositioned the waste package;
 - Ensures that the RTR audio/videotapes are transmitted to the PDCO and that one audio/videotape is retained in the NDT files;
 - Assigns NDT personnel;
 - Ensures that RTR operators are trained and certified to existing industry standards and comply with the training and qualification requirements of the WIPP-WAP and the QAPD;
 - Ensures the preventive and routine maintenance is conducted in accordance with the requirements of this document; and
 - Ensures that nonconformances are reported and corrective actions have been completed.

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3.1.1.1.4 Communication and Organizational Interface Responsibilities (continued)

Waste Certification & Oversight

The Waste Certification & Oversight (WC&O) organization performs the following activities through the **Waste Certification Official (WCO)**:

- Reports to the Manager of WC&O who reports to the manager of Environmental Compliance.
- Maintains independence from waste generating organizations.
- Reviews and concurs with process and quality controls.
- Reviews and approves NDA Qualification Reports.
- Serves as a point-of-contact for TRU waste NCRs.
- Certifies that TRU waste is properly segregated and packaged, including designation of wastes as RCRA/Toxic Substances Control Act (TSCA) hazardous constituents or Land Disposal Restricted materials, as applicable, based on a thorough review of inspection, test, and surveillance information.
- Certifies that TRU waste meets all applicable WIPP-WAC based requirements on the waste generator's characterization, RTR, and other quality controls.
- Certifies by signature that the TRU waste is properly classified, packaged, marked, labeled, and loaded in the TRUPACT-II package, and meets WIPP-WAC.
- Signs the TRU waste certification checklist attesting that the TRU waste shipment meets WIPP-WAC requirements.
- Assures waste certification records are maintained as required by project procedures.
- Reviews and concurs with TRU waste management procedures.

Document Control

The Document Control organization conducts information resource management by performing the following:

- Ensures controlled distribution of specific documents related to the TRU Waste Programs.
- Maintains document history files as specified in MAN-001-SDRM, Site Document Requirements Manual (SDRM).

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3.1.1.1.4 Communication and Organizational Interface Responsibilities (continued)

Traffic and Transportation

The Traffic and Transportation organization is independent from waste generation, inspection, test and certification organizations. The Traffic Management group supports the Traffic and Transportation organization. Traffic and Transportation organization is responsible for the following:

- All issues concerning on-site transfer or off-site shipments.
- Compliance to DOT requirements.
- Appointing the Manager of Traffic Management.

The Manager of Traffic Management performs the following:

- Reports to the Manager of Traffic and Transportation.
- Generates and maintains site procedures providing guidance and specifying the DOT marking and labeling requirements for waste packages.
- Prepares shipping papers from shipment data information.
- Delivers and certifies personnel training for DOT hazardous materials transportation, as required in 49 CFR.
- Notifies the TRU waste disposal site (WIPP) of each shipment prior to departure.
- Interfaces with WIPP, oversight groups, the WCO, and TRU Waste Programs on transportation issues.
- Maintains an auditable records system pertaining to shipments.
- Schedules TRUPACT-II package movements to and from RFETS.
- Performs pre-loading and post-loading vehicle, trailer, and load inspections per Commercial Vehicle Safety Alliance (CVSA) requirements.
- The Manager of Traffic Management fulfills the Transportation Certification Official (TCO) duties by appointing the Transportation Certification Official.

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3.1.1.1.4 Communication and Organizational Interface Responsibilities (continued)

Traffic and Transportation (continued)

The Transportation Certification Official (TCO) performs the following:

- Signs the Bill of Lading and the Uniform Hazardous Waste Manifest, and thereby certifying the following:
 - Waste package contents are fully and accurately described, classified, described, and packaged;
 - Waste packages are properly marked and labeled;
 - Waste shipments are , in all respects, in proper condition for transportation according to the applicable regulations of the Department of Transportation and meet Title 40 and Title 49 CFR hazardous waste and transportation requirements;
 - A waste minimization program is in place;
 - Approval of payload packages;
 - Compliance with packaging and records requirements.
- Verifies the Payload Container Transportation Certification Document (PCTCD), Overpack Payload Container Transportation Certification Document (OPCTCD), and the Payload Assembly Transportation Certification Document (PATCD). Each item on these documents must be verified per 4-T20-Traffic-505, Certifying Authorized Payloads for TRUPACT-II, and this procedure is consistent with the TRAMPAC).
- Ensures compliance to all requirements before releasing the truck to the carrier.

Procurement Systems

Procurement Systems is responsible for the following:

- Solicits and evaluates offers and awards purchase orders.
- Subcontracts for WIPP packagings and supporting items.

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3.1.1.1.4 Communication and Organizational Interface Responsibilities (continued)

Procurement Engineering & Quality Assurance

The Procurement Engineering & Quality Assurance organization, supported by the Rocky Flats Closure Site Services (RFCSS), is responsible for the following:

- Evaluates suppliers.
- Maintains Site Evaluated Subcontractors List.
- Investigates supplier issues leading to resolution.
- Represents the Site to the DOE Contractor's Supplier Quality Information Group.

RFCSS performs the following:

- Maintains appropriate stock levels.
- Pre-assembles the Pipe Overpack Component (POC) in accordance with PRO-284-POC-001, Pipe Overpack Component Initial Assembly Process.
- Prepares and transfers accepted empty waste packaging, including hardware and associated waste packaging items, to various contractors in compliance with the established warehouse transfer operation procedure, PRO-Q49-PKG-4040, Warehouse Waste Packaging Operations.
- Conducts essential source and receipt inspection and certification processes (as required) on new waste packagings, drum rings, hardware, and associated waste packaging materials, to verify that purchased items and services meet all applicable requirements, standards, and specifications of the purchase agreement, prior to the final certification and release to the RFETS warehouse storage facility.
- Records and controls nonconforming items identified by certification and inspection (C&I) inspection using Receiving Inspection Deficiency Reports, implementing the nonconformance process described in 1-A65-ADM-15.01, Control of Nonconforming Items. This prevents inadvertent or unauthorized use while a technical evaluation of the item's condition is being conducted.
- Maintains inspection records to substantiate item compliance with established requirements, standards and specifications relevant to the Purchase Order agreement.

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3.1.1.1.4 Communication and Organizational Interface Responsibilities (continued)

Remediation, Industrial D&D, and Site Services (RISS)

The RISS organization, supported by the Metrology, Laboratory, and Analytical Services groups

The Metrology group manages the subcontracted calibration of measuring and test equipment used in the packaging and processing of waste.

The Laboratory group is responsible for the following:

- Provides analytical chemistry services in support of waste characterization.
- Performs the material testing.
- Performs the destructive analysis of wastes and radioactive materials.
- Appointing the Analytical Laboratories Manager.

Analytical Laboratories Manager performs, or delegates to subordinate managers, the following responsibilities:

- Interfaces with the TWCP Site PM and the TWCP Site PQAO on TRU Waste Program activities affecting cost, schedule, and quality-related matters.
- Ensures that analytical personnel are trained and qualified.
- Ensures participation in the PDPs for analytical testing.
- When performing the functional role of Technical Supervisor, reviews, approves, and releases the Analytical Batch Data Report. Other qualified personnel [i.e., qualified as specified in PLN-97-007, TWCP Training Implementation Plan (TWCP TIP)] may perform the role of Technical Supervisor.
- Coordinates and schedules analytical work to support the TRU Waste Program.
- Ensures that corrective and preventive actions have been completed.
- Reviews and approves all Analytical Laboratory SOPs and reports.
- Assigns laboratory staff.
- Manages the implementation of the Analytical Laboratories' roles and responsibilities.
- Verifies compliance to analytical requirements of the WIPP-WAP and QAPjP.

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3.1.1.1.4 Communication and Organizational Interface Responsibilities (continued)

RISS (continued)

The Analytical Services group is responsible for the following:

- Performs evaluations of requisitions for subcontracted analytical services.
- Generates Chain-of-Custody and unique identification and control numbers for sampling activities.
- Appointing the Analytical Laboratories Project Quality Assurance Officer (LPQAO).

The LPQAOs perform the following:

- Directs all of the Analytical Laboratories' WIPP-related QA activities and is matrixed to the Analytical Laboratories' Manager in fulfilling this function.
- Interfaces directly with the TWCP Site PQAO on analytical laboratory specific QA matters related to this project.
- Ensures that all project laboratory personnel have a clear understanding of the special QC requirements for the Project.
- Develops, reviews, and revises laboratory-related portions of the TWCP QAPjP.
- Provides quality surveillance of analytical laboratory TRU Waste Program-related activities.
- Tracks and reports analytical laboratory nonconformances for management reporting to the TWCP Site PQAO.
- Verifies the implementation of project QA requirements.
- Identifies and reports laboratory quality deficiencies to the appropriate Project personnel and the TWCP Site PQAO.
- Initiates, recommends, and tracks corrective actions to closure.
- Reviews and verifies that all Analytical Laboratory SOPs comply with QAPjP and WIPP-WAP requirements.
- Reviews and approves Bath Data Reports prior to release to the Waste Records Center and ensures that Batch Data Reports are transmitted in a timely manner.
- Ensures that all analytical laboratory requirements of the WIPP-WAP and QAPjP have been met.

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3.1.1.1.4 Communication and Organizational Interface Responsibilities (continued)

Measurements

The Measurements organization is responsible for the following technical, operational, data management and planning, and quality assurance activities:

Technical activities include:

- Establishing and maintaining a Measurement Control Program in accordance to the QAPD;
- Selecting, validating, and qualifying RFETS NDA measurement systems;
- Coordinating with the TWCP Site PM, TWCP Site PQAO and Materials Control & Accountability on NDA activities affecting TRU Waste Programs;
- Ensuring that Measurements documents are compliant with TRU Waste Programs requirements;
- Providing expert review, if necessary, of NDA Testing Batch Data Reports;
- Designating and providing supervision of NDA functions; and
- Providing oversight of subcontracted NDA services (if required).

Operational activities include:

- Supervises the installation of new NDA equipment that measure radionuclides for Residues, TRU Waste, and low-level waste (LLW);
- Perform calibrations and calibration verifications of NDA equipment to applicable requirements and at specified frequencies;
- Maintains and repairs RFETS NDA counters and equipment;
- Maintains configuration control of RFETS NDA counters to meet applicable NDA QC requirements and frequencies;
- Provides subject matter expert (SME) support for the maintenance and operation of NDA equipment;
- Tracks RFETS NDA standard certification status;
- Establish and maintain adequate NDA procedures; and
- Adequately qualify, train and re-qualify NDA personnel upon existing industry training standards.

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3.1.1.1.4 Communication and Organizational Interface Responsibilities (continued)

Measurements (continued)

Quality Assurance activities include:

- Implementing a documented QA program for measurement facility that specify qualitative and quantitative QC acceptance criteria and corrective action processes;
- Investigating measurement problems, and documents and performs corrective actions.
- Facilitating the implementation of Measurement's quality assurance activities, including NDA operations, procedure development and updates, nonconformance reports, and corrective actions.
- Supporting quality assurance activities of measurement operations and data management.

Data management activities include:

- Designating and providing supervision of NDA data quality functions
- Establishing and maintaining an inventory of isotopic ratios of prevalent radionuclides for confirmation of AK;
- Designating and providing supervision of Data Generation Level Data Validation and Verification (V&V) as follows:
 - Provides NDA Data V&V;
 - Monitors the measurement control and instrument check data to assure that RFETS NDA counters perform according to quality requirements; and
 - Resolves Batch Data Report issues related to data quality.
- Provides Technical Supervisor Review of NDA Testing Batch Data Reports.

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3.1.1.1.4 Communication and Organizational Interface Responsibilities (continued)

Materials Control & Accountability (MC&A)

The MC&A organization performs the following:

- Responsible for control and accountability of nuclear material. Controls are described in the Safeguards Accountability Manual.
- Maintains program for the application of tamper indicating devices (TIDs).
- Generates the DOE/Nuclear Regulatory Commission (NRC) 741 form based on the load list for waste shipments to WIPP.
- Updates the RFETS accountability system with measurement results.

3.1.1.1.5 Delegation of Work

The organizations responsible for establishing, planning, accomplishing and assessing TRU Waste Program activities may delegate work to individuals. Listed below are the individuals, and their respective responsibilities, tasked with performing TRU Waste Program activities.

3.1.1.2 Implementation of the QA Program

The documentation, controls, and training described in this document implement the TRU Waste Program QA program. Section 3 of this document provides an overall description of project activities and the QA Program.

3.1.1.2.1 Quality Assurance Program Documents

The TWMM and the TWCP QAPjP document the plans and procedures that effectively implement the requirements of the QAPD, the WIPP-WAP, the WIPP-WAC, and the TRUPACT-II Authorized Methods for Payload Control (TRAMPAC).

3.1.1.2.2 Procedures Matrix

INS-246, Transuranic Waste Characterization Project (TWCP) QAPD Procedures Matrix, implements the specific controls to meet requirements identified the QA Program.

3.1.1.2.3 Applicability of QAPD Requirements

The applicability of the QAPD requirement to the TRU Waste Program are specified in the INS-246, Transuranic Waste Characterization Project (TWCP) QAPD Procedures Matrix.

3.1.1.2.4 Grading Items and Activities & Applying Management Controls

PRO-486-WIPP-006, TRU Waste Characterization Project QA Grading, provides instructions for implementing the graded approach utilized in implementing the QA program.

3.1.1.2.5 Planning Work

95-QAPjP-0050, RFETS QAPjP, PRO-486-WIPP-006 and the applicable sections of this document are used in the planning of waste management activities at RFETS.

3.1.2 Personnel Training & Qualification

Training development, approval and delivery complies with applicable DOE orders and the WIPP-WAP. Personnel associated with the generation, handling, packaging, inspection, testing, processing, certification, and shipment of waste shall be trained and qualified to applicable criteria, in accordance with the Site TPM.

3.1.2.1 Additional Qualification Requirements

The Site TPM and TIP document the applicable qualification criteria for TRU Waste Program personnel.

3.1.2.2 Additional Training Requirements

The TWCP TIP documents the training requirements for personnel supporting the TRU Waste Program. RFETS management having employees performing tasks directly in support of the TRU Waste Program (performing to procedures on activities described in this document and the TWCP QAPjP) are responsible for ensuring their employees meet the training requirements in the TWCP TIP.

The Training, Scheduling, and Records database provides the official status of training. Training records are maintained and transferred to the Waste Records Center according to instructions in the Site TPM and TIP.

3.1.3 Quality Improvement

Quality Improvement is achieved through the management assessment, surveillance, independent assessment, nonconformance, and corrective action processes. Improvement or corrective actions are identified, root cause analysis performed, action plans defined, and actions implemented.

3.1.3.1 General Quality Improvement Requirements

The RFETS Management organizations are responsible for ensuring compliance to quality improvement requirements by creating a culture of continuous improvement, detecting and preventing adverse quality conditions, implementing appropriate corrective actions and by identifying nonconforming items, activities and processes.

3.1.3.2 Specific Quality Improvement Requirements

RFETS organizations ensure compliance to specific quality requirements by identifying, classifying and controlling conditions adverse to quality, by ensuring adequate control and disposition of nonconforming items, implementing corrective action planning and follow-up, and by improvement analyses.

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3.1.3.2.1 Identification and Classification of Conditions Adverse to Quality

Conditions adverse to waste acceptability are identified promptly through inspections, tests, surveillances, and audits and corrected as soon as practical. The site corrective action program is defined in 3-X31-CAP-001, Corrective Action Process.

3.1.3.2.2 Control of Conditions Adverse to Quality

The TWCP Site PQAO trends conditions adverse to quality related to the TRU Waste Program according to PRO-943-WIPP-007, TRU Waste Characterization Program Conditions Adverse to Quality Trending and Analysis, and identifies opportunities for improvement. A lessons learned program has been implemented through procedure PRO-1541-SLLP, Site Lessons Learned Process.

Periodically TRU Waste Program may review the radioactive waste management activities. This activity could result in the identification of programmatic issues and deficiencies or significant adverse trends, which could affect the certifiability of waste. Follow-up actions will include applicable activities defined in 3-X31-CAP-001, Corrective Action Process.

3.1.3.2.3 Control and Disposition of Nonconforming Items

Procedure PRO-U76-WC-4030, Control of Waste Nonconformances, addresses the system to control waste nonconformances. When a waste nonconformance is identified, controls are established to prevent the nonconforming waste package from being shipped off-site. Acceptable control includes segregating the waste package, tagging the waste package, or administrative control. Nonconforming waste packages are tracked in the WEMS system.

Packages not meeting certification requirements may be returned to the waste generating organization for corrective action. Return of the rejected waste package to its originating organization is dependent upon area storage capacity, 90 day storage limitations, and radiation and chemical protective equipment requirements. Waste Nonconformance Reports (WNCRs) are dispositioned by describing the corrective action to be taken in the space provided on the WNCR. Independent verification of the corrective action is performed by WC&O prior to closure.

The Nonconformance Reports (NCRs) pertaining to TRUPACT-II packages will be submitted to CBFO per the requirements of DOE/WIPP-02-3183, CH Packaging Program Guidance, for review, final disposition, and approval.

Nonconformances that are not waste nonconformances are controlled according to 1-A65-ADM-15.01, Control of Nonconforming Items. These NCRs are tracked in the Plant Action Tracking System in accordance with 3-X31-CAP-001, Corrective Action Process.

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3.1.3.2.4 Corrective Action Planning and Follow-up

Procedure 3-X31-CAP-001, Corrective Action Process initiates documents, and tracks corrective actions. Stop work orders are issued according to procedure 1-V10-ADM-15.02, Stop Work Action. Deficiencies resulting in Stop Work Actions must be corrected prior to resuming waste processing.

The TWCP Site PQAQ reviews all documented deficiencies to determine if the deficiency identified impacts the TRU Waste Program. If so, the Plant Action Tracking System is notified to include the TRU Waste Program in the corrective action characterization. The action is then tracked and trended as a deficiency affecting the project. The TWCP Site PQAQ also reviews the actions to determine those that are significant conditions adverse to quality or relate to violations of the WIPP Hazardous Waste Permit. Corrective action planning and follow-up for the deficiency will meet the requirements of QAPD, Section 1.3.2.4. The process of identifying and assuring proper tracking and processing of TRU Waste Program corrective actions is described in PRO-943-WIPP-007, TRU Waste Characterization Program Conditions Adverse to Quality Trending and Analysis.

Procedure PRO-943-WIPP-007, TRU Waste Characterization Program Conditions Adverse to Quality Trending and Analysis, also defines the process of notifying CBFO of corrective action reports affecting waste that will be shipped to WIPP and the forwarding of copies of all internal corrective action reports that relate to violations of the WIPP-WAP.

Cause analysis is performed when significant adverse conditions are identified (refer to MAN-062-CAUSEANALYSIS, Cause Analysis Requirements Manual). Significant conditions adverse to quality may result in issuance of a stop work order by the WCO, the TWCP Site PM, or the QA organization.

3.1.4 Document Control

3.1.4.1 General Document Control Requirements

MAN-001-SDRM, Site Document Requirements Manual, PRO-815-DM-01, Developing and Maintaining Documents and PRO-1329-DM-03, Site Document Control define the RFETS Document Control Program. Procedures and documents supporting the TRU Waste Program are maintained in document control systems that comply with the requirements of the QAPD.

3.1.4.2 Specific Document Control Requirements

The RFETS Document Control organization ensures compliance to specific document control requirements by controlling the preparation, modification, review, approval, issuance, distribution and use of TRU Waste Program-related documents.

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3.1.4.2.1 Document Preparation, Review, Approval, and Issuance

PRO-815-DM-01, Developing and Maintaining Documents and PRO-1329-DM-03, Site Document Control define the process by which TRU Waste Program-related documents are prepared, reviewed, approved and issued.

3.1.4.2.2 Document Distribution and Use

PRO-1329-DM-03, Site Document Control defines the process used to distribute which TRU Waste Program-related documents.

3.1.4.2.3 Document Changes

PRO-815-DM-01, Developing and Maintaining Documents defines the change process of TRU Waste Program-related documents.

3.1.5 Records

QA records are maintained in order to furnish documented evidence that wastes are generated, packaged, inspected, assayed, analyzed, tested, and shipped according to the applicable requirements.

3.1.5.1 General Records Requirements

PRO-815-DM-01, Developing and Maintaining Documents and PRO-1329-DM-03, Site Document Control define the RFETS Document Control Program. Procedures and documents supporting the TRU Waste Program are maintained in document control systems that comply with the requirements of this procedure.

3.1.5.2 Specific Records Requirements

The RFETS Waste Records Center ensures compliance to specific record maintenance requirements through the effective implementation the RFETS Records System. The record control system ensures the generation, indexing, classification, retrieval, storage and correction of TRU Waste Program-related QA records.

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3.1.5.2.1 Records System

1-V41-RM-001, Records Management Manual, PRO-767-WIPP-001, Waste Records Center Processing, 1-PRO-077-WIPP-005, Management of Waste Information Prior to Transmittal to the Waste Records Center and PRO-1191-WRCM, WIPP Records Micrographics are used to define the RFETS Records System. The Record System ensures compliance with the QAPD for TRU Waste Program-related records.

The RFETS procedure for the control of records, 1-V41-RM-001, Records Management Manual, refers generators of TRU Waste Program records to 1-PRO-077-WIPP-005, Management of Waste Information Prior to Transmittal to the Waste Records Center. This procedure provides instructions for maintenance of TRU Waste Program records in compliance with the QAPD.

When records are microfilmed, the records are microfilmed according to PRO-1191-WRCM, WIPP Records Micrographics.

3.1.5.2.2 Generating QA Records

PRO-767-WIPP-001, Waste Records Center Processing and 1-PRO-077-WIPP-005, Management of Waste Information Prior to Transmittal to the Waste Records Center define the process used to control which TRU Waste Program-related QA records.

3.1.5.2.3 Indexing QA Records

PRO-767-WIPP-001, Waste Records Center Processing defines the process used to index TRU Waste Program-related QA records.

3.1.5.2.4 Classifying QA Records

Records pertaining to the TRU Waste Program are defined by type and are only considered valid records if they are signed and dated by authorized personnel from the applicable organizations. PRO-767-WIPP-001, Waste Records Center Processing define the process used to classify TRU Waste Program-related QA records.

3.1.5.2.5 Receiving QA Records

1-PRO-077-WIPP-005, Management of Waste Information Prior to Transmittal to the Waste Records Center provides instructions for receipt of QA records by the Waste Records Center.

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3.1.5.2.6 Storage, Preservation, Safekeeping and Disposition of QA Records

Procedure PRO-767-WIPP-001, Waste Records Center Processing, provides instructions for the handling of records in the Waste Records Center. A Records Inventory Disposition Schedule (RIDS) is developed and maintained. PRO-767-WIPP-001, 1-PRO-077-WIPP-005, Management of Waste Information Prior to Transmittal to the Waste Records Center, and RFETS-SOP-BACKUP-001, Server Backup Standard Operating Procedure provide instructions for the preservation, storage and safekeeping of TRU Waste Program-related QA records.

3.1.5.2.7 Correcting Information in QA Records

1-PRO-077-WIPP-005, Management of Waste Information Prior to Transmittal to the Waste Records Center provides instructions for correction of QA records.

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3.2 **Performance Requirements**

3.2.1 **Work Processes**

Work on the TRU Waste Program is performed according to established technical standards and administrative controls (procedures) identified in this document and the TWCP QAPjP. Each person supporting the project is responsible for the quality of his or her work and has the goal of doing work correctly the first time.

Management of the project has established processes and procedures to ensure that work is planned and performed under controlled conditions by trained personnel; items are maintained to prevent their damage, loss, or deterioration; and equipment used for process monitoring or data collection are calibrated and maintained.

This section further establishes management involvement in the work processes through their interactions with personnel performing the work and through their review and verification of ongoing and completed work. This will help ensure that the definition of "acceptable work performance" is clearly communicated and that personnel are provided the necessary training, resources, and administrative controls to properly accomplish their tasks. These processes and procedures are identified in this document and the TWCP QAPjP.

3.2.1.1 **Work**

TRU Waste Program work processes are performed through procedures implemented to meet the requirements of the QAPD. Qualified processes and equipment, approved procedures, qualified personnel, and documentation of operating conditions control waste treatment and packaging operations. This assures that waste processing activities are conducted in a consistent, repeatable, and acceptable manner. Waste treatment process control is the responsibility of operations management with technical support provided by the Waste Requirements Group.

Specific control criteria for treated wastes, untreated wastes, and associated waste processes are addressed in this section. PCPs are developed when required in accordance with 1-M60-WPC-001, Waste Process Control. Refer to INS-246, Transuranic Waste Characterization Project (TWCP) QAPD Procedures Matrix, Section 2.1 – Work Processes, for additional procedures

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3.2.1.1 Work (continued)Solid Radioactive Waste Packaging - Untreated Wastes

Process controls for untreated solid radioactive waste packaging are:

- Physical control of all TRU waste packages using locking fixtures or limited access cages (including packages used for room trash collection in Radiation Control Areas);
- Controlled access to TRU waste packages, opening packages only during filling, inspection, or repacking operations;
- Approved, revision-controlled solid waste packaging procedures, 1-PRO-079-WGI-001, Waste Characterization, Generation, and Packaging; 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure; and 1-C80-WO1102-W/RT, Waste/Residue Traveler Instructions; the W/RT, the Drum Label or Box Label; and the NDA count sheets;
- Approved, revision-controlled WSRIC Building Books issued to Building Operations management;
- Required waste generator Training and OJT for all waste packaging personnel.
- These controls assure that wastes are properly identified, and comply with WIPP-WAC and the WIPP-WAP.

Waste Treatment or Packaging Processes - Process Control Plans (PCPs)

Controls that assure waste treatment and packaging operations produce consistent, acceptable wastes are specified in individual PCPs. The PCP requirements supplement general quality assurance program requirements stated in this document. The PCPs are developed by operations management per 1-M60-WPC-001, Waste Process Control.

Process and Equipment Qualification

Waste treatment and characterization operations, processes and equipment are tested and qualified before being put into routine production. The governing document for initial equipment installation acceptance is 1-PRO-072-001, Inspection and Acceptance Test Program. Appendix 1, Application of Inspection and Acceptance Testing, of 1-PRO-072-001, Inspection and Acceptance Test Program, provides the template for identifying specific applications (e.g., Component Checkout (CC) Testing or Systems Operability (SO) Testing).

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3.2.1.1 Work (continued)Process and Equipment Qualification (continued)

Any process determined to be a critical treatment process, a final treatment process, or a special process, and which produces a waste form that must meet a requirement, or whose specified quality and conformance of waste cannot be determined readily by inspection or test before shipment, requires a PCP.

The responsible manager of the process being evaluated must determine the need for a PCP or PQP in accordance with 1-M60-WPC-001, Waste Process Control. If necessary, the responsible manager will then coordinate the development of the PQP, performance of the process qualification, and development of the PCP. The end result is a documented, quantified process capability report. The report specifies the required operating parameters, recommends measuring equipment calibration accuracy and precision, and when appropriate recommends control chart monitoring for critical process parameters.

Radioactive Waste Measurement - NDA

The NDA process is controlled through: operator training, approved procedures, calibrated instruments, periodic measurement of measurement control samples and evaluation of data, daily instrument checks, and qualification of NDA systems to meet specific data quality objectives.

When subcontractor NDA equipment services are used on the TRU Waste Program the subcontractor is required through the procurement process to document how their processes meet applicable CBFO requirements and WIPP-WAC requirements.

See Appendix 4 of this manual for additional details on NDA systems.

3.2.1.2 Implementing Procedures

Implementing procedures are listed in this document and in INS-246, Transuranic Waste Characterization Project (TWCP) QAPD Procedures Matrix. RFETS implementing procedures are developed and maintained according to MAN-001-SDRM, Site Document Requirements Manual; PRO-1329-DM-03, Site Document Control; and PRO-815-DM-01, Developing and Maintaining Documents.

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3.2.1.2 Implementing Procedures (continued)

Instructions, Procedures, and Drawings

TRU wastes are collected, treated, processed, packaged, inspected, certified, and loaded for shipment according to written approved instructions, procedures, and drawings. The Site Document Control Program is designed such that Site documents to prescribe processes, specify requirements, or establish design are prepared, reviewed, approved, issued, and controlled for use by personnel managing or performing work..

Supporting Processes

Departmental procedures provide detailed instructions for all routine processes associated with waste generation, inspection, test, certification, and shipping activities. Operations management is responsible to develop procedures that adequately describe and control their operations.

In addition to operations management having procedures for their processes, each building has its own WSRIC Building Book. A WSRIC Building Book has all the routine processes for a building listed in it, along with the waste streams associated with that process. Information about the waste stream also includes whether or not the waste produced is Low Level or TRU.

RFETS work controls are provided in MAN-071-IWCP, Integrated Work Control Program Manual, and MAN-066-COOP, Site Conduct of Operations Manual. No WIPP waste characterization requirements are met through controls in MAN-071-IWCP, Integrated Work Control Program Manual, or through MAN-066-COOP, Site Conduct of Operations Manual.

3.2.1.3 Item Identification and Control

Identification and/or traceability of waste streams, waste packages, involved packaging, testing, analytical results, and other items associated with TRU waste management are required. Items such as waste streams and waste packages are uniquely identified from the initial generation or receipt up to and including use, packaging, storage, and transportation to the WIPP. Specific waste characteristics, waste generation sources, applicable chemical analyses, and any inspections, tests, and certifications for wastes are traceable back to the wastes and packages by documentation records maintained in accordance with the records retention requirements of the QAPD. The TWCP QAPjP identifies quality assurance controls for waste characterization performed at RFETS in accordance with the WIPP-WAP.

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3.2.1.3 Item Identification and Control (continued)

The key document that records traceability information is the W/RT (refer to 1-C80-WO1102-W/RT, Waste/Residue Traveler Instructions). As described in Section 4.3.1, either an electronic W/RT or a manual W/RT may be used for packaging activities. The W/RT data collection form is generated for each waste package and documents the employee numbers of the waste generators, Waste Inspectors, and test technicians directly involved with processing that waste package. The form also documents inspection and test results, waste generation source (process number), hazardous constituent number (if applicable), and package serial number. Waste Management personnel control the development of waste identification and characterization information through 1-PRO-079-WGI-001, Waste Characterization, Generation and Packaging. MAN-955-099, Waste Requirements Group Operations Manual, provides instructions for control of the WGI.

Packaging and Waste Segregation Overview

The following provides an overview listing of the quality controls implemented to assure TRU waste meets requirements.

- Controlled procedures for waste packaging, segregation, inspection, assay, transportation, processing, testing, and certification.
- Training and qualification of waste generators and waste handlers involved in repackaging, sampling and visual examination processes, Waste Inspectors, NDA Operators, Nondestructive Test (NDT) technicians, and other TRU Waste Program personnel.
- Completed, documented, and characterized RFETS waste streams published in the WSRIC Building Books.
- For routinely generated wastes, documented traceability of each item placed in a waste package to the generation point represented by the unique WSRIC process number.
- Accountability of individual waste package segregation, characterization, and traceability documentation to the person(s) responsible.
- Waste reassessments for wastes not identified by a WSRIC process number.
- TRU waste package access control during all phases of waste generation, packaging, and handling using locked packages and qualified package custodians.
- 100% verification of package content compliance achieved by utilizing the waste generator and a waste verifier during fill operations.

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3.2.1.3 Item Identification and Control (continued)Packaging and Waste Segregation Overview (continued)

- Independent in-process sample inspection of waste packages and contents.
- Independent 100% waste package integrity and W/RT completeness inspections.
- RTR of waste package contents (when required by the WIPP-WAP).
- Routine, systematic surveillance of TRU Waste Program activities.
- Independent audit of TRU Waste Program activities to Quality Assurance Program requirements.
- Sampling and analysis (as applicable) of TRU waste to demonstrate compliance to the WIPP-WAP and the WIPP-WAC.

The Uniform Hazardous Waste Manifest records the EPA Hazardous Waste Numbers (EPA HWNs) and other required information for RCRA regulated hazardous wastes. More specific definitions of traceable control numbers are defined below.

Content Code

The content code is a unique, alpha-numeric code which identifies the generator site, the generator's waste stream, and the TRUPACT-II package contents, to personnel at the WIPP. The content codes are established and controlled by DOE WIPP. A list of all shipping content codes can be found in the TRUCON document, DOE/WIPP 89-004.

Item Description Code (IDC) Number

The IDC number is a three or four digit number assigned to a waste form type, such as plastics, dry combustibles, light metals, etc. These numbers provide accountability, allow for segregation of wastes into identifiable forms for ease of processing, and when assessing nuclear material content during NDA. The IDCs from each of the ten DOE sites are translated into content codes so that waste streams can be uniformly identified. Approved waste IDCs are documented in 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual. If a new TRU/TRM-related IDC is created, approval from the Site Nuclear Material Control group is required. A list of RFETS IDCs that have been assigned a content code and that meet the WIPP-WAC is contained in Section 6 of this document.

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3.2.1.3 Item Identification and Control (continued)Process Number

The process number designates the unique RFETS location that generated the wastes. Each building has a complete listing of the waste generating processes published in the applicable WSRIC Building Book.

Chemical Constituent Code

The Chemical Constituent Code (CCC) is a two-character alpha or numeric designator used to identify chemical constituents associated with a particular waste stream. The numbers are defined by Waste Systems for use by waste generators in identifying and segregating wastes. RCRA CCCs identify constituents in the waste stream which are RCRA regulated. Non-RCRA CCCs identify constituents in the waste stream which are not RCRA regulated.

EPA Hazardous Waste Number

NOTE: *WRG prepares WGLs to communicate waste characterization (including HWNs) and packaging requirements to waste generators at the floor level. Acceptable Knowledge (AK) is re-evaluated at the Project Level based on confirmatory testing (e.g., RTR, headspace gas sampling, and/or solid sampling) as described in the TWCP QAPjP, Section B4. Prior to shipment, waste package information is reviewed and certified by the WCO.*

The EPA HWN is required by Title 40 CFR, Part 261, Subparts C and D. This number indicates the characteristic wastes, the nonspecific source wastes, the specific source wastes, and the commercial chemical products that are regulated as hazardous waste under this statute. This number is recorded on each package on the Hazardous Waste Label. The waste generator is responsible for assigning the EPA HWN to all waste packages.

Waste Package Numbers

Waste packages are assigned a unique number with bar code as they are issued to waste generator organizations. Three identical bar code labels are attached to the drum under the drum ring approximately 120 degrees apart. Bar codes are applied to the flat sides of the SWBs.

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3.2.1.3 Item Identification and Control (continued)

Tamper Indicating Device (TID) Number

The TIDs are strips of mylar tape imprinted with a unique bar code number. The TIDs are attached to all sealed drums and SWBs containing Special Nuclear Material (Pu isotopes). The tape cannot be removed without visible damage to the TID. The Nuclear Material Control department controls the issue of TIDs per MAN-010-MCA, Materials Control and Accountability Manual and 4-P16-SA-TID-001, Tamper-Indicating Devices (TIDs).

Material Transfer and Storage Label

The Material Transfer and Storage Label (RF-46148, sometimes referred to as a "Checkerboard Label") or an alternate method, as specified in 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure, is used to identify individual waste items. Each waste item will have a checkerboard label placed on it. The label has a block for an identification number. The waste generator is responsible for assigning and recording this number on the label and on the appropriate block on the W/RT.

Employee Numbers

The unique employee numbers of waste generators, Waste Inspectors, RTR operators, NDA counter operators, Radiation Control Technologists, and others are recorded during each stage of waste processing on the W/RT and other associated documents. Sub-contractor personnel use Social Security numbers in lieu of the employee number.

Radioactive Material Tag/Label

The Radioactive Material Tag/Label (form RF 46751) is applied to the exterior of waste drums or boxes. Requirements for this label are defined in the Site Radiological Control Manual.

Other Procedures for Item Identification and Control

The RFETS procedure providing requirements for controlling items is as follows:

- 1-A67-QAP-08.01, Identification and Control of Items.

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3.2.1.4 Special Processes

Special processes are those processes whose results are highly dependent on control of process, the skill of the operator and/or processes where inspection or testing of results is not performed easily. Listed below are the applicable special processes associated with the TRU waste programs.

Real-Time Radiography (RTR)

RTR is designated as a "special" process due to the skill required to accurately interpret radiographs of sealed waste packages. The RTR operators must be certified prior to conducting waste package radiography. Training and certification of RFETS RTR operators is conducted by the NDT department in accordance with 5-NDT-TC-1A, Training, Qualification, and Certification of Nondestructive Testing Personnel. Training and certification of mobile RTR operators is conducted in accordance with the mobile vendor training plan. RTR procedures contain instructions for performing verifications of waste packages and packages contents using RTR. See the TWCP QAPjP, Sections B1-3, B1-7, B3-4, B3-10, and B3-12 for details.

Leak Testing of the TRUPACT-II Package

TRUPACT-II package helium leak testing is designated as a "special" process since the effectiveness of the test is based on operator knowledge, which is obtained through formalized training. Procedure PRO-1419-WO-LKTST, TRUPACT-II Leak Test, contain instructions for performing a verification leak test on the TRUPACT-II package. NDA leak test operators are trained and certified by the NDT department in accordance with 5-NDT-TC-1A, Training, Qualification, and Certification of Nondestructive Testing Personnel.

3.2.1.5 Handling, Storage and Shipping

The following are the primary procedures for controlling the marking, handling, storage, labeling, staging, and shipping of waste packages in order to prevent damage or loss, to minimize deterioration, and to assure safety of operations:

- 1-PRO-Q11-WO-1221, Controls for Updating Waste Package Information in WEMS
- 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure
- 1-PRO-079-WGI-001, Waste Characterization, Generation and Packaging
- 1-C80-WO1102-W/RT, Waste/Residue Traveler Instructions
- MAN-010-MCA, Materials Control & Accountability Manual

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3.2.1.5 Handling, Storage and Shipping (continued)

- MAN-T91-STSM-001, Site Transportation Safety Manual.
- Waste generators, Waste Inspectors, custodians, field technicians, and certification officials verify and document compliance to these procedures from the initial point of generation to final disposal.
- Marking and labeling requirements for off-site shipment are defined in 1-T13-Traffic-306, Labeling & Marking TRUPACT Packages.

Handling and Storage

TRU wastes are stored in RFETS approved and designated areas. Mixed TRU waste is stored in RCRA Part B permitted storage areas. Wastes that are scheduled for off-site shipment are processed through the Building 664 and Building 440 staging areas by Waste Operations personnel. Nuclear Material Control personnel authorize and track the movement of nuclear material throughout RFETS. Dock inspection, RTR verification, document review, and storage are conducted in accordance with established procedures, drawings, and specifications. Procedure PRO-1418-WO-TRUOP, TRUPACT-II Operations, describes the physical handling and loading of waste packages into the TRUPACT-II for off-site shipment.

Waste Shipping

The Traffic Management department coordinates the off-site shipment of TRU waste to the WIPP disposal site. All TRU waste shipments consigned to the WIPP will be made in accordance with applicable DOT, EPA, WIPP-WAP, state, and local hazardous waste regulations, including WIPP transportation requirements and applicable requirements of the Certificate of Compliance. Procedures for waste transfer are specified in MAN-T91-STSM-001, Site Transportation Safety Manual and Traffic Management procedures (e.g., 4-T20-TRAFFIC-505, Certifying Authorized Payloads for TRUPACT-II).

Regulated wastes are collected in three areas: satellite collection areas, 90-day accumulation areas, and permitted storage areas. Management of RFETS hazardous waste storage areas complies with federal requirements 40 CFR Parts 262, 264, and 265 and the associated Colorado State requirements in 6 CCR 1007-3 Parts 262, 264, and 265.

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3.2.1.5 Handling, Storage and Shipping (continued)**Waste Shipping (continued)**

The satellite and 90-day waste collection areas are managed by KH. A master list of the waste collection areas is maintained. This list includes information on the location of the area, the waste that can be managed in the area, and the responsible individual. Any modification to the existing storage areas should be coordinated with KH.

The CDPHE RCRA Part A and Part B Permits discuss interim status and permitted units that exist at RFETS. These documents give detailed information on the location, material types, and quantities of hazardous wastes that reside at RFETS. KH – Environmental Systems and Stewardship is responsible for ensuring that the Part A and the Part B permits are accurate and contain current information. This responsibility includes drawings of the permitted storage units.

3.2.2 Design Control

Design processes are controlled through RFETS procedures and processes identified in 1-V51-COEM-DES-210, Site Engineering Process Procedure. The TRU Waste Program does not perform design. Refer to INS-246, Transuranic Waste Project (TWCP) QAPD Procedures Matrix, Section 2.2 – Design Control, for additional procedures. See Section 4.6.3 for explanatory information regarding design control as it applies to the POC.

Facilities and Equipment

Engineering provides engineering design packages and configuration control of facilities and equipment. This includes maintenance of existing equipment and installation of new equipment and facilities. The Engineering department prepares engineering packages including technical drawings and associated specifications. Engineering maintains and archives associated records. An overview of the engineering process is provided in MAN-027-SERM, Site Engineering Requirements Manual.

Radiation Detection Instruments

RFETS does not design radiation detection instruments. However, RFETS does utilize radiation detection instruments in designed systems. The Radiation Instrumentation department maintains control of portable assay equipment and concurs with system design drawing changes when the design includes the use of radiation detection instruments. Design control for the use of radiation detection instruments in designed systems is specified in RFETS engineering documents.

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3.2.2 Design Control (continued)

Radioactive Assay Equipment

Nondestructive assay equipment is purchased from commercial vendors according to specifications developed by Measurements. Measurements maintains all drawings and maintenance records. See Appendix 4 for additional details on NDA systems.

Design control of NDA equipment is maintained by:

- Facilities Engineering through the use of configuration control and design control procedures; and
- Nondestructive Assay through the selection, validation and qualification of NDA counters and associated documentation.

3.2.3 Procurement

Procurement documents address design, fabrication, and quality assurance requirements, and are reviewed by appropriate organizations, disciplines, and subject matter experts to assure they contain adequate scope of work, technical requirements, supplier quality assurance program requirements and provisions for acceptance.

3.2.3.1 General Procurement Requirements

The Procurement Engineering Quality Assurance organization ensures that suppliers of materials and items are evaluated, approved, and continually verified based on adequate criteria. The Procurement organization supports the RFETS TRU Waste Program by establishing a procurement system that ensures materials and items perform as specified and comply with applicable regulatory, technical and quality requirements.

3.2.3.2 Specific Procurement Requirements

The procurement system ensures compliance to the following specific requirements: control of procurement documentation, procurement planning, supplier selection, proposal/bid evaluation, supplier performance evaluations, acceptance of items or services, and control of nonconforming and commercial grade items.

3.2.3.2.1 Procurement Planning

MAN-134-PPM, Procurement Program Manual; PRO-1326-Commodities, Requisitioning Commodities; PRO-1327-Services, Requisitioning Services define the procurement planning activities.

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3.2.3.2.2 Supplier Selection

1-J55-ADM-08.10, Subcontractor Quality Evaluations defines the methods for the performance of quality assurance evaluation activities.

3.2.3.2.3 Proposal/Bid Evaluation

The procurement initiating organization is responsible for developing procurement requisitions for waste commodities in accordance with MAN-134-PPM, Procurement Program Manual. Metrology reviews requisitions for test and measuring equipment after the procurement specifications are generated per MAN-134-PPM, Procurement Program Manual.

The Procurement Engineering and Quality Assurance group performs evaluations in accordance with 1-J55-ADM-08.10, Subcontractor Quality Evaluations, and maintains the Evaluated Subcontractors List. Purchase Orders are developed based on procurement specifications, which specify receipt and source inspection requirements.

3.2.3.2.4 Procurement Document Control

The procurement document control system is defined in MAN-134-PPM, Procurement Program Manual; PRO-1034-PEQA, Procurement Engineering and Quality Assurance; PRO-1326-Commodities, Requisitioning Commodities; PRO-1327-Services, Requisitioning Services; PRO-1306-ARIBA, Ariba Buyer Users Guide; and, for design packages, 1-V51-COEM-DES-210, Site Engineering Process Procedure. The procurement document controls specified in these manuals apply to:

- Waste packages, associated hardware and ancillary packaging materials;
- Capital equipment, piping, treatment units and other installed items used to treat or process waste;
- Radioactivity measuring equipment;
- Waste analysis laboratory chemicals, reagents, materials, and equipment;
- Measuring and test equipment used in waste treatment or processing; and
- Contracted waste management services.

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3.2.3.2.5 Procurement Document Review and Approval

MAN-134-PPM, Procurement Program Manual; PRO-1034-PEQA, Procurement Engineering and Quality Assurance and 1-V51-COEM-DES-210, Site Engineering Process Procedure define the procurement document review and approval process.

Management prepares purchase requisitions according to MAN-134-PPM, Procurement Program Manual. Quality attributes are specified in PRO-1034-PEQA, Procurement Engineering and Quality Assurance; or in 1-V51-COEM-DES-210, Site Engineering Process Procedure.

The Procurement organization prepares solicitations for waste commodities, submits them to suppliers, and receives offers as part of the bidding process, per the KH Procurement System Manual. When required by the requisition, Procurement lets contracts to successful bidders on the Evaluated Subcontractors List. The Waste Requirements Group (WRG) and Site PQAO review requisitions for WIPP-related commodities to ensure project requirements are included.

3.2.3.2.6 Supplier Performance Evaluations

MAN-134-PPM, Procurement Program Manual; PRO-1034-PEQA, Procurement Engineering and Quality Assurance and 1-J55-ADM-08.10, Subcontractor Quality Evaluations define the supplier performance evaluation process.

3.2.3.2.7 Acceptance of Items or Services

Items and services purchased to support the TRU Waste Program are controlled at all stages of procurement from requisition and purchase order preparation, specification development and approval, approval and selection of suppliers, supplier bid evaluation and award, verification, control of nonconformance and corrective action, acceptance of item or service, and maintenance of records. The system control procedures are found in MAN-134-PPM, Procurement Program Manual; PRO-1034-PEQA, Procurement Engineering and Quality Assurance; PRO-1326-Commodities, Requisitioning Commodities; PRO-1327-Services, Requisitioning Services; PRO-1306-ARIBA, Ariba Buyer Users Guide; and 1-V51-COEM-DES-210, Site Engineering Process Procedure.

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3.2.3.2.7 Acceptance of Items or Services (continued)

Acceptance of Items

Supplied items are purchased, inspected, and certified in accordance with direction and criteria contained in procurement specifications, or purchasing documents. Inspection and/or verification is performed to verify vendor products comply with procurement specifications when delivered in accordance with PRO-J44-RC&I-6600, Procured Items Inspection and Certification. When items do not conform to requirements they are dispositioned in accordance with applicable NCR procedures.

All component replacement and maintenance involving TRUPACT-II packages are performed under the direct instructions of DOE/WIPP 02-3183, CH Packaging Program Guidance; DOE/WIPP 02-3184, CH Packaging Operations Manual; and DOE/WIPP 02-3185, CH Packaging Maintenance Manual; Department of Energy procedures controlled through document control processes at CBFO.

Acceptance of Services

Site and/or TRU Waste Program management may elect to subcontract TRU waste characterization or waste processing operations based on cost effectiveness or other management initiatives. Procurement selects suppliers from the Evaluated Subcontractor List for purchases designated to be made from an approved supplier. A subcontractor evaluation is performed by Procurement Quality Assurance. This evaluation may be based on evaluation of existing or subcontractor provided documents or records, or by a direct evaluation of the subcontractor's facilities, personnel, and quality assurance program. When services are procured for subcontractor owned and/or operated systems, the following additional requirements apply:

- The statement of work for the prospective subcontractor shall be reviewed by the TWCP Site PM and TWCP Site PQAO to ensure appropriate TRU Waste Program requirements are incorporated and specified as contract deliverables. KH organizations preparing statements of work for subcontractor owned or operated systems shall provide copies of statements of work to the TRU Waste Program office for review and approval.
- Subcontractors selected to provide services must demonstrate implementation of QA program requirements that apply to scope of work activities. The subcontractor's QA program must be approved and placed on the Evaluated Subcontractors List when specified in the procurement document.

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3.2.3.2.7 Acceptance of Items or Services (continued)

Acceptance of Services (continued)

- The subcontractor shall prepare an interface document in accordance with PRO-1132-WIPP-012, Preparation of an Interface Document for Vendor Owned or Operated Systems, that clearly defines the organizational working relationship with the subcontracting organization and the TRU Waste Program office. The interface document addresses implementation details of how the vendor quality assurance program integrates with TRU Waste Program requirements. The interface document provides review/concurrence/approval requirements of subcontractor procedures and documents. The interface document SHALL be reviewed and approved by the TWCP Site PM and the TWCP Site PQAO.
- If the subcontractor is providing new waste treatment or certified WIPP characterization services to the program, a PCP and/or a PQP and reports shall be prepared that demonstrates operations comply with TRU Waste Program requirements. The PCPs or PQPs shall be prepared in accordance with 1-M60-WPC-001, Waste Process Control.

Currently, Los Alamos Technical Associates (LATA), provides mobile gas generation sampling services at RFETS. The corresponding interface document for mobile gas generation sampling is LATA-MGSSID-001, LATA Program Interface Document for the Mobile Gas Generation Sampling System.

3.2.3.2.8 Control of Supplier Nonconformances

MAN-134-PPM, Procurement Program Manual and PRO-J44-RC&I-6600, Procured Items Inspection and Certification address the supplier nonconformance control process.

3.2.3.2.9 Commercial Grade Items

PRO-1034-PEQA, Procurement Engineering and Quality Assurance and PRO-J44-RC&I-6600, Procured Items Inspection and Certification address the use of commercial grade items.

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3.2.4 Inspection & Testing

Inspections are planned and performed at various points from initial waste generation through final shipment. The status of certification activities is maintained from the point of waste generation through the final shipment inspection through the waste packaging procedures. Required certification activities are identified, described, and referenced in waste certification procedures:

- 1-PRO-072-001, Inspection & Acceptance Test Program;
- PRO-J44-RC&I-6600, Procured Items Inspection and Certification; and
- PRO-X05-WC-4018, Transuranic (TRU) Waste Certification.
- PRO-1045-WI-001, Solid Radioactive Waste Inspection.

3.2.4.1 General Inspection and Test Requirements

Inspections that verify conformance to certification requirements are performed by personnel other than those who performed the work. Procedure 1-PRO-072-001, Inspection & Acceptance Test Program addresses the inspection and testing requirements which are implemented by the procedures identified in INS-246, TWCP QAPD Procedures Matrix.

3.2.4.2 Specific Inspection and Test Requirements

INS-246, TWCP QAPD Procedures Matrix identifies procedures that ensure compliance to specific inspection and testing requirements specified in the QAPD. These procedures address the qualification of inspection and test personnel, qualification of non-destructive examination personnel, inspection and test planning, types of inspection and testing performed, and inspection and test documentation.

3.2.4.2.1 Qualification of Inspection and Test Personnel

Only personnel, qualified by using written instructions and defined acceptance criteria, perform inspection and test activities. Qualification results are documented and maintained as part of the certification records. PLN-97-007, TWCP Training Implementation Plan and MAN-094-TPM, Training Program Manual address the qualification of inspection and test personnel.

3.2.4.2.2 Qualification of Nondestructive Examination (NDE) Personnel

PLN-97-007, TWCP Training Implementation Plan, MAN-094-TPM, Training Program Manual, and 5-NDT-TC-1A, Training Qualification and Certification of NDT Personnel address the qualification of NDE personnel.

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3.2.4.2.3 Inspection Requirements

Inspections performed to verify conformance of an item or activity to specific requirements are planned, controlled and documented to assure consistent, repeatable, and retrievable results. Waste inspection procedures establish the inspection points, define the Waste Inspector responsibilities, include standards for acceptance and rejection, and provide instructions for inspection performance.

These inspections assess package integrity, package contents conformance, and package documentation, labeling, and marking. Nonconformance to criteria is documented according to PRO-U76-WC-4030, Control of Waste Nonconformances on a Waste Nonconformance Report (WNCR). The copy of the WNCR is attached to the package documentation and returned to the waste generator or Solid Waste Operations for corrective actions.

The following inspections are performed:

- Pre Use - inspection of drums or SWBs conducted by the waste generator prior to use (refer to 1-PRO-079-WGI-001, Waste Characterization, Generation, and Packaging for packaging type, and to 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure, for pre-use inspection);
- In Process - performed at management discretion during waste generation, to ensure wastes comply with IDC designation, contain no free liquids, compressed gases or gross levels of particulates or other prohibited materials, includes dock inspection performed on filled and sealed boxes and drums on process building docks to assess package integrity, labeling, handling damage and proper documentation (refer to PRO-1045-WI-001, Solid Radioactive Waste Inspection);
- Final Inspection - performed just prior to loading drums or SWBs into the TRUPACT-II package, to ensure proper documentation and package integrity (PRO-1045-WI-001, Solid Radioactive Waste Inspection; and PRO-X05-WC-4018, Transuranic (TRU) Waste Certification);
- Traffic Management inspection of TRUPACT-IIs are in accordance with 4-T28-Traffic-513, Waste Packages Inspections and Shipments, to ensure compliance with applicable DOT and DOE requirements (See Section 4.6.13.2 for Traffic procedures related to inspection);
- TRUPACT-II Vehicle Inspection - to ensure proper loading of vehicle and the condition of the tractor, trailer, and TRUPACT-II packages performed by the carrier, Traffic Management, and the Colorado State Patrol.

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3.2.4.2.3 Inspection Requirements (continued)

Inspection points in the waste stream verify the performance of required activities. Passage of a waste package through an inspection point is verified by the Waste Inspector signing and/or stamping the W/RT. Waste items found nonconforming must be tagged with a Waste Nonconformance Status Tag (RF-47841) and segregated from conforming waste items. Refer to INS-246, Transuranic Waste Characterization Project (TWCP) QAPD Procedures Matrix, Section 2.4 – Inspection and Testing, for additional procedures.

The progress and control of waste packages through the waste stream is maintained by forms, labels and markings which require the performance of specific tasks to ensure compliance of each waste package to the WIPP-WAC and the WIPP-WAP. The performance of identified activities is documented by the waste generator or responsible party by affixing their signature at the appropriate location on the documentation. The serialization of each waste package and use of these numbers on all documentation ensures traceability through the system. The inspection status of waste is clearly marked on the forms, labels, and marking attached to the waste packages.

3.2.4.2.4 Test Requirements

Testing activities ensure the capability of an item to meet specified requirements by subjecting the item to physical, chemical, environmental or operating conditions. Tests performed to verify conformance of an item or activity to specific requirements are planned, controlled and documented to assure consistent, repeatable, and retrievable results. The tests associated with the TRU Waste Program are:

- Equipment Systems Operations Tests or component checkout (per 1-PRO-072-001, Inspection and Acceptance Test Program)
- TRUPACT II Leak Testing (per PRO-1419-WO-LKTST, TRUPACT-II Leak Test.)
- Waste Characterization Process Qualification Tests (per 1-M60-WPC-001, Waste Process Control)
- NDA Qualification Plans (Refer to Appendix 4)
- LATA Mobile Gas Generation Sampling System (Refer to LATA-MGSSID-001, LATA Program Interface Document for the Mobile Gas Generation Sampling System for use at the Rocky Flats Environmental Technology Site (RFETS); and INS-246, Transuranic Waste Characterization Project (TWCP) QAPD Procedures Matrix, Section 2.4.2.4 - Test Requirements and Section 6 - Software Requirements.

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3.2.4.3 Monitoring, Measuring, Testing and Data Collection Equipment

To prevent inadvertent use of malfunctioning or otherwise defective equipment, inspection and test personnel clearly designate and document the operating status of equipment associated with waste management activities. Operational status controls are contained in MAN-066-COOP, Site Conduct of Operations Manual, and MAN-072-OS&IH PM, Occupational Safety & Industrial Hygiene Program Manual, Chapter 9: Lockout/Tagout.

3.2.4.3.1 Use and Control of Measuring and Testing Equipment

All test and measurement equipment used is controlled and calibrated in accordance with requirements specified in MAN-092-M&TEM, Measuring and Test Equipment Management Manual. Calibration of test and measuring equipment may be performed either internally, using in-house reference standards, or externally by national certifying agencies or manufacturers. All reference standards have valid relationships to nationally recognized standards, for example, National Institute of Science and Technology (NIST). If national standards do not exist, the basis for calibration is documented. All test and measuring equipment are uniquely identified.

Several RFETS organizations, including Metrology, Analytical Services, and Measurements, have responsibilities for controlling and calibrating test and measuring equipment. MAN-092-M&TEM, Measuring and Test Equipment Management Manual, establishes Metrology as responsible for approving all other calibrating organizations through an active surveillance program. In addition, Metrology is responsible for performing calibrations for a variety of physical and dimensional measurements. This is accomplished in accordance with PRO-1205-MLA-008, Metrology Control of Measuring and Test Equipment, which describes the recall system which establishes the traceability of all standards and test and measuring equipment under the purview of Metrology. All calibrating facilities shall have mechanisms in place for evaluating inspections or tests where out-of-tolerance instruments were used. These mechanisms shall include methods for evaluating the data obtained from the use of these instruments, and methods for re-testing or correcting the data to ensure data accuracy.

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3.2.4.3.1 Use and Control of Measuring and Testing Equipment (continued)

As part of its surveillance program, Metrology assures that RFETS calibrating organizations comply with MAN-092-M&TEM, Measuring and Test Equipment Management Manual. All calibrating organizations must establish a control system for the equipment under their purview, which includes unique identification of test and measuring equipment. All calibrating organizations must also use approved procedures for performing calibrations of test and measuring equipment. Those instruments that are calibrated shall be calibrated in an environmentally controlled area and the environmental data recorded and maintained (e.g. temperature, humidity, and dust concentrations). Reference standards must either be certified by the Metrology Laboratories or be obtained from a nationally recognized source. Calibrating organizations must establish calibration frequencies and a mechanism for ensuring that only calibrated equipment is used for this project.

Measurements is responsible for tracking standard certification.

3.2.4.3.2 Calibration

Nondestructive Assay Radiometric Counters Calibration

NDA equipment used to assay TRU waste is calibrated and qualified according to approved procedures before assays of waste drums are performed. Calibration and qualification of each measurement system currently used to assay or planned to assay TRU waste are described in Appendix 4 of this document. Systems are calibrated with standards used to determine the response characteristics of a measurement system. Whenever possible radioactive calibration standards shall be obtained from NIST, the New Brunswick Laboratory, or from suppliers maintaining measurement systems traceable to NIST. Evidence of such traceability and certificates for individual standards shall be obtained from the standards suppliers.

RFETS still uses Chemical Standards Laboratory (CSL) calibration standards that were prepared in accordance with PRO-697-MLC-00013, Preparation and Certification of Nondestructive Assay Standards and Sources. The RFETS plutonium oxide stream used to prepare NDA standards has been characterized using measurement systems traceable to NIST and/or New Brunswick Laboratory (NBL). Calibration standards are re-certified using PRO-1566-NDA-STD, Maintenance of NDA Standards.

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3.2.4.3.2 Calibration (continued)**Nondestructive Assay Radiometric Calibration Verification**

Measurement control procedures and the controlling software of each NDA counter system ensure proper operating status of the NDA counter. It is usually possible to verify the proper function of the instruments with rugged, long-lived sources. Since the data obtained from these "check" sources is not directly used to calculate analytical data, they do not have to be NIST traceable, but only need to be adequately characterized for the proposed usage. The principal requirements for such sources are that they be long-lived, simple to reposition with respect to the detector(s), of sufficiently high activity to obtain adequate counting statistics in short count times, and relatively insensitive to handling.

3.3 Assessment Requirements**3.3.1 Management Assessments**

Managers at all levels of the project periodically assess performance of their organizations to determine the effectiveness of QA program provisions. The TWCP Site PM schedules and performs management assessments in accordance with 3-W24-MA-002, Kaiser-Hill Management Assessment Program. Refer to INS-246, Transuranic Waste Characterization Project (TWCP) QAPD Procedures Matrix, Section 3.1 – Management Assessments, for additional procedures.

3.3.2 Independent Assessments

The independent assessment program implemented for the TRU Waste Program is described in this section. It is implemented as part of overall RFETS independent assessment activities. Operations and functional managers are required to provide audit and surveillance personnel free access to documents, work areas, workers, and supervision during independent assessment activities.

3.3.2.1 General Assessment Requirements

Material Stewardship QA coordinates and issues an annual schedule of surveillances using input from the Site PQAO and other involved quality organizations. Material Stewardship QA performs this coordination to ensure that focus areas that may be identified by DOE or RFETS managers are included, and to reduce redundant surveillance activities. The schedule is distributed to the TWCP Site PM and involved quality managers. Corrective actions are documented and tracked according to 3-X31-CAP-001, Corrective Action Process.

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3.3.2.2 Specific Assessment Requirements

Surveillances are performed to: 1) monitor work in progress; 2) verify compliance with established requirements and procedures; 3) identify actual and potential conditions adverse to quality; 4) obtain timely corrective action commitment from cognizant managers for identified conditions adverse to quality; 5) provide notification to responsible managers of the status and performance of work under surveillance; and 6) verify timely implementation of corrective action.

Audits and surveillances of activities performed by other organizations are reviewed by the TWCP Site PQAQO for applicability to project activities. These audits and surveillances may substitute for project surveillances when project affecting activities are evaluated. Conditions adverse to quality identified in these surveillances are monitored in project trending of conditions adverse to quality.

3.3.2.3 Surveillances

Surveillances of the TRU Waste Project are coordinated by the TWCP PQAQO and performed by technically qualified personnel, knowledgeable of and independent of the areas assessed. The surveillances are performed according to PRO-985-SURV, Performance of Surveillances.

3.3.2.4 Audits

An annual independent assessment or a series of smaller independent assessments of the TRU Waste Program is performed.

3.3.2.4.1 Scheduling Audits

The annual audit is scheduled according to 1-W37-IA-002, Integrated Planning and Scheduling of Independent Assessment Activities.

3.3.2.4.2 Planning and Preparation for Audits

Procedure 3-B52-1A-003, Conduct of Independent Assessment Activities, is used to plan and perform the assessment and report the audit results.

3.3.2.4.3 Audit Team Selection

Procedure 3-B52-1A-003, Conduct of Independent Assessment Activities addresses the process for audit team selection.

3.3.2.4.4 Auditor Qualification

Personnel performing audits are qualified according to procedure 1-N92-ADM-02.03, Training and Qualification of Assessment and Surveillance Personnel.

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3.3.2.4.5 Technical Specialist Qualification

Technical specialists for the independent audit teams are supplied for the audit team by the TRU Waste Program. The technical specialists supplied shall be independent of the processes to be audited. Qualification of Technical Specialist is addressed in section 3.3.2.4.4.

3.3.2.4.6 Lead Auditor Qualification

Procedure 1-N92-ADM-02.03, Training and Qualification of Assessment and Surveillance Personnel addresses the qualification requirements for Lead Auditors.

3.3.2.4.7 Performing Audits

Audits are performed in accordance with procedure 3-B52-1A-003, Conduct of Independent Assessment Activities.

3.3.2.4.8 Reporting Audit Results

Procedure 3-X31-CAP-001, Corrective Action Process, defines the site-level process for documenting and characterizing corrective actions identified during the assessment. The Plant Action Tracking System (refer to 3-X31-CAP-001, Corrective Action Process) provides for tracking of corrective actions.

3.3.2.4.9 Audit Response and Follow-up

Responses and follow-up to audits by management of the audited organization is directed by the requirements in 3-X31-CAP-001, Corrective Action Process.

3.3.2.4.10 Audit Records

Audit records are controlled according to 1-V41-RM-001, Records Management Manual.

Records storage is performed in accordance with 1-PRO-077-WIPP-005, Management of Waste Information Prior to Transmittal to the Waste Records Center. Refer to INS-246, Transuranic Waste Characterization Project (TWCP) QAPD Procedures Matrix, Section 3.2 – Independent Assessments, for additional procedures.

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3.4 Sample Control Requirements

The sampling and analysis of RFETS wastes is planned, controlled, and performed in accordance with the TWCP QAPjP. The specific waste streams characterized through sample collection and laboratory analysis must be specified. The results of these efforts are compiled into reports contained in the WSRIC Building Books which provide information for the RCRA Part B operating permit application. The WSRIC Building Books are the source of much of the waste characterization data needed for certification of TRU waste to the WIPP-WAC.

3.4.1 Sample Control Requirements

The WIPP-WAP defines the requirements for waste sample control which are reiterated and implemented by the TWCP QAPjP. Waste sampling is performed in accordance to Waste Sampling and Analysis Plans & to meet specified Data Quality Assurance Objectives.

3.4.2 Sample Identification

The TWCP QAPjP specifies the requirements for sample identification which are implemented by the procedures identified in INS-246, TWCP QAPD Procedures Matrix.

3.4.3 Handling, Storage And Shipping Samples

The requirements for waste sampling, storage and analysis and data quality objectives are defined in the WIPP-WAP and are reiterated and implemented by the TWCP QAPjP.

3.4.4 Disposition Of Sample Nonconformance

All waste stream analysis data are required to be validated to the DQO criteria, and data sets dispositioned as acceptable, acceptable with qualifications, or unacceptable. The Waste Operations organization is required to disposition data sets, initiate corrective actions such as re-sampling if necessary, and maintain retrievable records of these activities.

CBFO is notified of any non-administrative nonconformances related to applicable requirements specified in the WIPP-WAP which are first identified at the TWCP Site PM's signature release level. This process is defined in PRO-940-WIPP-010, WIPP TRU Waste Characterization Project Level Data Review and Reporting.

3.5 Scientific Investigation Requirements

RFETS does not conduct scientific investigations.

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3.6 Software Requirements

3.6.1 Software Quality Assurance (SQA)

TRU Waste Program operations, supported by software systems, are controlled during development, use, and maintenance, to ensure that the software performs reliably and to expectations. 1-MAN-004-CSMM and PRO-1327-Services are the procedures that control the purchase or development and maintenance of computer software. These software programs also comply with the requirements of the QAPD, Section 6 - Software Requirements. Each user identifies how their system complies with the requirements of the QAPD, Section 6 - Software Requirements. Refer to INS-246, Transuranic Waste Characterization Project (TWCP) QAPD Procedures Matrix, Section 6 – Software Requirements, for additional procedures that demonstrate compliance to the QAPD requirements.

The following describes the primary software systems and software QA compliance:

- The WEMS is a multi-user software package that operates on the unclassified VAX cluster. This system tracks all waste types (TRU/TRU Mixed, LLW/LLW Mixed, and Hazardous) from "cradle-to-grave" and is the responsibility of the Waste Systems organization. The WEMS software tracks individual waste packages during the waste generation, packing, storage, and shipping process and is used to prepare load lists to waste disposal sites. Waste Systems is responsible for maintaining 4-F72-WEM-WP1205, WEMS and WSRIC Software Quality Assurance Compliance, for WEMS which addresses Software QA. Software validation testing for WEMS is performed according to 4-F72-WEM-WP-1205, WEMS and WSRIC Software Quality Assurance Compliance.
- All software used to control NDA equipment and report results is demonstrated to satisfy the requirements of the QAPD, Section 6. INS-246, Transuranic Waste Characterization Project (TWCP) QAPD Procedures Matrix, identifies the procedures that demonstrate compliance of software for each measurement system currently used to assay or planned to assay TRU waste.
- INS-246, Transuranic Waste Characterization Project (TWCP) QAPD Procedures Matrix, lists the procedures used to demonstrate compliance with QAPD, Section 6.
- The Analytical Laboratories use a laboratory data management system to support TRU Waste Program activities. This software is part of the analytical instrumentation used for analysis in the Radioactive Laboratories. Software Quality Assurance on this software is described in L-4031, Software Quality Assurance. Refer to INS-246, Transuranic Waste Characterization Project (TWCP) QAPD Procedures Matrix, for specific information on compliance with requirements.

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4.0 RFETS TRU WASTE PACKAGING & CERTIFICATION

This section describes the characterization, packaging, and certification process followed at RFETS to prepare TRU waste for shipment to WIPP. The Waste Packaging QA program requirements from 10 CFR 71, Subpart H are addressed in Section 4.6.

4.1 Characterization Process

Acceptable Knowledge (AK) is used to characterize TRU waste. Certification of RFETS to the WIPP disposal and transportation criteria is accomplished using a "tiered" or hierarchical approach. The certification process begins with the waste generator who must generate waste to procedures 1-PRO-079-WGI-001, Waste Characterization, Generation, and Packaging; 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure; and other applicable documents. Procedures 1-PRO-079-WGI-001, Waste Characterization, Generation, and Packaging; and 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual, apply to all personnel involved in radioactive line and non-line generated waste packaging activities both inside and outside the Protected Area (PA).

The first part of the actual waste certification process is performed by the waste generator who affirms by signature on the W/RT that the waste is properly identified, segregated, and packaged in accordance to the procedures. In addition, a verification signature is required by a person (not the same person that signed the waste generator signature) who is trained and qualified to package and segregate waste for the area of the package origin. Details on the W/RT and the waste generator statements are provided in Section 4.3.1.

During the waste handling and packaging process, applicable information on the waste package paperwork is entered into the WEMS, in addition to the information obtained from the count sheets (from NDA of package) and Hazardous Waste Label. Information pertinent to the certification is continually entered into WEMS as the package is transferred on-site. (See Section 4.3.2 for more information on WEMS.)

The signatures on the waste package paperwork and information from WEMS are used by the WCO to assess the package and its contents for compliance with the certification requirements. Section 4.2 provides more details on other information used as a basis for certification by the WCO. The WCO affirms compliance for each waste package by completing the checklist in PRO-X05-WC-4018, Transuranic (TRU) Waste Certification. Certification is also indicated through an entry in WEMS.

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4.1 **Characterization Process (continued)**

Certification that waste shipments comply with DOT requirements is provided on the Bill of Lading, and signed by the TCO or designated alternate, after all other certifications are complete. Certification that mixed waste shipments comply with RCRA requirements is provided on the Uniform Hazardous Waste Manifest, also signed by the TCO after all other certifications are complete. Mixed waste requires a Uniform Hazardous Waste Manifest.

This tiered approach provides instructions to all involved personnel so that all wastes are properly characterized, identified, in compliance with requirements, and ready for off-site shipment. The following sections provide descriptions of the responsibilities and functions of each unit in this tiered approach.

AK was used to characterize legacy wastes packaged prior to the full implementation of the TWCP (December 16, 1992). Specific criteria for AK data contents and assembly are contained in the WIPP-WAP. RFETS uses a three phase process to characterize TRU wastes by means of AK information: 1) compiling enough AK documentation for an auditable record, 2) confirming AK information using radiography, sampling and analysis (as applicable), and 3) audit of AK records. The TWCP QAPjP, Section B4-3b, describes the RFETS program for development, assembly, and approval of AK records.

4.2 **TRU Waste Certification Official (WCO)**

The WCO is independent of waste generation organizations. The WCO is responsible for certifying that wastes shipped from RFETS comply with applicable WIPP disposal requirements, and associated state and federal regulations. A complete description of WCO responsibilities is included under Section 3.1.1.1.4. This certification is based on review and verification of, but not limited to, the following information:

- Overall waste generation/packaging system;
- The waste generator's statement on the waste package paperwork stating that wastes are properly packaged and identified according to applicable procedures;
- In-process package contents inspection results;
- RTR dispositions;
- RTR Technician(s) certification status;
- Nondestructive Assay (NDA) or radiochemical analysis for determination of waste type as TRU waste, dependent on point of origin of the waste;

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4.2 TRU Waste Certification Official (WCO) (continued)

- Applicable WEMS data (Fissile Gram Equivalent (FGE), PE-Ci, Wattage Limits, etc.);
- Physical condition of the waste package (dents, rust, etc.);
- Installation of correct filters on waste boxes and drums;
- Documentation accuracy, completeness, legibility, and compliance to limits during certification processing activities and verification of shipment documentation;
- Verification that the waste IDC has been correctly identified and documented;
- Waste package marking, labeling, and stenciling is complete, accurate, and in compliance with Traffic Management department procedures;
- Computer data input (WEMS) for completeness and accuracy during certification processing activities and for electronic transmittal of information to WIPP by WEMS Program Management;
- Loading of accepted waste packages for shipment; and
- Surveillance or audit information.

The WCO must assess the information presented and based on this documentation, determine whether the waste in question meets requirements.

4.3 Waste Packaging and Documentation Requirements

All TRU waste is packaged under controlled conditions, and those conditions are documented on approved data collection forms. All instructions necessary to assure that wastes are packaged to comply with the WIPP-WAC are provided to operations personnel. In the event that procedures are unclear or incomplete, the waste generator shall cease packaging operations, obtain information from the WRG, and initiate revisions to procedures that clarify or address the situation. The following requirements must be met when packaging TRU waste:

- Packaging in compliance to current packaging procedures: 1-PRO-079-WGI-001, Waste Characterization, Generation, and Packaging; 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure; 1-C80-WO1102-W/RT, Waste/Residue Travelers Instructions; individual process procedures for those packages which are attached to gloveboxes and are not covered by 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure; and MAN-010-MCA, Materials Control & Accountability Manual for packaging and handling 55 gallon drums inside the PA;

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4.3 Waste Packaging and Documentation Requirements (continued)

- Use of current data collection form;
- Waste generators are currently trained in waste handling courses;
- Waste data is entered into WEMS (see Section 4.3.2 for details);
- Waste streams are identified and characteristics documented using the WSRIC Building Books.

4.3.1 Waste/Residue Traveler

The W/RT is used as an in-process control document that provides objective evidence of activities associated with packaging of radioactive and radioactive mixed line and non-line generated waste.

Currently either an electronic W/RT or a manual W/RT may be used for packaging activities. If an electronic W/RT is to be used, a printout of the electronic W/RT is obtained prior to waste generation. The electronic W/RT is printed from the E-Traveler form in WEMS. Portions of the electronic W/RT are electronically filled-in based on information provided to WEMS from the WGI information.

Unpopulated portions of the electronic W/RT are filled-in by hand. When using the manual W/RT, all portions of the W/RT are filled-in by hand. Throughout this document (i.e., the TWMM) discussion pertaining to the W/RT is generalized (i.e., including both the electronic W/RT and the manual W/RT).

Individual packaging procedures sequence W/RT completion steps as they occur in packaging evolution. All radioactive waste generated after December 12, 1992 (the implementation date of applicable TRU waste packaging procedures) are required to have a W/RT. Prior to December 12, 1992, a Drum Label was used to provide objective evidence of activities associated with packaging of radioactive waste. 1-C80-WO1102-W/RT, Waste/Residue Traveler Instructions, provides instructions for personnel to complete W/RT information.

The W/RT is the documented, approved source of "process knowledge" information describing the presence or absence of RCRA regulated materials for each waste package. The waste generator is responsible for the accuracy of process knowledge information and affirms this by signature on the W/RT for each item placed in a waste package, see Section 4.3.1.1 for more details. Waste generators are required to obtain written guidance from Waste Management - Technical Operations in the event that process knowledge characterization information is suspect, incomplete, or inaccurate. Waste generators are required to file a WCF or initiate a WCR if process material inputs or outputs change per WSRIC.

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4.3.1.1 Generator Waste Identification Statements

The waste generator is responsible for accurate and complete identification of wastes that are packaged for off-site disposal. This statement affirms that to the best of the waste generator's knowledge, the contents of each waste package or item placed in the package are properly identified and documented on the W/RT. A second waste generator verification signature affirms that the package was visually inspected by a second party and complies with waste acceptance criteria. The waste generator and waste verifier signatures appear on the W/RT.

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4.3.2 Waste and Environmental Management System (WEMS)

WEMS is a secure computer database used for the storage and management of data related to waste packages. WEMS users are responsible for adherence to security requirements and procedures. WEMS User Authorizations are requested from the WEMS system administrator.

Packages are initially entered into WEMS when they are empty and they are tracked through waste processing operations until the waste is sent to an off-site facility. Information obtained from the W/RT is entered, as well as information obtained from package count sheets, the Hazardous Waste Label, and other source documents. Detailed operational instructions are provided in 1-PRO-087-WEMS-WP-1201, WEMS Waste Package Inventory, Tracking, and Control.

Prior to off-site shipment, packages are verified and certified in WEMS. Detailed operational instructions are provided in 4-G83-WEM-WP-1209, WEMS Waste Package Verification and Certification. These functions are summarized below:

- **Verification Function**

Prior to shipping, all waste package data must be verified for accuracy and completeness. This data verification includes the resolution of any discrepancies between the data in WEMS and the data shown on the documentation accompanying the package.

- **Certification**

Once a package has been verified as correct in WEMS it is reviewed for certification. The package is certified in WEMS when it meets all the criteria for shipment and is acceptable for the appropriate off-site facility.

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4.3.2 Waste and Environmental Management System (WEMS) (continued)

- **Shipping Reports and Electronic Data Transmission**

Shipping reports are available to assist the users in preparing a load for a shipment. Data is electronically transferred to the WIPP Waste Information System (WWIS).

WEMS is programmed to halt the verification of final waste package information and to display an error message when data is missing from required fields. When applicable, field validation is performed on data in required fields with the information checked against a table of values. For optional entry fields, data is checked when data is entered.

**4.3.3 Waste Stream and Residue Identification and Characterization (WSRIC)
Building Books****4.3.3.1 Description**

The WSRIC is a comprehensive site-wide assessment of current waste and residue generating processes. The WSRIC Building Books provide waste characterization information for waste generating processes for each building. Waste streams are characterized and assigned unique numbers for waste management purposes. The WSRIC provides preliminary designations of waste streams as RCRA regulated or non-RCRA regulated.

WSRIC Building Books are controlled and maintained by Waste Systems according to 4-H19-WSRIC-001, Waste Characterization and Reverification; and PRO-1003-WSRIC-ADMIN, WSRIC Administration Guidance. Operations Management has prime responsibility to assure that process knowledge information contained in the books is current and accurate.

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4.3.3.2 Process Knowledge and Analytical Characterization

The WSRIC Building Books provide documented, reviewed, and approved characterization of wastes based on process knowledge and analytical data (see Section 4.1). Chemical and physical waste parameters characterized by analysis will also be provided in WSRIC, as this information becomes available through 95-WP/SAP-001, Transuranic (TRU/TRM) Waste Sampling Plan.

4.3.3.3 Maintenance, Control, Review and Approval

Document control, review and approval of the WSRIC Building Books is performed according to 4-H19-WSRIC-001, Waste Characterization and Reverification. The operations approval indicates that the processing material inputs and outputs are accurately described; and the Waste Disposal approval indicates that the materials are properly designated as RCRA or non-RCRA wastes. The waste generator is responsible for maintaining WSRIC accuracy when process changes occur by submitting a WCF or initiating a WCR per 4-H19-WSRIC-001, Waste Characterization and Reverification.

4.3.3.4 Use

The WSRIC provides characterization information for waste and residue packaging and handling; however, the definitive source of process knowledge information is provided by the waste generator on the W/RT as wastes are generated. Information excerpted from the WSRIC Building Books may be reformatted and posted by operations personnel at process lines or waste generation sources. This posted information must be controlled through the building conduct of operation protocols and approved by the Operations Manager (or cognizant designee).

4.3.4 **Backlog Waste Reassessment Baseline Book (BWRBB)**

In 1994 and 1995, the Backlog Waste Reassessment project was responsible for compiling characterization information for process waste and residues generated prior to the implementation of the WSRIC and the W/RT programs. Information from numerous sources was reviewed to assess the characterization of the containers in the backlog inventory. The results of this assessment were documented in the BWRBB. The resulting changes to container characterization were incorporated into WEMS and on container documentation, if necessary. The BWRBB is maintained as a controlled document and updated to reflect current container characterization as new information becomes available for the inventory. In addition, the BWRBB is being utilized to document changes to container characterization resulting from Waste Non-Conformance Reports and other waste certification and analyses activities through the waste reassessment in accordance with 4-H19-WSRIC-001, WSRIC Characterization and Reverification.

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4.4 Shipment Certification Statements

Each shipment of waste is collectively certified to DOT requirements using the Bill of Lading. Hazardous waste shipments are collectively certified using the Uniform Hazardous Waste Manifest. Certification statements are signed by the TCO after all other internal certifications are signed by the involved groups.

Additional shipping documents required for the shipment of waste to WIPP include the PCTCD, OPCTCD, and the PATCD. These documents will be reviewed, verified, and signed by the TCO. Refer to Section 6 for additional information on these documents.

4.5 RFETS IDCs Certifiable to WIPP Operations and Safety Criteria and TRUPACT-II Payload Control Criteria

Table 6-2 provides a listing of the RFETS waste materials (by IDC descriptions) which have been shown to be certifiable to the requirements listed in Sections 2.1 and 2.2 of this document.

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4.6 Packaging QA Program Plan

The Packaging QA Program Plan describes the RFETS QA Program for TRU Waste Packaging. The QA Requirements for packaging are found in 10 CFR 71, Subpart H. Preparation guidance is found in Regulatory Guide 7.10, Annex 2 (NRC 1986) Quality Assurance Programs Applicable to Procurement, Use, Maintenance, and Repair of Packaging Used in Transport of Radioactive Material. A Packaging QA Program consistent with the provisions of Subpart H of 10 CFR 71 is required in order to deliver packaged licensed material to a carrier for transport.

This section describes how the requirements are met for the TWCP. This section follows the guidance given in Regulatory Guide 7.10, Annex 2, (NRC 1986) Quality Assurance Programs Applicable to Procurement, Use, Maintenance, and Repair of Packaging Used in Transport of Radioactive Material. The section numbers and titles follow those in Annex 2 beginning with Section 4.6.1, Organization, which corresponds with Section 2.1, Organization in Annex 2.

4.6.1 Organization

Section 3.1.1.1, of this document, defines the organization responsible for TWCP activities. Controls over activities important to safety are defined in accordance with PRO-486-WIPP-006, TRU Waste Characterization Project QA Grading, and implemented through Site infrastructure QA documents. QA personnel have the responsibility and authority to stop unsatisfactory work and delivery or installation of nonconforming material according to 1-V10-ADM-15.02, Stop Work Action, and have direct access to management levels to ensure that QA procedures important to safety have been accomplished.

Section 3.1.1.1.3 of this document identifies the responsibilities of the principal personnel for the overall QA program; the TWCP Site PM, who has overall authority and responsibility for the TWCP QA program; the TWCP Site PQAO; the Material Stewardship QA Manager; and the KH Quality Program Manager. The TWMM is approved by the TWCP Site PM.

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4.6.2 Quality Assurance Program**4.6.2.1 Scope of Quality Assurance Program**

The scope of the Packaging QA Program includes packaging and transport of 55-gallon waste drums and SWBs and the receiving, preparation, and loading of the TRUPACT-II. Procedures are established and identified in this plan which ensure that activities important to safety are performed using suitable equipment and under suitable environmental conditions. These procedures identify QA/QC responsibilities for implementing activities important to safety. The Site TPM and the TWCP TIP are implemented to identify and document training and qualification necessary for personnel to adequately perform their functions.

4.6.2.2 Applicability of Quality Assurance Program

CBFO provides the QA Program for the TRUPACT-II packaging. The TRUPACT-II has been authorized by a Certificate of Compliance per the Nuclear Regulatory Commission regulation 10 CFR 71. DOE/WIPP 02-3183, CH Packaging Program Guidance; DOE/WIPP 02-3184, CH Packaging Operations Manual; and DOE/WIPP 02-3185, CH Packaging Maintenance Manual; are followed in maintaining the TRUPACT-II for use. Loading and preparation of the TRUPACT-II is covered by the program in this section. Where it has been determined that Packaging QA Program requirements apply to the loading and preparation of the TRUPACT-II, controls are specifically identified relative to the TRUPACT-II.

The program described here is currently applicable to 55 gallons drums, the POC and SWBs used for shipment of TRU waste to the WIPP. Receiving the TRUPACT-II vessels at RFETS, and loading and preparing the TRUPACT-II for shipment is also covered by the Packaging QA Program.

Items and activities important to safety are categorized and identified in accordance with PRO-486-WIPP-006, TRU Waste Characterization Project QA Grading.

4.6.3 Design Control

The TWCP complies with design configuration for the POC (Reference DOE/CAO Drawing No. 163-001) through the application of 1-V51-COEM-DES-210, Site Engineering Process Procedure. Refer to PRO-284-POC-001, Pipe Overpack Component Initial Assembly Process for the applicable RFETS POC fabrication drawings.

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4.6.4 Procurement Document Control**4.6.4.1 Packaging Procurement**

The procurement document control system is defined in MAN-134-PPM, Procurement Program Manual; the KH Procurement System Manual; and Engineering procedures. The 55-gallon drum and SWB packages are procured according to specifications that are controlled by 1-V51-COEM-DES-210, Site Engineering Process Procedure; and PRO-1034-PEQA, Procurement Engineering and Quality Assurance. The Process Specification identifies the appropriate certifications to be provided by the manufacturer and provides the information necessary for receipt at RFETS.

TRUPACT-II vessels are government-furnished equipment maintained according to DOE/WIPP 02-3183, CH Packaging Program Guidance; DOE/WIPP 02-3184, CH Packaging Operations Manual; and DOE/WIPP 02-3185, CH Packaging Maintenance Manual. DOE maintains the Certificate of Compliance for the TRUPACT-II vessels. RFETS verifies the vessel number against a list of certified vessels through 4-T43-Traffic-528, TRUPACT Operations Flow.

4.6.4.2 Replacement Part Procurement

Procedure MAN-134-PPM, Procurement Program Manual; and KH Procurement System Manuals, provide for procurement of replacement parts for drums and SWBs.

Replacement parts for TRUPACT-II vessels are not procured by RFETS, but are obtained according to DOE/WIPP 02-3183, CH Packaging Program Guidance.

4.6.4.3 High Purity Helium Procurement

High purity helium used for leak testing TRUPACT-II seals is procured according to MAN-134-PPM, Procurement Program Manual. The vendor provides certification for product purity which exceeds the purity specified by ANSI N14.5-1997, Radioactive Materials – Leakage Tests on Packages for Shipment.

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4.6.5 Instructions, Procedures, and Drawings**4.6.5.1 Preparation of Packaging for Use**

Waste generators package waste in accordance with 1-PRO-079-WGI-001, Waste Generating, Characterization, and Packaging. A WGI is then provided to the waste generator. The WGI and 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure, provide instructions for the waste generator to put the waste package into use.

TRUPACT-II vessels are prepared for use following PRO-1418-WO-TRUOP, TRUPACT-II Operations.

4.6.5.2 Repair, Rework, and Maintenance

The procedure PRO-1406-SWB, Standard Waste Box Repair/Replacement Operations provides controls for field repair and replacement parts for SWBs. No repair or maintenance of drums is performed. Drums and SWBs may be reworked if nonconformances to requirements are determined to exist. Waste generation and packaging processes include appropriate inspection steps and hold-points that assure waste is properly packaged. Any deficiencies identified in the waste generation and packaging processes are documented on WNCRs. WNCRs on waste packages are issued according to PRO-U76-WC-4030, Control of Waste Nonconformances. Dispositioning of nonconformances assures packaging is reworked to meet the requirements of the waste packaging requirements in 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; and 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure.

No repair or rework of TRUPACT-II vessels is performed. Maintenance of TRUPACT-II vessels is accomplished according to DOE/WIPP 02-3183, CH Packaging Program Guidance; and DOE/WIPP 02-3185, CH Packaging Maintenance Manual.

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4.6.5.3 Loading and Unloading Contents

The documents 1-PRO-079-WGI-001, Waste Characterization, Generation, and Packaging; 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; and 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure, provide instructions for loading radioactive materials into the drum and SWB packaging.

TRUPACT-II vessels are loaded in accordance with the following procedures:

- PRO-1418-WO-TRUOP, TRUPACT-II Operations
- PRO-1419-WO-LKTST, TRUPACT-II Leak Test

Maintenance and calibration of TRUPACT-II leak testing equipment to the guidelines of ANSI N14.5-1997, Radioactive Materials – Leakage Tests on Packages for Shipment requirements is performed according to equipment manufacturer's instructions and procedure PRO-1419-WO-LKTST, TRUPACT-II Leak Test.

4.6.5.4 Transport of Packages

Traffic Management coordinates the on-site transfer of waste packages. Requirements for assuring packages are properly marked, secured and transported are specified in MAN-T91-STSM-001, Site Transportation Safety Manual and PRO-015-NMT-003, Transferring Category III and IV Material.

Measures are included in 4-T20-Traffic-505, Certifying Authorized Payloads for TRUPACT-II, and 4-T43-Traffic-528, TRUPACT Operations Flow, to assure TRUPACT-II vessels are in good condition, are adequately secured, properly sealed, and properly marked.

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4.6.6 Document Control

Controls to assure that documents affecting packaging are controlled, that the most recent revisions are available to those persons using the documents, and that changes are reviewed and approved are contained in MAN-001-SDRM, Site Document Requirements Manual; PRO-1329-DM-03, Site Document Control; and PRO-815-DM-01, Developing and Maintaining Documents.

As a minimum, that control should be exercised over the following documents:

- QA and QC Manuals
- Operating Procedures
- Maintenance Procedures
- Inspection and Test Procedures
- Loading and Unloading Procedures
- Packaging for Transport Procedures
- Repair Procedures, and
- Procurement Procedures

MAN-001-SDRM, Site Document Requirements Manual, requires that the 8 bulleted items listed above, as well as other RFETS documents, are controlled.

PRO-815-DM-01, Developing and Maintaining Documents, requires that changes to items 1-8 above are reviewed and approved by appropriate organizations.

PRO-1329-DM-03, Site Document Control, requires that the 8 bulleted items listed above are verified, distributed, and that the most recent revision is available to those persons responsible for using those documents.

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4.6.7 Control of Purchased Material, Equipment, and Services

The following documents provide direction for the control of purchased material, equipment, and services:

- MAN-134-PPM, Procurement Program Manual
- PRO-1034-PEQA, Procurement Engineering and Quality Assurance
- PRO-1326-Commodities, Requisitioning Commodities
- PRO-1327-Services, Requisitioning Services
- PRO-1306-ARIBA, Ariba Buyer Users Guide
- 1-V51-COEM-DES-210, Site Engineering Process Procedure
- PRO-J44-RC&I-6600, Procured Items Inspection and Certification

TRUPACT-II vessels are not purchased by RFETS.

For details regarding how these documents address design, fabrication, and quality assurance requirements for procurement of items and services see Section 3.2.3.2.4, Procurement Document Control; Section 3.2.3.2.5, Purchasing; and Section 3.2.3.2.7, Control of Purchased Items and Services.

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4.6.8 Identification and Control of Materials, Parts, and Components

Identification and/or traceability of TRU waste packages (drums and SWBs) is ensured through several measures. Waste packages are uniquely identified from the initial receipt up to and including use, packaging, storage, and transportation to the WIPP.

The key document that records traceability information is the W/RT (1-C80-WO1102-W/RT, Waste/Residue Traveler Instructions). As described in Section 4.3.1, either an electronic W/RT or a manual W/RT may be used for packaging activities. The WR/T data collection form is generated for each waste package and documents the employee numbers of the waste generators, waste verifiers, Waste Inspectors, and test technicians directly involved with processing the waste package. The form also documents inspection and test results, waste generation source (process number), hazardous constituent number (if applicable), and package serial number. Waste Management-Technical Operations personnel control the development of waste identification and characterization information through 1-PRO-079-WGI-001, Waste Characterization, Generation and Packaging.

Refer to Section 3.2.1.3 of this document for further information on the identification and control of materials, parts, and components.

4.6.9 Control of Special Processes

The TRUPACT-II verification leak check is the only special process in the Packaging QA Program. Procedure PRO-1419-WO-LKTST, TRUPACT-II Leak Test, ensure that: 1) Procedures, equipment, and personnel are qualified in accordance with applicable codes, standards, and specifications; 2) Operations are performed by qualified personnel and accomplished in accordance with written process sheets with recorded evidence of verification; and 3) Qualification records of procedures, equipment, and personnel are established, filed, and kept current.

4.6.10 Inspection Control**4.6.10.1 Receipt Inspection**

Receipt Inspection is performed to assure packaging meets procurement specifications in accordance with PRO-J44-RC&I-6600, Procured Items Inspection and Certification. Nonconformances are documented according to procedure 1-A65-ADM-15.01, Control of Nonconforming Items.

TRUPACT-II vessels are inspected when received on-site according to 4-T43-Traffic-528, TRUPACT Operations Flow.

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4.6.10.2 Maintenance

Inspections of packaging during use and prior to shipment is performed by Waste Inspectors according to PRO-1045-WI-001, Solid Radioactive Waste Inspection.

TRUPACT-II vessels maintenance inspections are performed in accordance with DOE/WIPP 02-3183, CH Packaging Program Guidance; and DOE/WIPP 02-3185, CH Packaging Maintenance Manual.

4.6.10.3 Final Inspection

Final inspection of the packaging is performed according to PRO-1045-WI-001, Solid Radioactive Waste Inspection, and PRO-X05-WC-4018, Transuranic (TRU) Waste Certification. Also see Section 6.6 of this document for controls implemented for the final inspection and certification of packaging and the TRUPACT-II.

Final inspection measures for TRUPACT-II vessels are included in PRO-T95-OSTP-002, Off-Site Transportation Procedure; 1-T13-Traffic-306, Labeling and Marking TRUPACT Packages; 4-T20-Traffic-505, Certifying Authorized Payloads for TRUPACT-II; and 4-T43-Traffic-528, TRUPACT Operations Flow. The above procedures ensure inspections verify the following have been complied with:

- All shipping papers are properly completed,
- Packages are legibly, conspicuously and durably marked as required by DOT regulations,

All inspections are performed by personnel who are independent from the individual performing the work being inspected.

4.6.11 Test Control

The TRUPACT-II verification leak check is the only testing conducted as part of the Packaging QA Program. Testing is controlled PRO-1419-WO-LKTST, TRUPACT-II Leak Test. See Sections 3.9.6.2 and 4.6.9 for additional details.

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4.6.12 Control of Measuring and Test Equipment

Measuring and test equipment (M&TE) is calibrated, adjusted, and maintained according to MAN-092-M&TEM, Measuring and Test Equipment Management Manual. Measuring and test equipment are labeled to assure calibration at prescribed intervals or prior to use. Calibration records are maintained to identify historical information and assure traceability to nationally recognized standards. Procedure MAN-092-M&TEM, Measuring and Test Equipment Management Manual, describes the action to take to validate previous inspection/test results if M&TE is found to be out of calibration. See Section 3.2.4.3.1 of this document for additional details and controls related to M&TE.

4.6.13 Handling, Storage, and Shipping**4.6.13.1 Handling and Storage**

Measures to ensure that special handling and lifting equipment is used are established through the MAN-072-OS&IH PM, Occupational Safety & Industrial Hygiene Program Manual, Chapter 11: Powered Industrial Trucks and Chapter 12: Hoisting and Rigging.

Special handling or storage provisions for packaging (e.g., shock absorbers, tags, or markings to adequately protect and identify critical components) are used for the TRUPACT-II vessels according to instructions in the TRUPACT-II loading procedures (PRO-1418-WO-TRUOP, TRUPACT-II Operations; PRO-1419-WO-LKTST, TRUPACT-II Leak Test; and PRO-1411-WO-WASTE, Waste Receiving, Transfer, & Handling).

On-site sample transfer is discussed in the TWCP QAPjP, Section B1-5.

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4.6.13.2 Preparation for Release and Shipment

TRU waste packaging is inspected by Traffic Management prior to shipment according to 4-T28-Traffic-513, Waste Package Inspection and Shipments; PRO-T95-OSTP-002, Off-Site Transportation Procedure; and 1-T13-Traffic-306, Labeling and Marking TRUPACT Packages.

Inspection of the TRUPACT-II for certification and shipment is performed according to PRO-T95-OSTP-002, Off-Site Transportation Procedure; 4-T20-Traffic-505, Certifying Authorized Payloads for TRUPACT-II; 4-T43-Traffic-528, TRUPACT Operations Flow; and 4-T30-Traffic-515, Preparation and Retention of Shipping Papers.

4.6.14 Inspection, Test, and Operating Status

The measure for ensuring the inspection and operating status of drum and SWB waste packaging is the W/RT. Instructions for preparing the W/RT are provided in 1-C80-WO1102-W/RT, Waste/Residue Traveler Instructions.

The operating status of the TRUPACT-II vessels is identified through the use of DOE/WIPP 02-3183, CH Packaging Program Guidance; DOE/WIPP 02-3184, CH Packaging Operations Manual; and DOE/WIPP 02-3185, CH Packaging Maintenance Manual.

See Section 3.2.4 for additional details.

4.6.15 Control of Nonconforming Materials, Parts, or Components

Controls for the identification, segregation, disposition, and evaluation of nonconforming packaging are provided in 1-A65-ADM-15.01, Control of Nonconforming Items; and PRO-U76-WC-4030, Control of Waste Nonconformances. See Section 3.1.3.2.3 for additional detail of the control of the nonconformance process.

4.6.16 Corrective Action**4.6.16.1 Reporting**

Conditions adverse to waste acceptability are identified promptly through inspections, tests, surveillances, and audits and corrected as soon as practical. Corrective actions are initiated, documented and tracked in accordance with 3-X31-CAP-001, Corrective Action Process.

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4.6.16.2 Closeout

Closeout to ensure that corrective actions have been implemented is performed according to instructions in 3-X31-CAP-001, Corrective Action Process. The individuals responsible for closeout are identified in this procedure.

See Section 3.1.3.2.4 of this document for additional detail of the corrective action process.

4.6.17 **Quality Assurance Records**

4.6.17.1 General

Records are maintained and transmitted to the TWCP files according to 1-PRO-077-WIPP-005, Management of Waste Information Prior to Transmittal to the Waste Records Center. In addition to the following, Section 3.1.5 of this document provides more additional description of Quality Assurance Records.

4.6.17.2 Generating Records

Measures to ensure that documents designated as QA records are legible and completed to reflect the work accomplished and are processed quickly to avoid unnecessary delay when the record is needed have been established. These measures are contained in 1-PRO-077-WIPP-005, Management of Waste Information Prior to Transmittal to the Waste Records Center, and the RIDS.

4.6.17.3 Receipt, Retrieval, and Disposition of Records

A receipt system is established in 1-PRO-077-WIPP-005, Management of Waste Information Prior to Transmittal to the Waste Records Center. Measures to ensure records maintained are identifiable and retrieval and are not disposed of until prescribed conditions are satisfied are contained in the RIDS and PRO-767-WIPP-001, Waste Records Center Processing.

4.6.17.4 Storage, Preservation, and Safekeeping

Measures for storage, protection, and safekeeping of records are provided in 1-PRO-077-WIPP-005, Management of Waste Information Prior to Transmittal to the Waste Records Center; and PRO-767-WIPP-001, Waste Records Center Processing.

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4.6.18 Audits

An independent assessment (or a series of smaller independent assessments) of the TWCP is performed annually by MS Quality Assurance. The scope of the audit includes the Packaging QA Program requirements. Procedure 3-B52-1A-003, Conduct of Independent Assessment Activities, is used to plan and perform the assessment and report the audit results. Procedure 3-X31-CAP-001, Corrective Action Process, defines the site level process for documenting, characterizing and tracking corrective actions identified during the assessment. Additional description of the audit process is provided in Sections 3.3.2 and 3.3.2.4 of this document.

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5.0 RFETS CERTIFICATION TO WIPP WASTE ACCEPTANCE CRITERIA

The requirements and associated criteria for acceptance of defense TRU waste at WIPP for disposal (the WIPP-WAC Section 3) and the method(s) of compliance employed at RFETS to meet these criteria are specified in the following subsections. The acceptance criteria of the WIPP-WAC describe the controlling (i.e., the most restrictive) requirements to be used by RFETS in preparing waste for transportation to and disposal at the WIPP. In some instances the acceptance criteria and regulatory requirements are synonymous. The WIPP-WAC requirements are derived from several source documents: the WIPP SAR, the TRUPACT-II Certificate of Compliance, the WIPP Land Withdrawal Act, the WIPP Hazardous Waste Facility Permit, and the Criteria for the Certification and Re-Certification of the Waste Isolation Pilot Plant's Compliance with the 40 CFR Part 191 – Disposal Regulations. Definitions of terms used in this document are included as Section 9.1.

5.1 General

All of the requirements and associated criteria from the WIPP-WAC are addressed in this section. However, some of these criteria are not limiting when the restrictions for TRUPACT-II payload control and the WIPP Waste Acceptance Criteria are combined. The TRUPACT-II payload criteria that are defined in the TRAMPAC parallel the WIPP-WAC for many of the restrictions. In the cases where the WIPP-WAC and the TRAMPAC have identified equivalent criteria or where the TRAMPAC criteria are more restrictive, Section 6.0 of this TWMM, RFETS TRUPACT-II Payload Compliance Plan, is referenced to demonstrate compliance.

The WIPP Waste Acceptance Requirements and Criteria (WIPP-WAC, Section 3) are organized into five main categories in this document. These categories (and their corresponding section numbers) include the following:

- Container Properties (Section 5.2);
- Radiological Properties (Section 5.3);
- Physical Properties (Section 5.4);
- Chemical Properties (Section 5.5); and
- Data Packages (Section 5.6);

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5.1 General (continued)

Within each of these categories the specific requirement(s) is quoted and the method(s) of compliance documented. Only CH-TRU wastes from a properly characterized and approved waste stream may be certified as meeting the requirements and associated criteria contained in the WIPP-WAC. Any waste payload package from a waste stream that has not been preceded by an appropriate certified WSPF is not acceptable for disposal at WIPP.

RFETS plans and procedures, as referenced in this document, contain details of the processes, controls, techniques, tests, and other actions to be applied to each TRU payload package, waste stream, and shipment. Methods of compliance with each requirement are described and the specific procedure cited. These methods of compliance include procedural controls, administrative controls, and waste generation process controls. The QA requirements applicable to waste characterization, certification, and transportation are addressed in the TWCP QAPjP, and Sections 3, 4.6, and Appendix 4 of this TWMM. The data resulting from the implementation of the plans and procedures will form the basis for verifying that CH-TRU waste to be sent to WIPP is certified to meet the WIPP-WAC by the responsible site certifying official.

RFETS shall transmit required characterization, certification, and shipping data to WIPP using the WWIS. The WWIS is an electronic database equipped with edit/limit checks to ensure that the data representing the waste payload packages are in compliance with the WIPP-WAC. Before shipping TRU waste payload packages from a WIPP-accepted waste stream, RFETS shall transmit the required waste characterization, certification, and shipping data via WWIS to WIPP. RFETS may periodically be requested to transmit payload package radiography reports or other data to WIPP. WIPP will not accept any waste package shipments for disposal if the waste payload package information has not been correctly submitted and approved for shipment by the WWIS Data Administrator. The WWIS User's Manual provides the information needed by TRU waste sites to perform tasks associated with transmittal of the payload package's characterization, certification, and shipment information to WIPP.

RFETS will be notified of revisions to external regulatory requirements by CBFO. Revisions of requirements in referenced documents not controlled by the DOE (but by, for example, the EPA, NRC, or NMED) shall have precedence over the values specified in the WIPP-WAC if they are more restrictive. These changes will be incorporated in future revisions of the WIPP-WAC.

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5.1.1 DOE Operations and Safety Requirements

The WIPP SAR addresses CH-TRU waste handling and emplacement operations. The waste accepted for emplacement in the WIPP must conform to the SAR and the associated technical safety requirements. The WIPP SAR documents the safety analyses that develop and evaluate the adequacy of the WIPP safety bases necessary to ensure the safety of workers, the public, and the environment from the hazards posed by WIPP waste receiving, handling, and emplacement operations. The WIPP SAR establishes and evaluates the adequacy of the safety bases in response to WIPP normal and abnormal operations and postulated accident conditions. In addition to the requirements found in the WIPP SAR, requirements from best practices and operational experience are also listed in this section.

5.1.1.1 Methods of Compliance

Compliance with the applicable Operations and Safety Requirements are described throughout Section 5 of this document.

5.1.2 NRC Transportation Safety Requirements for the TRUPACT-II

Acceptable methods for payload compliance are defined in the TRAMPAC. For shipments to WIPP, RFETS must prepare a site-specific TRAMPAC describing how it will ensure compliance with each payload parameter. This technical plan shall contain sufficient detail to allow reviewers to adequately understand and evaluate the compliance methodology for each payload parameter.

RFETS shall have a packaging QA program that defines the QA activities that apply to the use of NRC-approved transportation packagings in accordance with 10 CFR Part 71, subpart H.

5.1.2.1 Methods of Compliance

The RFETS TRAMPAC is defined in Section 6.0 of this document. The corresponding packaging QA program is described in Section 4.6 of this document.

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5.1.3 NMED Hazardous Waste Facility Permit Requirements

TRU waste is classified as TRU mixed waste if it contains hazardous constituents regulated under RCRA. Only TRU mixed waste and TRU waste that have been characterized in accordance with the WIPP-WAP and that meet the TSDF waste acceptance criteria as presented in permit conditions II.C.3.a through II.C.3.k of the WIPP Hazardous Waste Facility Permit will be shipped to WIPP for disposal in the permitted underground hazardous waste disposal unit.

Prior to disposal, RFETS shall develop and implement a QAPjP that addresses all the applicable requirements specified in the WIPP-WAP. In accordance with attachment B5 of the WIPP-WAP, the QAPjP will include the qualitative or quantitative criteria for making a hazardous waste determination. RFETS QAPjP will be reviewed and approved by the CBFO.

5.1.3.1 Methods of Compliance

The TWCP QAPjP describes compliance with the WIPP-WAP. The TWCP QAPjP is approved by CBFO.

5.1.4 EPA Compliance Certification Decision Requirements

Title 40 CFR Part 194.24(c) states that the DOE shall specify the limiting values for waste components to be emplaced in the repository. Appendix WCL (Waste Component Limits) of the Compliance Certification Application (CCA) identifies the repository limits for several waste components including free water, metals; and cellulose, plastic, and rubber (CPR). Although the CCA does not specify limiting values for the activities and masses of specific radionuclides, Table 4-6 of the CCA identifies the listed values for a number of radionuclides that are considered in the Performance Assessment. To demonstrate that the cumulative total activities of the specified radionuclides (^{241}Am , ^{238}Pu , ^{239}Pu , ^{240}Pu , ^{242}Pu , ^{233}U , ^{234}U , ^{238}U , ^{90}Sr , and ^{137}Cs) are consistent with the levels used for the Performance Assessment and the compliance certification decision, reporting and tracking of the specified radionuclides (^{241}Am , ^{238}Pu , ^{239}Pu , ^{240}Pu , ^{242}Pu , ^{233}U , ^{234}U , ^{238}U , ^{90}Sr , and ^{137}Cs) is necessary, as required by Table 4-10 of the CCA. TRU waste payload packages shall contain more than 100 nanocuries per gram of waste (nCi/g) of alpha-emitting TRU isotopes with half-lives greater than 20 years, as specified in Section 3.3.3 of the WIPP-WAC.

The repository limit for free water is a maximum of 1684 m³ and is met by the residual liquid criterion specified in Section 3.4.1 of the WIPP-WAC.

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5.1.4 EPA Compliance Certification Decision Requirements (continued)

The limits for metals are a minimum of 2×10^7 kg for ferrous metals and 2×10^3 kg for nonferrous metals. These limits will be met in the total repository inventory by the metals that constitute the waste payload packages alone; thus, WIPP tracks and reports the number and type of payload packages emplaced in the repository as reported in the WWIS by the sites (see WIPP-WAC Section 3.2.1).

The repository limit for CPR is a maximum of 2×10^7 kg. RFETS estimates the CPR weights and reports these estimates in the WWIS on a payload package basis as required by WIPP-WAC Section 3.6.1.

RFETS must quantify and report the activities and masses of specific radionuclides for the purpose of tracking the total radionuclide inventory of the repository as specified in Section 3.3.1 of the WIPP-WAC. The presence or absence of these specific radionuclides is determined from AK, radioassay, or both in accordance with Appendix A of the WIPP-WAC. The results of this determination are reported in the WWIS on a payload package basis.

5.1.4.1 Methods of Compliance.

Site compliance with free liquid requirements is discussed in Section 5.4.1 of this document. The information necessary for compliance with the metals limit is provided as described in Section 5.2.1 of this document. The weights of cellulose, plastic, and rubber (CRP) are estimated during the characterization processes (RTR or Visual Examination) described in the TWCP QAPjP. These weights are reported to the WWIS through 4-G83-WEM-WP-1209, WEMS Waste Package Verification for Certification; and 4-K47-WEM-WP1210, WEMS Offsite Shipping Module. The quantification and reporting of radionuclides is performed as described in Section 5.3.1 of this document.

5.1.5 Land Withdrawal Act Requirements

The term "WIPP" means the Waste Isolation Pilot Plant project authorized under Section 213 of the Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1980 (Pub. L. 96-164; 93 Stat. 1259-1265) to demonstrate the safe disposal of radioactive waste materials generated by atomic energy defense activities. Hence, by law, WIPP can accept only radioactive waste generated by atomic energy defense activities of the United States.

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5.1.5 Land Withdrawal Act Requirements (continued)

The DOE and its predecessor agencies were engaged in a broad range of activities that fall under the heading of atomic energy defense activities. A TRU waste is eligible for disposal at WIPP if it has been generated in whole or in part by one or more of the following functions:

- Naval reactors development
- Weapons activities, including defense inertial confinement fusion
- Verification and control technology
- Defense nuclear materials productions
- Defense nuclear waste and materials by-products management
- Defense nuclear materials security and safeguards and security investigations
- Defense research and development

Using AK, RFETS determines that each waste stream to be disposed of at WIPP is "defense" TRU waste.

High-level radioactive waste or spent nuclear fuel shall neither be transported, emplaced, nor disposed of at WIPP. Also, no transuranic waste may be transported by or for the DOE to or from WIPP, except in packages (1) the design of which has been certified by the NRC, and (2) that have been determined by the NRC to satisfy its quality assurance requirements.

5.1.5.1 Methods of Compliance

The RFETS' TRU waste was generated by Atomic Energy defense activities only. Using AK, RFETS determined that each waste stream to be disposed of at WIPP is defense waste. This is documented in an auditable record and summarized in RF/RMRS-97-018, RFETS TRU Waste Acceptable Knowledge Supplemental Information. Furthermore, based on review of AK information, there is no historical evidence or record of high-level waste or spent nuclear fuel ever being handled at RFETS. RFETS did not and does not generate or possess any high-level waste or spent nuclear fuel.

The RFETS TRAMPAC is defined in Section 6.0 of this document. The corresponding packaging QA program is described in Section 4.6 of this document.

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5.2 Container Properties

5.2.1 Description

Acceptance Criterion. Each payload package shall be assigned to a payload shipping category. Authorized payload packages include:

- 55-gallon drums (either direct loaded or containing a POC)
- SWBs (either direct loaded, or containing up to four direct loaded 55-gallon drums, or containing one bin)
- ten drum overpacks (TDOPs, either containing up to ten direct loaded 55-gallon drums, six 85-gallon drum overpacks, or one SWB)

Payload packages shall meet U.S. Department of Transportation (DOT) Specification 7A, Type A, packaging requirements. Payload packages must be made of steel and be in good and unimpaired condition prior to shipment from RFETS. To demonstrate compliance with the requirement that payload packages be in good and unimpaired condition, the exterior of all payload packages shall undergo 100% visual examination prior to loading into a TRUPACT-II. The results of this visual examination shall be documented using the payload package integrity checklist contained in Appendix 3. A payload package in good and unimpaired condition 1) does not have significant rusting, 2) is of sound structural integrity, and, 3) does not leak. Significant rusting is a readily observable loss of metal due to oxidation (e.g., flaking, bubbling, or pitting) that causes degradation of the payload package's structural integrity. Rusting that causes discoloration of the payload package surface or consists of minor flaking is not considered significant. A payload package is not of sound structural integrity if it has breaches or significant denting/deformation. Breaching is defined as a penetration in the payload package that exposes the internals of the packaging. Significant denting/deformation is defined as damage to the payload package that results in creasing, cracking, or gouging of the metal, or damage that affects payload package closure. Dents or deformations that do not result in creasing, cracking, or gouging or affect payload package closure are not considered significant. RFETS will report to the WWIS the number and types of payload packages planned for shipment to the WIPP.

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5.2.1.1 Methods of Compliance

See Section 6.5.1 for description of compliance with shipping category requirements.

Per document 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual, only 55-gallon drums (direct fill or containing a POC) or SWBs are approved TRU waste packages for use at the site. Both of these packages are composed of steel and are non-combustible.

Procedure 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure, and applicable WGIs, that are prepared in accordance with procedure 1-PRO-079-WGI-001, Waste Characterization, Generation and Packaging, specify packaging instructions that ensure that packagings used to package transuranic waste are Specification 7A, Type A packages.

Procedure PRO-1045-WI-001, Solid Radioactive Waste Inspection, provides instructions for the performance of a final inspection of each payload package prior to certification and shipment that ensures that payload packages are in good condition. The Container Integrity Checklist is used when examining the payload package condition.

RFETS reports the number and type of waste packages in the WWIS. Inspections, tests, or other certifications are conducted at the manufacturer to assure drums and SWBs meet RFETS specifications. See Section 6.2.1.1 for additional information related to compliance of payload packages to the requirements of the TRUPACT-II SAR.

5.2.2 **Weight Limits and Center of Gravity**

Acceptance Criterion. Each payload package, payload assembly, and loaded TRUPACT-II shall comply with the weight limits shown in Table 5-2. Weight calculations for the payload assembly must include the measurement error. The total weight of the top seven 55-gallon drums or SWB of the payload assembly shall be less than or equal to the total weight of the bottom seven 55-gallon drums or SWB, respectively. The total weight of the top five 55-gallon drums or three 85-gallon drum overpacks in a TDOP shall be less than or equal to the total weight of the bottom five 55-gallon drums or three 85-gallon drum overpacks, respectively. Calibrations of the scales used to make these weight determinations shall be in accordance with the National Institute of Standards and Technology (NIST) Handbook 44 or an equivalent standard.

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5.2.2.1 Methods of Compliance

NOTE: *The RFETS maximum weight of a 55-gallon drum is limited to 800 lbs. per 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual.*

Methods of compliance are described in Section 6.2.3.2.

5.2.3 **Assembly Configurations**

Acceptance Criterion. Payload package assembly configurations authorized for shipment in the TRUPACT-II shall be in accordance with Table 5-1.

Although 85-gallon drum overpacks are acceptable at WIPP, they are not authorized for transport in a TRUPACT-II as individual payload packages.

5.2.3.1 Methods of Compliance

Methods of compliance are described in Section 6.2.1.2.

5.2.4 **Removable Surface Contamination**

Acceptance Criterion. Removable surface contamination on CH-TRU waste payload packages, payload assemblies, and packagings shall not exceed 20 dpm/100 cm² alpha and 200 dpm/100 cm² beta-gamma. The fixing of surface contamination to meet these criteria is not allowed by WIPP in accordance with best management practices for ensuring worker radiation dose as low as reasonable achievable.

5.2.4.1 Methods of Compliance

The documents 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure; 1-PRO-079-WGI-001, Waste Characterization, Generation and Packaging; and 1-C80-WO1102-W/RT, Waste/Residue Traveler Instructions, include steps for completing the W/RT which instructs the RCT to complete the signature block of the form thereby assuring that the removable alpha surface contamination is <20 dpm/100 cm². Payload packages and assemblies are surveyed for compliance with the removable surface contamination criteria prior to shipment in accordance with applicable Radiological Safety Practices (RSP) procedures and instructions.

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5.2.5 Identification/Labeling

Acceptance Criterion. Each payload package shall be labeled with a unique package identification number using bar code labels permanently attached in conspicuous locations. The payload package identification number shall be in medium to low density Code 39 bar code symbology as required by American National Standards Institute (ANSI) standard ANSI/AIM BC1-1995 in characters at least one-inch high and alphanumeric characters at least one-half inch high. In the case of 55-gallon drums, the bar code identification labels shall be placed at three locations approximately 120 degrees apart so that at least one label is clearly visible when the drums are assembled into a seven-pack (i.e., a label must be visible after slip sheets and wrapping are applied). In the case of SWBs, bar code labels are required on the flat sides of the SWBs. For TDOPs, a minimum of one bar code is required.

Payload packages shall be marked "Caution Radioactive Material" using a yellow and magenta label as specified in 10 CFR Part 835. Those payload packages whose contents are also RCRA regulated (mixed-TRU) shall be additionally marked "Hazardous Waste" as specified in 40 CFR Part 262.32.

If an empty 55-gallon drum is used as dunnage to complete a payload configuration, the dunnage package shall be labeled with the following information:

- Unique package identification number
- "EMPTY" or "DUNNAGE"

If a seven-pack of only dunnage 55-gallon drums or a dunnage SWB is used in the TRUPACT-II, the package(s) shall be labeled only "EMPTY" or "DUNNAGE." The unique package identification number label is not required for a seven-pack of dunnage, 55-gallon drums, or a dunnage SWB.

5.2.5.1 Methods of Compliance

Payload package identification and labeling is performed in accordance with procedure 1-T13-Traffic-306, Labeling and Marking TRUPACT Packages. This procedure specifies instructions that ensure payload packages comply with the requirements for payload package identification and labeling. Refer to Section 6.2.4.2 for additional information on compliance to the requirements for payload package identification/labeling.

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5.2.6 Dunnage

Acceptance Criterion. RFETS shall use empty 55-gallon drums or a SWB as dunnage to complete a payload configuration if too few payload packages are available that meet transportation requirements. The dunnage package(s) must meet the specifications of Appendix 2.1 of the TRAMPAC with the exception that dunnage packages shall have open vent ports (i.e., not filtered or plugged).

To maximize the efficiency of disposal operations at the WIPP, the use of dunnage drums should be minimized. In the event the use of dunnage drums cannot be avoided, the preferred practice for maximizing the efficiency of waste handling and the utilization of disposal room capacity is to ship them in assemblies (i.e., a seven-pack assembly of 55-gallon drums). The use of dunnage drums is reviewed and approved concurrently with the review and approval of shipment assemblies by the WWIS Data Administrator on a case-by-case basis.

5.2.6.1 Methods of Compliance

Dunnage packages consist of 55-gallon drums and SWBs that are inspected to verify they meet the requirements as described in Section 6.2.2.2. Instructions specified in procedure DOE/WIPP 02-3183, CH Packaging Program Guidance, ensure dunnage drums or SWBs have open vent ports. Refer to Sections 6.2.2.2 and 6.2.4.2 for additional information on compliance with the dunnage requirements.

5.2.7 Filter Vents

Acceptance Criterion. Payload packages that have been stored in an unvented condition (i.e., no filter and/or unpunctured liner) shall be aspirated for a specific length of time as described in the TRAMPAC to ensure equilibration of any gases that may have accumulated in the closed payload package.

Each payload package shall have one or more filter vents that meet the specifications of Appendix 2.5 of the TRAMPAC. The model number of each filter vent or combination of filter vents installed on a payload package shall be reported to the WWIS. A listing of available CBFO filter vent models is provided on the CBFO Web Page.

5.2.7.1 Methods of Compliance

See Section 6.5.3.2 for methods of compliance with aspiration requirements.

Refer to Section 6.2.5.2 for methods of compliance with the filter vent requirements.

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5.3 Radiological Properties

With respect to the required radiological properties identified within this section, they can be divided into two distinct groups.

The first group includes the activities and masses of the ten WIPP-tracked radionuclides (i.e., ^{241}Am , ^{238}Pu , ^{239}Pu , ^{240}Pu , ^{242}Pu , ^{233}U , ^{234}U , ^{238}U , ^{90}Sr , and ^{137}Cs) and the TRU alpha activity concentration (i.e., > 100 nCi/g of alpha-emitting TRU isotopes with half lives greater than 20 years) of the waste. This set of radiological properties is regulated by the EPA in accordance with 40 CFR Parts 191 and 194. Estimates of their activities and masses shall be derived from a system of controls certified by CBFO that includes AK, computations, measurements, sampling, etc. Appendix 4 provides the methods and requirements by which to characterize the radiological composition of the CH-TRU waste utilizing radioassay techniques.

The second group includes the remaining radionuclides contributing to the fissile gram equivalent (FGE), the plutonium-239 equivalent curies (PE-Ci), and the decay heat of the payload package. This set of radiological data is regulated both by the NRC as specified in the TRAMPAC and the CBFO as required by the WIPP Technical Safety Requirements. PE-Ci quantities shall be calculated for each payload package in accordance with Appendix B of the WIPP-WAC. Any TRAMPAC compliant method may be used to quantify the remaining radiological properties at the discretion of RFETS. Appendix 4 provides radioassay methods by which to characterize the remaining radiological properties. However, the resulting data (e.g., AK from Safeguards and Security data), the source/method from which the data was generated, and the basis for the reliability of the data shall be submitted to and approved by CBFO prior to use.

5.3.1 Radionuclide Composition

Acceptance Criterion. The activities and masses of ^{241}Am , ^{238}Pu , ^{239}Pu , ^{240}Pu , ^{242}Pu , ^{233}U , ^{234}U , ^{238}U , ^{90}Sr , and ^{137}Cs shall be established on a payload package basis for purposes of tracking their contributions to the total WIPP radionuclide inventory. The estimated activities and masses, including their associated total measurement uncertainties (TMU) expressed in terms of one standard deviation, for these ten radionuclides shall be reported to the WWIS on a payload package basis. For any of these ten radionuclides whose presence can be substantiated from AK, direct measurement, computations, or a combination thereof, and whose measured data are determined to be below the lower limit of detection (LLD) for that radionuclide, RFETS shall report the character string "< LLD" to the WWIS for the activity and mass of that radionuclide; otherwise a value of zero shall be reported. See Appendix 4, Section A4.3, for information pertaining to the development and application of LLD.

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5.3.1 Radionuclide Composition (continued)

In addition, all radionuclides other than the ten WIPP-tracked radionuclides (i.e., ^{241}Am , ^{238}Pu , ^{239}Pu , ^{240}Pu , ^{242}Pu , ^{233}U , ^{234}U , ^{238}U , ^{90}Sr , and ^{137}Cs) that contribute to 95% of the radioactive hazard for the payload package shall be reported on the TRUPACT-II bill of lading or manifest in accordance with 49 CFR Part 172.203 and 49 CFR Part 173.433. The activities and masses of these other radioisotopes shall also be reported to the WWIS along with their associated TMU, expressed in terms of one standard deviation for each waste package.

5.3.1.1 Methods of Compliance

See Section 6.3.1.2.

5.3.2 Pu-239 Fissile Gram Equivalent

Acceptance Criterion. For each payload package and loaded TRUPACT-II, the sum of ^{239}Pu FGE plus two times its associated TMU, expressed in terms of one standard deviation, shall comply with the limits in Table 5-3. The values calculated for ^{239}Pu FGE and its associated TMU (expressed in terms of one standard deviation) shall be reported to the WWIS for each payload package.

5.3.2.1 Methods of Compliance

The quantity of radioactive material in payload packages is determined by approved and authorized assay methods (refer to Appendix 4). Assay is either performed directly on the payload package or on all of the smaller waste packages composing the payload package. If the payload package is not directly assayed, then the assay values (and uncertainties) for the payload package are calculated from the associated assay results for all of the smaller packages composing the payload package. The assay results are used to calculate the Pu-239 FGE and associated uncertainty.

The Pu-239 FGE of the radionuclides in each waste package is reported to WIPP using the WWIS. Refer to Section 6.3.1.2 for more specific information on the methods of compliance for the Pu-239 FGE requirements.

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5.3.3 TRU Alpha Activity Concentration

Acceptance Criterion. TRU waste payload packages shall contain more than 100 nCi/g of alpha-emitting TRU isotopes with half-lives greater than 20 years. Without taking into consideration the TMU, the TRU alpha activity concentration for a payload package is determined by dividing the TRU alpha activity of the waste by the weight of the waste. The weight of the waste is the weight of the material placed into the payload package (i.e., the net weight of the package). The weight of the waste is typically determined by subtracting the tare weight of the payload package (including the weight of the rigid liner and any shielding external from the waste, if applicable) from the gross weight of the payload package. In the event waste packages (e.g., 55-gallon drums) that have been radioassayed are overpacked in a payload package (e.g., in an SWB), RFETS shall sum the individual TRU alpha activity values of the individual waste packages and divide by the sum of the individual net waste weights (i.e., less container, shielding, and liner weights as appropriate) to determine the activity per gram for the payload package. Loading a 55-gallon POC with cans is considered direct loading - not overpacking for the purposes of calculating the weight of the package. The TRU alpha activity concentration shall be reported to the WWIS; however, there are no reporting requirements for its associated TMU.

5.3.3.1 Methods of Compliance

Approved and authorized assay methods are used to quantitate the radioactive material in payload packages. RFETS assay methods and procedures are described in Appendix 4. Calibrated scales are used to measure the weight of payload packages and/or their contents in accordance with approved procedures PRO-1411-WO-WASTE, Waste Receiving, Transfer and Handling and/or PRO-1031-WIPP-1112, TRU/TRM Waste Visual Verification (VV) and Data Review. The assay results and weight measurements are used to calculate the TRU alpha activity concentration. Both the assay results and the weight measurements are entered into the site Waste and Environmental Management System (WEMS). WEMS software specifications for Calculated and Assigned fields define the methods that WEMS uses to calculate the TRU alpha activity concentration including subtraction of the tare weight (including the rigid liner and any added shielding), if applicable, prior to performing the calculation. WEMS software specifications also provide the methodology used by WEMS to ensure transuranic payload packages comply with the TRU alpha activity concentration restrictions.

Verification that correct data is input and used by WEMS for calculation of TRU alpha activity concentration is performed during the "WIPP Verify" function described in 4-G83-WEM-WP-1209, WEMS Package Verification and Certification.

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5.3.4 Pu-239 Equivalent Activity

Acceptance Criterion. PE-Ci limits are shown in Table 5-4. PE-Ci quantities shall be calculated for each payload package (see WIPP-WAC Appendix B) and reported to WIPP using the WWIS. There are no reporting requirements for the associated TMU.

5.3.4.1 Methods of Compliance

Approved and authorized assay methods are used to quantitate the radioactive material in payload packages. The assay results are used to calculate the PE-Ci for each payload package as specified in Appendix B to the WIPP-WAC in WEMS. WEMS software specifications for Calculated and Assigned fields define the methods that WEMS uses to calculate the PE-Ci for each payload package. WEMS software specifications also provide the methodology used by WEMS to ensure transuranic payload packages comply with the PE-Ci restrictions prior to certification and shipment.

Verification that correct data is input and used by WEMS for calculation of PE-Ci is performed during the "WIPP Verify" function described in 4-G83-WEM-WP-1209, WEMS Package Verification and Certification. PE-Ci values for each package are transmitted to the WWIS using WEMS in accordance with 4-K47-WEM-WP1210, WEMS Offsite Shipping Module.

Most of the waste generated at the site is not treated or overpacked (i.e., 55-gallon drums overpacked into a SWB or a TDOP). In general, waste is treated or overpacked if needed to produce a waste form or package in compliance with all applicable disposal waste acceptance criteria or other site-specific requirements.

5.3.5 Radiation Dose Rate

Acceptance Criterion. The external radiation dose equivalent rate of individual payload packages shall be ≤ 200 mrem/h at the surface. The external radiation dose equivalent rate of the TRUPACT-II shall be ≤ 200 mrem/h at the surface and ≤ 10 mrem/h at 2 meters. Additional internal payload package shielding, beyond that identified in Appendix 2.1 of the TRAMPAC as an integral component of the payload package, shall not be used to meet this criterion. Total dose equivalent rate and the neutron contribution to the total dose equivalent rate shall be reported for each payload package in the WWIS.

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5.3.5.1 Methods of Compliance

Radiation dose rates are determined as described in Section 6.3.2.2. Neutron contributions to the total payload package dose rate are reported separately in the WWIS as specified in procedure 4-K47-WEM-WP1210, WEMS Offsite Shipping Module.

5.3.6 **Decay Heat**

Acceptance Criterion. The sum of the decay heat for each payload package plus its TMU shall be less than or equal to the limits of the assigned shipping category specified in Table 5.5-1 of Appendix 5.5 of the TRAMPAC. For those payload packages that exceed the decay heat limit, a determination of compliance with the unified flammable (gas/volatile organic compound [VOC]) concentration limit as specified in the TRAMPAC allows the payload package to be shipped in the TRUPACT-II package under test category. The values calculated for decay heat and its associated TMU (expressed in terms of one standard deviation) shall be reported to the WWIS for each payload package.

5.3.6.1 Methods of Compliance

Compliance with decay heat requirements is described in Section 6.5.2.2.

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5.4 Physical Properties

5.4.1 Residual Liquids

Acceptance Criterion. Liquid waste is prohibited at WIPP. Waste shall contain as little residual liquid as is reasonably achievable by pouring, pumping, and/or aspirating. Internal containers shall also contain no more than 1 inch or 2.5 cm in the bottom of the internal containers. The total residual liquid in any payload package shall not exceed 1 percent by volume of that payload package. If visual examination methods are used in lieu of radiography, then the detection of any liquids in non-transparent internal containers will be addressed by using the total volume of the internal container when determining the total volume of liquids within the payload package.

5.4.1.1 Methods of Compliance

Compliance is provided through the use of 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; 1-PRO-079-WGI-001, Waste Characterization, Generation and Packaging; PRO-1031-WIPP-1112, TRU/TRM Waste Visual Verification (VV) and Data Review; 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure; associated WGI(s); and/or radiography, or the appropriate Residues repackaging procedures as referenced in the TWCP QAPjP. To comply with 49 CFR, RFETS procedures do not permit the packaging of free liquids. The document 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual, includes the requirement to thoroughly dry all wastes prior to packaging when possible. When it is not possible to thoroughly dry the waste items, the waste must be packaged in contact with enough suitable absorbent to accommodate twice the amount of any liquid that could potentially accumulate due to gravity or condensation.

Refer to Section 6.2.6.2 for additional information on compliance with the liquids restriction.

5.4.2 Sealed Containers

Acceptance Criterion. Payload packages shall be verified to be free of sealed containers greater than 4 liters.

5.4.2.1 Compliance Methods

Refer to Section 6.2.8.2 for information on compliance with the prohibition of sealed containers greater than 4 liters in volume. Unvented rigid containers greater than 4 liters in volume are either headspace gas sampled or are vented prior to initiating headspace drum age and equilibrium criteria.

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5.5 Chemical Properties

5.5.1 Pyrophoric Materials

Acceptance Criterion. Pyrophoric radioactive materials shall be present only in small residual amounts (< 1 percent by weight) in payload packages and shall be generally dispersed in the waste. Radioactive pyrophorics in concentrations ≥ 1 percent by weight and all nonradioactive pyrophorics shall be reacted (or oxidized) and/or otherwise rendered nonreactive prior to placement in the payload package. Nonradionuclide pyrophoric materials are not acceptable at WIPP.

5.5.1.1 Methods of Compliance

The document 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual, provides the requirement to exclude pyrophoric materials from being packaged. WGs provide instructions for excluding pyrophoric materials from being packaged with the waste by referring to AK characterization.

AK documentation verifies no pyrophoric materials are present in TRU waste. This documentation is contained in an auditable record and summarized in RF/RMRS-97-018, RFETS TRU Waste Acceptable Knowledge Supplemental Information.

Additional discussion of compliance is provided in the TRAMPAC section of this document. Specifically, Section 6.4.1.2 addresses compliance with the restriction on pyrophoric materials.

5.5.2 Hazardous Waste

Acceptance Criterion. Hazardous wastes not occurring as co-contaminants with TRU wastes (non-mixed hazardous wastes) are not acceptable at WIPP. Each CH-TRU mixed waste package shall be assigned one or more EPA hazardous waste codes as appropriate. Only EPA hazardous waste codes listed as allowable in the Hazardous Waste Facility Permit may be managed at WIPP. Wastes exhibiting the characteristic of ignitability, corrosivity, or reactivity (EPA hazardous waste numbers of D001, D002, or D003) are not acceptable at WIPP. In the context of the WIPP-WAC, hazardous waste codes are synonymous with hazardous waste numbers.

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5.5.2.1 Methods of Compliance

AK is the basis for compliance and verification to the hazardous waste criterion. AK documentation, in the form of WSRIC process descriptions and Backlog Waste Reassessments, is used to assign EPA HWNs to waste packages. A detailed description of the RFETS AK process and controls is presented in the TWCP QAPjP, Section B4.

The documents 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; and 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure, specify requirements and instructions to segregate non-mixed waste from mixed waste to prevent commingling of RCRA regulated waste with non-RCRA regulated waste. These documents also specify that waste may contain hazardous constituents as co-contaminants of the waste only. Assigned EPA HWNs are entered into WEMS on a waste package basis (1-PRO-087-WEMS-WP-1201, WEMS Waste Package Inventory, Tracking, and Control) and subsequently verified to ensure accuracy (4-G83-WEM-WP-1209, WEMS Waste Package Verification and Certification). The WEMS software disqualifies transuranic waste packages with assigned EPA HWNs (including HWNs D001, D002, and D003) that are not included on the list of EPA Hazardous Waste Numbers Acceptable at WIPP.

A complete discussion of how information on these constituents and compounds is collected and reported, along with references to implementing procedures, is provided in the TWCP QAPjP, Section B.

5.5.3 **Chemical Compatibility**

Acceptance Criterion. TRU waste containing incompatible materials or materials incompatible with payload package and packaging materials, shipping container materials, other wastes, repository backfill, or seal and panel closure materials are not acceptable for transport in the TRUPACT-II and disposal at the WIPP. Chemical constituents shall conform to the lists of allowable materials in Tables 4-1 through 4-8 of the TRAMPAC. Other chemicals or materials not identified in these tables are allowed provided that they meet the requirements for trace constituents as specified in Section 4.3 of the TRAMPAC.

5.5.3.1 Methods of Compliance

Compliance with chemical compatibility requirements is accomplished by only shipping wastes under approved TRUCON codes. Chemical compatibility is evaluated during the submittal and authorization of site TRUCON codes. Chemical compatibility is accomplished by only shipping waste that comply with the TRUPACT-II chemical lists for the assigned TRUCON code and waste material type. Refer to Sections 6.4.3 and 6.4.4 for additional information on the TRUPACT-II chemical lists.

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5.5.4 Explosives, Corrosives, and Compressed Gases

Acceptance Criterion. Waste shall contain no explosives, corrosives, or compressed gases (pressurized containers).

5.5.4.1 Methods of Compliance

The TRAMPAC Section (Section 6.4.2.2) documents compliance with the restriction on explosives, corrosives, and compressed gases. These prohibited items are controlled through a combination of AK, RTR and visual examination.

5.5.5 Headspace Gas Concentrations

Acceptance Criterion. The headspace gas of payload packages shall be sampled and analyzed in accordance with an approved site specific QAPjP, as defined in the WIPP WAP, to determine VOC concentrations.

Flammable VOCs are restricted to ≤ 500 ppm in the payload package headspace. For those payload packages that exceed the flammable VOC limit, a determination of compliance with the unified flammable (gas/VOC) concentration limit as described in the TRAMPAC allows the payload package to be shipped in the TRUPACT-II under the test category.

Test category payload packages shall be tested to quantify the hydrogen/methane, VOC, and total gas generation rates (as appropriate) for purposes of determining if all applicable limits are met.

5.5.5.1 Methods of Compliance

The RFETS TWCP QAPjP is the approved site-specific QAPjP at Rocky Flats. Headspace gas sampling and analysis of payload packages is performed to determine VOC concentrations in accordance with the RFETS TWCP QAPjP.

Flammable VOCs are restricted to ≤ 500 ppm in the payload package headspace. Payload packages that exceed the 500 ppm flammable VOC limit are categorized as Test Category Waste and evaluated to determine compliance with the unified flammable (gas/VOC) concentration limits as described in the TRAMPAC (see Section 6.5.2.1).

Test category payload packages are tested to quantify the hydrogen/methane, VOC and total gas generation rate (as appropriated) to determine if the payload package is shippable in the TRUPACT-II. The methods used to test and qualify test category waste for shipment in the TRUPACT-II are described in detail in Section 6.5.2.3.

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5.5.6 Polychlorinated Biphenyls

Acceptance Criterion. Waste shall contain no polychlorinated biphenyl (PCB) concentrations equal to or greater than 50 parts per million (ppm).

5.5.6.1 Methods of Compliance

Compliance is accomplished through AK and/or through sampling and analysis in accordance with the TWCP QAPjP and 95-WP/SAP-001, Transuranic (TRU/TRM) Waste Sampling Plan. Waste streams containing PCBs are identified in the WSRIC Building Books. Individual packages containing PCBs are identified in the BWRBB. This information is tracked in WEMS for each PCB-contaminated package. Waste potentially containing PCBs in concentration equal to or greater than 50 ppm are not shipped to WIPP for disposal.

5.6 Data Package Contents**5.6.1 Characterization and Certification Data**

Acceptance Criterion. RFETS shall prepare a WSPF for each waste stream. Each WSPF shall be approved by the CBFO prior to the first shipment of that waste stream. Characterization and certification information for each payload package shall be submitted to the WWIS and approved by the Data Administrator. Sites are required to estimate the CPR weights and report these estimates in the WWIS on a payload package basis. Any payload package from a waste stream that has not been preceded by an appropriate certified WSPF is not acceptable at WIPP.

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5.6.1.1 Compliance Methods

WSPFs are prepared and submitted to WIPP for review and acceptance in accordance with PRO-944-WIPP-008, Completion of Waste Stream Profile Form for Waste to be Disposed of at WIPP. Characterization and certification data are maintained in WEMS and transmitted to the WWIS in accordance with 4-K47-WEM-WP1210, WEMS Offsite Shipping Module; 4-G83-WEM-WP-1209, WEMS Waste Package Verification and Certification; and 1-PRO-110-WP-1212, WIPP Waste Information System (WWIS) Data Entry. Prior to WSPF approval, WEMS software controls allow characterization data to be transmitted to WWIS, but prevent transmission of certification data. Once a WSPF is approved by CBFO and an approval date is entered into the WWIS and WEMS, WEMS software controls allow transmission of certification data to the WWIS for payload packages in the waste stream. Assignment of payload packages to, and assembly of, TRUPACT-II payloads is controlled by the e-TRAMPAC system in WWIS. The e-TRAMPAC system prevents payload packages from being assembled into TRUPACT-II payloads until the payload package certification data are approved in the WWIS by a WWIS Data Administrator. This prevents any payload package from being shipped to WIPP prior to approval of a WSPF.

The quantity of cellulose, plastics and rubber (CPR) (and other waste material parameters) are estimated either by RTR or Visual Verification in accordance with approved procedures as described in the RFETS TWCP QAPjP.

5.6.2 **Shipping Data**

Acceptance Criterion. Sites shall prepare either a bill of lading or a uniform hazardous waste manifest for CH-TRU waste shipments as required by the transportation requirements. The land disposal restriction notification for CH-TRU mixed waste shipments shall state that the waste is not prohibited from land disposal. For shipment in TRUPACT-II, the following documents shall be prepared for packages and assemblies, as appropriate: payload container transportation certification document; overpack payload container transportation certification document; and payload assembly transportation certification document.

5.6.2.1 Methods of Compliance

The Uniform Hazardous Waste Manifest and/or the Bill of Lading is completed according to Traffic Management procedures. A LDR notification for TRU mixed waste shipments is generated in WEMS. The LDR notification states that the waste is not prohibited from land disposal. Refer to Section 6.6.2 for information on completion and processing of PCTCDs, OPCTCDs and PATCDs that are prepared for payload packages and assemblies.

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Table 5-1, Payload Package Assembly Configurations

NUMBER OF PAYLOAD PACKAGES IN ASSEMBLY	PAYLOAD PACKAGE CONFIGURATION
14	55-gallon drums
14	55-gallons drums, each containing one standard POC
14	55-gallons drums, each containing one S100 POC
14	55-gallons drums, each containing one S200 POC
2	SWBs
2	SWBs, each containing one (1) bin
2	SWB, each containing up to four (4) 55-gallon drums
1	TDOP, containing up to ten (10) 55-gallon drums
1	TDOP, containing up to six (6) 85-gallon drums (each 85-gallon drum containing one 55-gallon drum)
1	TDOP, containing one (1) SWB
1	TDOP, containing one (1) bin within a SWB
1	TDOP, containing up to four (4) 55-gallon drums within a SWB

Table 5-2, Weight Limits

COMPONENT	MAXIMUM WEIGHT (LBS)
Individual Payload package	
55-Gallon Steel Drum (DOT Spec. 17C)	≤ 1,000
55-Gallon Steel Drum (DOT Spec. 17H)	≤ 1,000
55-Gallon Steel Drum (UN/1A2/X320/S)	≤ 700
55-Gallon Steel Drum (UN/1A2/X325/S)	≤ 716
55-Gallon Steel Drum (UN/1A2/X400/S)	≤ 822
55-Gallon Steel Drum (UN/1A2/X425/S)	≤ 937
55-Gallon Steel Drum (UN/1A2/X430/S)	≤ 948
55-Gallon Steel Drum (UN/1A2/X435/S)	≤ 959
55-Gallon Drum Overpacked in SWB	≤ 1,450
SWB	≤ 4,000
TDOP	≤ 6,700
POC Payload package	
Standard POC - 6" diameter	≤ 328
Standard POC - 12" diameter	≤ 547
S100 POC	≤ 650
S200 POC	≤ 547
Payload package Assembly	
Payload Assembly of 14 55-gallon drums	≤ 7,265
Payload Assembly of two SWBs	≤ 7,265
TRUPACT-II	≤ 19,250
Truck (Tractor/Trailer)	≤ 80,000

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Table 5-3, Pu-239 FGE Limits

PACKAGE TYPE	PU-239 FGE LIMIT
55-gallon drum (including all POCs)	≤200
SWB	≤325
TDOP	≤325
TRUPACT-II (containing either 14 55-gallon drums, 2 SWBs, or 1 TDOP)	≤325
TRUPACT-II (containing either 14 standard, 14 S100, or 14 S200 POCs)	≤2800

Table 5-4, PE-Ci Limits

WASTE PACKAGE	PACKAGING CONFIGURATION	²³⁹ PU PE-Ci LIMIT
55-gallon drum in good condition	Direct load – all approved waste forms	≤ 80
	Direct load – solidified/vitrified waste only	≤ 1,800
	Overpacked into a 85-gallon drum, SWB, or TDOP – all approved waste forms	≤ 1,100
	Overpacked into a 85-gallon drum, SWB, or TDOP – solidified/vitrified waste only	≤ 1,800
55-gallon drum in damaged condition	Overpacked into a 85-gallon drum, SWB, or TDOP – all approved waste forms	≤ 80, ≤ 130, ≤ 130 respectively
	Overpacked into a 85-gallon drum, SWB, or TDOP – solidified/vitrified waste only	≤ 1,800
55-gallon POC in good condition	Direct load – all approved waste forms	≤ 1,800
85-gallon drum in good condition	Overpacked into a TDOP – all approved waste forms	≤ 1,100
	Overpacked into a TDOP – solidified/vitrified waste only	≤ 1,800
85-gallon drum in damaged condition	Overpacked into a TDOP – all approved waste forms	≤ 130
	Overpacked into a TDOP – solidified/vitrified waste only	≤ 1,800
SWB in good condition	Direct load (or a bin) – all approved waste forms	≤ 130
	Direct load (or a bin) – solidified/vitrified waste only	≤ 1,800
	Overpacked into a TDOP – all approved waste forms	≤ 1,100
	Overpacked into a TDOP – solidified/vitrified waste only	≤ 1,800
SWB in damaged condition	Overpacked into a TDOP – all approved waste forms	≤ 130
	Overpacked into a TDOP – solidified/vitrified waste only	≤ 1,800

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6.0 TRUPACT-II AUTHORIZED METHODS FOR PAYLOAD CONTROL (TRAMPAC) COMPLIANCE PLAN

6.1 Introduction

The TRAMPAC is the governing document for payload shipments in the TRUPACT-II. All users of the TRUPACT-II are required to comply with all payload requirements outlined in the TRAMPAC, using one or more of the methods described therein.

Each site shipping TRU waste in the TRUPACT-II is required to prepare a site-specific TRAMPAC Compliance Plan. This section of the TWMM (i.e., Section 6.0) constitutes the TRAMPAC Compliance Plan for RFETS.

This TRAMPAC Compliance Plan identifies requirements and responsibilities for the management of TRU and TRU mixed waste in order to ensure compliance with the payload restrictions of the TRUPACT-II package as outlined in the TRAMPAC. The TRAMPAC lists the restrictions on the waste to be transported in the TRUPACT-II and the allowable methods for determination and control of these restrictions, and this TRAMPAC Compliance Plan also identifies applicable procedures to demonstrate how RFETS complies with each of the TRUPACT-II payload restrictions. Appendix 10 correlates TRUPACT-II payload restrictions to applicable RFETS procedures. The RFETS procedures will also be shown to be acceptable methods for payload control and/or determination and verification as is dictated by the TRAMPAC. Adherence to the TRAMPAC Compliance Plan ensures that RFETS TRU and TRU mixed wastes are characterized, packaged, and controlled according to the methods and procedures described herein and will qualify for transport in the TRUPACT-II package.

6.1.1 Scope

The scope of the RFETS TRAMPAC Compliance Plan is to define and identify the methods used to ensure that only authorized contents are shipped in the TRUPACT-II package from RFETS.

6.1.2 Purpose

The purpose of this TRAMPAC Compliance Plan is to:

- Define the applicable requirements for a payload to be transported in the TRUPACT-II.
- Describe the methods of compliance used at RFETS to prepare and characterize the contact-handled (CH) TRU materials or other payload materials prior to transport in a TRUPACT-II package, including the quality control (QC) and quality assurance (QA) programs that shall be applied to these methods.

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6.1.3 Requirements

Requirements are established to ensure compliance of the payload with the transportation parameters of the TRUPACT-II packaging. This TRAMPAC Compliance Plan identifies payload requirements under the following categories:

- Container and Physical Properties
- Nuclear Properties
- Chemical Properties
- Gas Generation
- Payload Assembly
- Quality Assurance.

6.1.4 Methods of Compliance

The TRAMPAC describes all allowable methods to be used for determining compliance with each payload requirement and the controls imposed on the use of each method. This TRAMPAC Compliance Plan describes the specific allowable methods used at RFETS to ensure that the payload is compliant with each requirement and is qualified for shipment.

Compliance with transportation requirements applies to the following two categories of waste:

1. Waste Generated Under a Formal Certification Program. Payload packages in this category (designated "100 Series") are characterized individually based on process knowledge and visual examination at the time of waste generation. For sites using a set of site/equipment-specific procedures for payload control for compliance, an independent verification of compliance must be performed prior to transport for no less than 10 percent of the 100 Series payload packages transported from each site per year. This independent verification may consist of a second operator verifying the package contents or waste records during the waste generation process or RTR.

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6.1.4 Methods of Compliance (continued)

2. Waste Generated Prior to Site Implementation of a Formal Certification Program. Payload packages in this category (designated "200 Series") are characterized based on process knowledge. An independent verification of compliance shall be performed prior to transport for 200 Series waste using visual examination, RTR, measurement, etc., under a statistical sampling program.

NOTE: *All waste currently at RFETS was generated after a formal certification program was established at the Site in the mid-1980s and so is categorized as "100 Series" waste.*

A summary of the methods of compliance used, individually or together, for TRUPACT-II payload control is provided in the following subsections.

6.1.4.1 Visual Examination

Visual examination at the time of waste generation may be used to qualify waste for transport (e.g., 100 Series waste). The operator(s) of a waste generating area shall visually examine the physical form of the waste according to site/equipment-specific procedures, and remove all prohibited waste forms, prior to its placement in the payload package. Observation of the waste generation process by an independent operator may be used as an independent verification of the compliance prior to closure of the payload package. Visual examination under a sampling program may be used to verify the absence of prohibited items (e.g., 200 Series waste). See the TWCP QAPjP, Section B-3c for details.

6.1.4.2 Visual Inspection

Visual inspection may be used to evaluate compliance with specific restrictions (e.g., visual inspection of payload package type, marking, number of filters, etc.). Visual inspection by a second operator may be considered independent verification.

6.1.4.3 Real-Time Radiography

RTR may be used as an independent verification to qualify waste for transport. RTR shall be used to nondestructively examine the physical form of the waste, and to verify the absence of prohibited waste forms, after the payload package is closed. Site/equipment-specific QA and QC procedures should ensure that RTR operator(s) are properly trained and qualified. See Section 3.2.4.2.2 for additional details.

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6.1.4.4 Records and Database Information

Information obtained from existing site records and/or databases or knowledge of process may be used as a basis for reporting the absence of prohibited waste forms within waste packages. This information can be verified using RTR and/or a waste sampling program.

6.1.4.5 Administrative and Procurement Controls

Site-specific administrative and procurement controls may be used to show that the payload package contents are monitored and controlled, and to demonstrate the absence of prohibited items.

6.1.4.6 Sampling Programs

Sampling programs may be used as an independent verification of the compliance (e.g., for 200 Series waste). A site-specific sampling program designed to address all payload requirements needing verification is recommended.

6.1.4.7 Measurement

Direct measurement or evaluation based on analysis using the direct measurement may be used to qualify waste (e.g., direct measurement of the weight or analysis of assay data to determine decay heat).

6.1.5 TRUCON Document

The TRUCON document is a catalog of authorized contents for the TRUPACT-II and provides specific information on the transportation parameters for each RFETS authorized content code. Content codes in TRUCON describe how a particular waste form complies with the TRAMPAC. Each code is assigned to one or more payload shipping categories. A shipping category places restrictions on the transportation parameters that are discussed in this TRAMPAC Compliance Plan.

A content code begins with a two-letter abbreviation to identify the shipping site (i.e., RF denotes RFETS). This is followed by a three-digit number: AXX. If A is "1," this indicates that the waste was generated after a formal certification program was established at the Site. If A is "2" this indicates that the waste was generated before a formal certification program was established at the Site. Note: All waste currently at RFETS was generated after a formal certification program was established at the Site in the mid-1980s and so is categorized as "100 Series waste."

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6.1.5 TRUCON Document (continued)

The XX is a number representing a general waste form (glass, metals, combustibles, filter waste, etc.). The TRUCON document provides descriptions for these general waste form codes. For the RFETS content codes, a letter suffix is added to identify different packaging configurations.

The content codes defined in TRUCON fully characterize the waste and provide descriptions for compliance with the following parameters:

- Content Description
- Storage Site (if applicable)
- Generating Site
- Waste Description
- Generating Source(s)
- Waste Form
- Waste Packaging
- Assay
- Free Liquids
- Explosives/Compressed Gases
- Pyrophorics
- Corrosives
- Chemical Compatibility
- Payload Package Venting and Aspiration
- Additional Criteria
- Shipping Category.
- Maximum Allowable Wattage

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6.1.5 TRUCON Document (continued)

All payload packages must have an approved TRUCON code to be eligible for shipment in the TRUPACT-II. Table 6-7 lists the RFETS content codes. If RFETS requires the transportation of TRU waste in the TRUPACT-II that is not listed in Table 6-7, the revision or addition of a content code must be requested in writing and submitted to the TRUPACT-II Cognizant Engineer. The process for requesting a new or revised content code is outlined in Section 1.5 of the TRAMPAC. Specifically, a shipping site is required to perform the following actions to add or revise a TRUCON code:

1. The Site prepares in writing a draft TRUCON code containing sufficient information to satisfy all of the necessary elements of a TRUCON code, previously identified. If the request is for a TRUCON code revision, only the revised elements require preparation and documentation. The site shall ensure that the information submitted in the form of a TRUCON code addition or revision accurately describes the waste and waste generating processes to the best of their knowledge.
2. The site submits the draft TRUCON code or TRUCON code elements in writing to the TRUPACT-II Cognizant Engineer for review.
3. If the request is approved, a site may begin using the new or revised TRUCON code once official notification is received from the TRUPACT-II Cognizant Engineer. Sites may not use proposed TRUCON code additions or revisions to make shipments in the TRUPACT-II prior to receipt of written notification from the TRUPACT-II Cognizant Engineer.

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6.1.6 Compliance Program

RFETS documents and demonstrates compliance with the TRAMPAC in a site/equipment-specific set of procedures for payload control as identified and described in this TRAMPAC Compliance Plan. The TRAMPAC Compliance Plan is submitted to CBFO for approval. This TRAMPAC Compliance Plan has been prepared in accordance with the TRAMPAC.

6.1.6.1 Transportation Certification Official (TCO)

The TCO is responsible for administratively verifying the compliance of payload packages and the payload assembly with transportation requirements. The TCO approves by signature on the transportation certification documents every payload for transport.

A similar position (i.e., WCO) is responsible for verifying that all waste prepared for shipment to the WIPP meets the specified WIPP-WAC. The functions of the two positions may be performed by the same or different official(s).

6.1.6.2 Carlsbad Field Office (CBFO)

The CBFO is responsible for the performance of compliance verification audits, which are conducted prior to the first shipment and periodically thereafter, to evaluate TRUPACT-II payload compliance. Audit activities include document review and interview of operators on a job-function basis relative to meeting the applicable criteria. The audit team will grant or deny waste certification and waste transportation authorization based on objective findings.

6.1.7 Quality Assurance

The QA requirements applicable to the use of the TRUPACT-II packaging are Title 10, Code of Federal Regulations (CFR), Part 71, Subpart H. The use, operation, and maintenance of the TRUPACT-II are conducted under a QA program approved by the DOE field office. The compliance of a payload to be transported in the TRUPACT-II is determined by the user under a QA program approved by the CBFO. The packaging QA program is described in Section 4.6.

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6.2 Container and Physical Properties Requirements**6.2.1 Container Descriptions****6.2.1.1 Requirements**

Only the following payload packages are authorized for shipment in the TRUPACT-II (see the TRAMPAC, Section 2.1):

- 55-Gallon Drum (including standard, S100, or S200 POCs)
- 100-Gallon Drum
- SWB
- TDOP

All packages transported within the TRUPACT-II shall comply with the specifications in the TRAMPAC, Appendix 2.1. The maximum number of packages per TRUPACT-II and authorized packaging configurations are as follows:

- Fourteen 55-gallon drums
- Fourteen standard POCs
- Fourteen S100 POCs
- Fourteen S200 POCs
- Six 100-gallon drums

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6.2.1.1 Requirements (continued)

- Two SWBs
- Two SWBs, each SWB containing up to four 55-gallon drums¹
- Two SWBs, each SWB containing one bin
- One TDOP
- One TDOP, containing up to ten 55-gallon drums¹
- One TDOP, containing up to six 85-gallon drums each overpacking one 55-gallon drum¹
- One TDOP, containing one SWB
- One TDOP, containing up to four 55-gallon drums within an SWB¹
- One TDOP, containing one bin within an SWB.

NOTE: *Use of all payload configurations above may not currently be implemented (e.g., bin or TDOP). Prior to using a payload configuration not currently in use, procedures must be developed and implemented. Mention of all payload package types is for information only.*

6.2.1.2 Methods of Compliance and Verification

Compliance is accomplished using administrative and procurement controls demonstrating that payload packages have been procured to the specifications of the TRAMPAC, Appendix 2.1 (see Packaging QA Program Plan - Section 4.6).

As required by 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual, waste packaging materials (e.g., drums, SWBs, and POCs) are inspected upon receipt from vendors, if required, in accordance with PRO-J44-RC&I-6600, Procured Items Inspection and Certification, by the appropriate receiving certification and inspection organization(s) to ensure conformance to procurement specifications. Waste packages, hardware, package liners, and ancillary equipment are procured in accordance with MAN-134-PPM, Procurement Program Manual. Procurement specifications are prepared in accordance with the 1-V51-COEM-DES-210, Site Engineering Process Procedure, and PRO-1034-PEQA, Procurement Engineering and Quality Assurance.

¹ Empty packages or spacers are required if fewer packages are overpacked.

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6.2.1.2 Methods of Compliance and Verification (continued)

Procedure 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure, and applicable WGs, that are prepared in accordance with procedure 1-PRO-079-WGI-001, Waste Characterization, Generation, and Packaging, include instructions for inspecting the integrity of the drum or SWB before loading, packaging, or use.

Procedure PRO-1045-WI-001, Solid Radioactive Waste Inspection, provides instruction for the performance of a final inspection of each payload package prior to certification and shipment. Procedure PRO-X05-WC-4018, Transuranic (TRU) Waste Certification, provides instructions for verifying the integrity of the payload package as part of the waste certification process.

Payloads are created in the e-TRAMPAC system in WWIS. Software controls in the e-TRAMPAC system ensure that created payloads comply with one of the authorized payload configurations. A PATCD is generated from e-TRAMPAC for each payload and the PATCD specifies the exact composition of each payload configuration. The payload configuration as specified on the PATCD is verified in accordance with instructions in procedure PRO-X05-WC-4018, Transuranic (TRU) Waste Certification.

6.2.2 **Dunnage****6.2.2.1** Requirements

A shipper shall use empty 55-gallon drums, 100-gallon drums, or an SWB as dunnage to complete a payload configuration if too few payload packages are available that meet transportation requirements. Dunnage must meet the specifications of the TRAMPAC, Appendix 2.1, with the exception that dunnage shall have open vent ports (i.e., not filtered or plugged).

Dunnage shall be marked in accordance with Section 6.2.4.

6.2.2.2 Methods of Compliance and Verification

Dunnage drums may be assembled into a seven-pack (55-gallon) or three-pack (100-gallon) of only dunnage drums, or they may be assembled into a seven-pack or three-pack with drums of waste that meet all applicable requirements. In the latter case, the dunnage drum(s) must be labeled with a unique package identification number like the waste drums because of requirements associated with the WWIS. All dunnage packages must be labeled "EMPTY" or "DUNNAGE." Waste Operations is responsible for preparing dunnage drums for shipment, which is discussed in the TRUPACT-II loading procedures. WEMS initiates and tracks dunnage drums used for TRUPACT-II shipments in accordance with 4-K47-WEM-WP1210, WEMS Offsite Shipping Module.

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6.2.2.2 Methods of Compliance and Verification (continued)

Dunnage containers are visually inspected to verify compliance with the dunnage requirements in accordance with procedure PRO-X05-WC-4018, Transuranic (TRU) Waste Certification.

6.2.3 Container/Assembly Weight and Center of Gravity**6.2.3.1 Requirements****6.2.3.1.1 Requirements for Package/Assembly Weight**

NOTE: *Actual payload assembly weights are limited by "as-built" TRUPACT-II weights and DOT requirements for a loaded tractor/trailer.*

Each payload package, payload assembly, and loaded TRUPACT-II shall comply with the following weight limits:

- 328 pounds per 6-inch diameter standard POC
- 547 pounds per 12-inch diameter standard POC
- 650 pounds per S100 POC
- 547 pounds per S200 POC
- 1,000 pounds per 55-gallon drum (Note: The RFETS limit is 800 lbs.)
- 1,000 pounds per 100-gallon drum
- 4,000 pounds per SWB
- 6,700 pounds per TDOP
- 7,265 pounds per payload of up to 14 55-gallon drums or up to 6 100-gallon drums, including pallet, guide tubes, slip sheets (optional), banding material and reinforcing plate, **OR**
- 7,265 pounds per payload of two SWBs, including adjustable sling (optional)
AND
- 19,250 pounds for payload and TRUPACT-II package (as built weight of TRUPACT-II is approximately 13,050 lbs.).

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6.2.3.1.2 Requirements for Center of Gravity

The total weight of the top seven 55-gallon drums, three 100-gallon drums, or SWB of the payload assembly shall be less than or equal to the total weight of the bottom layer of drums or the bottom SWB. The total weight of the top five drums in a TDOP shall be less than or equal to the total weight of the bottom five drums.

6.2.3.2 Methods of Compliance and Verification

6.2.3.2.1 Methods of Compliance and Verification for Package/Assembly Weight

Weighing of Individual Payload Packages

Compliance is verified by measurement. Each payload package (or dunnage) is weighed on a calibrated scale in accordance with approved procedures PRO-1411-WO-WASTE, Waste Receiving, Transfer and Handling and/or PRO-1031-WIPP-1112, TRU/TRM Waste Visual Verification (VV) and Data Review. The weight and the measurement error of each payload package is recorded in the TRUPACT-II PCTCD. RFETS uses a measurement error of one standard deviation or greater for all weight measurements.

One of two methods is used to calculate the total weight of the TRUPACT-II payload:

- If total payload weight is obtained by summing the weights of the individual payload packages or dunnage (plus 265 pounds for pallets, reinforcing plates, slip sheets, guide tubes, banding material, etc.), it includes the square root of the sum of the squares of the individual measurement errors.
- If the total payload is weighed as an assembly, the measurement includes the error.

The weight and the measurement error is reported in accordance with the PATCD.

The scale calibrations are performed in accordance with the National Institute for Standards and Testing (NIST) Handbook 44 or an equivalent standard.

6.2.3.2.1 Methods of Compliance and Verification for Package/Assembly Weight (continued)

The document 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual, defines gross weight limits for payload packages. 55-gallon drums (without POC) have a limit of 800 lbs. The gross weight of each payload package is recorded on the W/RT and in WEMS. The recorded weight of the payload package includes the addition of the error and is verified as part of the "Radioactive Verify" function as described in procedure 4-G83-WEM-WP-1209, WEMS Waste Package Verification and Certification. A payload package that does not comply with the weight limit or container certification weight (allowable Type A test weight limit) is segregated for repackaging or other corrective action. WEMS ensures compliance with TRUPACT-II limitations. Procedure PRO-1045-WI-001, Solid Radioactive Waste Inspection, provides instructions for final inspection to verify that the acceptance criteria for the weight of the waste packages are not exceeded; and also contains the instructions for final loading of waste packages. These procedures, as well as Traffic Management procedure, 4-T20-Traffic-505, Certifying Authorized Payloads for TRUPACT-II, address verification that the weight of waste packages does not exceed the acceptance criteria.

Trained and qualified personnel calibrate and maintain the scale and document those actions in accordance with formal operating and QA procedures. Calibration is in accordance with NIST Handbook 44. Metrology is responsible for oversight of the RFETS Calibration program. Procedure MAN-092-M&TEM, Measuring and Test Equipment Management Manual, describes the process and instructions used for the calibration of measurement and test equipment such as scales.

6.2.3.2.2 Methods of Compliance and Verification for Center of Gravity

The weight and measurement error of each payload package and of the total TRUPACT-II payload is calculated and reported in the PATCD as generated through the e-TRAMPAC system in WWIS. The e-TRAMPAC system, in conjunction with procedure DOE/WIPP 02-3184, CH Packaging Operations Manual ensures compliance with the total TRUPACT-II payload weight, center of gravity restrictions, and all applicable DOT weight restrictions. The total weight includes the square root of the sum of the squares of the individual measurement errors or, if weighed as an assembly, includes the error in the measurement.

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6.2.4 Container Marking**6.2.4.1 Requirements**

Each payload package and dunnage shall be labeled with a unique container identification number.

If an empty 55- or 100-gallon drum or SWB is used as dunnage to complete a payload configuration, the dunnage package shall be labeled with the following information:

- Unique container identification number
- "EMPTY" or "DUNNAGE."

If a seven-pack of only dunnage 55-gallon drums, a three-pack of only dunnage 100-gallon drums, or a dunnage SWB is used in the TRUPACT-II, the package(s) will be labeled "EMPTY" or "DUNNAGE." The unique container identification number is not required for these configurations.

6.2.4.2 Methods of Compliance and Verification

Labeling and marking is performed in accordance with instruction in 1-T13-Traffic-306, Labeling and Marking TRUPACT Packages.

Compliance is demonstrated through a visual inspection of each payload and dunnage package in accordance with PRO-X05-WC-4018, Transuranic (TRU) Waste Certification. The package is recorded (through the use of the unique package identification number) on the PCTCD.

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6.2.5 Filter Vents**6.2.5.1 Requirements**

Each payload package to be transported in the TRUPACT-II, including all payload packages that are overpacked in other payload packages, shall have one or more filter vents that meet the specifications of the TRAMPAC, Appendix 2.5. Filter vents in plastic bags used as confinement layers within payload packages shall also meet the specifications in the TRAMPAC, Appendix 2.5. Filters procured and used comply with the applicable efficiency, flow, and hydrogen diffusion requirements specified in the TRAMPAC, Appendix 2.5. The minimum number of filter vents required is as follows:

- One filter per heat-sealed plastic bag
- One filter per filtered metal can
- One filter per 55-gallon drum
- One filter per 55-gallon drum overpacked in an SWB
- One filter per 100-gallon drum
- Two filters per SWB
- Two filters per Bin
- Nine filters per TDOP
- One filter per standard, S100, or S200 POC.

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6.2.5.2 Methods of Compliance and Verification

Compliance is demonstrated by one, or a combination, of the following methods:

- Administrative and procurement controls demonstrating that filter vents have been procured to the specifications of the TRAMPAC, Appendix 2.5.
- Visual inspection to the specifications of the TRAMPAC, Appendix 2.5.
- Sampling by measurement of filter characteristics to the specifications of the TRAMPAC, Appendix 2.5.

Site-specific QA and procurement procedures provide verification that filters meet the specifications. Visual inspection provides verification that the correct number of filters has been installed on each payload package.

Filters are procured in accordance with MAN-134-PPM, Procurement Program Manual. Procurement specifications for filters are prepared in accordance with 1-V51-COEM-DES-210, Site Engineering Process Procedure, and PRO-1034-PEQA, Procurement Engineering and Quality Assurance.

Procedure PRO-1045-WI-001, Solid Radioactive Waste Inspection, provides instructions for ensuring that the minimum number of filters are installed in the drums and the SWBs. In addition, 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure, and associated WGLs provide instructions for ensuring that the minimum number of filters are installed in the drum and SWB at the time of waste packaging. Procedure 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure, also provides specifications for the filters. These filters meet the criteria specified in the TRAMPAC, Appendix 2.5.

Verification that the correct number and type of filters are installed on payload packages is accomplished by visual inspection per procedure PRO-1045-WI-001, Solid Radioactive Waste Inspection.

6.2.6 **Liquids**

6.2.6.1 Requirements

NOTE: 49 CFR allows no free liquids in solid material packages.

Liquid waste is prohibited in payload packages, except for residual amounts in well-drained inner containers. The total volume of residual liquid in a payload package is restricted to less than 1 volume percent of the payload package (e.g., drum or SWB).

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6.2.6.2 Methods of Compliance and Verification

Compliance is demonstrated by one, or a combination, of the following methods:

- Review of records and database information, which may include knowledge of process
- RTR
- Visual examination
- Sampling program.

Documents 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; 4-D99-WO-1100, Radioactive Waste Packaging Procedure; and waste-specific WGIs are used to specify packaging requirements to the waste generators or operators, defining those waste items and materials that are prohibited from the waste. These instructions identify methods for ensuring that free liquids are not present in the payload package. RFETS prohibits the presence of free liquids in the payload packages for both on-site transfers and off-site shipments, as defined in 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; and 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure.

Verification of compliance is accomplished using visual examination, in-process inspection, and/or RTR. Specifically, verification of compliance with the physical form restrictions in each payload package is accomplished using the following methods:

1. Documented independent visual examination of the waste contents at the time of packaging per 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure; 1-PRO-079-WGI-001, Waste Characterization, Generation, and Packaging; PRO-1031-WIPP-1112, TRU/TRM Waste Visual Verification (V^2) and Data Review; associated WGI(s); and/or the appropriate Residues repackaging procedures as referenced in the TWCP QAPjP; and/or
2. Radiography of the waste contents performed in accordance with procedures referenced in the TWCP QAPjP.

Independent visual examination of the waste contents at the time of packaging involves using a second operator (or QA inspector), other than the operator who filled the payload package, to inspect the waste and verify that the physical waste form is in compliance with applicable requirements. This second operator documents the verification by signature on the W/RT.

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6.2.6.2 Methods of Compliance and Verification (continued)

Payload packages rejected at RTR for non-compliance with the physical form criteria are identified and controlled as nonconformances in accordance with PRO-U76-WC-4030, Control of Waste Nonconformances. RFETS RTR operators are trained in accordance with 5-NDT-TC-1A, Training, Qualification, and Certification of Nondestructive Testing Personnel. Training and certification of mobile vendor RTR operators is in accordance with the mobile vendor training plan (refer to the TWCP QAPjP). Additional RFETS training that orients mobile vendor RTR personnel to the RFETS TWCP is required per the TWCP TIP.

Compliance for previously packaged TRU waste is verified by periodic visual examination of a random sample of previously packaged waste in accordance with 4-H80-776-ASRF-007, Visual Examination for Confirmation of RTR¹; PRO-986-VE440, Visual Examination Operations for Building 440; and/or PRO-1471-VE-771, Visual Examination for Confirmation of RTR.

¹ This procedure is inactive as of November 6, 2001.

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6.2.7 Sharp or Heavy Objects**6.2.7.1 Requirements**

Sharp or heavy objects in the waste shall be blocked, braced, or suitably packaged as necessary to provide puncture protection for the payload packages containing these objects.

6.2.7.2 Methods of Compliance and Verification

Compliance is demonstrated by one, or a combination, of the following methods:

- Review of records and database information, including knowledge of process
- RTR
- Visual examination
- Sampling program.

Documents 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure; and the use of WGIs per 1-PRO-079-WGI-001, Waste Characterization, Generation, and Packaging, where applicable, provide packaging and documentation instructions to ensure that sharp or heavy objects are suitably blocked, braced, or packaged to preclude damage to the payload package.

Compliance for previously packaged transuranic waste is verified by radiography of the waste contents performed in accordance with procedures referenced in the TWCP QAPjP. Additionally, compliance is also verified through periodic visual examination of a random sample of previously packaged waste performed in accordance with 4-H80-776-ASRF-007¹, Visual Examination for Confirmation of RTR; PRO-986-VE440, Visual Examination Operations for Building 440; and/or PRO-1471-VE-771, Visual Examination for Confirmation of RTR.

¹ This procedure is inactive as of November 6, 2001.

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6.2.8 Sealed Containers**6.2.8.1 Requirements**

Sealed containers greater than 4 liters are prohibited 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 (see the TRAMPAC, Appendix 5.1).

NOTE: *The type II.2 exception is not allowed for shipments to WIPP per the WIPP-WAC, Section 3.4.2.*

6.2.8.2 Methods of Compliance and Verification

Compliance is demonstrated by one, or a combination, of the following methods:

- Review of records and database information, including knowledge of process
- RTR
- Visual examination
- Sampling program.

Verification of compliance is accomplished using visual examination, and/or RTR. Specifically, verification of compliance with the sealed containers restrictions in each payload package is accomplished using the following methods:

1. Documented independent visual examination of the waste contents at the time of packaging per 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure; 1-PRO-079-WGI-001, Waste Characterization, Generation, and Packaging; PRO-1031-WIPP-1112, TRU/TRM Waste Visual Verification (V^2) and Data Review; associated WGI(s); and/or the appropriate Residues repackaging procedures as referenced in the TWCP QAPjP; and/or
2. Radiography of the waste contents performed in accordance with procedures referenced in the TWCP QAPjP.

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6.2.8.2 Methods of Compliance and Verification (continued)

Compliance for previously packaged transuranic waste is verified by periodic visual examination of a random sample of previously packaged waste performed in accordance with 4-H80-776-ASRF-007¹, Visual Examination for Confirmation of RTR; PRO-986-VE440, Visual Examination Operations for Building 440; and/or PRO-1471-VE-771, Visual Examination for Confirmation of RTR.

Containers with volumes greater than four liters may be present in the waste only if there is verifiable evidence that they are not sealed (e.g., documented or visible absence of cap, presence of a puncture in the container, or test data that demonstrates that the container is not sealed).

¹ This procedure is inactive as of November 6, 2001.

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6.3 Nuclear Properties Requirements

The nuclear properties' requirements outlined in this section require a knowledge of isotopic composition and quantity of fissile material. The four major product material isotopic compositions are:

- Weapons-grade plutonium (Pu) (primarily Pu-239)
- Fuel-grade plutonium (primarily Pu-239)
- Heat-source plutonium (primarily Pu-238)
- Other transuranic isotopes.

RFETS process areas usually only handle product materials of specific isotopic composition (e.g., weapons-grade plutonium composition is shown in Section 6.3.1.2). Therefore, the isotopic composition in the waste from specific process areas remains constant since product isotopic composition is closely controlled to meet production isotopic specification requirements.

Plutonium is also recovered from scrap material to produce product material. TRU wastes generated from scrap recovery operations are assigned the same plutonium isotopic composition as the product material. The recovery operation removes the non-plutonium radionuclides [e.g., ^{241}Am] from the scrap material. The removed radionuclides are concentrated in the recovery operation's waste streams, and additional analyses (e.g., gamma ray pulse height analysis) are performed on the waste streams, to determine their isotopic composition.

Other product material mixtures are occasionally produced by special request, and the isotopic compositions of these special mixtures [e.g., varying ratios of ^{241}Am , ^{244}Cm , and ^{252}Cf] are thoroughly characterized by the production facility.

Research and development facilities provide support to the plutonium production facilities and utilize a production facility's product specification data [determined by mass spectrometry (MS)] when assigning the radioisotopic composition to their waste.

Facilities that produce or utilize special (non-plutonium) TRU radionuclides have more variability in the isotopic distribution in the waste. There is less reliance on production records and specifications for determining isotopic distribution.

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6.3 Nuclear Properties Requirements (continued)

Facilities that examine special reactor fuels have the most detailed and traceable data regarding the isotopic composition of the waste. The quantity of waste generated from these activities is very small and highly characterized. The initial isotopic composition of the fuel, neutron flux, irradiation time, and cooldown time are measured and documented. The isotopic composition of the irradiated fuel is calculated based on the data mentioned above, or the isotopic composition of the irradiated fuel is confirmed by radiochemical analysis. The isotopic composition of the waste shall be determined by either referencing the irradiated fuel analysis or by direct measurement of the waste by segmented gamma scan.

6.3.1 Nuclear Criticality**6.3.1.1 Requirements**

NOTE: *Pu-239 fissile gram equivalent (FGE) measurement error refers to standard error (i.e., FGE measurement error at one standard deviation = 1 sigma).*

A payload package shall be acceptable for transport only if the Pu-239 FGE plus two times the measurement error is less than 200 grams for a 55- or 100-gallon drum, 200 grams for a standard, S100, or S200 POC, 325 grams for an SWB, or 325 grams for a TDOP. Note: If a payload package will be overpacked, FGE limits apply only to the outermost payload package of the overpacked configuration.

A TRUPACT-II shall be acceptable for transport only if the Pu-239 FGE plus two times the measurement error is less than or equal to 325 grams for a TRUPACT-II with a payload of 14 55-gallon drums, 6 100-gallon drums, 2 SWBs, or 1 TDOP; or 2,800 grams for a TRUPACT-II with a payload of 14 standard, S100, or S200 POCs.

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6.3.1.2 Methods of Compliance and Verification

Compliance with the FGE requirements involves the following steps:

- Determination of the isotopic composition
- Determination of the quantity of radionuclides
- Calculation of the FGE and compliance evaluation

Each of these steps is discussed in detail below.

Isotopic Composition

The isotopic composition of the waste may be determined from direct measurements taken on the product material during the processing or post-process certification, analysis of the waste, or from existing records. The isotopic composition of the waste need not be determined by direct analysis or measurement of the waste unless process information is not available.

Pu-239 FGE for other fissile or fissionable isotopes, including special actinide elements, shall be obtained using the American National Standards Institute (ANSI)/American Nuclear Society (ANS) method ANSI/ANS-8.15-1981, Nuclear Criticality Control of Special Actinide Elements, or an equivalent method.

The two allowed analytical methods for determining isotopic composition are:

- Mass Spectrometry (MS)
- Gamma ray pulse height analysis

Depending on the mixture of radionuclides present in the waste, one or both of the methods may be required. These assay methods are described in greater detail in the TRAMPAC.

MS is a primary method for determining the radioisotopic composition in product material (e.g., plutonium isotopic composition). The plutonium isotope analyses shall be performed in accordance with the following American Society for Testing and Materials (ASTM) MS methods: ASTM C 696-80, Methods for Chemical, Mass Spectrometric, and Spectrochemical Analysis of Nuclear-Grade Uranium Dioxide Powders and Pellets; ASTM C 697-86, Methods for Chemical, Mass Spectrometric, and Spectrochemical Analysis of Nuclear-Grade Plutonium Dioxide Powders and Pellets; ASTM C 759-79, Methods for Chemical, Mass Spectrometric, and Spectrochemical, Nuclear, and Radiochemical Analysis of Nuclear-Grade Plutonium Nitrate Solutions; and ASTM C 853-82, Standard Test Methods for Nondestructive Assay of Special Nuclear Materials Contained in Scrap and Waste, or equivalent methods.

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6.3.1.2 Methods of Compliance and Verification (continued)

Gamma ray pulse height analysis or MS is used to determine the isotopic composition for gamma-emitting radionuclides. Gamma ray pulse height analysis shall be performed in accordance with ASTM C 1030-84, or an equivalent method.

The isotopic composition of the waste streams generated at RFETS is well characterized through destructive measures performed on product material during processing and this acceptable knowledge (AK) is documented in an auditable record. Therefore, the isotopic composition of a particular waste stream need not be determined by direct methods of analysis or measurement unless process information is not available.

All nondestructive assay (NDA) equipment used for assaying TRU waste is equipped with the ability to determine the isotopic composition of wastes for which the counters are qualified to assay. If isotopic information is measured, then this information supercedes the isotopic compositions determined by AK as described above.

The plutonium used at the RFETS is weapons grade (WG) plutonium. The isotopic distribution has been well characterized and was routinely checked and verified during operations at the RFETS using one of the two allowed analytical methods identified previously (gamma ray pulse height analysis or MS). The standard isotopic distribution for WG plutonium is as follows:

<u>Isotope</u>	<u>Weight%</u>
Pu-238	0.016
Pu-239	93.737
Pu-240	5.872
Pu-241	0.332
Pu-242	0.043

Table 6-1 lists the Pu-239 FGE, as well as the decay heat and specific activity, of many additional radionuclides.

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6.3.1.2 Methods of Compliance and Verification (continued)

AK is utilized to determine the possible presence of radionuclides other than weapons grade plutonium in TRU waste. Specifically, AK as described in RF/RMRS-97-018, RFETS TRU Waste Acceptable Knowledge Supplemental Information, provides information by which waste packages can be identified to contain radionuclides other than weapons grade plutonium based on the area and date of generation of the waste.

Quantity of Radionuclides

The quantity of the radionuclides in each payload package is estimated by either a direct measurement or records of the individual payload package, a summation of assay results from individual packages in a payload package, or a direct measurement on a representative sample of a waste stream (such as solidified inorganics). An assay refers to one of several radiation measurement techniques that determine the quantity of nuclear material in TRU wastes. In certain cases, AK is used to quantify radionuclides. If assay is performed to quantify radionuclides, then, one or a combination of the following allowed assay methods is used:

- Passive Gamma [e.g., Segmented Gamma Spectrometry (SGS) and Tomographic Gamma-Ray Scanner (TGS)]
- Radiochemical assay (alpha and gamma spectroscopy)
- Passive neutron coincidence counting (PNCC) – including high efficiency neutron counting
- Passive-active neutron assay (PAN)
- Calorimetry.

Appendix 4 provides a description of the currently used and planned NDA methods and compliance of these methods with applicable requirements. These methods comply with the assay methods described in the TRAMPAC, Attachment B.

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6.3.1.2 Methods of Compliance and Verification (continued)

General assay requirements that apply for determination and control of radionuclide quantity are:

- The selection and use of an assay method(s) must be identified in this document as an allowable method(s) with prescribed controls implemented.
- The applicable waste content code descriptions list the specific assay method(s) and their applications(s).
- Operating and QA procedures describe the assay method(s) and the controls imposed on the assay operations. The controls include performing calibration and background measurements. The calibration and background measurements must fall within the stated acceptable ranges before assays are performed.
- QA plans and procedures include oversight of assay methods and controls.
- A specialized training program for assay operators must be provided.

Calculation of the FGE and Compliance Evaluation

The FGE of each payload package is calculated from the isotopic composition and quantity of radionuclides to ensure that the FGE plus two times the measurement error is less than or equal to the applicable limit for each payload package. The Pu-239 FGE of each payload package is recorded in the PCTCD and OPCTCD, as applicable.

The total Pu-239 FGE for a TRUPACT-II payload is calculated and recorded in the PATCD. The total Pu-239 FGE error is the square root of the sum of the squares of twice the individual Pu-239 FGE errors. This error is added to the calculated TRUPACT-II payload FGE to determine compliance with the applicable payload FGE limit.

WEMS software specifications for Calculated and Assigned fields and TRUPACT-II Load Management define the methods and controls that WEMS uses to calculate the FGE for each payload package. The e-TRAMPAC software system in the WWIS also calculates FGE for each payload package and verifies compliance with the FGE limits prior to WWIS approval. Furthermore, the e-TRAMPAC system provides the methods and controls used for calculation of FGE for assembled TRUPACT-II payloads. These software specifications/systems provide the methodology used to ensure compliance with the FGE limits and verify that the FGE limits are not exceeded.

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6.3.1.2 Methods of Compliance and Verification (continued)

Verification that correct data is input and used by WEMS for calculation of FGE is performed during the "WIPP Verify" and "Radioactive Verify" functions described in 4-G83-WEM-WP-1209, WEMS Waste Package Verification and Certification.

Verification of compliance with FGE restrictions for each individual payload package is performed as part of the waste certification process as described in procedure PRO-X05-WC-4018, Transuranic (TRU) Waste Certification. Verification of calculated payload FGE values are performed by the TCO prior to transport in a TRUPACT-II package in accordance with 4-T20-Traffic-505, Certifying Authorized Payloads for TRUPACT-II.

Pu-239 FGE is obtained using American National Standards Institute/American Nuclear Society (ANSI/ANS) - 8.15-1981. The total TRUPACT-II Pu-239 FGE error is calculated using the square root of the sum of the squares of twice the individual payload package Pu-239 FGE errors.

6.3.2 Radiation Dose Rates**6.3.2.1 Requirements**

The external radiation dose rates of individual payload packages shall be less than or equal to 200 mrem/hr at the surface. The external radiation dose rates of the TRUPACT-II shall be equal to or less than 200 mrem/hr at the surface and equal to or less than 10 mrem/hr at 2 meters.

Internal payload package shielding shall not be used to meet the above requirement, except for POC configurations as shown in the TRAMPAC, Appendices 2.2 through 2.4. Payload packages that meet the above radiation dose rate requirements may be shielded to levels that are ALARA.

NOTE: Any payload package (except for the POC configurations) that exceeds the 200 mrem/hr surface reading without shielding shall not be transported.

In addition, S100 and S200 POC payloads shall meet the curie limits in the TRAMPAC, Appendices 2.3 and 2.4, respectively.

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6.3.2.2 Methods of Compliance and Verification

Maximum surface, 1 meter and 2 meter dose rates are measured and recorded on the Contamination Dose Information Required for Shipment of TRUPACT-II form in accordance with PRO-497-RSP-09.7, TRUPACT-II Contamination and Radiation Survey Requirements. The information is transferred to the WEMS system.

Payload packages that have neutron contribution are noted on the package label.

Surface dose rate must not exceed 200 mrem/hr and 1 meter (or 2 meter) dose rate must not exceed 10 mrem/hr. The document 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual, specifies the requirements associated with the TRUPACT-II dose rate restrictions. Neutron dose rates of individual payload packages are transmitted to the WWIS using WEMS in accordance with 4-K47-WEM-WP1210, WEMS Offsite Shipping Module.

The document 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual, also requires that the payload package be measured before using lead shielding. This value is recorded on the W/RT in accordance with 1-C80-WO1102-W/RT, Waste/Residue Traveler Instructions, as well as documenting that shielding is being used. The W/RT is an in-process control document that provides objective evidence of radiation monitoring activities associated with the packaging of radioactive waste and radioactive mixed waste.

The TRUPACT-II surface is surveyed before shipping, and the highest combined gamma and neutron reading is recorded in WEMS and reported on the PATCD. The PATCD is generated from WEMS and is used by Traffic Management to ensure that the TRUPACT-II payload meets all of the requirements of the TRAMPAC, Section 6. TRUPACT-II loading procedures ensure that each loaded TRUPACT-II is surveyed for radiation dose rates as part of the overall TRUPACT-II loading operation and process.

Monitoring/surveying is performed according to the applicable Radiological Safety Practices procedures and with instruments whose calibration is traceable to a national standard. WEMS, supplemented with 100% verification by the WCO and TCO, provides assurance that the surveyed value meets the TRUPACT-II restrictions.

6.4 Chemical Properties Requirements

The chemical properties of waste are controlled and restricted so that all payload packages are safe for handling and transport. Chemical constituents in a payload shall not be in a form that could be reactive during transport.

6.4.1 Pyrophoric Materials

A pyrophoric (solid) is defined as:

Any solid material, other than one classed as an explosive, which under normal conditions is likely to cause fires through friction, retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious transportation, handling, or disposal hazard. Included are spontaneously combustible and water reactive materials.

Examples of pyrophoric radionuclides are metallic plutonium and americium. Examples of nonradioactive pyrophorics are organic peroxides, sodium metal, and chlorates.

All waste generating sites administratively control the procurement, distribution, use, and disposal of nonradioactive pyrophoric materials. In general, pyrophoric materials are not permitted in TRU process areas. The quantity of pyrophoric materials that does enter any process is strictly limited and controlled by site safety considerations.

6.4.1.1 Requirements for Control of Pyrophoric Materials

Pyrophoric radioactive materials shall be present only in small residual amounts (less than 1% by weight) in payload packages. Radioactive pyrophorics in concentrations greater than 1% by weight and all nonradioactive pyrophorics are reacted (or oxidized) and/or rendered nonreactive prior to placement in the payload package.

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6.4.1.2 Methods of Compliance and Verification

Compliance is demonstrated by one, or a combination, of the following methods:

- Review of records and database information, which may include knowledge of process
- Administrative and procurement controls, and
- the appropriate residues repackaging procedures as referenced in the TWCP QAPjP.

The documents 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure; 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual, PRO-1031-WIPP-1112, TRU/TRM Waste Visual Verification (V²) and Data Reporting, and associated WGLs provide instructions for excluding all pyrophoric materials from being packaged with the waste by referring to AK characterization. AK documentation verifies that pyrophoric radionuclides are less than 1% by weight in the waste forms. This documentation is contained in an auditable record and summarized in RF/RMRS-97-018, RFETS TRU Waste Acceptable Knowledge Supplemental Information.

6.4.2 **Explosives, Corrosives, and Compressed Gases**

An explosive is defined as:

Any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion (i.e., with substantial instantaneous release of gas and heat).

Examples of explosives are ammunition, dynamite, black powder, detonators, nitroglycerin, urea nitrate, and picric acid.

Corrosives are defined as:

Aqueous materials (i.e., water based liquids), which have a pH less than or equal to 2, or greater than or equal to 12.5.

The physical form of the waste and waste generating procedures at the sites ensure that the waste is in a nonreactive form. All waste generating sites control the procurement, distribution, use, and disposal of explosives. Most sites have lists of restricted materials that include explosives. Typically, the TRU waste generating and storage sites do not allow explosives in the same facility as TRU waste. In addition, sampling programs for pH of inorganic sludges have shown that the sludges consistently meet the limitation on corrosives.

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6.4.2.1 Requirements for Control of Explosives, Corrosives, and Compressed Gases

Explosives, corrosives, and compressed gases (pressurized containers) are prohibited from the payload.

6.4.2.2 Methods of Compliance and Verification

Compliance shall be by one, or a combination, of the following methods:

- Visual examination of the waste
- Administrative and procurement controls
- RTR
- Sampling program
- Review of records and database information, which may include knowledge of process.

Waste-generating processes are assessed for safety hazards such as potential explosion hazards and potential inadvertent production of explosive materials. Documents 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements

Manual; 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure; and any associated WGIs strictly prohibit explosives from the packaged waste.

The Site Transportation Safety Manual prohibits explosives in TRU waste generating areas at RFETS. Traffic Management must be notified before the arrival of any explosives, and the Transportation Security Officers will move and escort any explosives.

The document MAN-071-IWCP, Integrated Work Control Program Manual, describes the process, called the Integrated Safety Management process, used to plan, control, and perform RFETS work. This process includes procedures and instructions on hazard identification and analysis. If potential explosive hazards, among others, are identified, then actions and procedures are planned and executed to control the hazard.

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6.4.2.2 Methods of Compliance and Verification (continued)

Specifically, verification of the absence of free liquid, and thus corrosive material, for each payload package is accomplished using the following methods:

1. Documented independent visual examination of the waste contents at the time of packaging per 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure; 1-PRO-079-WGI-001, Waste Characterization, Generation, and Packaging; PRO-1031-WIPP-1112, TRU/TRM Waste Visual Verification (V²) and Data Review; associated WGI(s); and/or the appropriate Residues repackaging procedures as referenced in the TWCP QAPjP; and/or
2. Radiography of the waste contents performed in accordance with procedures referenced in the TWCP QAPjP.

Compressed gases (pressurized containers) are prohibited by waste generating instructions.

Verification of the absence of compressed gases (pressurized containers) for each payload package is accomplished using the following methods:

1. Documented independent visual examination of waste contents at the time of packaging per 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure; 1-PRO-079-WGI-001, Waste Characterization, Generation, and Packaging; PRO-1031-WIPP-1112, TRU/TRM Waste Visual Verification (V²) and Data Review; associated WGI(s); and/or the appropriate Residues repackaging procedures as referenced in the TWCP QAPjP; and/or
2. Radiography of the waste contents performed in accordance with procedures referenced in the TWCP QAPjP.

Compliance for previously packaged transuranic waste is verified by periodic visual examination of a random sample of previously packaged waste performed in accordance with 4-H80-776-ASRF-007¹, Visual Examination for Confirmation of RTR; PRO-986-VE440, Visual Examination Operations for Building 440; and/or PRO-1471-VE-771, Visual Examination for Confirmation of RTR.

¹ This procedure is inactive as of November 6, 2001.

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6.4.3 Chemical Composition

The chemical constituents allowed in a given waste material type (e.g., concreted inorganic particulate waste) are restricted so that a conservative bounding G value can be established for the gas generation potential in each waste material type.

Compliance with the allowable chemical lists in the TRAMPAC Tables 4-1 through 4-8 (reproduced here as Table 6-2) has been demonstrated for all chemical lists corresponding to TRUCON Content Codes. The assignment of any content code to a waste material type will also be conservative with respect to G values. For example, if an inorganic solid waste material type contains materials that do not comply with the materials listed in TRAMPAC Table 4-4 (e.g., solid organics excluding packaging), it shall be classified as Waste Material Type III.1 (solid organics), which has twice the bounding G value.

6.4.3.1 Requirements

Chemical constituents in a payload shall conform to the allowable chemical lists in Table 6-2. Total quantity of the trace chemicals/materials (materials that occur individually in the waste in quantities less than 1 percent [weight]) not listed as allowed materials for a given waste material type in any payload package is restricted to less than 5 percent (weight).

6.4.3.2 Methods of Compliance and Verification

Compliance shall be by one, or a combination, of the following methods:

- Review of records and database information, which may include knowledge of process
- Administrative and procurement controls
- Sampling program.

AK (process knowledge) is the primary basis for compliance and verification to the restrictions associated with chemical properties. AK documentation, in the form of WSRIC process descriptions and Backlog Waste Reassessments, and waste packaging instructions are used to verify compliance with chemical property restrictions. A detailed description of the RFETS AK process and controls used is presented in the TWCP QAPjP.

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6.4.3.2 Methods of Compliance and Verification (continued)

Only waste containers with approved TRUCON codes are shipped in the TRUPACT-II. In certain cases sampling/analysis (i.e., a sampling program) may be used to demonstrate compliance to the allowable chemical lists for an approved TRUCON code. Typically, these situations involve demonstrating that a certain chemical (water for instance) exists as a trace constituent and does not exceed one weight percent in the waste matrix. In these circumstances, a representative sampling program of a waste stream (or waste stream lot) is conducted in accordance with a sampling and analysis plan. The results from the sampling program are statistically evaluated to determine the upper 95% confidence limit (UCL_{95}) for the sample mean. The UCL_{95} is then compared to the applicable chemical composition limit for a given constituent. If the UCL_{95} is less than the applicable limit, then, the evaluated chemical constituent is considered to be below the limit in the waste matrix for the waste stream/waste stream lot. If the UCL_{95} is greater than the limit, then, the concentration of the evaluated chemical constituent is considered to be potentially above the limit for the waste stream/waste stream lot.

Content codes approved in the TRUCON document (DOE/WIPP 89-004) comply with the chemical composition requirements. Any proposed change in process technology at RFETS for a given content code shall be evaluated for compliance with the chemical lists of Table 6-2. This change shall be evaluated and approved by the TRUPACT-II Cognizant Engineer for compliance with existing waste material type restrictions. All changes in the chemical characteristics of the waste shall be recorded, and the date of the new process, description of the process, and list of new chemicals submitted to the TRUPACT-II Cognizant Engineer as described in Section 6.1.5. The WCO verifies that the assigned content code for a payload package to be shipped off-site is listed in the TRUCON document during certification of the payload package as described in PRO-X05-WC-4018, Transuranic (TRU) Waste Certification.

6.4.4 **Chemical Compatibility**

The allowable chemical/materials listed in Table 6-2 restrict the chemical composition of the TRUPACT-II payload. The basis for evaluating chemical compatibility is contained in the EPA document "A Method for Determining the Compatibility of Hazardous Wastes" (EPA-600/2-80-076). This method provides a systematic means of analyzing the chemical compatibility for specific combinations of chemical compounds and materials. Any incompatibilities between the payload and the packaging shall be evaluated separately if not covered by the EPA method. As described in the TRUPACT-II SAR, Appendix 2.10.12, the EPA method classifies individual chemical compounds into chemical groups and identifies the potential adverse reactions resulting from incompatible combinations of the groups.

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6.4.4.1 Requirements

Chemical compatibility shall be ensured for the following four conditions:

- Chemical compatibility of the waste form within each individual payload package.
- Chemical compatibility between contents of payload packages during hypothetical accident conditions.
- Chemical compatibility of the waste forms with the TRUPACT-II Inner Containment Vessel (ICV).
- Chemical compatibility of the waste forms with the TRUPACT-II O-ring seals.

6.4.4.2 Methods of Compliance and Verification

Compatibility of all waste material types has been demonstrated for transport in the TRUPACT-II using the chemicals listed in Table 6-2. The restrictions imposed on the chemical constituents of the content codes ensure compliance with the compatibility requirements. Only RFETS content codes approved in the TRUCON document (DOE/WIPP 89-004) are shipped. The WCO verifies that the assigned content code for a payload package to be shipped off-site is listed in the TRUCON document during certification of the payload package as described in PRO-X05-WC-4018, Transuranic (TRU) Waste Certification. The WCO also verifies that no chemicals or materials are incompatible and only wastes that meet the approved TRUPACT-II chemical lists, Table 6-2, are in the package.

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6.5 Gas Generation Requirements

Gas generation, concentrations, and pressures during transport of CH-TRU wastes in a TRUPACT-II payload are restricted as follows:

- For any package containing water and/or organic substances that could radiolytically generate combustible gases, determination must be made by tests and measurements or by analysis of a representative package such that the following criterion is met over a period of time that is twice the expected shipment time: The hydrogen generated must be limited to a molar quantity that would be no more than 5 percent by volume of the innermost layer of confinement (or equivalent limits for other inflammable gases) if present at standard temperature and pressure (STP) (i.e., no more than 0.063 gram-moles/cubic foot at 14.7 pounds per square inch absolute and 32°F).
- The gases generated in the payload and released into the ICV cavity shall be controlled to maintain the pressure within the TRUPACT-II ICV cavity below the acceptable design pressure of 50 pounds per square inch gauge (psig).

The analysis presented in the TRUPACT-II SAR, Section 3.4.4.3, shows that all payloads authorized for transport in the TRUPACT-II will comply with the design pressure limit for both twice the expected shipping period and a one-year period.

Specific requirements associated with the restrictions on gas generation during transport of a TRUPACT-II payload are described in detail below.

6.5.1 Payload Shipping Category

The CH-TRU waste at the DOE sites has been classified into "payload shipping categories" to evaluate and ensure compliance with the gas generation requirements.

Shipping Category Definition

A shipping category is defined by the following parameters:

- Chemical composition of the waste (waste type)
- Gas generation potential of the waste material type (quantified by the "G value" for hydrogen, which is the number of molecules of hydrogen generated per 100 electron volts of energy absorbed)
- Gas release resistance (type of payload package and type and maximum number of confinement layers used).

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6.5.1 Payload Shipping Category (continued)

For any given payload package, the shipping category provides a basis to determine the gas generation potential of the contents and the resistance to gas release of the packaging configuration. This enables evaluation of compliance with the gas generation requirements. Two payload shipping category notations are available. Either notation may be used by a shipping site. Descriptions of the two notations are presented below.

Numeric Shipping Category Notation

The numeric shipping category notation (initiated in Revision 17 of the TRUPACT-II SAR) is a ten-digit code:

XX YYYY ZZZZ

where,

- | | | |
|------|---|---|
| XX | = | The waste type, which indicates the chemical composition of the waste |
| YYYY | = | The G value, or gas generation potential, of the waste material type multiplied by 10^2 |
| ZZZZ | = | The resistance to hydrogen release of the packaging configuration multiplied by 10^{-4} . |

A description of each of the parameters follows.

Waste Type

Payloads for the TRUPACT-II package are subdivided into four (4) waste types based on physical and chemical form as shown in Table 6-3. Table 6-3 also shows the shipping category notation denoting each waste type.

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6.5.1 Payload Shipping Category (continued)*Waste Material Type (G Value)*

The four waste types can be further subdivided into waste material types. The waste material types define the gas generation potential of the waste, and a listing of the chemicals/materials allowed in each waste material type is presented in Table 6-2. An effective bounding G value quantifying the gas generation potential of each waste material type is assigned based on the chemicals allowed. The determination of bounding G values for each waste material type is shown in the TRAMPAC, Appendices 5.1 and 5.2. Table 6-4 presents the waste material types and their respective bounding G values, along with the shipping category notation denoting the bounding G value.

Total Resistance

The determination of the total resistance to gas release of a payload package requires a knowledge of the type and maximum number of layers of confinement used to package the waste. CH-TRU materials are typically placed in a payload package within multiple layers of plastic and/or metal cans that act as layers of confinement for radionuclides during waste handling operations. The payload safety analysis considers the layers of confinement as barriers that impede, but do not preclude, the release of gases from inside the layers of confinement (e.g., plastic bags or metal cans) to the outside of the payload package. Allowable closure methods for confinement layers are specified in the TRAMPAC, Appendix 5.3. The plastic layers of confinement in payload packages are of three types—liner bags, inner bags, and filtered bags. As described in the TRAMPAC, Appendices 2.5 and 2.6, the release rates for these three types of bags have been quantified or presented as specifications. Any other type of confinement layer (other than the three types of plastic bags or metal cans with filters) used at RFETS shall be shown to be equivalent to one of these for purposes of minimum hydrogen release.

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6.5.1 Payload Shipping Category (continued)

The numeric shipping category notation used to denote the total resistance to hydrogen release of the packaging configuration of a payload package is the sum of the resistances from all confinement layers (seconds/mole) multiplied by 10^{-4} , rounded up, and reported as four digits (ZZZZ). For example, the shipping category notation for a total resistance of 1,395,163 seconds/mole is "0140." The shipping category assignment for a 55-gallon drum containing solid inorganic waste packaged within two filtered, plastic liner bag layers is:

20 0170 0140

Where,

20	=	Waste Type II
0170	=	G value (1.7) of Waste Material Type II.1 ($\times 10^2$)
0140	=	Total resistance to hydrogen release ($\times 10^{-4}$) of two filtered liner bags.

Alphanumeric Shipping Category Notation

The alphanumeric shipping category notation (used through Revision 16 of the TRUPACT-II SAR) was based on the same parameters as the numeric notation (initiated in Revision 17 of the TRUPACT-II SAR), but conveyed the information through a different set of notations. The alphanumeric shipping category notation is based on the waste material type, the payload package type, and the type and number of confinement layers within a payload package. An example of the alphanumeric shipping category notation is:

II.1A2af

Where,

II.1	=	The Waste Material Type (solid inorganics in plastic bags, see Table 6-4)
A	=	The type of payload package (55-gallon drum, see Table 6-5)
2	=	The number of confinement layers (2 bag layers, see Table 6-6)
af	=	The type of confinement layers (filter drum liner bags, see Table 6-6)

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6.5.1.1 RequirementsPayload Package Shipping Category Notation

Each payload package shall be assigned to an approved payload shipping category, and each payload shipping category shall have information on the following components:

- Waste type, which shall match the content code description from the TRUCON
- Waste material type, which defines the gas generation potential and shall match the content code description from the TRUCON
- Total resistance to gas release by the packaging confinement layers. Total resistance has specific requirements associated with:

Confinement Layers: The inner layers of confinement around the waste materials in the payload packages shall be plastic bags and/or metal cans that meet the specifications outlined in the TRAMPAC, Appendix 5.3. Any other type of confinement layers used at the sites shall be shown, by testing or analysis, to be equivalent to one of the approved confinement layers described in the TRAMPAC, Appendix 5.3. "Equivalency" shall be established by demonstration of a hydrogen release rate greater than or equal to that of the approved confinement layers. For waste within a given content code, the maximum number of layers of confinement shall comply with that specified in the TRUCON.

Rigid Liners: The rigid liner, if present, in a payload package shall be punctured by a ≥ 0.3 -inch diameter hole, or fitted with an equivalent filter vent as specified in the TRAMPAC, Appendix 2.1.

Each payload package shall have an assigned shipping category that is included in an approved content code in the TRUCON document. Table 2 of the TRUCON document lists all approved content codes and the corresponding assigned shipping categories.

NOTE: *As described in Section 6.5.1.2.1, the payload shipping category notation for waste material type, which denotes effective gas generation potential, is replaced with the notation for dose-dependent gas generation potential specified in Table 6-4 when the payload package meets the watt*year criteria (Waste Material Type II.1 [20] and Waste Type III [30] only) of >0.012 .*

Complete descriptions of all content codes listed are categorized in the TRUCON document.

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6.5.1.1 Requirements (continued)Payload Assembly Shipping Category Notation

A payload assembly may be made up of payload packages with the same, equivalent, or different (nonequivalent) shipping categories.

If individual payload packages each assigned the same shipping category are assembled into a single payload, each payload package is limited to the same decay heat limit or gas generation rate limit.

For payload shipping categories to be considered equivalent, the payload packages must be described by the same waste type, but may be described by different waste material types and/or have different gas release resistance factors, provided that the decay heat or the hydrogen gas generation rate for each payload package is bound by the lowest decay heat limit or hydrogen gas generation rate limit of all payload packages in the assembly. These payload packages are then considered to have shipping categories equivalent to the shipping category of the package with the lowest decay heat limit or hydrogen gas generation rate limit in the assembly. If individual payload packages each assigned to an equivalent shipping category are assembled into a payload, each payload package is limited to the decay heat limit or gas generation rate limit of the "governing" shipping category. An assembly may also be made up of payload packages with different shipping categories as described in Section 6.5.2.4.

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6.5.1.2 Methods of Compliance and Verification

6.5.1.2.1 Assignment of Shipping Category to an Individual Payload Package

TRUCON Content Codes and Approved Shipping Categories

The TRUCON (DOE/WIPP 89-004) document catalogs content codes, which describe the authorized contents and compliance methods for waste to be transported in the TRUPACT-II. Each content code may be assigned multiple shipping categories to describe the variations in waste form and packaging configurations within the content code. One shipping category is assigned to each payload package.

RFETS uses the WEMS to assign a shipping category listed in the TRUCON document for the appropriate RFETS waste form and packaging configuration for the following:

- Payload packages of Waste Type I (10) and Waste Material Types II.2 and II.3 (20)
- Payload packages of Waste Material Type II.1 (20) and Waste Type III (30) that do not meet the criteria used to apply dose-dependent G values ($\text{watt} \cdot \text{year} \leq 0.012$).

The shipping categories listed in the TRUCON document reflect the application of the effective G value. As defined in the TRAMPAC, payload packages of Waste Material Type II.1 (20) and Waste Type III (30) that meet the $\text{watt} \cdot \text{year}$ criteria shall be assigned a shipping category that uses a dose-dependent G value. Table 6-4 provides the dose-dependent G values and the four digit notations to be used as the "YYYY" portion of the numeric shipping category for qualifying packages of these Waste Types.

Based on data entered into the WEMS for actual watt loading and age of the payload package, RFETS uses the e-TRAMPAC system in WWIS to assign a shipping category that reflects the application of a dose-dependent G value for the following:

- Payload packages of Waste Material Type II.1 (20) and Waste Type III (30) that meet the criteria for the application of dose-dependent G values ($\text{watt} \cdot \text{year} > 0.012$).

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6.5.1.2.1 Assignment of Shipping Category to an Individual Payload Package (continued)

Table 6-7 lists the RFETS content codes, correlating item description codes (IDCs), associated shipping categories as assigned in the TRUCON document (with effective G value) and, as applicable, associated shipping categories assigned with dose-dependent G values, and the applicable decay heat limits for each shipping category.

Waste packaging procedures 1-PRO-079-WGI-001, Waste Characterization, Generation, and Packaging; 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; and 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure, provide instructions and requirements for the packaging of solid transuranic waste. These procedures require waste to be segregated by physical form as identified by IDCs and require specific WGIs be prepared prior to generation and packaging of transuranic waste. Among other things, the WGIs specify the IDC, the packaging configuration to be used to package waste at the point of generation, and the associated content code to which the waste is being packaged to comply.

Verification of the IDC in a payload package is accomplished using the following methods:

1. Documented independent visual examination of the waste contents at the time of packaging per 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure; 1-PRO-079-WGI-001, Waste Characterization, Generation, and Packaging; PRO-1031-WIPP-1112, TRU/TRM Waste Visual Verification (V^2) and Data Review; associated WGI(s); and/or the appropriate Residues repackaging procedures as referenced in the TWCP QAPjP; and/or
2. Radiography of the waste contents performed in accordance with procedures referenced in the TWCP QAPjP.

For previously packaged waste (i.e., transuranic waste generated prior to WGI implementation), the associated TRUCON content code is assigned to a payload package using the TRUCON document (DOE/WIPP 89-004) and information about its packaging configuration and the IDC of the package contents are entered during the "WIPP Verify" function described in procedure 4-G83-WEM-WP-1209, WEMS Waste Package Verification and Certification.

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6.5.1.2.1 Assignment of Shipping Category to an Individual Payload Package (continued)

The WCO verifies that the assigned content code for a payload package to be shipped off-site is listed in the TRUCON document during certification of the payload package as described in PRO-X05-WC-4018, Transuranic (TRU) Waste Certification. Based upon its assigned content code, the filter model installed into the payload package, its watt loading, and age, WEMS then assigns a shipping category to each payload package.

The shipping category information is recorded in Appendix 7 or 8, as applicable.

Verification of Shipping Category

Verification of the shipping category is performed by looking up the authorized shipping category for the appropriate content code of the payload package in the TRUCON document. For Waste Material Type II.1 (20) and Waste Type III (30), determine if payload package meets the watt*year criteria of >0.012 . If payload packages of Waste Material Type II.1 (20) or Waste Type III (30) meet watt*year >0.012 , look up the numeric shipping category notation for dose-dependent G value in Table 6-7. The Numeric Payload Shipping Category Worksheet (Appendix 5) may be completed as part of verifying the payload package shipping category. Instructions for completing the worksheet are located in the TRAMPAC, Appendix 5.4. Record the shipping category information on the PCTCD or OPCTCD, as appropriate.

Addition of New Shipping Categories

Any proposed change in payload packaging configuration resulting in a new payload shipping category for a given content code shall be submitted to the TRUPACT-II Cognizant Engineer for evaluation. The procedure for submitting requests to the Cognizant Engineer, in compliance with the TRAMPAC requirements, is described in Section 6.1.5 of this document. RFETS may begin using the new shipping category upon written notification of approval from the Cognizant Engineer. Transport of the waste may also be allowed under a more conservative approved shipping category for the content code (listed in the TRUCON document) if the waste material criteria and the packaging restriction of both the content code and shipping category are met.

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6.5.1.2.2 Assignment of Shipping Category to a Payload Assembly

The assignment of a shipping category for payload assemblies comprised of payload packages with same or equivalent shipping categories is described in Section 6.6.2.4 of this document. RFETS mixing of different shipping categories within a payload assembly is described in Section 6.6.2.5 of this document.

6.5.1.2.3 Compliance With Specific Requirements for Total Resistance

The following paragraphs outline the methods of compliance and verification for confinement layers and rigid liners.

Confinement Layers

RTR, visual examination, administrative and procedural controls, or a combination of these methods are used to demonstrate that the method of closure for each layer of confinement is in accordance with the TRAMPAC, Appendix 5.3. Any other type of confinement layers used at RFETS shall be shown, by testing or analysis, to be equivalent to one of the approved confinement layers described in the TRAMPAC, Appendix 5.3. If necessary, RFETS shall establish "equivalency" by demonstration of a hydrogen release rate greater than or equal to that of the approved confinement layers. The waste generation procedures specify the maximum number of confinement layers for each content code. For previously packaged waste, the maximum number of layers is determined from the waste management practices in use at the time the waste was packaged and available records and database information. This is confirmed as part of a sampling program.

Waste packaging procedures 1-PRO-079-WGI-001, Waste Characterization, Generation, and Packaging, and 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure, provide instructions and requirements for the packaging of solid transuranic waste. These procedures specify waste packaging requirements and require specific WGIs be prepared prior to generation and packaging of transuranic waste. Among other things, the WGIs specify the packaging configuration to be used to package waste at the point of generation and the restrictions on the layers of confinement as specified in the TRUCON document. The WGIs and waste packaging procedures include instructions to ensure that packaging of line and non-line generated waste to be transported in the TRUPACT-II complies with the descriptions in Table 6-7. Additionally, 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual, specifies the allowable method of closure for bags in payload packages.

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6.5.1.2.3 Compliance With Specific Requirements for Total Resistance (continued)

For previously packaged waste (i.e., TRU waste generated prior to WGI implementation), the maximum number of layers of confinement (bags) is known from the waste management techniques in use at the time the waste is packaged. For instance, standard operating practice has always involved double bagging (i.e., two layers of confinement) any waste items to be removed from a glove box. If a payload waste package was not attached to the glovebox proper, then these double-bagged waste items would be placed into a drum that could have contained one or two drum liner bags, depending on the waste management practices in use at the time the waste was generated. Therefore, based on this historical practice, the maximum number of layers of confinement of this waste material would be four (up to two possible waste item layers and up to two drum liner bags).

Compliance with the restrictions on inner confinement layers is verified by periodic visual examination of a random sample of previously packaged waste in accordance with 4-H80-776-ASRF-007¹, Visual Examination for Confirmation of RTR²; PRO-986-VE440, Visual Examination Operations for Building 440; and/or PRO-1471-VE-771, Visual Examination for Confirmation of RTR.

Radiography of the waste contents performed in accordance with procedures referenced in the TWCP QAPjP, is used to verify the restrictions for liner bag confinement layers.

Rigid Liner

The requirements for the rigid liner shall be met by procurement controls and site QA procedures. Venting of the lid of a liner for newly generated waste shall be controlled administratively (i.e., buying only punctured liners) or by visual examination of the liner prior to closure. For retrievably stored waste, RTR or sampling programs and existing records shall be used to verify that the liner meets the requirements.

¹ This procedure is inactive as of November 6, 2001.

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6.5.1.2.3 Compliance With Specific Requirements for Total Resistance (continued)

Approved rigid liners for TRU waste drums are specified in 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual, and associated WGs as either a vented Type III rigid liner, or Type IV rigid liner. Type IV rigid liners may be procured and received from the vendor with puncture holes. Type III rigid liners typically are not received with puncture holes from the vendor. Procedures 4-D99-WO-1100, Solid Radioactive Waste Packaging Procedure; 1-M12-WO-4034, Solid Radioactive Waste Packaging Requirements Manual; and associated WGs require waste generators to ensure that the rigid liner lid is punctured prior to use in packaging waste. The use of a punctured rigid liner for a given drum is documented on the associated drum's W/RT, in accordance with 1-C80-WO1102-W/RT, Waste/Residue Traveler Instructions.

RTR of drums performed in accordance with procedures referenced in the TWCP QAPjP is used to identify/verify the presence of a rigid liner. Venting and/or verification of venting of potential unvented rigid liner lids is accomplished during headspace gas sampling performed in accordance with procedures referenced in the TWCP QAPjP.

TRU waste that was previously supercompacted was packaged inside of a Type V rigid liner. The Type V rigid liner, like the Type IV, was typically procured and received from the vendor with a puncture hole. The use of a punctured Type V rigid liner for supercompacted waste drums is documented on each applicable drum W/RT.

For legacy waste, puncturing of unvented rigid liners is accomplished in compliance with the venting and aspiration requirements as described in Subsection 6.5.3.

Verification that rigid liners are punctured or vented is accomplished visually through in-process inspections (PRO-1045-WI-001, Solid Radioactive Waste Inspection) or waste characterization headspace gas sampling activities conducted in accordance with the TWCP QAPjP.

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6.5.1.2.4 Alphanumeric Shipping Category Notation

For the alphanumeric shipping category notation (used through Revision 16 of the TRUPACT-II SAR), verification of the shipping category requirements shall be by comparison of the shipping category for the payload package with the allowable shipping categories from the information in the TRUCON. This is performed as part of the WEMS WIPP Verification function in accordance with procedure 4-G83-WEM-WP-1209, WEMS Waste Package Verification and Certification. The shipping category information is also recorded in Appendix 7 or 8, as applicable.

6.5.2 Compliance With Flammable (Gas/VOC) Concentration Limits

TRU wastes to be transported in the TRUPACT-II are restricted so that no flammable mixtures can occur in any layer of confinement during shipment. While the predominant flammable gas of concern is hydrogen, the presence of methane and flammable VOCs is also limited along with hydrogen to ensure the absence of flammable (gas/VOC) mixtures in TRU waste payloads.

Payload packages to be transported in the TRUPACT-II can be classified into one of two categories based on compliance with the flammable (gas/VOC) limits:

- Analytical Category - Under the analytical category, a conservative analysis is used to impose decay heat limits on individual payload packages to ensure that flammable (gas/VOC) limits are met. Specifically, flammable VOCs are restricted to less than or equal to 500 parts per million (ppm) in the payload package headspace (to ensure that their contribution to flammability is negligible), and a bounding G value is used to conservatively estimate the potential for flammable gas generation due to radiolysis. This G value accounts for both hydrogen and methane gas generation potential based on the waste type. The 5% limit on hydrogen concentration is then met by imposing a decay heat limit that restricts the amount of radioactive material that can be present in the payload package.

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6.5.2 Compliance With Flammable (Gas/VOC) Concentration Limits (continued)

- Test Category - Payload packages that do not meet the analytical category limits are classified as test category. Under the test category, one of two options is used for determining compliance with flammable (gas/VOC) limits:
 - (1) **Measurement** of the headspace of payload packages for flammable (gas/VOC) concentrations and determination of the potential flammability of the (gas/VOC) mixture in the innermost layer of confinement during transportation, and
 - (2) **Full-Drum Testing** to determine compliance with flammable (gas/VOC) limits for individual payload packages.

VOC absorbing or adsorbing material (such as granular activated carbon to adsorb carbon tetrachloride) may be placed in a payload package provided that RFETS personnel can verify or demonstrate the following through testing, analysis, or AK:

1. The absorbent/adsorbent remains effective in retaining VOCs from the time of waste packaging through the end of the maximum shipping period in the TRUPACT-II, and
2. A flammable mixture of gases does not exist in the innermost layer of confinement, and
3. The total concentration of potentially flammable VOCs does not exceed 500 ppm in the headspace of a payload package.

Only payload packages that meet the flammable (gas/VOC) limits based on these determinations are eligible for shipment in the TRUPACT-II. Implementation of compliance methods under the analytical and test categories is described in the following subsections and is summarized in Figure 6-1.

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6.5.2 Compliance With Flammable (Gas/VOC) Concentration Limits (continued)

Figure 6-1 presents a logic flow diagram for performing the compliance evaluation for flammable (gas/VOC) limits. Figures 5-1 through 5-5 of the TRAMPAC provides expanded logic and detailed descriptions of each step of this compliance. The compliance evaluation by analysis requires data associated with the payload package, which is gathered from one or more of the methods of payload compliance listed in Section 6.1.4 of this document.

NOTE: *The e-TRAMPAC system in the WWIS will verify compliance with flammable (gas/VOC) concentration limits. RFETS will ship only payloads that comply with the flammable (gas/VOC) limits as ensured by the e-TRAMPAC system in the WWIS.*

The evaluation of compliance with flammable (gas/VOC) concentration limits under either the analytical category or the test category requires the determination of the flammable VOC concentration. A list of flammable VOCs is provided in Table 6-10.

As applicable, RFETS determines the flammable VOC concentration through AK, which may include results from previous headspace gas sampling data. If a payload package headspace concentration of flammable VOCs cannot be established to be ≤ 500 ppm based on the payload package AK data, then the flammable VOC concentration of the payload package headspace must be measured.

Per the requirements of the WIPP-WAP, a statistical sample or 100% of all payload packages in each waste stream must be headspace gas sampled and analyzed for VOCs, which includes most of the flammable VOCs listed in Table 6-10. Flammable VOCs not included in the WIPP-WAP target analyte list will be detected as tentatively identified compounds (TICs) as part of the headspace VOC analysis, or will be added to the target analyte list and analyzed as target analytes. Headspace gas sampling and analysis is performed in accordance with L-4146, Headspace Gas Sampling of Waste Containers; L-4231, Headspace Gas Sampling and Analysis Using an Automated Manifold; and L-4111, GC/MS Determination of Volatile Organics Waste Characterization.

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6.5.2.1 Determination of Flammable Volatile Organic Compounds Concentration

Analysis data are validated and then input into WEMS and the WEMS software sums the results for the flammable VOCs. WEMS software specifications then ensure that any payload package that exceeds 500 ppm flammable VOCs in the headspace is identified as test category waste as described in procedure 4-G83-WEM-WP-1209, WEMS Waste Package Verification and Certification.

If a payload package headspace concentration of flammable VOCs can be established to be ≤ 500 ppm, then compliance with the flammable (gas/VOC) limits is determined under the analytical category as described in Section 6.5.2.2.

The TRAMPAC, Appendix 5.6, specifies drum age criteria (DAC) (i.e., minimum number of days) for the measurement of headspace flammable VOCs. If the payload package meets the DAC for the applicable packaging configuration, the measured headspace flammable VOC concentration is evaluated. If the payload package has not yet met the DAC, the 90-percent steady-state headspace flammable VOC concentration must be calculated from the measured concentration as described in the TRAMPAC, Appendix 5.6. If the measured headspace flammable VOC concentration or the calculated steady-state payload package headspace flammable VOC concentration is less than or equal to 500 ppm, the evaluation of compliance with the flammable (gas/VOC) limits is determined under the analytical category as described in Section 6.5.2.2. If the measured or calculated headspace flammable VOC concentration exceeds 500 ppm, the evaluation of compliance with the flammable (gas/VOC) limits is determined under the test category as described in Section 6.5.2.3.

The e-TRAMPAC system in WWIS applies the appropriate DAC to the headspace flammable VOC concentration measurement, performs any required calculation of the steady-state headspace flammable VOC concentration, and identifies any payload package that exceeds the 500 ppm limit.

NOTE: *If WIPP-WAP requirements pertaining to the DAC are more restrictive than those specified in the TRAMPAC, Appendix 5.6, the application of the DAC will be in accordance with the WIPP-WAP.*

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6.5.2.2 Analytical Category Compliance

Compliance with the flammable (gas/VOC) concentration limits is demonstrated under the analytical category if the payload package meets all of the following conditions:

- The total concentration of potentially flammable VOCs within the payload package headspace is less than or equal to 500 ppm (as determined in Section 6.5.2.1)
- The payload package is classified as Waste Types I (10), II (20), or III (30).

If the payload package exceeds 500 ppm or is classified as Waste Type IV, compliance with the flammable (gas/VOC) concentration limits must be demonstrated under the test category as described in Section 6.5.2.3.

NOTE: *The compliance evaluation described in this section assumes that the payload package under consideration is proposed for shipment with payload packages belonging to the same or an equivalent shipping category. If the payload package is proposed for shipment in a payload assembly comprised of payload packages of different shipping categories and/or dunnage packages, compliance is evaluated as described in Section 6.6.2.5.*

If the payload package is proposed for shipment in a payload assembly comprised of payload packages of the same or equivalent shipping category, RFETS evaluates compliance with the analytical decay heat limit. An analytical decay heat limit is established for each payload shipping category such that the hydrogen generated during twice the expected shipping time results in a molar quantity of not more than 5% by volume in any layer of confinement in the payload package. The analytical decay heat limit for each shipping category is specified in Table 6-7.

The decay heat within each payload package plus the measurement error shall be less than or equal to the decay heat limit shown in Table 6-7 for each authorized payload shipping category.

NOTE: *If the payload package meets the watt*year criteria of >0.012 , the shipping category reflecting the dose-dependent G value and the associated decay heat limit applies.*

The decay heat limit for an authorized shipping category associated with an SWB overpack configuration (i.e., drums overpacked in SWBs) applies to each overpacked drum within the SWB and not the entire SWB itself.

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6.5.2.2 Analytical Category Compliance (continued)

The total decay heat from all payload packages in a TRUPACT-II shall be less than or equal to 40 watts.

NOTE: *Decay heat error refers to standard error (i.e., decay heat error at one standard deviation = 1 sigma).*

WEMS and associated software specifications define the methods and controls that WEMS uses to calculate the decay heat for each payload package. The e-TRAMPAC software system in the WWIS also calculates decay heat for each payload package and verifies compliance with decay heat restrictions prior to WWIS approval. Furthermore, the e-TRAMPAC system provides the methods and controls used for calculation of decay heat for assembled TRUPACT-II payloads. These software specifications/systems provide the methodology used to ensure compliance with the decay heat limits in Table 6-7 and verify that the decay heat limits are not exceeded.

Verification that correct data is input and used by WEMS for calculation of decay heats is performed during the "WIPP Verify" and "Radioactive Verify" functions described in 4-G83-WEM-WP-1209, WEMS Waste Package Verification and Certification.

Verification of compliance with decay heat restrictions for each individual payload package is performed as part of the waste certification process as described in PRO-X05-WC-4018, Transuranic (TRU) Waste Certification. Verification of calculated payload decay heat values are performed by the TCO prior to transport in a TRUPACT-II package in accordance with 4-T20-Traffic-505, Certifying Authorized Payloads for TRUPACT-II.

Compliance with the above criteria is shown by ensuring that the waste is listed in the TRUCON document, and that the restrictions associated with the shipping category assignment are met. Section 6.5.1 of this document describes procedures and methods for meeting shipping category criteria. If the payload package meets the analytical decay heat limit, compliance with the flammable (gas/VOC) limits is ensured. If the payload package exceeds the analytical decay heat limit, compliance with the flammable (gas/VOC) concentration limits may be demonstrated through mixing the package in a payload assembly of different shipping categories as described in Section 6.6.2.5 or by measurement/test as described in Section 6.5.2.3.

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6.5.2.3 Test Category Compliance

Compliance with the flammable (gas/VOC) concentration limits is demonstrated under the test category if the payload package meets one or more of the following conditions:

- The total concentration of potentially flammable VOCs within the payload package headspace exceeds 500 ppm. Waste Types I (10), II (20), and III (30) belong in this category.
- The decay heat loading of the payload package exceeds the analytical limit for the shipping category of that payload package. Waste Types I (10), II (20), and III (30) belong in this category.
- A waste form does not have a fully characterized bounding G value from previous sampling or waste stream analysis. Waste Type IV (40) belongs to this category.

The packages classified as test category waste shall meet all other restrictions of this document, including the 40-watt limit on total decay heat from all payload packages in a TRUPACT-II.

RFETS qualifies test category payload packages for shipment by the following methods:

- Measurement
- Full-Drum Testing.

NOTE: *The compliance evaluation described in this section assumes that the payload package under consideration is proposed for shipment with payload packages belonging to the same or an equivalent shipping category. If the payload package is proposed for shipment in a payload assembly comprised of payload packages of different shipping categories and/or dunnage packages, compliance is evaluated as described in Section 6.6.2.5. However, the data obtained from the performance of measurement or testing may be used in the compliance demonstration described in Section 6.6.2.5.*

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6.5.2.3.1 Measurement

If the payload package exceeds the analytical decay heat limit and/or its headspace flammable VOC concentration exceeds 500 ppm, the compliance evaluation for flammable (gas/VOC) limits may be based on measurement of the headspace gas. This method is applicable only to Waste Types I (10), II (20), and III (30).

NOTE: *Full-drum testing (Section 6.5.2.3.2) may be implemented instead of measurement to qualify test category waste for shipment.*

RFETS performs headspace gas measurements in accordance with L-4146, Headspace Gas Sampling of Waste Containers; L-4231, Headspace Gas Sampling and Analysis Using an Automated Manifold; and L-4111, GC/MS Determination of Volatile Organics Waste Characterization. For overpacked payload packages, measurement of the payload package headspace is performed prior to the overpacking. For all payload packages, flammable (gas/VOC) concentrations may be conservatively measured in an inner layer of confinement rather than the payload package headspace.

The concentration of methane present in the headspace of the payload package may be estimated in accordance with the Quality Assurance Program Plan for TRUPACT-II Gas Generation Test Program (GGTP QAPP) and RS-020-001, Gas Generation Testing Program Quality Assurance Project Plan (GGTP QAPjP), or be measured in accordance with L-4146, Headspace Gas Sampling of Waste Containers; L-4231, Headspace Gas Sampling and Analysis Using an Automated Manifold; and L-4111, GC/MS Determination of Volatile Organics Waste Characterization. If the payload package headspace methane concentration exceeds 1,250 ppm, the payload package is not eligible for shipment and must be segregated for repackaging, treatment, or other mitigation measures. If the payload package headspace methane concentration is less than or equal to 1,250 ppm, and the payload is to be assembled with payload packages of different shipping categories, compliance shall proceed according to the methodology described in Section 6.5.2.4. Otherwise, the flammable (gas/VOC) concentration within the innermost layer of confinement is determined using the measured headspace flammable (gas/VOC) concentrations and the time history of the payload package as described in Appendices 5.7 and 5.8 of the TRAMPAC. Using the headspace gas measurement and the time history of the payload package, a mixture lower explosive limit (MLEL) (or flammable gas generation rate) is calculated as described in Appendix 5.7 of the TRAMPAC. If the sum of the flammable (gas/VOC) concentration in the innermost layer of confinement meets the MLEL, the payload package may be qualified for shipment. If not, the payload package must be subjected to Full-Drum Testing as described in Section 6.5.2.3.2.

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6.5.2.3.1 Measurement (continued)

The WEMS software evaluates the headspace methane concentration measurement and prevents any payload package that exceeds the 1,250 ppm limit from being verified during the "WIPP Verify" function as described in procedure 4-G83-WEM-WP-1209, WEMS Waste Package Verification and Certification.

WEMS and associated software specifications define the methods and controls that WEMS uses to calculate the MLEL for each payload package. These software specifications also provide the methodology used by WEMS to ensure compliance with the applicable MLEL and verify that the MLEL is not exceeded. Additionally, all payload packages are processed through the e-TRAMPAC software system in WWIS. The e-TRAMPAC system also verifies compliance with the applicable MLEL and verifies that the MLEL is not exceeded.

Verification that correct data is input and used by WEMS for calculation of MLEL is performed during the "WIPP Verify" and "Radioactive Verify" functions described in 4-G83-WEM-WP-1209, WEMS Waste Package Verification and Certification.

6.5.2.3.2 Full-Drum Testing

If the payload package exceeds the MLEL (as described in Section 6.5.2.3.1) or is Waste Type IV (40), the compliance evaluation for flammable (gas/VOC) limits may be based on the results of full-drum testing, which quantifies the gas generation rate of the payload package.

Prior to full-drum testing, the concentration of methane present in the headspace of the payload package must be estimated in accordance with RS-020-001, GGTP QAPjP, or be measured in accordance with L-4146, Headspace Gas Sampling of Waste Containers; L-4231, Headspace Gas Sampling and Analysis Using an Automated Manifold; and L-4111, GC/MS Determination of Volatile Organics Waste Characterization. If the payload package headspace methane concentration exceeds 1,250 ppm, the payload package is not eligible for shipment and must be segregated for repackaging, treatment, or other mitigation measures. If the payload package headspace methane concentration is less than or equal to 1,250 ppm, and the payload is to be assembled with payload packages of different shipping categories, compliance shall proceed according to the methodology described in Section 6.5.2.4. Otherwise, the total gas generation rate is determined from full-drum testing as described in the TRAMPAC, Appendix 5.7.

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6.5.2.3.2 Full-Drum Testing (continued)

RFETS performs full-drum testing in accordance with LATA-MGSSID-001, LATA Program Interface Document for the Mobile Gas Generation Sampling System for use at the Rocky Flats Environmental Technology Site (RFETS) and the criteria specified in Table 6-8. Full-drum testing is accomplished under the QA program defined by RS-020-001, GGTP QAPjP, which ensures compliance with the GGTP QAPP. For overpacked payload packages, full-drum testing is to be performed prior to the overpacking.

As applicable, if the determined total gas generation rate exceeds the limit for the appropriate shipping category, mitigation measures must be taken or the payload package may be evaluated for compliance within a payload assembly of different

shipping categories as described in Section 6.6.2.5. If the determined total gas generation rate is less than or equal to the limit for the appropriate shipping category as specified in Table 6-9, the flammable gas concentration within the innermost layer of confinement must be determined using the data from the testing as described in the TRAMPAC, Appendices 5.7 and 5.8. A specific MLEL (or flammable gas generation rate) is calculated for the payload package as described in the TRAMPAC, Appendix 5.7. If the sum of the flammable gas and VOC concentrations exceeds the MLEL, the payload package does not comply with flammable (gas/VOC) limits. Either mitigation measures must be taken or the payload package may be evaluated for compliance within a payload assembly of different shipping categories as described in Section 6.6.2.5. If the flammable (gas/VOC) concentration is less than or equal to the MLEL, the payload package may be qualified for shipment.

The WEMS software evaluates the headspace methane concentration measurement and prevents any payload package that exceeds the 1,250 ppm limit from being verified during the "WIPP Verify" function as described in procedure 4-G83-WEM-WP-1209, WEMS Waste Package Verification and Certification.

Pursuant to the TRAMPAC, for applicable shipping categories, total gas generation rate data are input to WEMS. The WEMS software prevents any payload package that exceeds the total gas generation rate limit for the appropriate shipping category from being verified during the "WIPP Verify" function as described in procedure 4-G83-WEM-WP-1209, WEMS Waste Package Verification and Certification.

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6.5.2.3.2 Full-Drum Testing (continued)

WEMS and associated software specifications define the methods and controls that WEMS uses to calculate the MLEL for each payload package. These software specifications also provide the methodology used by WEMS to ensure compliance with the applicable MLEL and verify that the MLEL is not exceeded. Additionally, all payload packages are processed through the e-TRAMPAC software system in WWIS. The e-TRAMPAC system also verifies compliance with the applicable MLEL and verifies that the MLEL is not exceeded.

Verification that correct data is input and used by WEMS for calculation of MLEL is performed during the "WIPP Verify" and "Radioactive Verify" functions described in 4-G83-WEM-WP-1209, WEMS Waste Package Verification and Certification.

6.5.2.4 Mixing of Shipping Categories in a Payload Assembly

In accordance with Appendix 6.3 of the TRAMPAC, an assembly may be made up of payload packages with different shipping categories by ensuring that each payload package does not contain a flammable mixture of gases. The flammability index (FI) is assessed for each payload package, which accounts for the properties of each of the other packages in the assembly. Section 6.6.2.5 describes the procedure for qualifying an assembly of payload packages with different shipping categories. Unlimited mixing of shipping categories within a single payload package type is allowed for direct loaded payload configurations, with the FIs calculated based on each payload package in the assembly.

For payload assemblies comprised of overpacked payload configurations, mixing of shipping categories is allowed provided that all payload packages being overpacked meet the lowest decay heat limit or lowest hydrogen gas generation rate limit ("governing limit") of all the payload packages in the payload assembly.

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6.5.3 Venting and Aspiration

6.5.3.1 Requirements

This requirement applies only to unvented payload packages. Payload packages that have been stored in an unvented condition (i.e., no filter and/or unpunctured rigid liner) **SHALL** be aspirated for the specific length of time to ensure equilibration of any gases that may have accumulated in the closed payload package. For payload packages with waste types in packaging configurations that do **NOT** generate any flammable gas, aspiration is **NOT** required (i.e., Waste Material Type II.2) (Section 5.9.1 of the TRAMPAC).

6.5.3.2 Methods of Compliance and Verification

Three options are available for meeting aspiration requirements as follows:

- **Option 1 - Aspiration Time Based on Date of Payload Package Closure.**
Compliance shall be by records and database information. For this option, the steps outlined below shall be implemented to determine the aspiration time for a payload package.
 1. The potential shipping category of the payload package shall be known.
 2. The duration for which the payload package has been in a closed condition should be computed from a knowledge of the date of closure of the drum. This closure time should be rounded up to the next highest time period listed in the TRAMPAC, Appendix 5.9, Tables 5.9-1 through 5.9-3.
 3. The required aspiration time corresponding to this closure time shall then be read from the same table under the column listing the number of layers of confinement associated with the potential shipping category of the payload package.
 4. The payload package shall be qualified for shipment only after being aspirated for at least this period of time.

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6.5.3.2 Methods of Compliance and Verification (continued)

- **Option 2 - Headspace Gas Sampling at the Time of Venting.** Compliance shall be by measurement of headspace gas concentrations and records. For this option, the steps outlined below shall be implemented to determine the aspiration time for a payload package.
 1. The potential shipping category of the payload package shall be known.
 2. At the time of venting, a headspace sample shall be taken from the payload package headspace (Option 2A) or from the rigid liner headspace (Option 2B) and analyzed for the hydrogen concentration.
 3. The measured headspace concentration of all hydrogen shall be rounded up to the next highest mole percentage listed in the TRAMPAC, Appendix 5.9, Tables 5.9-4 through 5.9-9, determined by Option 2A or 2B, as appropriate.
 4. The required aspiration time corresponding to this molar percentage shall then be read from the same table under the column listing the number of layers of confinement associated with the potential shipping category of the payload package.
 5. The payload package shall be qualified for shipment only after being aspirated for at least this period of time.

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6.5.3.2 Methods of Compliance and Verification (continued)

- **Option 3 - Headspace Gas Sampling During Aspiration.** Compliance shall be by direct measurement of the headspace gas concentration. For this option, the steps outlined below shall be implemented to determine the aspiration time for a payload package.
 1. The potential shipping category of the payload package shall be known.
 2. Prior to measuring the hydrogen concentration in the payload package headspace, the drum shall be vented for at least two weeks.
 3. The measured headspace concentration of hydrogen shall be rounded up to the next highest mole percentage listed in the TRAMPAC, Appendix 5.9, Tables 5.9-10 through 5.9-12.
 4. The required aspiration time corresponding to this molar percentage shall then be read from the same table under the column listing the number of layers of confinement associated with the potential shipping category of the payload package.
 5. The payload package shall be qualified for shipment only after being aspirated for this period of time.

Venting and aspiration of unvented payload packages is/was performed in accordance with procedures PRO-1141-WP-4701, Waste Characterization Gas Sampling; PRO-984-440-HSGS, C-Cell Operations; or PRO-1351-440-SWB, Perm-Con Operations. Vent/Puncture dates are entered into WEMS as a start date for determining aspiration time.

Aspiration times are determined in accordance with the applicable aspiration method and are also entered into WEMS per 4-G83-WEM-WP-1209, WEMS Waste Package Verification and Certification. WEMS software controls ensure that applicable payload packages aspirate longer than the required aspiration period prior to being certified and shipped.

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6.6 Payload Assembly Requirements

This section presents an overview of the control procedures that shall be used to assemble a payload qualified for transport in the TRUPACT-II. The parameters described in previous sections shall be evaluated for selection of a payload. The flowchart of transport requirements for a payload package is shown in Figure 6-2. The container identification (ID) number shall uniquely identify the payload package. Each payload package shall have an assigned shipping category and content code. Wherever applicable, the measured parameters (weight, fissile material, and the decay heat) shall be checked against the limits after addition of the measurement error, as detailed in previous sections. If any of the limits are not met by the package, it shall be rejected from transport (subject to mitigation or repackaging), marked, and segregated.

Assembled payloads shall comply with the authorized payload configurations specified in Section 6.2.1.1 of this document. A TRUPACT-II payload may be assembled of payload packages belonging to the same shipping category, equivalent shipping categories, or different/nonequivalent shipping categories (e.g., payload may consist of several shipping categories and/or may take credit for void volume provided by dunnage packages). The logic for selecting a payload qualified for transport in the TRUPACT-II when all payload packages belong to the same or equivalent shipping category is presented in Figure 6-3. Payload selection shall be made from only those payload packages that have been approved for shipment. A payload comprised of individual payload packages selected from the same or equivalent shipping categories shall meet the requirements for weight, center of gravity, dose rate, fissile quantity limits, and decay heat limits on the total TRUPACT-II payload. Payload packages belonging to different/nonequivalent shipping categories may be assembled in a single payload (with or without dunnage packages) in accordance with the criteria described in Section 6.6.2.5.

6.6.1 Requirements

Once compliance with all transportation parameter requirements is verified and Appendix 7 or Appendix 8 (and Appendix 9, as applicable) is completed, the TRUPACT-II package shall be authorized for shipment by the site TCO by completing and signing the PATCD (Appendix 6). Shipping records shall be maintained by the shipper for a minimum period of 3 years.

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6.6.2 Methods of Compliance and Verification

Shipping records are maintained for a minimum period of 3 years in accordance with the applicable Records Inventory Disposition Schedule (RIDS) and procedure PRO-077-WIPP-005, Management of Waste Information Prior to Transmittal to the Waste Records Center.

NOTE: *The text in Sections 6.6.2.1 through 6.6.2.4 providing instructions for payload packages and assembly qualification is reproduced from the TRAMPAC.*

6.6.2.1 Procedure for Certification of Individual Payload Packages (Analytical Category)

RFETS qualifies an individual payload package for transport in a TRUPACT-II under the analytical category by verifying that the payload package meets the parameter requirements/limits listed in Appendix 7, PCTCD, Analytical Category and, if applicable, the OPCTCD in Appendix 9. The PCTCD is completed for each payload package to be directly loaded into the ICV. If overpack payload configurations are used, the PCTCD is completed for each payload package to be overpacked, and the OPCTCD is completed for the payload package overpacking the other payload package(s). For example, if four 55-gallon drums are overpacked in one SWB, the PCTCD is completed separately for each 55-gallon drum, and the OPCTCD is completed once for the SWB. However, pipe overpack configurations do not require the completion of the OPCTCD. Appendices 7 and 9 are reproductions of the forms as shown in the TRAMPAC and are reformatted in RFETS procedures. All parameters noted on the original TRAMPAC form are included in the modified version. Data on the parameters for specific payloads are obtained by the methods outlined in this document and are consistent with the information for each parameter provided in the TRUCON.

Appendix 7 is completed as follows (The section numbers in parentheses refer to sections in this document that provide requirement, compliance, and verification information for the transportation parameter described):

- Container ID/Container Bar Code # (Section 6.2.4): The site-specific ID number is unique to each container of waste (payload package) and provides a means for tracking process data records and package history. These records on the properties of the payload package are referred to as the data package. The container ID number is assigned to the payload package prior to waste packaging. The ID number appears on a label affixed to the payload package and can be read for visual verification or for electronic retrieval (i.e., bar codes). Information necessary for transporting payload packages is entered into the data package under this ID number.

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6.6.2.1 Procedure for Certification of Individual Payload Packages (Analytical Category)
(continued)

- Shipping Category (Section 6.5.1): The proper shipping category is assigned to the payload package either by 1) completing the Numeric Payload Shipping Category Worksheet (Appendix 5) and comparing the results to the allowed shipping category for the appropriate content code in the TRUCON; or 2) by choosing the appropriate shipping category from the list of allowable shipping categories for the content code in the TRUCON. If the shipping category determined by completing the worksheet does not match any of the shipping categories contained in the TRUCON for the content code, the payload package is not eligible for shipment.
- Content Code (Section 6.5.1): The content code from the data package for the payload package is approved as part of the TRUCON document and is listed in Table 6-7. If the content code is not listed in the TRUCON document, it is not eligible for shipment. The methodology by which a shipping category is assigned to a content code is shown in Figure 6-4. The content code of the waste determines its physical and chemical form. The TRUCON is a comprehensive catalogued description of this flowchart for all content codes that are allowed to be transported from all the DOE sites.
- Container Configuration (Section 6.2.1): Select the appropriate payload package configuration. The packages shall be one of the approved types in one of the following authorized configurations:
 - Direct Load Configurations:
 - 55-Gallon Drum: Waste directly loaded into one 55-gallon drum. Complete the PCTCD for the 55-gallon drum.
 - 100-Gallon Drum: Waste directly loaded into one 100-gallon drum. Complete the PCTCD for the 100-gallon drum.
 - SWB: Waste directly loaded into one SWB. Complete the PCTCD for the SWB.
 - TDOP: Waste directly loaded into a TDOP. Complete the PCTCD for the TDOP.

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6.6.2.1 Procedure for Certification of Individual Payload Packages (Analytical Category) (continued)

- Container Configuration (Section 6.2.1) (continued):
 - Fixed Configurations:
 - Standard POC: Waste packaged in one pipe component overpacked in one 55-gallon drum, as described in Appendix 2.2 of the TRAMPAC. Complete the PCTCD for the standard POC.
 - S100 POC: Waste packaged in one pipe overpacked in one 55-gallon drum, as described in Appendix 2.3 of the TRAMPAC. Complete the PCTCD for the S100 POC.
 - S200 POC: Waste packaged in one pipe overpacked in one 55-gallon drum, as described in Appendix 2.4 of the TRAMPAC. Complete the PCTCD for the S200 POC.
 - Bin Overpack: Waste packaged in one bin overpacked in one SWB.
Note: the bin is only authorized for use in this configuration. Complete the PCTCD for the bin overpack.
 - 85-Gallon Drum Overpack: Waste packaged in one 55-gallon drum overpacked in one 85-gallon drum. Note that the 85-gallon drum is only authorized for use in this configuration. Complete the PCTCD for the 85-gallon drum overpack.
 - Overpacked Configurations:
 - SWB with 55-Gallon Drum(s) (SWB Overpack): Waste packaged in one 55-gallon drum to be overpacked in one SWB (up to four 55-gallon drums per SWB). Complete the PCTCD for each of the 55-gallon drums and the OPCTCD for the SWB.
 - TDOP with 55-Gallon Drum(s): Waste packaged in one 55-gallon drum to be overpacked in one TDOP (up to ten 55-gallon drums per TDOP). Complete the PCTCD for each of the 55-gallon drums and the OPCTCD for the TDOP.
 - TDOP with SWB Overpack: Waste packaged in one 55-gallon drum to be overpacked in one SWB (up to four 55-gallon drums per SWB) to be overpacked in one TDOP (one SWB per TDOP). Complete the PCTCD for each of the 55-gallon drums and the OPCTCD once for the SWB and once for the TDOP.

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6.6.2.1 Procedure for Certification of Individual Payload Packages (Analytical Category) (continued)

- Container Configuration (Section 6.2.1) (continued):
 - Overpacked Configurations (continued):
 - TDOP with 85-Gallon Drum Overpack(s): Waste packaged in one 55-gallon drum overpacked in one 85-gallon drum to be overpacked in one TDOP (up to six 85-gallon drum overpacks per TDOP). Complete the PCTCD for each of the 85-gallon drum overpack(s) and the OPCTCD for the TDOP.
 - TDOP with SWB: Waste packaged in one SWB to be overpacked in one TDOP (one SWB per TDOP). Complete the PCTCD for the SWB and the OPCTCD for the TDOP.
 - TDOP with Bin Overpack: Waste packaged in one bin overpacked in one SWB to be overpacked in one TDOP (one bin overpack per TDOP). Complete the PCTCD for the bin overpack and the OPCTCD for the TDOP.
- Certification Site: The certification site is recorded as the location at which transportation certification occurs. For newly generated waste, this is the generating site. For retrievably stored waste, it may be either the generating or storage site.

TRAMPAC Transportation Parameters

Compliance information for the TRAMPAC transportation parameters shall be obtained from the data package for the payload package. The TCO shall indicate compliance with each requirement in the space provided. The following criteria shall be met:

- Free liquids ≤ 1 percent of payload package volume (Section 6.2.6).
- Non-radioactive pyrophorics are not present (Section 6.4.1).
- Radioactive pyrophorics are < 1 weight percent (Section 6.4.1).
- Explosives are not present (Section 6.4.2).
- Corrosives are not present (Section 6.4.2).
- Pressurized containers are not present (Section 6.4.2).

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6.6.2.1 Procedure for Certification of Individual Payload Packages (Analytical Category)
(continued)

TRAMPAC Transportation Parameters (continued)

- Sealed containers >4 liters are not present, except for Waste Material Type II.2 packaged in metal cans (Section 6.2.8).
- Drum liner (if present) is punctured/filtered (Section 6.5.1.2.3).
- Flammable VOCs ≤ 500 ppm in payload package headspace (Section 6.5.2).
- Radiation dose rates ≤ 200 mrem/hr at surface of payload package (Section 6.3.2). If the payload package is overpacked, the limit applies only to the outermost payload package.
- Filter Identification (Section 6.2.5): Identification is listed for the type and appropriate number of filters as determined by payload package type. If the PCTCD is being completed for a fixed configuration, filter information is listed for both payload packages.

Measured Parameters

- Weight (Section 6.2.3): The maximum allowable weight for the appropriate payload package type shall be recorded. If the payload package will be overpacked, the limit for the maximum allowable weight applies only to the outermost payload package of the overpacked configuration.

The measured weight of the payload package may be obtained from its data package. The measured payload package weight plus the measurement error (one standard deviation) shall be compared to the maximum allowable weight limit for the appropriate payload package type. If the PCTCD is being completed for a payload package that will be overpacked and the weight of the entire overpack configuration will be determined, the recorded weight of the individual payload package to be overpacked is not required. Alternatively, the weights of the individual payload packages and the weight of the empty overpack package may be summed to determine the total measured weight of the overpacked configuration in the completion of the OPCTCD. The measured weight of the individual payload package may be recorded in the PCTCD for later use in completing the OPCTCD for the overpacked configuration. The weight of the overpack configuration plus the measurement error shall be recorded in the OPCTCD and compared to the maximum allowable weight limit for the outermost payload package of the overpack configuration.

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6.6.2.1 Procedure for Certification of Individual Payload Packages (Analytical Category) (continued)

Measured Parameters (continued)

- Decay Heat (Section 6.5.2.2): The maximum allowable decay heat limit per payload package for the applicable payload shipping category shall be recorded from the determination made pursuant to Section 6.5.2.2. The measured decay heat plus the measurement error (one standard deviation) of the payload package may be obtained from its data package. Measured decay heats are determined from the isotopic composition and quantity of radionuclides, as described in Section 6.5.2.2 of this document. The measured decay heat plus the measurement error shall be compared to the maximum allowable decay heat limit per payload package for the appropriate shipping category if the anticipated payload consists of payload packages belonging to the same (or equivalent) shipping category. For these configurations, compliance with flammable gas generation limits is determined by compliance with decay heat limits. For payload assemblies where credit is taken for dunnage or different shipping categories, the flammability index, based on the assembled payload, determines compliance with flammable gas generation limits, as described in Appendix 6.3 of the TRAMPAC. The flammability index in this case is recorded in the PATCD. For these configurations, indicate under "Limit" that a decay heat limit for the payload package is not applicable.
- Fissile Mass (FGE) (Section 6.3.1): The maximum allowable fissile mass limit for the appropriate payload package type shall be recorded. If the payload package will be overpacked, the limit for maximum allowable fissile mass applies only to the outermost payload package of the overpacked configuration. The measured fissile mass of the payload package may be obtained from its data package. The measured payload package fissile mass value plus two times the measurement error (two standard deviations) shall be compared to the maximum allowable fissile mass limit for the appropriate payload package type. If the PCTCD is being completed for a payload package that will be overpacked, the measured fissile mass of the individual payload package may be recorded in the PCTCD for later use in completing the OPCTCD for the overpack configuration. The measured fissile mass plus two times the measurement error (two standard deviations) for the entire overpack configuration shall be recorded in the OPCTCD and compared to the maximum allowable fissile mass limit for the outermost payload package and the overpack configuration.
- Curie Limits (Section 6.3.2.1): Curie limits for specific radionuclides apply to S100 and S200 POCs only and are presented in Appendices 2.3 and 2.4, respectively, of the TRAMPAC. The TCO shall verify that, for all applicable radionuclides, the measured value plus error (one standard deviation) meets the appropriate curie limit. Compliance shall be documented on the PCTCD.

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6.6.2.1 Procedure for Certification of Individual Payload Packages (Analytical Category) (continued)

Unvented Waste Parameters

- Aspiration Method (Section 6.5.3): This portion of the PCTCD applies to retrievably stored waste only.
 - Aspiration Method: Option 1, 2A, 2B, or 3 is indicated.
 - Container Closed Time (Option 1 Only): The period of time that a payload package has been unvented in storage is recorded.
 - Headspace Hydrogen Concentration (Options 2A, 2B, and 3): The concentration of hydrogen measured in the headspace is recorded.
 - Aspiration Period/Table: The aspiration time for the option chosen is noted, along with the appropriate table from which the value was derived (i.e., TRAMPAC, Appendix 5.9, Tables 5.9-1 through 5.9-12). If the hydrogen concentration indicates that aspiration is not needed, a zero shall be entered.
 - Time Container Vented: Indicate the number of days the payload package has vented. Verify that the time the package was vented complies with the prescribed aspiration time recorded above.
- TCO (Section 6.1.6.1): The TCO verifies that all of the requirements for the above transportation parameters are met as stated in this document. The TCO signs and dates the PCTCD upon completion, thereby authorizing the payload package for TRUPACT-II transport (or to be overpacked in another payload package, in which case the OPCTCD is also completed). If the requirements are not met, the payload package is rejected (nonconformance disposition) and not qualified for shipment.

The information listed in Appendix 7 (and Appendix 9, as applicable) is recorded in WEMS, and the applicable PCTCD is generated from the entered information. WEMS software controls ensure compliance with applicable payload package restrictions. Procedure PRO-X05-WC-4018, Transuranic (TRU) Waste Certification, provides instructions for verifying that the information is complete and in compliance with applicable restrictions for each payload package. The TCO ensures payload compliance with the TRUPACT-II restrictions in accordance with 4-T20-Traffic-505, Certifying Authorized Payloads for TRUPACT-II. Additionally, all payload packages are processed through the e-TRAMPAC software system in WWIS. The e-TRAMPAC system also verifies compliance with the applicable payload package restrictions.

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6.6.2.2 Procedure for Certification of Individual Payload Packages (Test Category)

RFETS qualifies an individual payload package for transport in a TRUPACT-II under the test category by verifying that the payload package meets the parameter requirements/limits listed in Appendix 8, PCTCD, Test Category, and Appendix 9 OPCTCD, if applicable. The PCTCD is completed for each payload package to be directly loaded into the ICV. If payload packages are overpacked, the PCTCD is completed for each payload package overpacked, and the OPCTCD is completed for the payload package overpacking other payload packages. Appendix 8 is a reproduction of the form as shown in the TRAMPAC and is modified in RFETS procedures. All parameters noted on the form are included in the modified version. Data on the parameters for specific payload packages are obtained by the methods outlined in this document.

Appendix 8 is completed as follows:

- Complete items described for Appendix 7 as directed above.
- The test criteria data are obtained from the test procedure of each payload package. If the Unified Flammable Gas Test Procedure (TRAMPAC, Appendix 5.7) is implemented for a payload package, the test criteria are obtained from Attachment A of Appendix 5.7 of the TRAMPAC. The TCO shall verify and indicate on the PCTCD that all test criteria have been met pursuant to Attachment A of Appendix 5.7 of the TRAMPAC.
- TCO (Section 6.1.6.1): The TCO verifies that all of the requirements for the above transportation parameters are met as stated in this document. The TCO signs and dates the PCTCD upon completion, thereby authorizing the payload package for TRUPACT-II transport (or to be overpacked in another payload package, in which case the OPCTCD is also completed). If the requirements are not met, the payload package is rejected (nonconformance disposition) and not qualified for shipment.

The information associated with Test Category waste is recorded in WEMS, and the applicable PCTCD is generated from the entered information. WEMS software controls ensure compliance with applicable payload package restrictions. Procedure PRO-X05-WC-4018, Transuranic (TRU) Waste Certification, provides instructions for verifying that the information is complete and compliance with applicable restrictions for each payload package. The TCO ensures payload compliance with the TRUPACT-II restrictions in accordance with 4-T20-Traffic-505, Certifying Authorized Payloads for TRUPACT-II. Additionally, all payload packages are processed through the e-TRAMPAC software system in WWIS. The e-TRAMPAC system also verifies compliance with the applicable payload package restrictions.

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6.6.2.3 Procedure for Certification of Overpack Payload Packages

Appendix 9, the OPCTCD, shall be completed for each payload package overpacking other payload packages. Appendix 9 is a reproduction of the form as shown in the TRAMPAC and is modified in RFETS procedures. Data on the parameters for specific payload packages are obtained by methods outlined in this document. The OPCTCD shall be completed as follows (section numbers in parentheses refer to the sections in this document that provide requirements and compliance and verification information for the transportation parameters described):

Identification Parameters

- Overpack Container ID#/Overpack Container Bar Code # (Section 6.2.4): The site-specific ID number is unique to each container of waste (payload package) and provides a means for tracking process data records and package history. These records on the properties of the payload package are referred to as the "data package." The container ID number is assigned to the payload package prior to waste packaging. The ID number appears on a label affixed to the payload package and can be read for visual verification or for electronic retrieval (i.e., bar codes). Information necessary for transporting payload packages is entered into the data package under this ID number.
- Governing Payload Shipping Category Number (Section 6.5.1): The governing shipping category for the overpack configuration shall be determined by selecting the payload shipping category of the overpacked package with either the lowest decay heat limit or the lowest hydrogen/flammable gas generation rate limit. These values shall be determined by consulting the appropriate PCTCDs completed for the payload package(s) to be overpacked. The payload package type shall be the same for all packages overpacked within the overpack payload package.
- Governing Decay Heat Limit (Section 6.5.2.2): The maximum allowable decay heat per payload package for the governing payload shipping category of the overpacked configuration shall be recorded from Table 6-7 or derived using the methodology described in Appendix 5.5 of the TRAMPAC.
- Governing Hydrogen/Flammable Gas Generation Rate Limit (Section 6.5.2.2 or 6.5.2.3): The governing flammable gas generation rate limit for the overpack is recorded either from Table 6-7 or determined using the methodology described in Appendix 5.5 (for analytical category waste) or from Attachment A of Appendix 5.7 (for test category waste) of the TRAMPAC.

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6.6.2.3 Procedure for Certification of Overpack Payload Packages (continued)Identification Parameters (continued)

- Overpack/Overpacked Container Type (Section 6.2.1): Select the appropriate Overpack Container Type and Overpacked Container Type. The payload package shall be one of the approved types in one of the following authorized configurations:
 - SWB:
 - SWB with 55-Gallon Drum(s) (SWB Overpack): Waste packaged in 55-gallon drum(s) overpacked in one SWB (up to four 55-gallon drums per SWB). Complete the OPCTCD for the SWB using information from the PCTCD, which shall be completed separately for each 55-gallon drum. Select “SWB” as the Overpack Container Type and “55-Gallon Drum” as the Overpacked Container Type.
 - TDOP:
 - TDOP with 55-Gallon Drum(s): Waste packaged in 55-gallon drum(s) overpacked in one TDOP (up to ten 55-gallon drums per TDOP). Complete the OPCTCD for the TDOP using information from the PCTCD, which shall be completed separately for each 55-gallon drum. Select “TDOP” as the Overpack Container Type and “55-Gallon Drum” as the Overpacked Container Type.
 - TDOP with SWB: Waste packaged in one SWB overpacked in one TDOP (one SWB per TDOP). Complete the OPCTCD for the TDOP using information from the PCTCD, which shall be completed for the SWB. Select “TDOP” as the Overpack Container Type and “SWB” as the Overpacked Container Type.
 - TDOP with SWB Overpack - Waste packaged in 55-gallon drum(s) overpacked in one SWB (up to four 55-gallon drums per SWB) overpacked in one TDOP (one SWB per TDOP). Complete the OPCTCD for the SWB using information from the PCTCD, which shall be completed separately for each 55-gallon drum. Also complete the OPCTCD separately for the TDOP using information from the OPCTCD completed for the SWB overpacked in the TDOP. On the OPCTCD for the SWB, select “SWB” as the Overpack Container Type and “55-Gallon Drum” as the Overpacked Container Type. On the OPCTCD for the TDOP, select “TDOP” as the Overpack Container Type and “SWB Overpack” as the Overpacked Container Type.

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6.6.2.3 Procedure for Certification of Overpack Payload Packages (continued)

Identification Parameters (continued)

- Overpack/Overpacked Container Type (Section 6.2.1) (continued):
 - TDOP (continued):
 - TDOP with 85-Gallon Drum Overpack(s) - Waste packaged in one 55-gallon drum overpacked in one 85-gallon drum overpacked in one TDOP (up to six 85-gallon drum overpacks per TDOP). Complete the OPCTCD for the TDOP using information from the PCTCD, which shall be completed separately for each 85-gallon drum overpack. Select "TDOP" as the Overpack Container Type and "85-Gallon Drum Overpack" as the Overpacked Container Type.
 - TDOP with Bin Overpack - Waste packaged in one bin overpacked in one SWB overpacked in one TDOP (one bin overpack per TDOP). Complete the OPCTCD for the TDOP using information from the PCTCD, which shall be completed for the bin overpack. Select "TDOP" as the Overpack Container Type and "Bin Overpack" as the Overpacked Container Type.
- Weight Limit (Section 6.2.3): The maximum allowable weight limit for the appropriate overpacking payload package type (i.e., SWB or TDOP) shall be recorded. The limit applies only to the outermost payload package. If an SWB Overpack will be overpacked in a TDOP, the limit for maximum allowable weight applies only to the TDOP of the overpacked configuration.
- Fissile Mass Limit (Section 6.3.1): The maximum allowable fissile mass limit for the appropriate payload package type (i.e., SWB or TDOP) shall be recorded. The limit applies only to the outermost payload package.
- Certification Site: The certification site shall be recorded at the location at which transportation certification occurs.
- Content Code (Section 6.5.1): The content code from the data package for the payload package shall be approved as described in Section 6.5.1.

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6.6.2.3 Procedure for Certification of Overpack Payload Packages (continued)

TRAMPAC Transportation Parameters

Compliance information for the TRAMPAC transportation parameters shall be obtained from the data package for the payload package. The TCO shall indicate compliance with each requirement in the space provided. The following criteria shall be met:

- Radiation dose rate $\leq$ 200 mrem/hr at surface of payload package (Section 6.3.2): The limit applies only to the outermost payload package. If an SWB overpack will be overpacked in a TDOP, the limit for radiation dose rate applies only to the TDOP. Compliance with this parameter requirement is verified by completing the OPCTCD separately for the TDOP.
- Filter Identification (Section 6.2.5): Identification shall be listed for the type and appropriate number of filters as determined by payload package type (i.e., SWB or TDOP). See Section 6.2.5 for the number of filters required for each package type.

Overpacked Container Measured Parameters

- Overpacked Container ID Number (Section 6.2.4): List the site-specific identification number for each of the overpacked payload packages.

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6.6.2.3 Procedure for Certification of Overpack Payload Packages (continued)

Overpacked Container Measured Parameters (continued)

- Measured Weight and Measurement Error (Section 6.2.3): The measured weight and measurement error (one standard deviation) for each overpacked payload package or the entire overpack configuration shall be recorded. The measured weight and measurement error may be obtained from PCTCD(s) or OPCTCD for each overpacked payload package. The measured weight of the individual overpacked payload packages is not required if the entire overpack configuration will be weighed. If the weight of each individual overpacked payload package is recorded, enter the weight and measurement error (one standard deviation) of the empty overpack payload package on the last row. Calculate the total weight as the sum of each of the individual weights (including the weight of the empty overpack container), and record this value in the appropriate box. Calculate the root-mean square (RMS) error for the overpack configuration as the square root of the sum of the squares of the individually listed errors, and record this value in the appropriate box. If the entire overpack configuration is weighed, record the total weight of the overpack configuration and the measurement error (one standard deviation) in the appropriate boxes (in this case, the measurement error is the same as the RMS error).

The total weight plus the total RMS error of the entire overpack configuration shall be recorded in the space provided and compared to the maximum allowable weight limit for the outermost payload package of the overpack configuration (i.e., 4,000 lbs. per SWB or 6,700 lbs. per TDOP). As noted previously, if an SWB Overpack will be overpacked in a TDOP, the limit for maximum allowable weight applies only to the TDOP of the overpacked configuration.

- Measured Decay Heat and Measurement Error (Section 6.5.2.2): The measured decay heat value and measurement error (one standard deviation) for each overpacked analytical category payload package shall be recorded. The measured decay heat value and measurement error may be obtained from the PCTCD(s) or OPCTCD for each overpacked payload package.

For analytical category payload packages, the decay heat value plus the measurement error for each payload package shall be compared individually to the Governing Decay Heat Limit for the overpacked configuration. The spaces provided for "Total" and "Total RMS Error" are for use in completing the OPCTCD.

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6.6.2.3 Procedure for Certification of Overpack Payload Packages (continued)Overpacked Container Measured Parameters (continued)

- Decay Heat Limit (Section 6.5.2.2): For analytical category payload packages, the maximum allowable decay heat limit per overpacked payload package for the applicable payload shipping category shall be recorded from the PCTCD(s) or OPCTCD. The decay heat limits are recorded for use in determining the governing decay heat limit.
- Measured Fissile Mass (FGE) and Measurement Error (Section 6.3.1): The measured fissile mass and two times the measurement error (two standard deviations) for each payload package shall be recorded as obtained from the PCTCD(s) or OPCTCD for each overpacked payload package.

The subtotal fissile mass plus the total RMS error (RMS of twice each individual measurement error) of the entire overpack configuration shall be compared to the maximum allowable fissile mass limit for the outermost payload package of the overpack configuration (i.e., 325 FGE per SWB or per TDOP).
- Hydrogen/Flammable Gas Generation Rate (Section 6.5.2.3): The hydrogen/flammable gas generation rate for each overpacked test category payload package shall be recorded. The hydrogen/flammable gas generation rate limit for each payload package (analytical or test category) shall be recorded for later use in completing the PATCD.

For test category payload packages, the hydrogen/flammable gas generation rate for each payload package shall be compared individually to the Governing Hydrogen/Flammable Gas Generation Rate Limit.
- Hydrogen/Flammable Gas Generation Rate Limit (Section 6.5.2.3): For test category and analytical category payload packages, the hydrogen/flammable gas generation rate limit per overpacked payload package for the applicable payload shipping category shall be recorded from the PCTCD(s) (test category) or the TRAMPAC (analytical category). The hydrogen/flammable gas generation rate limits are recorded for use in determining the governing limit.
- Certification of Compliance: The TCO shall indicate compliance with the requirements for weight, fissile mass, decay heat, and hydrogen/flammable gas generation rate by initials in the spaces provided.

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6.6.2.3 Procedure for Certification of Overpack Payload Packages (continued)

Overpacked Container Measured Parameters (continued)

- Transportation Certification Official (Section 6.1.6.1): The site TCO shall verify that all of the requirements for the above transportation parameters are met as stated in this document. The site TCO shall sign and date the OPCTCD upon completion, thereby authorizing the payload package for TRUPACT-II transport or to be overpacked in another payload package, in which case the OPCTCD must be completed again. If the requirements are not met, the payload package is rejected (nonconformance disposition) and is not qualified for shipment.

The information associated with Test Category waste is recorded in WEMS, and the applicable PCTCD is generated from the entered information. WEMS software controls ensure compliance with applicable payload package restrictions. Procedure PRO-X05-WC-4018, Transuranic (TRU) Waste Certification, provides instructions for verifying that the information is complete and compliance with applicable restrictions for each payload package. The TCO ensures payload compliance with the TRUPACT-II restrictions in accordance with 4-T20-Traffic-505, Certifying Authorized Payloads for TRUPACT-II. Additionally, all payload packages are processed through the e-TRAMPAC software system in WWIS. The e-TRAMPAC system also verifies compliance with the applicable payload package restrictions.

6.6.2.4 Procedure for Assembly and Certification of a TRUPACT-II Payload of Same or Equivalent Shipping Category

RFETS qualifies a payload for transport in the TRUPACT-II by verifying that the payload meets the parameter requirements/limits listed in Appendix 6. Appendix 6 is a reproduction of the form as shown in the TRAMPAC.

Appendix 6 is completed as follows (section numbers in parentheses refer to sections in this document that provide requirement, compliance, and verification information for the transportation parameter described):

Identification Parameters

- Shipment #: The shipment number of the trailer or railcar of TRUPACT-IIs is recorded. For shipments by railcar, each railcar is assigned a separate shipment number or shipment number prefix.
- TRUPACT-II Outer Containment Assembly (OCA) Body/Lid #: The identification numbers on the TRUPACT-II OCA body and lid are recorded.

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6.6.2.4 Procedure for Assembly and Certification of a TRUPACT-II Payload of Same or Equivalent Shipping Category (continued)

Identification Parameters (continued)

- Governing Payload Shipping Category (Section 6.5.1): The governing shipping category of the payload is recorded only if all packages belong to the same or equivalent shipping category. The first two digits (representing the waste type) of the ten-digit payload shipping category notation are the same for all payload packages making up a payload. The value of the other digits of the shipping category (representing the bounding G value and the total resistance) for each payload package may differ provided the decay heat limit for all payload packages within the payload is conservatively assumed to be the same as that of the payload package with the lowest decay heat limit.

The procedures for certifying payloads of mixed shipping categories, including dunnage packages, are described in Section 6.6.2.5.

Visual inspection of the affixed shipping category labels on each payload package or the respective PCTCD (Appendices 7 and 8) or OPCTCD (Appendix 9), if applicable, ensures the appropriate shipping category assignment to the payload.

- Governing Payload Shipping Category Decay Heat Limit (Section 6.5.2.2): If all packages belong to the same or equivalent shipping category, the maximum allowable decay heat per payload package for the governing payload shipping category shall be recorded from the PCTCD and OPCTCD. Mixing of shipping categories and payloads of any authorized contents, including credit for dunnage, is allowed as described in Section 6.6.2.5.
- Governing Hydrogen/Flammable Gas Generation Rate Limit (Section 6.5.2.2): If all packages belong to the same or equivalent shipping category, the maximum allowable hydrogen/flammable gas generation rate per payload package for the governing payload shipping category shall be recorded from PCTCD(s) and OPCTCD(s). Mixing of shipping categories and payloads of any authorized contents, including credit for dunnage, is allowed as described in Section 6.6.2.5.
- Type of Payload (Section 6.2.1): The payload configuration consists of an approved type of payload package.
- Date ICV Closed: The date that the ICV is closed is recorded.

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6.6.2.4 Procedure for Assembly and Certification of a TRUPACT-II Payload of Same or Equivalent Shipping Category (continued)Identification Parameters (continued)

- Payload Composition: The following data are recorded from each PCTCD (Appendices 7 and 8) or from the OPCTCD, as applicable, for each payload package or dunnage comprising the payload. Only the "Container ID Number," "Weight," and weight measurement "Error" need to be completed for dunnage packages. If the data are obtained from the OPCTCD, errors should be the calculated RMS errors (the square root of the sum of the squares of the individually listed errors).
 - Payload package ID number or "DUNNAGE" or "EMPTY"
 - Measured weight and measurement error
 - Measured decay heat and measurement error (one standard deviation)
 - Measured fissile mass and two times the measurement error (two standard deviations or one times the RMS error if values are taken from an OPCTCD)
 - Measured hydrogen/flammable gas generation rate.

The weight, decay heat, and fissile mass values of individual payload packages and dunnage of both the bottom and top layers are summed, and the total measurement error for each parameter shall be calculated as the square root of the sum of the squares of the individual measurement errors (indicated in Appendices 7 and 8). The measurement error on the total weight can also be determined by weighing the total payload assembly and determining the measurement error.

- Weight of Pallets, Reinforcing Plates, Slip Sheets, Guide Tubes, Adjustable Slings, etc. (Section 6.2.3): The total measured weight of the pallets, reinforcing plates, slip sheets (optional), guide tubes, etc., (or 265 pounds) is recorded.
- Total Weight/Total RMS Weight Error (Section 6.2.3): The sum of the subtotal weights plus the weight of the pallets, reinforcing plates, slip sheets, guide tubes, etc., (or 265 pounds) and the RMS weight error is recorded. If the weight is determined through a single measurement of the payload assembly, the associated error is simply the error for that one measurement (one standard deviation).
- Total Decay Heat/Total RMS Decay Heat Error (Section 6.5.2): The sum of the subtotal decay heats and the total RMS error is recorded.

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6.6.2.4 Procedure for Assembly and Certification of a TRUPACT-II Payload of Same or Equivalent Shipping Category (continued)

Identification Parameters (continued)

- Total Fissile Mass/Total RMS Error (Section 6.3.1): The sum of the subtotal fissile masses and the total RMS error is recorded.
- Bottom Assembly Weight plus Subtotal RMS Error (Section 6.2.3): The subtotal weight plus the subtotal RMS error of the bottom layer of seven 55-gallon drums, three 100-gallon drums, seven POCs, SWB, five 55-gallon drums, or 4 85-gallon drums in a TDOP is recorded
- Top Assembly Weight plus Subtotal RMS Error: The subtotal weight plus the subtotal RMS error for the top layer of seven 55-gallon drums, three 100-gallon drums, seven POCs, SWB, or five drums in a TDOP is recorded..
- Total Weight plus Total RMS Error: The sum of the total weight plus the weight of the pallets, reinforcing plates, slip sheets, guide tubes, adjustable slings, etc., plus the total RMS weight error is recorded.
- Total Fissile Mass plus Total RMS Error: The sum of the total fissile mass values plus the total RMS fissile mass error is recorded.
- Total Decay Heat plus Total RMS Error: The sum of the total decay heat values plus the total RMS decay heat error is recorded.

Payload Certification Parameters

The TCO shall indicate compliance with the following requirements by initials in the spaces provided.

- Decay Heat plus Error of Each Analytical Category Payload Container Less Than or Equal to Governing Decay Heat Limit (Section 6.5.2.2): For payload packages with the same or equivalent payload shipping category shipped under a governing payload shipping category, all analytical category payload packages shall meet the governing decay heat limit.
- Hydrogen/Flammable Gas Generation Rate of Each Test Category Payload Container Less Than or Equal to Governing Hydrogen/Flammable Gas Generation Rate Limit (Section 6.5.2.3): For payload packages with the same or equivalent payload shipping category shipped under a governing hydrogen/flammable gas generation rate, all payload packages shall meet the governing hydrogen/flammable gas generation rate limit.

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6.6.2.4 Procedure for Assembly and Certification of a TRUPACT-II Payload of Same or Equivalent Shipping Category (continued)

Payload Certification Parameters (continued)

- Bottom Weight Greater Than or Equal to Top Weight (Section 6.2.3): The subtotal weight plus subtotal RMS weight error of the bottom layer of seven 55-gallon drums, three 100-gallon drums, seven pipe overpacks, one SWB, five 55-gallon drums in a TDOP, or four 85-gallon drums in a TDOP shall be greater than or equal to that of the top layer.
- Total Weight plus RMS Error Less Than or Equal to 7,265 Lbs. (Section 6.2.3): The total measured payload weight plus the weight of the pallets, reinforcing plates, etc., plus the total RMS weight error shall be less than or equal to 7,265 pounds.
- Decay Heat plus RMS Error Less Than or Equal to 40 Watts (Section 6.5.2.2): The total measured decay heat value plus the total RMS decay heat error shall be less than or equal to the design limit for the packaging. The design limit for the TRUPACT-II is 40 watts.
- Fissile Mass (Pu-239 FGE) plus RMS Error Less Than or Equal to Payload Limit (Section 6.3.1): The total measured fissile mass (Pu-239 FGE) plus the total RMS fissile mass error shall be less than or equal to the maximum allowable fissile mass limit established for the payload configuration. If the payload is composed of only POCs (standard, S100, or S200), the total Pu-239 FGE limit is 2,800 grams per TRUPACT-II. The total Pu-239 FGE limit for all other payloads is 325 grams per TRUPACT-II.
- Transportation Certification Official (Section 6.1.6.1): The Transportation Certification Official shall sign and date the PATCD upon verifying that the TRAMPAC transportation requirements are met and the payload is qualified for transport.

Appendix 6 lists the information that is required to be recorded for a TRUPACT-II payload assembly. A TRUPACT-II shipment is authorized only if all the payload control parameters are in compliance. The TCO is responsible for verifying this compliance before authorizing the TRUPACT-II for transport.

All data necessary to generate the information required in Appendix 6 is captured in WEMS and subsequently transmitted to the WWIS. The e-TRAMPAC system in WWIS calculates and ensures compliance with all applicable payload restrictions and generates the PATCD (Appendix 6) Procedure PRO-X05-WC-4018, Transuranic (TRU) Waste Certification, provides instructions for verifying that the information is complete and is in compliance with applicable restrictions for each payload package. The TCO ensures payload compliance with the TRUPACT-II restrictions in accordance with 4-T20-Traffic-505, Certifying Authorized Payloads for TRUPACT-II.

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6.6.2.5 Procedure for Assembly and Certification of a TRUPACT-II Payload of Different Shipping Categories

An assembly of payload packages with different shipping categories may be approved by ensuring that each payload package does not contain a flammable mixture of gases, while accounting for the properties of each of the other payload packages in the assembly, which may include dunnage packages. Each payload package is assessed through the calculation of the Flammability Index (FI) for the package, which accounts for the properties of each package in the mixed payload assembly. FI is only applicable to mixed payload assemblies.

Unlimited mixing of shipping categories is allowed for payload assemblies of direct-loaded payload configurations. For payload assemblies comprised of overpacked payload configurations, mixing of shipping categories is allowed provided that all payload packages being overpacked meet the lowest decay heat limit or lowest hydrogen gas generation rate limit of all the payload packages in the payload assembly as described in Section 6.6.2.4.

RFETS evaluates payload assemblies of direct-loaded payload configurations with different shipping categories by the following procedure:

- Appendix 6 is completed as described in Section 6.6.2.4 with the exception of the following identification parameters and payload certification parameters:
 - Identification Parameters:
 - Governing Payload Shipping Category
 - Governing Payload Shipping Category Decay Heat Limit
 - Governing Hydrogen/Flammable Gas Generation Rate Limit
 - Payload Certification Parameters:
 - Decay Heat plus Error of Each Analytical Category Payload Container $\leq$ Governing Limit
 - Hydrogen/Flammable Gas Generation Rate of Each Test Category Payload Container $\leq$ Governing Limit.

For mixed payloads, mark the above Appendix 6 sections as "N/A."

- In lieu of the above parameters, the following payload assembly composition parameter and payload certification parameter must be completed in Appendix 6:
 - Payload Assembly Composition Parameter:
 - Flammability Index
 - Payload Certification Parameter:
 - Flammability Index of Each Payload Container $\leq 50,000$.

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6.6.2.5 Procedure for Assembly and Certification of a TRUPACT-II Payload of Different Shipping Categories (continued)

- For payload assemblies with dunnage, or multiple shipping categories, record the Flammability Index (FI) for each payload package under the Payload Assembly Composition Parameter section. The FI determination is performed by the e-TRAMPAC system in WWIS using data transmitted to the WWIS from the WEMS. The e-TRAMPAC system ensures compliance with the applicable FI criteria. RFETS qualifies a payload for shipment only if the FI of each payload package is equal to or less than 50,000. If one or more payload package(s) fail the FI requirement, the payload assembly shall be reconfigured until all payload packages satisfy this requirement. Otherwise, payload packages not meeting the FI requirement shall be placed in the test category or rejected from transport, subject to mitigation or repackaging. All other PATCD fields must be completed as described in Section 6.6.2.4. Procedure PRO-X05-WC-4018, Transuranic (TRU) Waste Certification, provides instructions for verifying that the information is complete and is in compliance with applicable restrictions. The TCO ensures compliance with the TRUPACT-II restrictions in accordance with 4-T20-Traffic-505, Certifying Authorized Payloads for TRUPACT-II.

The logic for determining the FI for each payload package by the e-TRAMPAC is consistent with that described in Appendix 6.3 of the TRAMPAC. This logic is summarized as follows:

- For each payload package, the FI is calculated as the ratio of the actual flammable gas generation rate to the allowable flammable gas generation rate limit multiplied by 50,000. The FI for each payload package must be less than or equal to 50,000 for the payload to be eligible for shipment.
- Allowable Flammable Gas Generation Rate. Per Section 6.5.2, the determination of allowable flammable gas generation rates takes into account the concentrations of flammable VOCs within the innermost layer of confinement, if present, and the void volume of any dunnage packages. The maximum concentration of flammable gas and flammable VOCs in the innermost layer is limited to the MLEL. The allowable flammable gas concentration (AFGC) is calculated as the difference between the MLEL and the sum of the flammable VOC concentrations. An allowable flammable gas generation rate for each payload package is calculated to yield a maximum flammable gas concentration equivalent to the AFGC.
- For analytical category payload packages or test category payload packages that have headspace concentrations of flammable VOCs less than or equal to 500 ppm, the AFGC is equal to the MLEL of 0.05 mole fraction (i.e., 5 volume percent).

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6.6.2.5 Procedure for Assembly and Certification of a TRUPACT-II Payload of Different Shipping Categories (continued)

- For test category payload packages (i.e., payload packages exceeding the analytical decay heat limit, payload packages with headspace flammable VOC concentrations in excess of 500 ppm, and payload packages of Waste Type IV), the AFGC is calculated as the difference between the MLEL at the end of the 60-day shipping period and the innermost confinement layer sum of flammable VOC concentrations.
- Actual Flammable Gas Generation Rate. For analytical category payload packages, the actual flammable gas generation rate is calculated as:

$$CG_{i,actual} = \frac{Q_i (G \text{ molecules} / 100 \text{ eV})}{N_A (1.602(10)^{-19} \text{ watt} - \text{second} / \text{eV})}$$

where,

- Q_i = Decay heat of payload package (watts)
 N_A = Avogadro's number = $6.0225(10)^{23}$ molecules/mole
 G = G_{eff} (flam gas) = Effective G value for flammable gas
 (molecules of hydrogen formed/100 eV emitted energy)

- For test category payload packages, the actual gas generation rate is obtained either through measurement of the flammable gas concentration in the drum or liner headspace and calculation of the rate, or through testing.

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6.7 Quality Assurance

NOTE: *The general requirements identified in the TRAMPAC are addressed in the TWCP QAPjP. The specific processes are detailed in the radiography procedures referenced in the TWCP QAPjP (refer to the TWCP QAPjP, Table B-1, Section B1-3, and Section B3-4).*

This section describes the QA programs applicable to the TRAMPAC. QA programs applicable to procurement, design, fabrication, assembly, testing, use, maintenance, and repair of the TRUPACT-II packaging are found in the TRUPACT-II SAR, Section 9.0.

6.7.1 QA Requirements for Payload Compliance

Certification of authorized contents for shipment in the TRUPACT-II is performed under a written QA program that provides confidence, for both the shipper and receiver, that the TRAMPAC requirements are met. All waste is described in an approved content code.

6.7.2 QA Compliance and Verification

This TRAMPAC Compliance Plan documents the compliance methods used by RFETS in meeting the requirements of the TRAMPAC. The CBFO managing and operating contractor will perform surveillance of these compliance procedures to ensure all the requirements of the TRAMPAC are met. The CBFO will periodically audit RFETS' payload compliance QA Program.

See Section 3 for information on the QA program for the overall management of TRU and TRU mixed waste at RFETS. The Packaging QA Program is described in Section 4.6 of this document. Also see Section 2.2 of this document.

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**Table 6-1, Pu-239 Fissile Gram Equivalent, Decay Heat, and Specific Activity
of Many Radionuclides**

NUCLIDE		ATOMIC NUMBER	Pu-239FGE ^a	DECAY HEAT ^b (W/g)	SPECIFIC ACTIVITY ^c (Ci/g)
H	3	1	0.00E+00	3.28E-01	9.76E+03
C	14	6	0.00E+00	1.32E-03	4.51E+00
Na	22	11	0.00E+00	8.94E+01	6.32E+03
P	32	15	0.00E+00	1.19E+03	2.89E+05
Cr	51	24	0.00E+00	1.95E+01	9.24E+04
Mn	54	25	0.00E+00	3.88E+01	7.82E+03
Fe	55	26	0.00E+00	8.49E-02	2.44E+03
Fe	59	26	0.00E+00	3.80E+02	4.92E+04
Co	57	27	0.00E+00	7.29E+00	8.55E+03
Co	58	27	0.00E+00	1.91E+02	3.18E+04
Co	60	27	0.00E+00	1.76E+01	1.14E+03
Ni	59	28	0.00E+00	3.22E-06	8.08E-02
Ni	63	28	0.00E+00	6.05E-03	5.98E+01
Cu	64	29	0.00E+00	7.21E+03	3.89E+06
Zn	65	30	0.00E+00	2.89E+01	8.24E+03
As	73	33	0.00E+00	1.02E+01	2.25E+04
Se	79	34	0.00E+00	2.18E-05	6.97E-02
Kr	85	36	0.00E+00	5.94E-01	3.97E+02
Rb	86	37	0.00E+00	3.71E+02	8.22E+04
Sr	89	38	0.00E+00	1.01E+02	2.94E+04
Sr	90	38	0.00E+00	1.60E-01	1.38E+02
Y	88	39	0.00E+00	2.24E+02	1.41E+04
Y	90	39	0.00E+00	3.01E+03	5.44E+05
Y	90m	39	0.00E+00	4.40E+04	1.09E+07
Y	91	39	0.00E+00	8.83E+01	2.45E+04
Zr	88	40	0.00E+00	4.46E+01	1.80E+04
Zr	90	40	0.00E+00	N/A ^d	N/A ^d
Zr	90m	40	0.00E+00	2.13E+09	1.55E+11
Zr	93	40	0.00E+00	7.29E-07	2.51E-03
Zr	95	40	0.00E+00	1.10E+02	2.17E+04
Nb	95	41	0.00E+00	1.87E+02	3.91E+04
Nb	95m	41	0.00E+00	6.11E+02	3.81E+05
Tc	99	43	0.00E+00	8.49E-06	1.70E-02
Tc	99m	43	0.00E+00	4.31E+03	5.27E+06
Ru	103	44	0.00E+00	1.05E+02	3.26E+04
Ru	106	44	0.00E+00	2.00E-01	3.38E+03
Rh	103m	45	0.00E+00	7.55E+03	3.25E+07

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**Table 6-1, Pu-239 Fissile Gram Equivalent, Decay Heat, and Specific Activity
of Many Radionuclides (continued)**

NUCLIDE		ATOMIC NUMBER	Pu-239FGE ^a	DECAY HEAT ^b (W/g)	SPECIFIC ACTIVITY ^c (Ci/g)
Rh	106	45	0.00E+00	6.74E+07	3.56E+09
Pd	107	46	0.00E+00	2.83E-08	5.14E-04
Ag	109m	47	0.00E+00	1.32E+06	2.61E+09
Ag	110	47	0.00E+00	3.01E+07	4.17E+09
Ag	110m	47	0.00E+00	7.99E+01	4.80E+03
Cd	109	48	0.00E+00	1.68E+00	2.61E+03
Cd	113m	48	0.00E+00	2.34E-01	2.17E+02
Sn	119m	50	0.00E+00	2.38E+00	4.48E+03
Sn	121m	50	0.00E+00	1.44E-02	5.91E+01
Sn	123	50	0.00E+00	2.58E+01	8.22E+03
Sn	126	50	0.00E+00	3.06E-05	2.84E-02
Sb	125	51	0.00E+00	3.27E+00	1.04E+03
Sb	126	51	0.00E+00	1.54E+03	8.36E+04
Sb	126m	51	0.00E+00	1.01E+06	7.85E+07
Te	123	52	0.00E+00	6.50E-17	4.85E-12
Te	123m	52	0.00E+00	1.31E+01	8.87E+03
Te	125m	52	0.00E+00	1.57E+01	1.80E+04
Te	127	52	0.00E+00	3.59E+03	2.64E+06
Te	127m	52	0.00E+00	5.21E+00	9.43E+03
I	125	53	0.00E+00	6.38E+00	1.76E+04
I	129	53	0.00E+00	9.34E-08	1.79E-04
I	131	53	0.00E+00	4.23E+02	1.25E+05
Cs	134	55	0.00E+00	1.33E+01	1.31E+03
Cs	135	55	0.00E+00	3.82E-07	1.15E-03
Cs	137	55	0.00E+00	9.74E-02	8.80E+01
Ba	133	56	0.00E+00	6.82E-01	2.53E+02
Ba	137	56	0.00E+00	N/A ^d	N/A ^d
Ba	137m	56	0.00E+00	2.12E+06	5.38E+08
Ce	141	58	0.00E+00	4.19E+01	2.88E+04
Ce	144	58	0.00E+00	2.14E+00	3.22E+03
Pr	144	59	0.00E+00	5.54E+05	7.56E+07
Pr	144m	59	0.00E+00	6.22E+04	1.81E+08
Pm	146	61	0.00E+00	2.22E+00	4.43E+02
Pm	147	61	0.00E+00	3.44E-01	9.38E+02
Sm	146	62	0.00E+00	3.47E-07	2.38E-05
Sm	147	62	0.00E+00	3.04E-10	2.30E-08
Sm	151	62	0.00E+00	3.10E-03	2.66E+01
Eu	150	63	0.00E+00	5.95E-01	6.46E+01

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**Table 6-1, Pu-239 Fissile Gram Equivalent, Decay Heat, and Specific Activity
of Many Radionuclides (continued)**

NUCLIDE		ATOMIC NUMBER	Pu-239FGE ^a	DECAY HEAT ^b (W/g)	SPECIFIC ACTIVITY ^c (Ci/g)
Eu	152	63	0.00E+00	1.35E+00	1.78E+02
Eu	154	63	0.00E+00	2.39E+00	2.67E+02
Eu	155	63	0.00E+00	3.42E-01	4.70E+02
Gd	152	64	0.00E+00	2.77E-13	2.18E-11
Gd	153	64	0.00E+00	2.96E+00	3.53E+03
Tm	168	69	0.00E+00	8.39E+01	8.44E+03
Ta	182	73	0.00E+00	5.60E+01	6.31E+03
Au	198	79	0.00E+00	1.51E+03	2.45E+05
Tl	207	81	0.00E+00	5.58E+05	1.90E+08
Tl	208	81	0.00E+00	6.93E+06	2.95E+08
Tl	209	81	0.00E+00	8.58E+06	4.16E+08
Pb	209	82	0.00E+00	5.32E+03	4.54E+06
Pb	210	82	0.00E+00	1.96E-02	7.72E+01
Pb	211	82	0.00E+00	7.61E+04	2.47E+07
Pb	212	82	0.00E+00	2.64E+03	1.39E+06
Pb	214	82	0.00E+00	1.49E+05	3.28E+07
Bi	207	83	0.00E+00	5.34E-01	5.48E+01
Bi	210	83	0.00E+00	2.86E+02	1.24E+05
Bi	211	83	0.00E+00	1.64E+07	4.18E+08
Bi	212	83	0.00E+00	2.42E+05	1.47E+07
Bi	213	83	0.00E+00	7.64E+04	1.93E+07
Bi	214	83	0.00E+00	7.25E+05	4.41E+07
Po	209	84	0.00E+00	4.94E+00	1.68E+01
Po	210	84	0.00E+00	1.45E+02	4.54E+03
Po	211	84	0.00E+00	4.58E+09	1.04E+11
Po	212	84	0.00E+00	9.24E+15	1.77E+17
Po	213	84	0.00E+00	6.26E+14	1.26E+16
Po	214	84	0.00E+00	1.46E+13	3.21E+14
Po	215	84	0.00E+00	1.29E+12	2.95E+13
Po	216	84	0.00E+00	1.40E+10	3.48E+11
Po	218	84	0.00E+00	9.90E+06	2.78E+08
At	211	85	0.00E+00	3.05E+04	2.06E+06
At	217	85	0.00E+00	6.74E+10	1.61E+12
Rn	219	86	0.00E+00	5.30E+08	1.30E+10
Rn	220	86	0.00E+00	3.44E+07	9.22E+08
Rn	222	86	0.00E+00	5.01E+03	1.54E+05
Fr	221	87	0.00E+00	6.71E+06	1.77E+08
Fr	223	87	0.00E+00	1.10E+05	3.87E+07

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**Table 6-1, Pu-239 Fissile Gram Equivalent, Decay Heat, and Specific Activity
of Many Radionuclides (continued)**

NUCLIDE		ATOMIC NUMBER	Pu-239FGE ^a	DECAY HEAT ^b (W/g)	SPECIFIC ACTIVITY ^c (Ci/g)
Ra	223	88	0.00E+00	1.83E+03	5.18E+04
Ra	224	88	0.00E+00	5.37E+03	1.59E+05
Ra	225	88	0.00E+00	2.78E+01	3.92E+04
Ra	226	88	0.00E+00	2.88E-02	1.00E+00
Ra	228	88	0.00E+00	2.76E-02	2.76E+02
Ac	225	89	0.00E+00	1.99E+03	5.80E+04
Ac	227	89	0.00E+00	3.68E-02	7.32E+01
Ac	228	89	0.00E+00	1.80E+04	2.24E+06
Th	227	90	0.00E+00	1.11E+03	3.07E+04
Th	228	90	0.00E+00	2.71E+01	8.29E+02
Th	229	90	0.00E+00	6.17E-03	2.13E-01
Th	230	90	0.00E+00	5.75E-04	2.04E-02
Th	231	90	0.00E+00	6.43E+02	5.32E+05
Th	232	90	0.00E+00	2.68E-09	1.11E-07
Th	234	90	0.00E+00	3.45E+00	2.32E+04
Pa	231	91	0.00E+00	1.46E-03	4.78E-02
Pa	233	91	0.00E+00	4.90E+01	2.08E+04
Pa	234	91	0.00E+00	2.40E+04	2.00E+06
Pa	234m	91	0.00E+00	3.40E+06	6.87E+08
U	232	92	0.00E+00	6.93E-01	2.16E+01
U	233	92	1.00E+00	2.84E-04	9.76E-03
U	234	92	0.00E+00	1.82E-04	6.32E-03
U	235	92	1.00E+00	6.04E-08	2.19E-06
U	236	92	0.00E+00	1.78E-06	6.54E-05
U	237	92	0.00E+00	1.64E+02	8.25E+04
U	238	92	0.00E+00	8.62E-09	3.40E-07
U	239	92	0.00E+00	1.69E+05	3.35E+07
U	240	92	0.00E+00	1.17E+03	9.26E+05
Np	237	93	1.50E-02	2.09E-05	7.13E-04
Np	238	93	0.00E+00	1.49E+03	2.59E+05
Np	239	93	0.00E+00	5.87E+02	2.32E+05
Np	240	93	0.00E+00	8.52E+04	1.27E+07
Np	240m	93	0.00E+00	9.98E+05	1.08E+08
Pu	236	94	0.00E+00	1.87E+01	5.37E+02
Pu	238	94	1.13E-01	5.73E-01	1.73E+01
Pu	239	94	1.00E+00	1.95E-03	6.29E-02
Pu	240	94	2.25E-02	7.16E-03	2.30E-01
Pu	241	94	2.25E+00	3.31E-03	1.04E+02

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**Table 6-1, Pu-239 Fissile Gram Equivalent, Decay Heat, and Specific Activity
of Many Radionuclides (continued)**

NUCLIDE		ATOMIC NUMBER	Pu-239FGE ^a	DECAY HEAT ^b (W/g)	SPECIFIC ACTIVITY ^c (Ci/g)
Pu	242	94	7.50E-03	1.17E-04	3.97E-03
Pu	243	94	0.00E+00	5.38E+03	2.60E+06
Pu	244	94	0.00E+00	5.22E-07	1.79E-05
Am	241	95	1.87E-02	1.16E-01	3.47E+00
Am	242	95	0.00E+00	9.38E+02	8.08E+05
Am	242m	95	3.46E+01	4.32E-03	9.83E+00
Am	243	95	1.29E-02	6.49E-03	2.02E-01
Am	245	95	0.00E+00	2.12E+04	6.24E+06
Cm	240	96	0.00E+00	7.48E+02	2.01E+04
Cm	242	96	0.00E+00	1.23E+02	3.35E+03
Cm	243	96	5.00E+00	1.90E+00	5.22E+01
Cm	244	96	9.00E-02	2.86E+00	8.18E+01
Cm	245	96	1.50E+01	5.77E-03	1.74E-01
Cm	246	96	0.00E+00	1.02E-02	3.11E-01
Cm	247	96	5.00E-01	2.98E-06	9.38E-05
Cm	248	96	0.00E+00	5.53E-04	4.30E-03
Cm	250	96	0.00E+00	1.59E-01	2.10E-01
Bk	247	97	0.00E+00	3.69E-02	1.06E+00
Bk	249	97	0.00E+00	3.24E-01	1.66E+03
Bk	250	97	0.00E+00	3.34E+04	3.90E+06
Cf	249	98	4.50E+01	1.54E-01	4.14E+00
Cf	250	98	0.00E+00	4.12E+00	1.11E+02
Cf	251	98	9.00E+01	5.89E-02	1.60E+00
Cf	252	98	0.00E+00	4.06E+01	5.44E+02
Cf	254	98	0.00E+00	9.10E-01	8.50E+03
Es	252	99	0.00E+00	4.37E+01	1.11E+03
Es	253	99	0.00E+00	9.91E+02	2.52E+04
Es	254	99	0.00E+00	7.35E+01	1.88E+03
Es	254m	99	0.00E+00	1.69E+03	3.14E+05

^aAmerican National Standards Institute/American Nuclear Society (ANSI/ANS), 1981, "Nuclear Criticality Control of Special Actinide Elements," ANSI/ANS-8.15-1981, American National Standards Institute/American Nuclear Society, Washington, D.C.

^bInternational Commission on Radiological Protection, 1983. International Commission on Radiological Protection, 1983, "Radionuclide Transformations: Energy and Intensity of Emissions," Annals of the International Commission on Radiological Protection-38, Volumes 11-13, Pergamon Press, Oxford.

^cWalker, F.W., Kiravac, G.J., and Rourke, F.M., 1983, Chart of the Nuclides, 13th Edition, Knolls Atomic Power Laboratories, Schenectady, NY.

^dThese isotopes are stable and thus have decay heats and specific activities of zero.

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Table 6-2, Allowable Materials—Greater Than 1 Weight Percent

Allowable Materials for Waste Material Type I.1^a Absorbed, Adsorbed, or Solidified Inorganic Liquid	
Absorbents/adsorbents (e.g., Celite®, diatomaceous earth, diatomite, Florco®, Oil-Dri®, perlite, vermiculite)	Heel (e.g., ash heel; soot heel; firebrick heel; sand, slag, and crucible heel)
Acids, inorganic	Insulation, inorganic
Alumina cement	Magnesia cement (e.g., Ramcote® cement)
Aquaset® products (for aqueous solutions)	Metal hydroxides
Aqueous sludges	Metal oxides (e.g., slag)
Aqueous solutions/water	Metals (e.g., aluminum, cadmium, copper, steel, tantalum, tungsten, zinc)
Asbestos	Nitrates (e.g., ammonium nitrate, sodium nitrate)
Ash (e.g., ash bottoms, fly ash, soot)	Petroset® products (for aqueous solutions)
Batteries, dry (e.g., flashlight)	Portland cement
Ceramics (e.g., molds and crucibles)	Sand/soil, inorganic
Clays (e.g., bentonite)	Salts (e.g., calcium chloride, calcium fluoride, sodium chloride)
Concrete	Other inorganic materials
Envirostone® (no organic emulsifiers allowed)	a Other chemicals or materials not identified in this table are allowed provided that they met the requirements for trace constituents, as defined in Section 6.4.3.1. All materials in the final waste form must be inert (nonreactive), be in a nonreactive form, or have been rendered nonreactive.
Fiberglass, inorganic	
Filter media, inorganic	
Firebrick	
Glass (e.g., borosilicate glass, labware, leaded glass, Raschig rings)	
Graphite (e.g., molds and crucibles)	
Grit	

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Table 6-2, Allowable Materials—Greater Than 1 Weight Percent (continued)

Allowable Materials for Waste Material Type I.2^a Soils, Solidified Particulates, or Sludges Formed from Precipitation	
Absorbents/adsorbents (e.g., Celite®, diatomaceous earth, diatomite, Florco®, Oil-Dri®, perlite, vermiculite) Alumina cement Aquaset® products (for aqueous solutions) Aqueous sludges Aqueous solutions/water Asbestos Ash (e.g., ash bottoms, fly ash, soot) Batteries, dry (e.g., flashlight) Ceramics (e.g., molds and crucibles) Clays (e.g., bentonite) Concrete Fiberglass, inorganic Filter media, inorganic Firebrick Glass (e.g., borosilicate glass, labware, leaded glass, Raschig rings) Graphite (e.g., molds and crucibles) Grit	Heel (e.g., ash heel; soot heel; firebrick heel; sand, slag, and crucible heel) Insulation, inorganic Magnesia cement (e.g., Ramcote® cement) Metal hydroxides Metal oxides (e.g., slag) Metals (e.g., aluminum, cadmium, copper, steel, tantalum, tungsten, zinc) Nitrates (e.g., ammonium nitrate, sodium nitrate) Petroset® products (for aqueous solutions) Portland cement Sand/soil, inorganic Salts (e.g., calcium chloride, calcium fluoride, sodium chloride) Other inorganic materials a Other chemicals or materials not identified in this table are allowed provided that they met the requirements for trace constituents, as defined in Section 6.4.3.1. All materials in the final waste form must be inert (nonreactive), be in a nonreactive form, or have been rendered nonreactive.
Allowable Materials for Waste Material Type I.3^a Concreted Inorganic Particulate Waste	
Absorbents/adsorbents (e.g., Celite®, diatomaceous earth, diatomite, Florco®, Oil-Dri®, perlite, vermiculite) Asbestos Ash (e.g., ash bottoms, fly ash, soot) Batteries, dry (e.g., flashlight) Ceramics (e.g., molds and crucibles) Clays (e.g., bentonite) Concrete Fiberglass, inorganic Filter media, inorganic Firebrick Glass (e.g., borosilicate glass, labware, leaded glass, Raschig rings) Graphite (e.g., molds and crucibles) Grit Heel (e.g., ash heel; soot heel; firebrick heel; sand, slag, and crucible heel) Insulation, inorganic	Metal hydroxides Metal oxides (e.g., slag) Metals (e.g., aluminum, cadmium, copper, steel, tantalum, tungsten, zinc) Nitrates (e.g., ammonium nitrate, sodium nitrate) Portland cement Sand/soil, inorganic Salts (e.g., calcium chloride, calcium fluoride, sodium chloride) Water (maximum of 30 weight percent unbound water) Other inorganic materials a Other chemicals or materials not identified in this table are allowed provided that they met the requirements for trace constituents, as defined in Section 6.4.3.1. All materials in the final waste form must be inert (nonreactive), be in a nonreactive form, or have been rendered nonreactive.

Table 6-2, Allowable Materials—Greater Than 1 Weight Percent (continued)

Allowable Materials for Waste Material Types II.1 and II.2^a Solid Inorganic Materials	
Absorbents/adsorbents (e.g., Celite®, diatomaceous earth, diatomite, Florco®, Oil-Dri®, perlite, vermiculite) Asbestos Ash (e.g., ash bottoms, fly ash, soot) Batteries, dry (e.g., flashlight) Ceramics (e.g., molds and crucibles) Clays (e.g., bentonite) Concrete/Portland cement (surface contaminated only) Fiberglass, inorganic Filter media, inorganic Firebrick Glass (e.g., borosilicate glass, labware, leaded glass, Raschig rings) Graphite (e.g., molds and crucibles) Grit Heel (e.g., ash heel; soot heel; firebrick heel; sand, slag, and crucible heel) Insulation, inorganic Magnesium alloy Metal oxides (e.g., slag)	Metals (e.g., aluminum, cadmium, copper, steel, tantalum, tungsten, zinc) Nitrates (e.g., ammonium nitrate, sodium nitrate) Salts (e.g., calcium chloride, calcium fluoride, sodium chloride) Sand/soil, inorganic Other inorganic materials a Other chemicals or materials not identified in this table are allowed provided that they met the requirements for trace constituents, as defined in Section 6.4.3.1. All materials in the final waste form must be inert (nonreactive), be in a nonreactive form, or have been rendered nonreactive. b Dry absorbents/adsorbents and other dry desiccants are allowed if they contain no absorbed or adsorbed liquids.
Allowable Materials for Waste Material Type II.3^a Homogeneous Solid Inorganic Materials with Unbound Absorbed Ambient Moisture (≤6% by weight)	
Any material in Waste Material Types II.1 and II.2 and water as unbound absorbed ambient moisture (≤6% by weight). a Other chemicals or materials not identified in this table are allowed provided that they meet the requirements for trace constituents, as defined in Section 6.4.3.1. All materials in the final waste form must be inert (nonreactive), be in a nonreactive form, or have been rendered nonreactive.	

Table 6-2, Allowable Materials—Greater Than 1 Weight Percent (continued)

Allowable Materials for Waste Material Type III.1^a Solid Organic Materials	
Any material in Waste Types I or II (Tables above) Absorbent polymers, organic Acids, solid, organic Asphalt Bakelite® ^b Cellulose (e.g., Benelex®, cotton Conwed®, paper rags, rayon, wood) Cellulose acetate butyrate Cellulose propionate Chlorinated polyether Detergent, solid (e.g., emulsifiers, surfactants) Fiberglass, organic Filter media, organic Greases, commercial brands Insulation, organic Lead rubber (e.g., gloves, aprons, sheet material) Leather Oil (e.g., petroleum, mineral) Organophosphates (e.g., tributyl phosphate, dibutyl phosphate, monobutyl phosphite) Paint, dry (e.g., floor/wall paint, ALARA) Plastics (e.g., polycarbonate, polyethylene, polymethyl methacrylate [Plexiglas®, Lucite®], polysulfone, polytetrafluoroethylene [Teflon®], polyvinyl acetate, polyvinyl chloride [PVC], polyvinylidene chloride [saran]) Polyamides (nylon) Polychlorotrifluoroethylene (e.g., Kel-F®) Polyesters (e.g., Dacron®, Mylar®) Polyethylene glycol (e.g., Carbowax®) Polyimides Polyphenyl methacrylate	Polypropylene (e.g., Ful-Flo® filters) Polyurethane Polyvinyl alcohol Resins (e.g., aniline-formaldehyde, melamine-formaldehyde, organic resins, phenol-formaldehyde, phenolic resins, urea-formaldehyde) Rubber, natural or synthetic (e.g., chlorosulfonated polyethylene [Hypalon®], ethylene-propylene rubber, EPDM, polybutadiene, polychloroprene [neoprene], polyisobutylene, polyisoprene, polystyrene, rubber hydrochloride [pliofilm®]) Sand/Soil Waxes, commercial brands a. Other chemicals or materials not identified in this table are allowed provided that they met the requirements for trace constituents, as defined in Section 6.4.3.1. All materials in the final waste form must be inert (nonreactive), be in a nonreactive form, or have been rendered nonreactive. b. Bakelite is a trademark for materials that can be composed of several different polymers, including polyethylene, polypropylene, epoxy, phenolic, polystyrene, phenoxy, perylene, polysulfone, ethylene copolymers, ABS, acrylics, and vinyl resins and compounds.
Allowable Materials for Waste Material Types III.2 and III.3^a Homogeneous Mixed Organic (10% by weight) and Inorganic (90% by weight) Materials	
Any material in Waste Material Types I.1, I.2, I.3, II.1, II.2, II.3, or III.1, provided that the total amount of solid organic material and/or absorbed or adsorbed water is less than or equal to 10 weight percent of the total waste.	
a. Other chemicals or materials not identified in this table are allowed provided that they meet the requirements for trace constituents, as defined in Section 6.4.3.1. All materials in the final waste form must be inert (nonreactive), be in a nonreactive form, or have been rendered nonreactive.	

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Table 6-2, Allowable Materials—Greater Than 1 Weight Percent (continued)

Allowable Materials for Waste Material Type IV.1 ^a Solidified Organics	
Any material in Waste Types I, II, or III	Hydrocarbons, aliphatic (e.g., cyclohexane, n-paraffin hydrocarbons)
Acids, organic	Hydrocarbons, aromatic (e.g., benzene; ethyl benzene; toluene; 1,2,4-trimethylbenzene; 1,3,5-trimethylbenzene; xylene)
Alcohols (e.g., butanol, ethanol, isopropanol, methanol)	Ketones (e.g., acetone, methyl ethyl ketone, methyl isobutyl ketone)
Esters (e.g., ethyl acetate, polyethylene glycol ester)	Trioctyl phosphine oxide
Ethers (e.g., ethyl ether)	
Halogenated organics (e.g., bromoform; carbon tetrachloride; chlorobenzene; chloroform; 1,1-dichloroethane; 1,2-dichloroethane; 1,1-dichloroethylene; cis-1,2-dichloroethylene; methylene chloride; 1,1,2,2-tetrachloroethane; tetrachloroethylene; 1,1,1-trichloroethane; 1,1,2-trichloroethane; trichloroethylene; 1,1,2-trichloro-1,2,2-trifluoroethane)	a Other chemicals or materials not identified in this table are allowed provided that they meet the requirements for trace constituents, as defined in Section 6.4.3.1. All materials in the final waste form must be inert (nonreactive), be in a nonreactive form, or have been rendered nonreactive.

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Table 6-3, Summary of Payload Waste Types

Waste Type ^a	Waste Type ^b (XX)	Description and Examples
I	10	Solidified Aqueous or Homogeneous Inorganic Solids (< 1 percent organics - not including packaging) - absorbed, adsorbed or solidified inorganic liquid - soils, solidified particulates, or sludges formed from precipitates - concreted inorganic particulate waste
II	20	Solid Inorganics - glass, metal, crucibles - other solid inorganics
III	30	Solid Organics - plastics (e.g., polyethylene, polyvinyl chloride) - cellulose (e.g., paper, cloth, wood) - cemented organic solids - other solid organics
IV	40	Solidified Organics - cemented or immobilized organic liquids and solids

^a Payload shipping category notation used through Revision 16 of the TRUPACT-II SAR.^b Payload shipping category notation initiated in Revision 17 of the TRUPACT-II SAR.

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Table 6-4, CH-TRU Waste Material Types and G Values

Waste Material Type ^a	Typical Material Description	G Value	Numeric Shipping Category Notation ^b (G Value x 10 ²) (YYYY)
I.1	Absorbed, adsorbed, or solidified inorganic liquid	1.6	0160
I.2	Soils, solidified particulates, or sludges formed from precipitation	1.3	0130
I.3	Concreted inorganic particulate waste	0.4	0040
II.1	Solid inorganic materials in plastic bags (watt*year ≤ 0.012)	1.7	0170
II.1	Solid inorganic materials in plastic bags (watt*year > 0.012)	0.32	0032
II.2	Solid inorganic materials in metal cans	0	0000
II.3	Homogeneous solid inorganic materials with unbound absorbed ambient moisture (≤ 6% by weight) in metal cans	0.08	0008
III.1	Solid organic materials (watt*year ≤ 0.012)	3.4	0340
III.1	Solid organic materials (watt*year > 0.012)	1.09	0109
III.2	Homogeneous mixed organic (10% by weight) and inorganic (90% by weight) materials in metal cans (watt*year ≤ 0.012)	0.34	0034
III.2	Homogeneous mixed organic (10% by weight) and inorganic (90% by weight) materials in metal cans (watt*year > 0.012)	0.11	0011
III.3	Homogeneous mixed organic (10% by weight) and inorganic (90% by weight) materials in plastic bags (watt*year ≤ 0.012)	1.85	0185
III.3	Homogeneous mixed organic (10% by weight) and inorganic (90% by weight) materials in plastic bags (watt*year > 0.012)	0.4	0040
IV.1	Solidified organics	Unknown (test)	9999

^a Payload shipping category notation used through Revision 16 of the TRUPACT-II SAR.

^b Payload shipping category notation initiated in Revision 17 of the TRUPACT-II SAR.

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Table 6-5, Alpha-numeric Shipping Category Notation for Payload Package Configurations

ALPHA NOTATION	DESCRIPTION
A	55-gallon drums with materials in additional layers of confinement [such as rigid liner(s), bag(s), and can(s)] (includes 55-gallon drums overpacked in a TDOP)
B	Overpack of up to four 55-gallon drums in an SWB (SWB overpack)
C	SWB with materials in additional layers of confinement [such as bag(s) and can(s)]
D	Overpack of one experimental bin in an SWB
E	Overpack of one pipe component in a 55-gallon drum (standard POC)

Table 6-6, Alpha-numeric Shipping Category Notation for Layers of Confinement in Payload Packages

NOTATION	DESCRIPTION
0	No closed bags around waste
1	Up to a maximum of 1 closed bag around waste
2	Up to a maximum of 2 closed layers of bags around waste
3	Up to a maximum of 3 closed layers of bags around waste
4	Up to a maximum of 4 closed layers of bags around waste
5	Up to a maximum of 5 closed layers of bags around waste
6	Up to a maximum of 6 closed layers of bags around waste
M	Metal container(s) as the innermost layer of confinement
a	For Waste Types II and III packaged in drums, denotes a minimum of 2 liner bags
b	For all waste types packaged in SWBs, denotes a minimum of 1 SWB liner bag
f	All layers of bags around waste are vented with a minimum of one filter vent
T	Payload package qualified for shipment under the test category

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Table 6-7, RFETS TRUCON Content Codes, Correlating IDCs, Shipping Categories, and Decay Heat Limits

TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF111A RF211A	001, 002, 007, 053, 054, 054H, 057, 060, 061, 062, 065, 067, 080, 081, 087, 159, 289, 290, 291, 292, 299, 340, 559, 800, 803, 807, 828, 829	10 0130 0046 10 0130 0154 10 0130 0190 10 0130 0215 10 0130 0250	0.8068 0.2410 0.1962 0.1726 0.1486	NA	NA
RF111D RF211D	001, 002, 007, 053, 054, 054H, 057, 060, 061, 062, 065, 067, 080, 081, 087, 159, 289, 290, 291, 292, 299, 340, 559, 800, 803, 807, 828, 829	10 0130 0175	0.2121	NA	NA
RF111DF RF211DF	001, 002, 007, 053, 054, 054H, 057, 060, 061, 062, 065, 067, 080, 081, 087, 159, 289, 290, 291, 292, 299, 340, 559, 800, 803, 807, 828, 829	10 0130 0210 10 0130 0246	0.1767 0.1509	NA	NA
RF111E RF211E	001, 002, 007, 053, 054, 054H, 057, 060, 061, 062, 065, 067, 080, 081, 087, 159, 289, 290, 291, 292, 299, 340, 559, 800, 803, 807, 828, 829	10 0130 0156 10 0130 0191 10 0130 0216 10 0130 0252	0.2379 0.1943 0.1718 0.1473	NA	NA
RF111F RF211F	001, 002, 007, 053, 054, 054H, 057, 060, 061, 062, 065, 067, 080, 081, 087, 159, 289, 290, 291, 292, 299, 340, 559, 800, 803, 807, 828, 829	10 0130 0130 10 0130 0166 10 0130 0191 10 0130 0226 10 0130 0041	0.2855 0.2236 0.1943 0.1642 0.9051	NA	NA
RF111J RF211J	001, 002, 007, 053, 054, 054H, 057, 060, 061, 062, 065, 067, 080, 081, 087, 159, 289, 290, 291, 292, 299, 340, 559, 800, 803, 807, 828, 829	10 0130 0221 10 0130 0257 10 0130 0282 10 0130 0318	0.1679 0.1444 0.1316 0.1167	NA	NA
RF111K RF211K	001, 002, 007, 053, 054, 054H, 057, 060, 061, 062, 065, 067, 080, 081, 087, 159, 289, 290, 291, 292, 299, 340, 559, 800, 803, 807, 828, 829	10 0130 0197 10 0130 0232 10 0130 0257 10 0130 0293	0.1884 0.1600 0.1444 0.1267	NA	NA
RF111P RF211P	001, 002, 007, 053, 054, 054H, 057, 060, 061, 062, 065, 067, 080, 081, 087, 159, 289, 290, 291, 292, 299, 340, 559, 800, 803, 807, 828, 829	10 0130 0212	0.1751	NA	NA
RF111PF RF211PF	001, 002, 007, 053, 054, 054H, 057, 060, 061, 062, 065, 067, 080, 081, 087, 159, 289, 290, 291, 292, 299, 340, 559, 800, 803, 807, 828, 829	10 0130 0283 10 0130 0319	0.1311 0.1163	NA	NA
RF112A RF212A	003, 332, 801, 808, 816, 827	40 9999 0144 40 9999 0169 40 9999 0184 40 9999 0209	NA NA NA NA	NA	NA

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**Table 6-7, RFETS TRUCON Content Codes, Correlating IDCs, Shipping Categories,
and Decay Heat Limits (continued)**

TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF112D RF212D	003, 332, 801, 808, 816, 827	40 9999 0174	NA	NA	NA
RF112DF RF212DF	003, 332, 801, 808, 816, 827	40 9999 0225 40 9999 0250	NA NA	NA	NA
RF112F RF212F	003, 332, 801, 808, 816, 827	40 9999 0114 40 9999 0140 40 9999 0154 40 9999 0180	NA NA NA NA	NA	NA
RF112J RF212J	003, 332, 801, 808, 816, 827	40 9999 0153 40 9999 0179 40 9999 0193 40 9999 0219	NA NA NA NA	NA	NA
RF112N RF212N	003, 332, 801, 808, 816, 827	40 9999 0481 40 9999 0506 40 9999 0521 40 9999 0546	NA NA NA NA	NA	NA
RF113A RF213A	802	40 9999 0144 40 9999 0169 40 9999 0184 40 9999 0209	NA NA NA NA	NA	NA
RF114A RF214A	536, 806, 823	10 0040 0613 10 0040 0648 10 0040 0673 10 0040 0709	0.1968 0.1863 0.1792 0.1703	NA	NA
RF114B RF214B	536, 806, 823	10 0040 0634 10 0040 0669 10 0040 0695 10 0040 0730	0.1902 0.1803 0.1735 0.1652	NA	NA
RF114D RF214D	536, 806, 823	10 0040 0629	0.1917	NA	NA
RF114DF RF214DF	536, 806, 823	10 0040 0664 10 0040 0700	0.1816 0.1723	NA	NA
RF114E RF214E	536, 806, 823	10 0040 0156 10 0040 0191 10 0040 0216 10 0040 0252	0.7731 0.6315 0.5584 0.4786	NA	NA
RF114F RF214F	536, 806, 823	10 0040 0156 10 0040 0191 10 0040 0216 10 0040 0252	0.7731 0.6315 0.5584 0.4786	NA	NA

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TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF114G RF214G	536, 806, 823	10 0040 0175	0.6892	NA	NA
RF114GF RF214GF	536, 806, 823	10 0040 0210 10 0040 0246	0.5743 0.4903	NA	NA
RF114J RF214J	536, 806, 823	10 0040 0231 10 0040 0266 10 0040 0291 10 0040 0327	0.5221 0.4534 0.4145 0.3688	NA	NA
RF114JF RF214JF	536, 806, 823	10 0040 0302 10 0040 0337 10 0040 0362 10 0040 0398	0.3994 0.3579 0.3332 0.3030	NA	NA
RF114K RF214K	536, 806, 823	10 0040 0154 10 0040 0190 10 0040 0215 10 0040 0250	0.7832 0.6375 0.5610 0.4828	NA	NA
RF114L RF214L	536, 806, 823	10 0040 0130 10 0040 0166 10 0040 0191 10 0040 0226	0.9278 0.7266 0.6315 0.5337	NA	NA
RF114P RF214P	536, 806, 823	10 0040 0212	0.5689	NA	NA
RF114PF RF214PF	536, 806, 823	10 0040 0283 10 0040 0319	0.4262 0.3781	NA	NA
RF115A RF215A	300, 301, 301U, 303, 310, 310P, 312	20 0170 0502 20 0170 0528 20 0170 0542 20 0170 0568	0.0565 0.0537 0.0524 0.0500	20 0032 0502 20 0032 0528 20 0032 0542 20 0032 0568	0.3003 0.2855 0.2782 0.2654
RF115B RF215B	300, 301, 301U, 303, 310, 310P, 312	20 0000 0000	40.0000	NA	NA
RF115D RF215D	300, 301, 301U, 303, 310, 310P, 312	20 0000 0000	40.0000	NA	NA
RF115E RF215E	300, 301, 301U, 303, 310, 310P, 312	20 0170 0153 20 0170 0179 20 0170 0193 20 0170 0219	0.1855 0.1585 0.1470 0.1296	20 0032 0153 20 0032 0179 20 0032 0193 20 0032 0219	0.9854 0.8423 0.7812 0.6884
RF115F RF215F	300, 301, 301U, 303, 310, 310P, 312	20 0170 0114 20 0170 0140 20 0170 0154 20 0170 0180	0.2489 0.2034 0.1843 0.1577	20 0032 0114 20 0032 0140 20 0032 0154 20 0032 0180	1.3225 1.0769 0.9790 0.8376

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TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF115N RF215N	300, 301, 301U, 303, 310, 310P, 312	20 0170 0399 20 0170 0481 20 0170 0506 20 0170 0521 20 0170 0546	0.0711 0.0590 0.0561 0.0545 0.0520	20 0032 0399 20 0032 0481 20 0032 0506 20 0032 0521 20 0032 0546	0.3779 0.3134 0.2980 0.2894 0.2761
RF116A RF216A	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0041 30 0340 0502 30 0340 0528 30 0340 0542 30 0340 0568	0.3515 0.0283 0.0269 0.0262 0.0250	30 0109 0041 30 0109 0502 30 0109 0528 30 0109 0542 30 0109 0568	1.0795 0.0882 0.0838 0.0817 0.0779
RF116C RF216C	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0144 30 0340 0169 30 0340 0184 30 0340 0209	0.0985 0.0840 0.0771 0.0680	30 0109 0144 30 0109 0169 30 0109 0184 30 0109 0209	0.3074 0.2619 0.2405 0.2118
RF116D RF216D	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0147	0.0965	30 0109 0147	0.3011
RF116DF RF216DF	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216,	30 0340 0172 30 0340 0198	0.0825 0.0717	30 0109 0172 30 0109 0198	0.2573 0.2235
RF116E RF216E	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216,	30 0340 0079 30 0340 0153 30 0340 0179 30 0340 0193 30 0340 0219	0.1796 0.0927 0.0793 0.0735 0.0648	30 0109 0079 30 0109 0153 30 0109 0179 30 0109 0193 30 0109 0219	0.5603 0.2893 0.2473 0.2293 0.2021
RF116EF RF216EF	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216,	30 0340 0105 30 0340 0179 30 0340 0205 30 0340 0219 30 0340 0244	0.1351 0.0793 0.0692 0.0648 0.0582	30 0109 0105 30 0109 0179 30 0109 0205 30 0109 0219 30 0109 0244	0.4215 0.2473 0.2159 0.2021 0.1814
RF116F RF216F	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0034 30 0340 0114 30 0340 0140 30 0340 0154 30 0340 0180	0.4259 0.1245 0.1017 0.0921 0.0788	30 0109 0034 30 0109 0114 30 0109 0140 30 0109 0154 30 0109 0180	1.3018 0.3883 0.3161 0.2874 0.2459
RF116G RF216G	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0070 30 0340 0144 30 0340 0170 30 0340 0184 30 0340 0209	0.2027 0.0985 0.0835 0.0771 0.0680	30 0109 0070 30 0109 0144 30 0109 0170 30 0109 0184 30 0109 0209	0.6323 0.3074 0.2604 0.2405 0.2118

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TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF116GF RF216GF	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0096	0.1478	30 0109 0096	0.4610
		30 0340 0170	0.0835	30 0109 0170	0.2604
		30 0340 0195	0.0728	30 0109 0195	0.2270
		30 0340 0209	0.0680	30 0109 0209	0.2118
		30 0340 0235	0.0604	30 0109 0235	0.1883
RF116H RF216H	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0220	0.0646	30 0109 0220	0.2012
RF116I RF216I	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0052	0.2729	30 0109 0052	0.8512
		30 0340 0126	0.1126	30 0109 0126	0.3513
		30 0340 0152	0.0937	30 0109 0152	0.2912
		30 0340 0166	0.0856	30 0109 0166	0.2666
		30 0340 0192	0.0739	30 0109 0192	0.2305
RF116J RF216J	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0660	0.0215	30 0109 0660	0.0671
		30 0340 0686	0.0207	30 0109 0686	0.0645
		30 0340 0700	0.0203	30 0109 0700	0.0632
		30 0340 0725	0.0196	30 0109 0725	0.0610
RF116K RF216K	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0163	0.0871	30 0109 0163	0.2715
		30 0340 0188	0.0758	30 0109 0188	0.2354
		30 0340 0202	0.0702	30 0109 0202	0.2191
		30 0340 0228	0.0622	30 0109 0228	0.1941
RF116KF RF216KF	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0188	0.0758	30 0109 0188	0.2354
		30 0340 0214	0.0663	30 0109 0214	0.2068
		30 0340 0228	0.0622	30 0109 0228	0.1941
		30 0340 0254	0.0559	30 0109 0254	0.1743
RF116L RF216L	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0839	0.0169	30 0109 0839	0.0528
		30 0340 0865	0.0164	30 0109 0865	0.0512
		30 0340 0879	0.0161	30 0109 0879	0.0504
		30 0340 0905	0.0157	30 0109 0905	0.0489
RF116M RF216M	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0172	0.0825	30 0109 0172	0.2573
		30 0340 0198	0.0717	30 0109 0198	0.2235
		30 0340 0212	0.0669	30 0109 0212	0.2088
		30 0340 0237	0.0599	30 0109 0237	0.1868
RF116MF RF216MF	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0198	0.0717	30 0109 0198	0.2235
		30 0340 0223	0.0636	30 0109 0223	0.1985
		30 0340 0237	0.0599	30 0109 0237	0.1868
		30 0340 0263	0.0540	30 0109 0263	0.1683
RF116N RF216N	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0399	0.0356	30 0109 0399	0.1109
		30 0340 0481	0.0295	30 0109 0481	0.0920
		30 0340 0506	0.0280	30 0109 0506	0.0875
		30 0340 0521	0.0272	30 0109 0521	0.0850
		30 0340 0546	0.0260	30 0109 0546	0.0811

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TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF116P RF216P	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0174	0.0815	30 0109 0174	0.2544
RF116PF RF216PF	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0225 30 0340 0250	0.0631 0.0568	30 0109 0225 30 0109 0250	0.1967 0.1770
RF116Q RF216Q	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0459 30 0340 0485 30 0340 0499 30 0340 0525	0.0309 0.0293 0.0284 0.0270	30 0109 0459 30 0109 0485 30 0109 0499 30 0109 0525	0.0964 0.0913 0.0887 0.0843
RF116R RF216R	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0687 30 0340 0713 30 0340 0727 30 0340 0752	0.0207 0.0199 0.0195 0.0189	30 0109 0687 30 0109 0713 30 0109 0727 30 0109 0752	0.0644 0.0621 0.0609 0.0589
RF116RF RF216RF	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0713 30 0340 0738 30 0340 0752 30 0340 0778	0.0199 0.0192 0.0189 0.0182	30 0109 0713 30 0109 0738 30 0109 0752 30 0109 0778	0.0621 0.0600 0.0589 0.0569
RF116S RF216S	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0866 30 0340 0892 30 0340 0906 30 0340 0932	0.0164 0.0159 0.0157 0.0152	30 0109 0866 30 0109 0892 30 0109 0906 30 0109 0932	0.0511 0.0496 0.0489 0.0475
RF116SF RF216SF	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0892 30 0340 0918 30 0340 0932 30 0340 0957	0.0159 0.0155 0.0152 0.0148	30 0109 0892 30 0109 0918 30 0109 0932 30 0109 0957	0.0496 0.0482 0.0475 0.0462
RF116T RF216T	330, 336, 337, 487, 821, 822, 822X, 825, 831, 832, 832X, 833, 861, 862, 863, 2116, 2216	30 0340 0043	0.3329	30 0109 0043	1.0293
RF117A RF217A	197, 320, 321, 416, 479, 480, 481, 483, 484, 485, 486, 488, 489, 824, 854, 2117	20 0170 0041 20 0170 0502 20 0170 0528 20 0170 0542 20 0170 0568	0.7029 0.0565 0.0537 0.0524 0.0500	20 0032 0041 20 0032 0502 20 0032 0528 20 0032 0542 20 0032 0568	3.6771 0.3003 0.2855 0.2782 0.2654
RF117B RF217B	197, 320, 321, 416, 479, 480, 481, 483, 484, 485, 486, 488, 489, 824, 854, 2117	20 0000 0000	40.0000	NA	NA
RF117C RF217C	197, 320, 321, 416, 479, 480, 481, 483, 484, 485, 486, 488, 489, 824, 854, 2117	20 0170 0144 20 0170 0169 20 0170 0184 20 0170 0209	0.1971 0.1680 0.1542 0.1360	20 0032 0144 20 0032 0169 20 0032 0184 20 0032 0209	1.0470 0.8921 0.8194 0.7214

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Table 6-7, RFETS TRUCON Content Codes, Correlating IDCs, Shipping Categories, and Decay Heat Limits (continued)

TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF117D RF217D	197, 320, 321, 416, 479, 480, 481, 483, 484, 485, 486, 488, 489, 824, 854, 2117	20 0000 0000	40.0000	NA	NA
RF117E RF217E	197, 320, 321, 416, 479, 480, 481, 483, 484, 485, 486, 488, 489, 824, 854, 2117	20 0170 0079 20 0170 0153 20 0170 0179 20 0170 0193 20 0170 0219	0.3592 0.1855 0.1585 0.1470 0.1296	20 0032 0079 20 0032 0153 20 0032 0179 20 0032 0193 20 0032 0219	1.9084 0.9854 0.8423 0.7812 0.6884
RF117F RF217F	197, 320, 321, 416, 479, 480, 481, 483, 484, 485, 486, 488, 489, 824, 854, 2117	20 0170 0034 20 0170 0114 20 0170 0140 20 0170 0154 20 0170 0180	0.8518 0.2489 0.2034 0.1843 0.1577	20 0032 0034 20 0032 0114 20 0032 0140 20 0032 0154 20 0032 0180	4.4342 1.3225 1.0769 0.9790 0.8376
RF117H RF217H	197, 320, 321, 416, 479, 480, 481, 483, 484, 485, 486, 488, 489, 824, 854, 2117	20 0170 0220	0.1292	20 0032 0220	0.6853
RF117I RF217I	197, 320, 321, 416, 479, 480, 481, 483, 484, 485, 486, 488, 489, 824, 854, 2117	20 0170 0052 20 0170 0126 20 0170 0152 20 0170 0166 20 0170 0192	0.5457 0.2252 0.1875 0.1711 0.1478	20 0032 0052 20 0032 0126 20 0032 0152 20 0032 0166 20 0032 0192	2.8993 1.1965 0.9919 0.9082 0.7852
RF117N RF217N	197, 320, 321, 416, 479, 480, 481, 483, 484, 485, 486, 488, 489, 824, 854, 2117	20 0170 0399 20 0170 0481 20 0170 0506 20 0170 0521 20 0170 0546	0.0711 0.0590 0.0561 0.0545 0.0520	20 0032 0399 20 0032 0481 20 0032 0506 20 0032 0521 20 0032 0546	0.3779 0.3134 0.2980 0.2894 0.2761
RF117T RF217T	197, 320, 321, 416, 479, 480, 481, 483, 484, 485, 486, 488, 489, 824, 854, 2117	20 0170 0043	0.6659	20 0032 0043	3.5061
RF118A RF218A	360, 368, 370, 440, 441, 442, 443, 444, 601, 655, 855, 856, 859, 2118, 2218	20 0170 0041 20 0170 0502 20 0170 0528 20 0170 0542 20 0170 0568	0.7029 0.0565 0.0537 0.0524 0.0500	20 0032 0041 20 0032 0502 20 0032 0528 20 0032 0542 20 0032 0568	3.6771 0.3003 0.2855 0.2782 0.2654
RF118B RF218B	360, 368, 370, 440, 441, 442, 443, 444, 601, 655, 855, 856, 859, 2118, 2218	20 0000 0000	40.0000	NA	NA
RF118C RF218C	360, 368, 370, 440, 441, 442, 443, 444, 601, 655, 855, 856, 859, 2118, 2218	20 0170 0144 20 0170 0169 20 0170 0184 20 0170 0209	0.1971 0.1680 0.1542 0.1360	20 0032 0144 20 0032 0169 20 0032 0184 20 0032 0209	1.0470 0.8921 0.8194 0.7214

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TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF118D RF218D	360, 368, 370, 440, 441, 442, 443, 444, 601, 655, 855, 856, 859, 2118, 2218	20 0000 0000	40.0000	NA	NA
RF118E RF218E	360, 368, 370, 440, 441, 442, 443, 444, 601, 655, 855, 856, 859, 2118, 2218	20 0170 0079	0.3592	20 0032 0079	1.9084
		20 0170 0153	0.1855	20 0032 0153	0.9854
		20 0170 0179	0.1585	20 0032 0179	0.8423
		20 0170 0193	0.1470	20 0032 0193	0.7812
		20 0170 0219	0.1296	20 0032 0219	0.6884
RF118F RF218F	360, 368, 370, 440, 441, 442, 443, 444, 601, 655, 855, 856, 859, 2118, 2218	20 0170 0034	0.8518	20 0032 0034	4.4342
		20 0170 0114	0.2489	20 0032 0114	1.3225
		20 0170 0140	0.2034	20 0032 0140	1.0769
		20 0170 0154	0.1843	20 0032 0154	0.9790
		20 0170 0180	0.1577	20 0032 0180	0.8376
RF118H RF218H	360, 368, 370, 440, 441, 442, 443, 444, 601, 655, 855, 856, 859, 2118, 2218	20 0170 0220	0.1292	20 0032 0220	0.6853
RF118I RF218I	360, 368, 370, 440, 441, 442, 443, 444, 601, 655, 855, 856, 859, 2118, 2218	20 0170 0052	0.5457	20 0032 0052	2.8993
		20 0170 0126	0.2252	20 0032 0126	1.1965
		20 0170 0152	0.1875	20 0032 0152	0.9919
		20 0170 0166	0.1711	20 0032 0166	0.9082
		20 0170 0192	0.1478	20 0032 0192	0.7852
RF118N RF218N	360, 368, 370, 440, 441, 442, 443, 444, 601, 655, 855, 856, 859, 2118, 2218	20 0170 0399	0.0711	20 0032 0399	0.3779
		20 0170 0481	0.0590	20 0032 0481	0.3134
		20 0170 0506	0.0561	20 0032 0506	0.2980
		20 0170 0521	0.0545	20 0032 0521	0.2894
		20 0170 0546	0.0520	20 0032 0546	0.2761
RF118T RF218T	360, 368, 370, 440, 441, 442, 443, 444, 601, 655, 855, 856, 859, 2118, 2218	20 0170 0043	0.6659	20 0032 0043	3.5061
RF119A RF219A	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0041	0.3515	30 0109 0041	1.0795
		30 0340 0502	0.0283	30 0109 0502	0.0882
		30 0340 0528	0.0269	30 0109 0528	0.0838
		30 0340 0542	0.0262	30 0109 0542	0.0817
		30 0340 0568	0.0250	30 0109 0568	0.0779
RF119BA RF219BA	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0508	0.0279	30 0109 0508	0.0871
		30 0340 0533	0.0266	30 0109 0533	0.0830
		30 0340 0548	0.0259	30 0109 0548	0.0808
		30 0340 0573	0.0248	30 0109 0573	0.0772
RF119BAF RF219BAF	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0533	0.0266	30 0109 0533	0.0830
		30 0340 0559	0.0254	30 0109 0559	0.0792
		30 0340 0573	0.0248	30 0109 0573	0.0772
		30 0340 0599	0.0237	30 0109 0599	0.0739
RF119C RF219C	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0144	0.0985	30 0109 0144	0.3074
		30 0340 0169	0.0840	30 0109 0169	0.2619
		30 0340 0184	0.0771	30 0109 0184	0.2405
		30 0340 0209	0.0680	30 0109 0209	0.2118

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TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF119D RF219D	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0147	0.0965	30 0109 0147	0.3011
RF119DF RF219DF	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0172 30 0340 0198	0.0825 0.0717	30 0109 0172 30 0109 0198	0.2573 0.2235
RF119E RF219E	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0079 30 0340 0153 30 0340 0179 30 0340 0193 30 0340 0219	0.1796 0.0927 0.0793 0.0735 0.0648	30 0109 0079 30 0109 0153 30 0109 0179 30 0109 0193 30 0109 0219	0.5603 0.2893 0.2473 0.2293 0.2021
RF119EF RF219EF	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0105 30 0340 0179 30 0340 0205 30 0340 0219 30 0340 0244	0.1351 0.0793 0.0692 0.0648 0.0582	30 0109 0105 30 0109 0179 30 0109 0205 30 0109 0219 30 0109 0244	0.4215 0.2473 0.2159 0.2021 0.1814
RF119F RF219F	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0034 30 0340 0114 30 0340 0140 30 0340 0154 30 0340 0180	0.4259 0.1245 0.1017 0.0921 0.0788	30 0109 0034 30 0109 0114 30 0109 0140 30 0109 0154 30 0109 0180	1.3018 0.3883 0.3161 0.2874 0.2459
RF119G RF219G	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0070 30 0340 0144 30 0340 0170 30 0340 0184 30 0340 0209	0.2027 0.0985 0.0835 0.0771 0.0680	30 0109 0070 30 0109 0144 30 0109 0170 30 0109 0184 30 0109 0209	0.6323 0.3074 0.2604 0.2405 0.2118
RF119GF RF219GF	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0096 30 0340 0170 30 0340 0195 30 0340 0209 30 0340 0235	0.1478 0.0835 0.0728 0.0680 0.0604	30 0109 0096 30 0109 0170 30 0109 0195 30 0109 0209 30 0109 0235	0.4610 0.2604 0.2270 0.2118 0.1883
RF119H RF219H	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0220	0.0646	30 0109 0220	0.2012
RF119I RF219I	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0052 30 0340 0126 30 0340 0152 30 0340 0166 30 0340 0192	0.2729 0.1126 0.0937 0.0856 0.0739	30 0109 0052 30 0109 0126 30 0109 0152 30 0109 0166 30 0109 0192	0.8512 0.3513 0.2912 0.2666 0.2305
RF119J RF219J	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0660 30 0340 0686 30 0340 0700 30 0340 0725	0.0215 0.0207 0.0203 0.0196	30 0109 0660 30 0109 0686 30 0109 0700 30 0109 0725	0.0671 0.0645 0.0632 0.0610

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TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF119K RF219K	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0163	0.0871	30 0109 0163	0.2715
		30 0340 0188	0.0758	30 0109 0188	0.2354
		30 0340 0202	0.0702	30 0109 0202	0.2191
		30 0340 0228	0.0622	30 0109 0228	0.1941
RF119KF RF219KF	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0188	0.0758	30 0109 0188	0.2354
		30 0340 0214	0.0663	30 0109 0214	0.2068
		30 0340 0228	0.0622	30 0109 0228	0.1941
		30 0340 0254	0.0559	30 0109 0254	0.1743
RF119L RF219L	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0839	0.0169	30 0109 0839	0.0528
		30 0340 0865	0.0164	30 0109 0865	0.0512
		30 0340 0879	0.0161	30 0109 0879	0.0504
		30 0340 0905	0.0157	30 0109 0905	0.0489
RF119M RF219M	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0172	0.0825	30 0109 0172	0.2573
		30 0340 0198	0.0717	30 0109 0198	0.2235
		30 0340 0212	0.0669	30 0109 0212	0.2088
		30 0340 0237	0.0599	30 0109 0237	0.1868
RF119MF RF219MF	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0198	0.0717	30 0109 0198	0.2235
		30 0340 0223	0.0636	30 0109 0223	0.1985
		30 0340 0237	0.0599	30 0109 0237	0.1868
		30 0340 0263	0.0540	30 0109 0263	0.1683
RF119N RF219N	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0399	0.0356	30 0109 0399	0.1109
		30 0340 0481	0.0295	30 0109 0481	0.0920
		30 0340 0506	0.0280	30 0109 0506	0.0875
		30 0340 0521	0.0272	30 0109 0521	0.0850
		30 0340 0546	0.0260	30 0109 0546	0.0811
RF119P RF219P	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0174	0.0815	30 0109 0174	0.2544
RF119PF RF219PF	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0225	0.0631	30 0109 0225	0.1967
		30 0340 0250	0.0568	30 0109 0250	0.1770
RF119Q RF219Q	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0459	0.0309	30 0109 0459	0.0964
		30 0340 0485	0.0293	30 0109 0485	0.0913
		30 0340 0499	0.0284	30 0109 0499	0.0887
		30 0340 0525	0.0270	30 0109 0525	0.0843
RF119R RF219R	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0687	0.0207	30 0109 0687	0.0644
		30 0340 0713	0.0199	30 0109 0713	0.0621
		30 0340 0727	0.0195	30 0109 0727	0.0609
		30 0340 0752	0.0189	30 0109 0752	0.0589
RF119RF RF219RF	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0713	0.0199	30 0109 0713	0.0621
		30 0340 0738	0.0192	30 0109 0738	0.0600
		30 0340 0752	0.0189	30 0109 0752	0.0589
		30 0340 0778	0.0182	30 0109 0778	0.0569

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TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF119S RF219S	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0866 30 0340 0892 30 0340 0906 30 0340 0932	0.0164 0.0159 0.0157 0.0152	30 0109 0866 30 0109 0892 30 0109 0906 30 0109 0932	0.0511 0.0496 0.0489 0.0475
RF119SF RF219SF	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0892 30 0340 0918 30 0340 0932 30 0340 0957	0.0159 0.0155 0.0152 0.0148	30 0109 0892 30 0109 0918 30 0109 0932 30 0109 0957	0.0496 0.0482 0.0475 0.0462
RF119T RF219T	328, 331, 335, 342, 490, 491, 492, 2219	30 0340 0043	0.3329	30 0109 0043	1.0293
RF121A RF221A	000, 200, 302, 338S, 350, 374, 420F, 430, 431, 523, 545, 998, 3011	30 0340 0041 30 0340 0502 30 0340 0528 30 0340 0542 30 0340 0568	0.3515 0.0283 0.0269 0.0262 0.0250	30 0109 0041 30 0109 0502 30 0109 0528 30 0109 0542 30 0109 0568	1.0795 0.0882 0.0838 0.0817 0.0779
RF121D RF221D	000, 200, 302, 338S, 350, 374, 420F, 430, 431, 523, 545, 998, 3011	30 0340 0486 30 0340 0512	0.0292 0.0277	30 0109 0486 30 0109 0512	0.0911 0.0864
RF121DA RF221DA	000, 200, 302, 338S, 350, 374, 420F, 430, 431, 523, 545, 998, 3011	30 0340 0147	0.0965	30 0109 0147	0.3011
RF121DAF RF221DAF	000, 200, 302, 338S, 350, 374, 420F, 430, 431, 523, 545, 998, 3011	30 0340 0172 30 0340 0198	0.0825 0.0717	30 0109 0172 30 0109 0198	0.2573 0.2235
RF121DF RF221DF	000, 200, 302, 338S, 350, 374, 420F, 430, 431, 523, 545, 998, 3011	30 0340 0512 30 0340 0538	0.0277 0.0264	30 0109 0512 30 0109 0538	0.0864 0.0823
RF121E RF221E	000, 200, 302, 338S, 350, 374, 420F, 430, 431, 523, 545, 998, 3011	30 0340 0079 30 0340 0153 30 0340 0179 30 0340 0193 30 0340 0219	0.1796 0.0927 0.0793 0.0735 0.0648	30 0109 0079 30 0109 0153 30 0109 0179 30 0109 0193 30 0109 0219	0.5603 0.2893 0.2473 0.2293 0.2021
RF121F RF221F	000, 200, 302, 338S, 350, 374, 420F, 430, 431, 523, 545, 998, 3011	30 0340 0034 30 0340 0114 30 0340 0140 30 0340 0154 30 0340 0180	0.4259 0.1245 0.1017 0.0921 0.0788	30 0109 0034 30 0109 0114 30 0109 0140 30 0109 0154 30 0109 0180	1.3018 0.3883 0.3161 0.2874 0.2459
RF121H RF221H	000, 200, 302, 338S, 350, 374, 420F, 430, 431, 523, 545, 998, 3011	30 0340 0220	0.0646	30 0109 0220	0.2012
RF121I RF221I	000, 200, 302, 338S, 350, 374, 420F, 430, 431, 523, 545, 998, 3011	30 0340 0052 30 0340 0126 30 0340 0152 30 0340 0166 30 0340 0192	0.2729 0.1126 0.0937 0.0856 0.0739	30 0109 0052 30 0109 0126 30 0109 0152 30 0109 0166 30 0109 0192	0.8512 0.3513 0.2912 0.2666 0.2305

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TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF121N RF221N	000, 200, 302, 338S, 350, 374, 420F, 430, 431, 523, 545, 998, 3011	30 0340 0399 30 0340 0481 30 0340 0506 30 0340 0521 30 0340 0546	0.0356 0.0295 0.0280 0.0272 0.0260	30 0109 0399 30 0109 0481 30 0109 0506 30 0109 0521 30 0109 0546	0.1109 0.0920 0.0875 0.0850 0.0811
RF121T RF221T	000, 200, 302, 338S, 350, 374, 420F, 430, 431, 523, 545, 998, 3011	30 0340 0043	0.3329	30 0109 0043	1.0293
RF122A RF222A	044, 317, 334, 344, 371, 372, 375, 377, 378, 379, 387, 390, 390P, 391, 391P, 392, 392P, 394, 394P, 395, 395P, 396, 396P, 398, 398P, 398R, 438, 532, 869	20 0170 0041 20 0170 0502 20 0170 0528 20 0170 0542 20 0170 0568	0.7029 0.0565 0.0537 0.0524 0.0500	20 0032 0041 20 0032 0502 20 0032 0528 20 0032 0542 20 0032 0568	3.6771 0.3003 0.2855 0.2782 0.2654
RF122B RF222B	044, 317, 334, 344, 371, 372, 375, 377, 378, 379, 387, 390, 390P, 391, 391P, 392, 392P, 394, 394P, 395, 395P, 396, 396P, 398, 398P, 398R, 438, 532, 869	20 0000 0000	40.0000	NA	NA
RF122D RF222D	044, 317, 334, 344, 371, 372, 375, 377, 378, 379, 387, 390, 390P, 391, 391P, 392, 392P, 394, 394P, 395, 395P, 396, 396P, 398, 398P, 398R, 438, 532, 869	20 0000 0000	40.0000	NA	NA
RF122E RF222E	044, 317, 334, 344, 371, 372, 375, 377, 378, 379, 387, 390, 390P, 391, 391P, 392, 392P, 394, 394P, 395, 395P, 396, 396P, 398, 398P, 398R, 438, 532, 869	20 0170 0079 20 0170 0153 20 0170 0179 20 0170 0193 20 0170 0219	0.3592 0.1855 0.1585 0.1470 0.1296	20 0032 0079 20 0032 0153 20 0032 0179 20 0032 0193 20 0032 0219	1.9084 0.9854 0.8423 0.7812 0.6884
RF122F RF222F	044, 317, 334, 344, 371, 372, 375, 377, 378, 379, 387, 390, 390P, 391, 391P, 392, 392P, 394, 394P, 395, 395P, 396, 396P, 398, 398P, 398R, 438, 532, 869	20 0170 0034 20 0170 0114 20 0170 0140 20 0170 0154 20 0170 0180	0.8518 0.2489 0.2034 0.1843 0.1577	20 0032 0034 20 0032 0114 20 0032 0140 20 0032 0154 20 0032 0180	4.4342 1.3225 1.0769 0.9790 0.8376
RF122H RF222H	044, 317, 334, 344, 371, 372, 375, 377, 378, 379, 387, 390, 390P, 391, 391P, 392, 392P, 394, 394P, 395, 395P, 396, 396P, 398, 398P, 398R, 438, 532, 869	20 0170 0220	0.1292	20 0032 0220	0.6853
RF122I RF222I	044, 317, 334, 344, 371, 372, 375, 377, 378, 379, 387, 390, 390P, 391, 391P, 392, 392P, 394, 394P, 395, 395P, 396, 396P, 398, 398P, 398R, 438, 532, 869	20 0170 0052 20 0170 0126 20 0170 0152 20 0170 0166 20 0170 0192	0.5457 0.2252 0.1875 0.1711 0.1478	20 0032 0052 20 0032 0126 20 0032 0152 20 0032 0166 20 0032 0192	2.8993 1.1965 0.9919 0.9082 0.7852

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Table 6-7, RFETS TRUCON Content Codes, Correlating IDCs, Shipping Categories, and Decay Heat Limits (continued)

TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF122N RF222N	044, 317, 334, 344, 371, 372, 375, 377, 378, 379, 387, 390, 390P, 391, 391P, 392, 392P, 394, 394P, 395, 395P, 396, 396P, 398, 398P, 398R, 438, 532, 869	20 0170 0399 20 0170 0481 20 0170 0506 20 0170 0521 20 0170 0546	0.0711 0.0590 0.0561 0.0545 0.0520	20 0032 0399 20 0032 0481 20 0032 0506 20 0032 0521 20 0032 0546	0.3779 0.3134 0.2980 0.2894 0.2761
RF122T RF222T	044, 317, 334, 344, 371, 372, 375, 377, 378, 379, 387, 390, 390P, 391, 391P, 392, 392P, 394, 394P, 395, 395P, 396, 396P, 398, 398P, 398R, 438, 532, 869	20 0170 0043	0.6659	20 0032 0043	3.5061
RF123A RF223A	339	30 0340 0502 30 0340 0528 30 0340 0542 30 0340 0568	0.0283 0.0269 0.0262 0.0250	30 0109 0502 30 0109 0528 30 0109 0542 30 0109 0568	0.0882 0.0838 0.0817 0.0779
RF123E RF223E	339	30 0340 0144 30 0340 0169 30 0340 0184 30 0340 0209	0.0985 0.0840 0.0771 0.0680	30 0109 0144 30 0109 0169 30 0109 0184 30 0109 0209	0.3074 0.2619 0.2405 0.2118
RF123F RF223F	339	30 0340 0034 30 0340 0114 30 0340 0140 30 0340 0154 30 0340 0180	0.4259 0.1245 0.1017 0.0921 0.0788	30 0109 0034 30 0109 0114 30 0109 0140 30 0109 0154 30 0109 0180	1.3018 0.3883 0.3161 0.2874 0.2459
RF123I RF223I	339	30 0340 0052 30 0340 0126 30 0340 0152 30 0340 0166 30 0340 0192	0.2729 0.1126 0.0937 0.0856 0.0739	30 0109 0052 30 0109 0126 30 0109 0152 30 0109 0166 30 0109 0192	0.8512 0.3513 0.2912 0.2666 0.2305
RF123N RF223N	339	30 0340 0399 30 0340 0481 30 0340 0506 30 0340 0521 30 0340 0546	0.0356 0.0295 0.0280 0.0272 0.0260	30 0109 0399 30 0109 0481 30 0109 0506 30 0109 0521 30 0109 0546	0.1109 0.0920 0.0875 0.0850 0.0811
RF124B RF224B	409, 411R, 411X, 412, 414, 429R, 429X, 433R, 433X, 436R, 436X, 454R, 454X	20 0000 0000	40.0000	NA	NA
RF124D RF224D	409, 411R, 411X, 412, 414, 429R, 429X, 433R, 433X, 436R, 436X, 454R, 454X	20 0000 0000	40.0000	NA	NA
RF124E RF224E	409, 411R, 411X, 412, 414, 429R, 429X, 433R, 433X, 436R, 436X, 454R, 454X	20 0008 0193 20 0008 0229 20 0008 0254 20 0008 0289	3.1246 2.6334 2.3742 2.0867	NA	NA

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Table 6-7, RFETS TRUCON Content Codes, Correlating IDCs, Shipping Categories, and Decay Heat Limits (continued)

TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF124F RF224F	409, 411R, 411X, 412, 414, 429R, 429X, 433R, 433X, 436R, 436X, 454R, 454X	20 0008 0212	2.8446	NA	NA
RF124FF RF224FF	409, 411R, 411X, 412, 414, 429R, 429X, 433R, 433X, 436R, 436X, 454R, 454X	20 0008 0283 20 0008 0319	2.1309 1.8904	NA	NA
RF124G RF224G	409, 411R, 411X, 412, 414, 429R, 429X, 433R, 433X, 436R, 436X, 454R, 454X	20 0008 0175	3.4460	NA	NA
RF124GF RF224GF	409, 411R, 411X, 412, 414, 429R, 429X, 433R, 433X, 436R, 436X, 454R, 454X	20 0008 0210 20 0008 0246	2.8717 2.4514	NA	NA
RF124H RF224H	409, 411R, 411X, 412, 414, 429R, 429X, 433R, 433X, 436R, 436X, 454R, 454X	20 0008 0629	0.9587	NA	NA
RF124HF RF224HF	409, 411R, 411X, 412, 414, 429R, 429X, 433R, 433X, 436R, 436X, 454R, 454X	20 0008 0664 20 0008 0700	0.9082 0.8615	NA	NA
RF126A RF226A	089, 099, 340, 531, 537, 809	30 0340 0481 30 0340 0506 30 0340 0521 30 0340 0546	0.0295 0.0280 0.0272 0.0260	30 0109 0481 30 0109 0506 30 0109 0521 30 0109 0546	0.0920 0.0875 0.0850 0.0811
RF126D RF226D	089, 099, 340, 531, 537, 809	30 0340 0486	0.0292	30 0109 0486	0.0911
RF126DA RF226DA	089, 099, 340, 531, 537, 809	30 0340 0147	0.0965	30 0109 0147	0.3011
RF126DAF RF226DAF	089, 099, 340, 531, 537, 809	30 0340 0172 30 0340 0198	0.0825 0.0717	30 0109 0172 30 0109 0198	0.2573 0.2235
RF126DF RF226DF	089, 099, 340, 531, 537, 809	30 0340 0512 30 0340 0538	0.0277 0.0264	30 0109 0512 30 0109 0538	0.0864 0.0823
RF126E RF226E	089, 099, 340, 531, 537, 809	30 0340 0126 30 0340 0152 30 0340 0166 30 0340 0192	0.1126 0.0937 0.0856 0.0739	30 0109 0126 30 0109 0152 30 0109 0166 30 0109 0192	0.3513 0.2912 0.2666 0.2305
RF126J RF226J	089, 099, 340, 531, 537, 809	30 0340 0180 30 0340 0206 30 0340 0220 30 0340 0246	0.0788 0.0689 0.0646 0.0577	30 0109 0180 30 0109 0206 30 0109 0220 30 0109 0246	0.2459 0.2149 0.2012 0.1799
RF126K RF226K	089, 099, 340, 531, 537, 809	30 0340 0144 30 0340 0169 30 0340 0184 30 0340 0209	0.0985 0.0840 0.0771 0.0680	30 0109 0144 30 0109 0169 30 0109 0184 30 0109 0209	0.3074 0.2619 0.2405 0.2118

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TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF126L RF226L	089, 099, 340, 531, 537, 809	30 0340 0114 30 0340 0140 30 0340 0154 30 0340 0180	0.1245 0.1017 0.0921 0.0788	30 0109 0114 30 0109 0140 30 0109 0154 30 0109 0180	0.3883 0.3161 0.2874 0.2459
RF126P RF226P	089, 099, 340, 531, 537, 809	30 0340 0174	0.0815	30 0109 0174	0.2544
RF126PF RF226PF	089, 099, 340, 531, 537, 809	30 0340 0225 30 0340 0250	0.0631 0.0568	30 0109 0225 30 0109 0250	0.1967 0.1770
RF130A RF230A	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0185 0041 30 0185 0502 30 0185 0528 30 0185 0542 30 0185 0568	0.6360 0.0519 0.0494 0.0481 0.0459	30 0040 0041 30 0040 0502 30 0040 0528 30 0040 0542 30 0040 0568	2.9417 0.2403 0.2284 0.2225 0.2123
RF130B RF230B	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0034 0502 30 0034 0528 30 0034 0542 30 0034 0568	0.2827 0.2687 0.2618 0.2498	30 0011 0502 30 0011 0528 30 0011 0542 30 0011 0568	0.8737 0.8307 0.8092 0.7722
RF130BA RF230BA	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0034 0508 30 0034 0533 30 0034 0548 30 0034 0573	0.2793 0.2662 0.2589 0.2476	30 0011 0508 30 0011 0533 30 0011 0548 30 0011 0573	0.8634 0.8229 0.8003 0.7654
RF130D RF230D	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0034 0486 30 0034 0512	0.2920 0.2771	30 0011 0486 30 0011 0512	0.9024 0.8566
RF130DF RF230DF	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0034 0512 30 0034 0538	0.2771 0.2637	30 0011 0512 30 0011 0538	0.8566 0.8152
RF130E RF230E	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0034 0133 30 0034 0159 30 0034 0173 30 0034 0198	1.0669 0.8924 0.8202 0.7166	30 0011 0133 30 0011 0159 30 0011 0173 30 0011 0198	3.2976 2.7584 2.5352 2.2151

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Table 6-7, RFETS TRUCON Content Codes, Correlating IDCs, Shipping Categories, and Decay Heat Limits (continued)

TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF130F RF230F	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0185 0034 30 0185 0133 30 0185 0159 30 0185 0173 30 0185 0198	0.7670 0.1961 0.1640 0.1507 0.1317	30 0040 0034 30 0040 0133 30 0040 0159 30 0040 0173 30 0040 0198	3.5474 0.9068 0.7586 0.6972 0.6091
RF130G RF230G	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0034 0147 30 0034 0172	0.9653 0.8250	30 0011 0147 30 0011 0172	2.9836 2.5499
RF130GF RF230GF	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0034 0172 30 0034 0198	0.8250 0.7166	30 0011 0172 30 0011 0198	2.5499 2.2151
RF130H RF230H	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0185 0220	0.1185	30 0040 0220	0.5482
RF130I RF230I	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0185 0052 30 0185 0126 30 0185 0152 30 0185 0166 30 0185 0192	0.5015 0.2070 0.1716 0.1571 0.1358	30 0040 0052 30 0040 0126 30 0040 0152 30 0040 0166 30 0040 0192	2.3194 0.9572 0.7935 0.7266 0.6282
RF130J RF230J	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0034 0180 30 0034 0206 30 0034 0220 30 0034 0246	0.7883 0.6888 0.6450 0.5768	30 0011 0180 30 0011 0206 30 0011 0220 30 0011 0246	2.4366 2.1290 1.9936 1.7829
RF130K RF230K	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0185 0687 30 0185 0713 30 0185 0727 30 0185 0752	0.0380 0.0366 0.0359 0.0347	30 0040 0687 30 0040 0713 30 0040 0727 30 0040 0752	0.1756 0.1692 0.1659 0.1604
RF130N RF230N	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0185 0399	0.0654	30 0040 0399	0.3023

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Table 6-7, RFETS TRUCON Content Codes, Correlating IDCs, Shipping Categories, and Decay Heat Limits (continued)

TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF130P RF230P	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0034 0174	0.8155	30 0011 0174	2.5206
RF130PA RF230PA	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0034 0513	0.2766	30 0011 0513	0.8549
RF130PAF RF230PAF	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0034 0565 30 0034 0590	0.2511 0.2405	30 0011 0565 30 0011 0590	0.7763 0.7434
RF130PF RF230PF	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0034 0225 30 0034 0250	0.6306 0.5676	30 0011 0225 30 0011 0250	1.9493 1.7543
RF130Q RF230Q	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0185 0660 30 0185 0686 30 0185 0700 30 0185 0725	0.0395 0.0380 0.0373 0.0360	30 0040 0660 30 0040 0686 30 0040 0700 30 0040 0725	0.1827 0.1758 0.1723 0.1664
RF130R RF230R	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0185 0163 30 0185 0188 30 0185 0202 30 0185 0228	0.1600 0.1387 0.1291 0.1144	30 0040 0163 30 0040 0188 30 0040 0202 30 0040 0228	0.7399 0.6415 0.5971 0.5290
RF130RF RF230RF	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0185 0188 30 0185 0214 30 0185 0228 30 0185 0254	0.1387 0.1219 0.1144 0.1027	30 0040 0188 30 0040 0214 30 0040 0228 30 0040 0254	0.6415 0.5636 0.5290 0.4748
RF130S RF230S	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0185 0866 30 0185 0892 30 0185 0906 30 0185 0932	0.0301 0.0292 0.0288 0.0280	30 0040 0866 30 0040 0892 30 0040 0906 30 0040 0932	0.1393 0.1352 0.1331 0.1294

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Table 6-7, RFETS TRUCON Content Codes, Correlating IDCs, Shipping Categories, and Decay Heat Limits (continued)

TRUCON Content Code	RFETS Correlating IDCs	Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)	Watt*year Criteria > 0.012	
				Numeric Shipping Category *	Decay Heat Limit (Watts/pkg)
RF130SF RF230SF	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0185 0892 30 0185 0918 30 0185 0932 30 0185 0957	0.0292 0.0284 0.0280 0.0272	30 0040 0892 30 0040 0918 30 0040 0932 30 0040 0957	0.1352 0.1314 0.1294 0.1260
RF130T RF230T	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0185 0043	0.6065	30 0040 0043	2.8049
RF130U RF230U	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0185 0839 30 0185 0865 30 0185 0879 30 0185 0905	0.0311 0.0301 0.0297 0.0288	30 0040 0839 30 0040 0865 30 0040 0879 30 0040 0905	0.1438 0.1394 0.1372 0.1333
RF130V RF230V	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0185 0172 30 0185 0198 30 0185 0212 30 0185 0237	0.1516 0.1317 0.1230 0.1100	30 0040 0172 30 0040 0198 30 0040 0212 30 0040 0237	0.7012 0.6091 0.5689 0.5089
RF130VF RF230VF	090, 091, 092, 093, 097, 338, 373, 376, 393, 393R, 394C, 396C, 398C, 411, 419, 420, 420P, 421, 422, 423, 424, 425, 428, 429, 433, 436, 454, 532, 3010, H61	30 0185 0198 30 0185 0223 30 0185 0237 30 0185 0263	0.1317 0.1169 0.1100 0.0992	30 0040 0198 30 0040 0223 30 0040 0237 30 0040 0263	0.6091 0.5409 0.5089 0.4586

* Packaging specific information (container type, confinement layers, etc.) for each shipping category is located in Table 2 of the TRUCON.

NA = Not applicable.

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Table 6-8, Decay Heat Criteria for Drum Selection

Shipping Category	Maximum Decay Heat per TRUPACT-II (watts)	Test Temperature
All shipping categories for drums in Waste Type I	34	RT
All shipping categories for drums in Waste Type II	37	RT
All shipping categories for drums overpacked in SWBs in Waste Type I	10	RT
All shipping categories for drums overpacked in SWBs in Waste Type II	11	RT
All shipping categories for drums in Waste Type III less than or equal to 7 watts per TRUPACT-II	7	RT
All shipping categories for drums in Waste Type III greater than 7 watts per TRUPACT-II	20	146° F
All shipping categories for drums overpacked in SWBs in Waste Type III	5	RT
All shipping categories in Waste Type IV	7	135° F

RT = Room temperature.

Table 6-9, Maximum Total Gas Release Rates for Test Categories

55-Gallon Drums		Drums Overpacked in an SWB	
Payload Shipping Category	Maximum Gas Release Rate (moles/sec/container) ^a	Payload Shipping Category	Maximum Gas Release Rate (moles/sec/container) ^a
Payload shipping categories belonging to Waste Type III greater than 7 watts per TRUPACT-II	6.36E-07	Payload shipping categories belonging to Waste Type IV	3.26E-06
Payload shipping categories belonging to Waste Type IV	6.51E-07	N/A	N/A

^a The maximum gas release rates were determined from analysis as described in the TRUPACT-II SAR, Section 3.4.4.

Table 6-10, Flammable Volatile Organic Compounds

Flammable VOCs
Acetone
Benzene
Butanol
Chlorobenzene
Cyclohexane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethylene
cis-1,2-Dichloroethylene
Ethyl benzene
Ethyl ether
Methanol
Methyl ethyl ketone
Methyl isobutyl ketone
Toluene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
Xylenes
Carbon Disulfide ^a

^a This compound has been added to the RFETS target analyte list due to the frequency of detection as a Tentatively Identified Compound (TIC) in at least one waste stream (refer to the TWCP QAPjP, Table B3-2).

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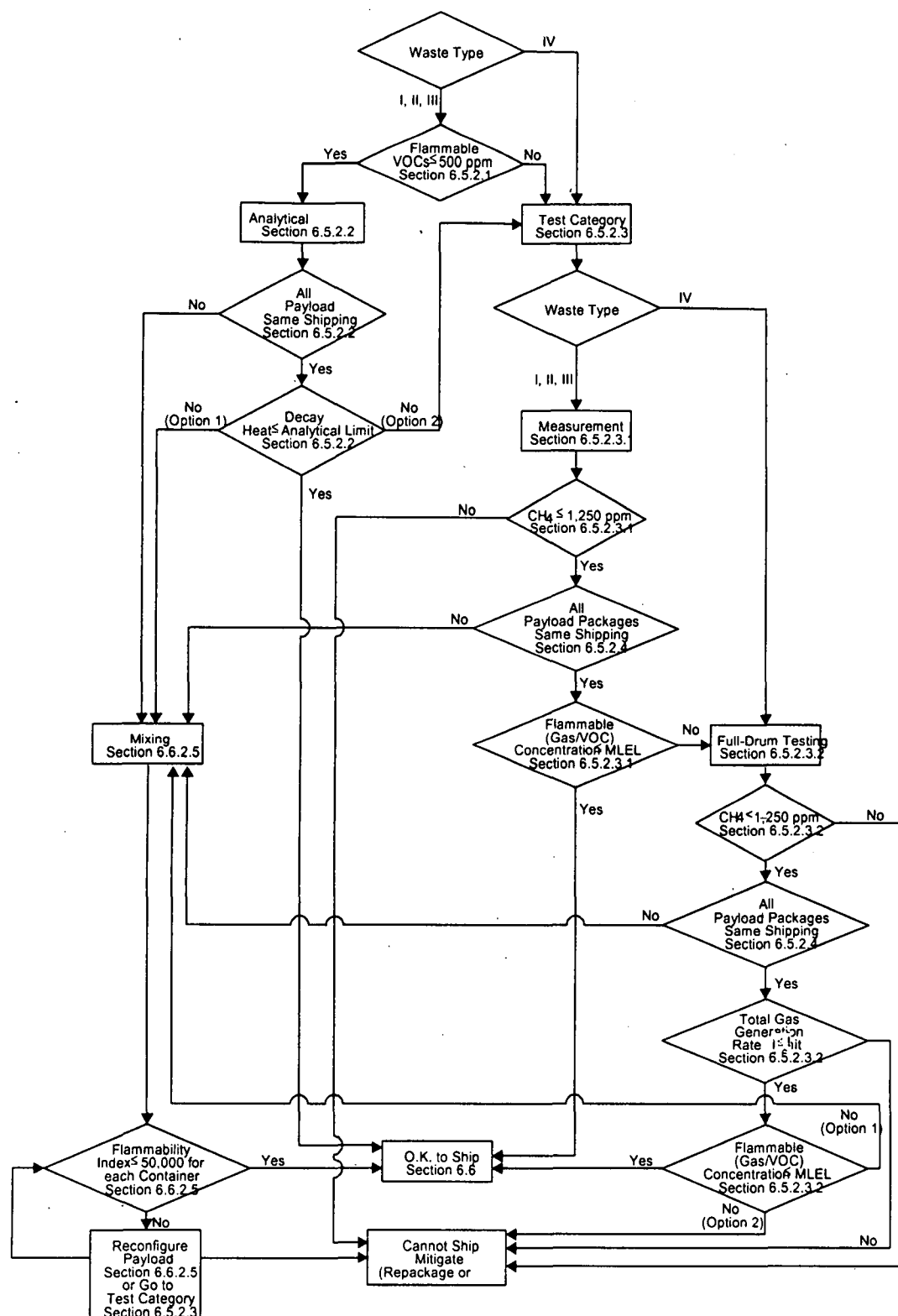
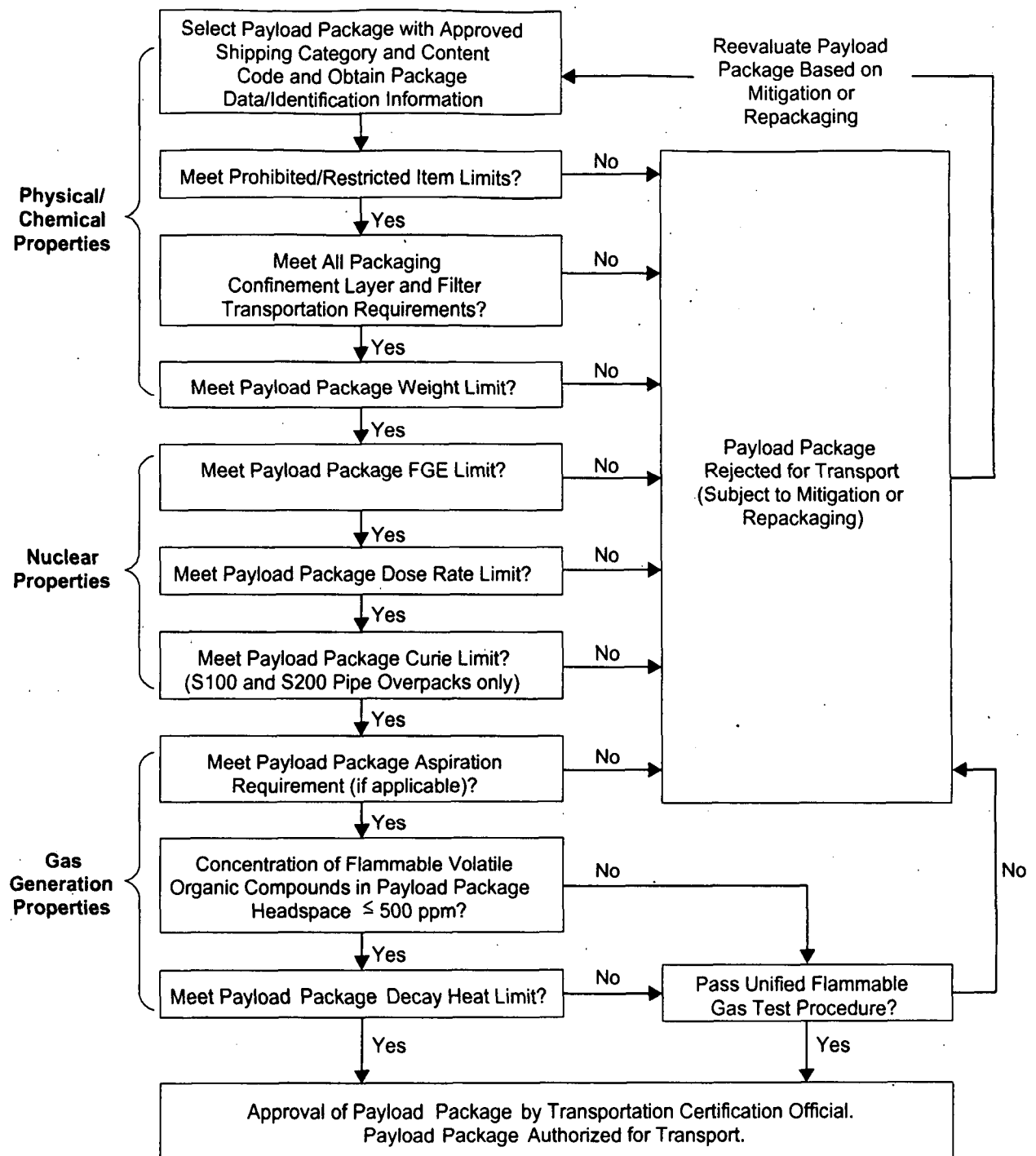


Figure 6-1, TRUPACT-II Gas Generation Requirements – RFETS Compliance Logic Flow Diagram

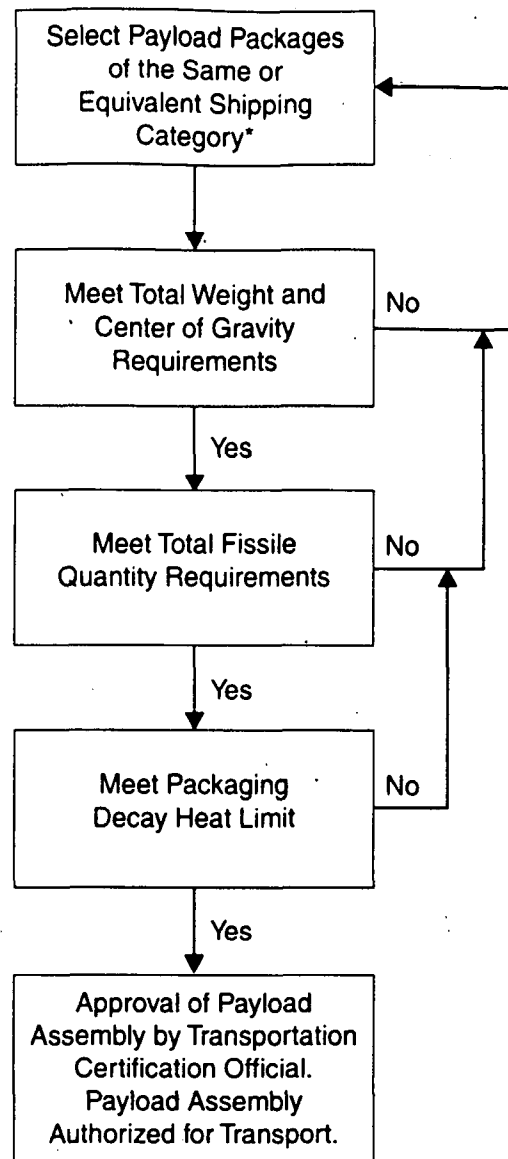
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Note: Compliance determinations illustrated by this figure may occur in any sequence.

Figure 6-2, Payload Selection

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* A TRUPACT-II payload may be assembled of payload packages belonging to the same shipping category or equivalent shipping categories (the same waste type but different bounding G values and resistances, provided the decay heat limit or hydrogen gas generation rate limit for all payload packages within the payload is conservatively assumed to be the same as that of the payload package with the lowest decay heat limit or hydrogen gas generation rate limit). A payload assembled of payload packages belonging to different shipping categories is subject to requirements discussed in Section 6.6.2.5.

Figure 6-3, TRUPACT-II Payload Assembly Criteria

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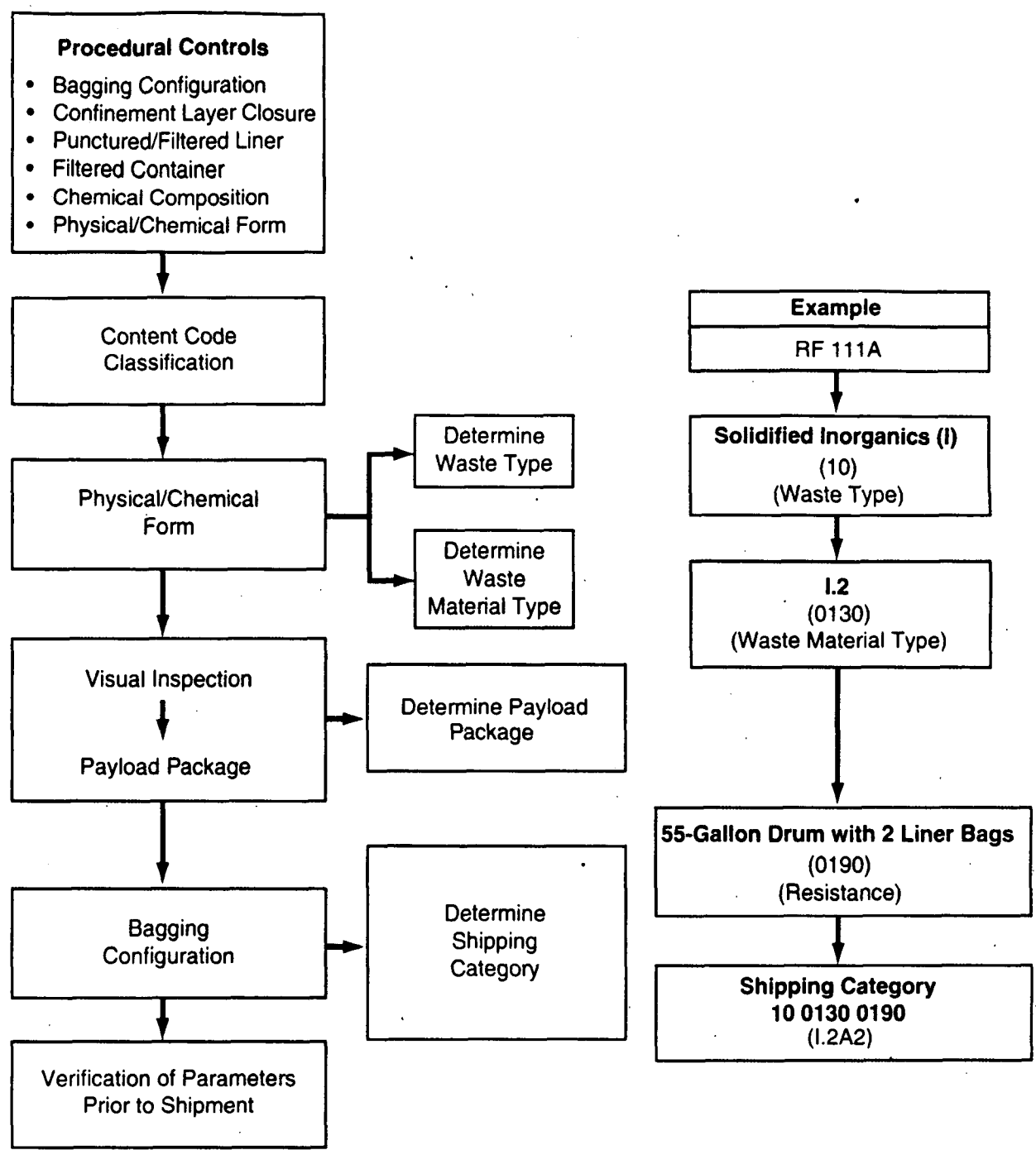


Figure 6-4, Assignment of Shipping Categories

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7. RECORDS PROCESSING

The following documents are initiated, processed or maintained as a result of this document and **SHALL** be processed as follows:

Records Identification	Record Type Determination	Protection / Storage Methods	Processing Instructions
NONE			

TRANSURANIC (TRU) WASTE
MANAGEMENT MANUAL

I-MAN-008-WM-001
REVISION 5
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40 CFR Part 194, February 1994, Criteria for the Certification & Re-Certification of the Waste Isolation Pilot Plant's (WIPP) Compliance with the 40 CFR Part 191 – Disposal Regulations, Code of Federal Regulations, Washington, D.C., Office of the Federal Register, National Archives and Records Administration

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40 CFR Parts 178-199, Transportation, Title 49, Code of Federal Regulations (Parts 178-199)

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- 1-T13-Traffic-306, Labeling and Marking TRUPACT Packages
- 1-V10-ADM-15.02, Stop Work Action
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- 1-V51-COEM-DES-210, Site Engineering Process Procedure
- 1-W37-IA-002, Integrated Planning and Scheduling of Independent Assessment Activities
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8215-C&VP-001, Building 569 Passive/Active Drum Counter Calibration and Validation Plan

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L-4111, GC/MS Determination of Volatile Organics For Waste Characterization

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MAN-066-COOP, Site Conduct of Operations Manual

MAN-071-IWCP, Integrated Work Control Program Manual

MAN-072-OS&IH PM, Occupational Safety & Industrial Hygiene Program Manual

MAN-092-M&TEM, Measuring and Test Equipment Management Manual

MAN-094-TPM, Training Program Manual

MAN-131-QAPM, Quality Assurance Program Manual

MAN-134-PPM, Procurement Program Manual

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PRO-486-WIPP-006, TRU Waste Characterization Project QA Grading

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Requirements

PRO-548-SSOC-SQA, Software Management for Nondestructive Assay Systems

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PRO-944-WIPP-008, Completion of Waste Stream Profile Form for Waste to be
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PRO-1418-WO-TRUOP, TRUPACT-II Operations

PRO-1419-WO-LKTST, TRUPACT-II Leak Test

PRO-1471-VE-771, Visual Examination for Confirmation of RTR

PRO-1541-SLLP, Site Lessons Learned Process

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PRO-Q49-PKG-4040, Warehouse Waste Packaging Operations

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RS-012-005, Cone and Quartering Method - Repack Solid Sampling and Analysis
Plan

RS-020-001, Gas Generation Testing Program Quality Assurance Project Plan

RS-020-006, Salt Residue Stabilization, Building 707 Process Control/Qualification
Plan *[The Salt Residue stabilization/repack activity that utilized this PCP was
completed in June 2000.]*

RS-020-012, Ash Residue Repack Process Control Plan

RS-020-013, Dry Residue Repackaging Process Control Plan

RS-020-018, Combustible Residue Repackaging Process Control Plan

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Site Radiological Control Manual

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WSRIC Building Books

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9. GLOSSARY

9.1 Definitions

Acceptable Knowledge (AK). An EPA term which includes process knowledge and results from previous testing, sampling, and analysis associated with the waste. Acceptable knowledge (AK) includes information regarding the raw materials used in a process or operation, process description, products produced, and associated wastes. AK documentation includes the site history and mission, site-specific processes or operations, administrative building controls, and all previous and current activities that generate a specific waste. The term "acceptable knowledge" is used interchangeably with the term "process knowledge" in this document.

As Low As Reasonably Achievable (ALARA). A philosophy of protection that controls and maintains radiation, radioactive contamination and hazardous material exposures to individuals and to the work force and general public as low as technically and economically feasible below the regulatory limits.

Becquerel. The International System unit of activity of a radionuclide equal to the activity of a quantity of a radionuclide having one spontaneous nuclear transition per second. 37 Becquerels equals one nCi.

Box. TRUPACT II standard waste box (SWB).

Calorimetry. An NDA measurement device used to measure the heat flow caused by the radioactive decay in materials.

Carbon Composite Filter. A high-efficiency particulate air filter designed to fit CH-TRU payload packages to prevent buildup of gases and pressure.

Certificate of Compliance (C of C). Authorizes use of a package for shipment of radioactive material in accordance with the provisions of 49 CFR 173.471, subject to the conditions listed in the certificate. The C of C is issued by the NRC to the Department of Energy, Albuquerque Operations Office.

Certification Authority. Authorization to certify TRU waste to the WIPP Waste Acceptance Criteria which is granted by the CBFO to those TRU waste generator/storage sites whose TRU Waste Characterization Programs have been evaluated and found to be acceptable.

Certified Waste. Payload packages, loaded with waste, that have been verified to meet the criteria of the WIPP-WAC.

Chemical Compatibility Testing. Assessing the properties of all potential chemicals in a payload package (>1 weight percent), to ensure that there will not be adverse safety or health hazards produced as a result of any mixtures that could occur.

Chemical Constituent Code (CCC). A two character alpha or numeric designator used to identify chemical constituents associated with a particular waste stream.

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9.1 Definitions (continued)

Combustibles. Organic materials that are dominantly cellulosics (e.g., cotton, paper, cloth, wood, etc.), but also includes plastics.

Compressed Gas. Any material or mixture having in the package an absolute pressure exceeding 40 psi at 70 °F, or regardless of the pressure at 70 °F, having an absolute pressure exceeding 104 psi at 130 °F; or any liquid flammable material having a vapor pressure exceeding 40 psi absolute at 100 °F, as determined by the ASTM Test D-323. Compressed gases are those materials defined as such by 49 CFR 173.300(a).

Contact-Handled (CH) TRU Waste. Transuranic waste with a surface radiation dose equivalent rate not greater than 200 mrem/hr.

Container. Serialized white drum or SWB for shipping radioactive or mixed waste. Note: The term "package" used in DOT requirements documents has replaced the use of container. This document now follows the DOT terminology except where DOE and WIPP requirements are being directly listed.

Content Code. A uniform system applied to waste forms to group those with similar characteristics for purposes of shipment in the TRUPACT-II.

Corrosive Materials. A corrosive material has a pH less than or equal to 2, or greater than or equal to 12.5. Corrosive materials are those defined as such by 40 CFR 261.22(a)(1). Also refer to 49 CFR 173.240 for an expanded definition.

Counts per minute (cpm). Related to the specific nuclear event being measured, i.e., a rate of decay (if measuring gamma radiation, the number of gamma rays detected in a minute. This number is usually less than but directly proportional to the decay rate.).

Crate Counter. An instrument used to measure radioactivity and help perform TRU or low-level waste (LLW) sorting of crates.

Curie (Ci). A unit of radioactivity equal to 3.7×10^{10} disintegrations per second (dps). A nCi is 10^{-9} Ci, or 37 dps. One nCi equals 37 Bq.

Decay Heat. Heat produced by radioactive emissions absorbed in the surrounding materials.

Dose Equivalent Rate. The radiation dose equivalent delivered per unit time (e.g., rem per hour).

D O T 7A Type A. A Department of Transportation (DOT) packaging specification for shipping Type A quantities of radioactive materials.

Environmental Coordinator/Environmental Program Manager. Individuals with technical expertise in environmental regulations and requirements who assist operations management and personnel with decisions and actions on wastes.

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9.1

Definitions (continued)

Explosive. An explosive material is any compound, mixture, or device, which produces a substantial release of gas and heat, spontaneously or by contact with sparks or flame. Also refer to 49 CFR 173.50.

Fissile Gram Equivalent (FGE). (See definition under Pu-239 Fissile Gram Equivalent).

Fissile Material. Any material consisting of or containing one or more radionuclides that can undergo neutron-induced fission with neutrons of essentially zero kinetic energy (e.g., thermal neutrons) such as ^{233}U , ^{235}U , and ^{239}Pu .

Flammable VOC. A headspace gas volatile organic component (VOC) that has a National Fire Protection Association Flammability Hazard Degree of 3 or 4 and a flashpoint of less than 100 °F or considered, by EPA, to be a significant fire hazard under WIPP repository conditions. Flammable headspace gas VOCs that are evaluated for the TWCP are listed in Table B-3 of the WIPP-WAP.

Generator. This term is interchangeable with Originator. Any person whose act or process produces a waste or whose act causes a waste to become subject to regulation or DOE order. This includes RFETS's subcontractors and DOE prime contractors who create wastes.

Glovebox. A sealed box with windows and rubber gloves attached to access ports such that an operator's hands and arms are protected as he/she works inside the box.

Hazardous Waste. Those wastes that exhibit the characteristics of being corrosive, ignitable, reactive, toxic, or are listed in 40 CFR 261 or the Code of Colorado Regulations (CCR), 6 CCR 1007-3, Colorado Hazardous Waste Regulations.

Hazardous Waste Requirements Manual. The governing document stating how RFETS identifies, treats, packages, and stores hazardous and mixed wastes.

Headspace. That volume of any containment that is not occupied by the volume of waste material. Headspace is also used to refer to the gases contained in this volume.

Item Description Code (IDC). A three or four digit number assigned to a waste form type, such as plastics, dry combustibles, light metals, etc.

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9.1 Definitions (continued)

Land Disposal Restricted (LDR). Those RCRA-regulated hazardous wastes that require treatment or applied waste constituent standards to comply with the RCRA regulations before land burial.

Layer of Confinement. Any closed plastic bag containing waste. Punctured bags or liners, bags open at the end, or pieces of plastic sheet wrapped around the waste for handling are not considered as layers of confinement.

Line Generated. Items that are removed from a glovebox or items generated from the cleanup of a contamination incident with direct count radioactivity levels greater than 500,000 cpm of alpha contamination when measured using a Ludlum-12-1A are categorized and packaged as TRU waste.

Lower Limit of Detection (LLD). The level of radioactivity which, if present, will yield a measured value greater than the critical limit with a 95% probability. The critical limit is defined as that value which measurements of background will exceed with a 5% probability.

Low Specific Activity LSA. [as defined by 49 CFR 173.403].

Neutron Multiplicity Counter (NMC). An NDA measurement device used to measure neutron radiation in packages.

Newly Generated Waste. There are two definitions for newly generated waste based on WIPP-requirement documents. One definition is derived from the WIPP-WAP and the other from TRAMPAC. Each definition is presented below:

- **WIPP-WAP Definition.** Newly generated waste is defined as TRU waste generated after the New Mexico Environmental Department approves the final audit report for RFETS.
- **TRAMPAC Definition.** Newly generated waste is defined as waste generated after a formal certification program has been established at the site.

Nondestructive Assay (NDA). The measurement of radioactivity and/or radionuclide specific activity without destroying the material.

Nondestructive Examination (NDE). Methods that allow examination of items without affecting the chemical or physical forms of these items. An example is real-time radiography (RTR) which provides visible evidence of the contents of payload packages.

Nondestructive Testing (NDT). Those groups of tests, such as Real-time Radiography (RTR), that evaluate an item's conformance without affecting the physical or chemical form of the material.

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9.1

Definitions (continued)

Non-line Generated. Radioactive waste excluding radioactive medical waste, that does not meet the definition of Line Generated; i.e., items which are not removed from a glovebox and display less than 500,000 cpm of alpha contamination when measured using a Ludlum 12-1A. This waste is packaged and characterized as LLW.

NQA-1. American Society of Mechanical Engineers (ASME) Quality Assurance Program Requirements, as specified in ASME NQA-1-1989, Quality Assurance Program Requirements for Nuclear Facilities.

Originator. This term is interchangeable with Generator. A person or persons who assemble and package waste or any person whose act or process produces a waste, or whose act causes a waste to become subject to regulation or DOE order. This includes RFETS subcontractors and DOE prime contractors who create wastes.

Overpack. Except when referenced to a packaging specified in 49 CFR 178, means an enclosure that is used by a consignor to provide protection or convenience in handling of a package, or to consolidate two or more packages. Overpack does not include a freight package. Also refer to 49 CFR 171.80.

Package. The packaging together with its radioactive contents as presented for transport (49 CFR 173.403).

Packaging. The assembly of components necessary to ensure compliance with the packaging requirements of 49 CFR. For radioactive materials, refer to 49 CFR 173.403.

Passive/Active Drum Counter (PADC). An instrument located in Building 371 that is used to measure radionuclide content and perform TRU or LLW sorting of waste drums. Measures both spontaneous and stimulated neutrons using differential die-away technique to determine nuclear material content of drummed material. Capable of measuring materials that are too dense for gamma measurements.

Payload Container Assembly. The outermost container, such as a seven-pack of drums, that is intended to be handled and emplaced in the WIPP as a single unit.

Payload Package Assembly. An assembly of payload packages, such as a seven-pack of drums, that is intended to be handled as a single unit.

Payload Packages. Fifty-five gallon drums and Standard Waste Boxes that are filled with wastes. They may also be called waste packages or payload packages.

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9.1

Definitions (continued)

Pipe Overpack Component (POC). This DOT 7A package is used primarily for TRU waste derived from the processing of residues, although other TRU wastes may also be packaged in POCs in accordance with specific project requirements. The POC packages are also known as Pipe Component Assemblies with 55-Gallon Drums or Pipe Components, but are referred to as POCs throughout this document. The POC is NRC-licensed and is an authorized configuration within the scope of the TRUPACT-II Package Certificate of Compliance (C of C No. 9218). Design configuration for the POC is maintained through the application of 1-V51-COEM-DES-210, Site Engineering Process Procedure. Supporting processes and procedures are discussed in this document.

Pressurized Vessels (Containers). Items in a payload package, such as aerosol cans, that may hold compressed gas.

Process Knowledge. Knowledge of the material used in a process that provides information for characterization of waste from that process.

Protected Area (PA). An area encompassed by physical barriers (such as, walls or fences), subject to access controls, surrounding a Material Access Area, and meeting the standards of DOE Order 5632.2A. The area of RFETS that is located within several physical security boundaries and in which most of the Special Nuclear Material is used, processed, and stored.

Pu-239 Fissile Gram Equivalent. The amount of Pu-239 that would produce the equivalent K_{eff} as that determined for the fissile material in the package (assuming all packages are in an optimally moderated infinite array) is called the Pu-239 fissile gram equivalent. U-235 and U-233 and other radionuclides shall be calculated as Pu-239 fissile equivalents using Table 6.1 in the TRUPACT-II TRAMPAC.

Pyrophoric Materials. Materials that may ignite spontaneously under ambient conditions, or are strong oxidizers (Refer to 49 CFR 173.115).

Radiochemical Assay. Process employing instrumentation capable of detecting and quantifying radioactive decay (e.g. alpha, beta, gamma) usually involving sample preparation techniques (e.g. separations which alter the original sample).

Radiological Control Technician (RCT). The job title of personnel who provide radiation protection through controls and monitoring of areas, items, and personnel.

RCRA Custodian. Designated individuals who are RCRA qualified to manage the operation(s) of a RCRA Hazardous Unit and whose actions or failure to act may result in noncompliance with the requirements of the Colorado Hazardous Waste Regulations, 6 CCR 1007-3, or the Custodian officially "on record" as the responsible RCRA Qualified Personnel for a given RCRA Hazardous Waste Unit.

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9.1 Definitions (continued)

Reactive Material. Material which is normally unstable and readily undergoes a violent change without detonating, reacts violently with water, forms potentially explosive mixtures with water, and/or generates gases, vapors or fumes when mixed with water.

Real-time Radiography (RTR). A radiographic method that allows simultaneous remote imaging for the viewing of waste package contents.

rem. Roentgen equivalent man, a unit of ionizing radiation dose equivalent.

Residual Liquid. Liquids in quantities of less than 1 volume percent of the waste package that result from liquid residues remaining in well-drained internal containers, condensation of moisture, and liquid separation resulting from sludge/resin setting.

Residue. As a result of production activities at RFETS, a variety of materials became contaminated with plutonium. If the level of plutonium contamination for specific materials exceeded the economic discard limit (EDL), the plutonium contaminated materials were originally categorized as "residue" rather than "waste" and were stored for later recovery of plutonium. These residues have now been declared to be waste.

Retrievably Stored Waste. Retrievably stored waste is defined as TRU waste generated after 1970 and before New Mexico Environmental Department notifies the WIPP facility, by approval of the final audit report, that the characterization requirements of the WIPP-WAP have been implemented appropriately at RFETS.

Segmented Gamma Scanner (SGS). An NDA measurement device used to measure gamma radiation in packages.

Segregate. To isolate, separate, or sort according to contamination level, IDC, and hazardous or nonhazardous constituency.

Shipper. A TRU waste site that releases a TRUPACT-II to a carrier for shipment.

Shipping Category. A grouping system for CH-TRU waste payload packages intended to prevent mixing of incompatible groups in the same TRUPACT-II. Refer to Section 6.5.1 of this document.

Standard Waste Box. A metal payload container authorized for use within the TRUPACT-II packaging, that has been tested by DOE to meet DOT Specification 7A, Type A requirements.

Tamper-Indicating Device (TID). A device that may be used on packages to reveal violations of containment integrity.

Ten Drum Overpack (TDOP). A specialized payload package authorized for use within the TRUPACT-II packaging that meets DOT specification 7A Type A.

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9.1 Definitions (continued)

Test Category. Payload containers that do not meet the analytical category limits are classified as test category. (TRAMPAC, revision 19, section 5.2).

Tomographic Gamma Scanner (TGS). An NDA measurement device used to measure gamma radiation in packages and drums.

Trace chemicals/materials. Chemicals/materials that occur individually in the waste in quantities less than 1 weight percent. The total quantity of trace chemicals/materials not listed as allowed materials for a given waste material type in any payload containers is restricted to less than 5 weight percent. (TRAMPAC, revision 19, section 4.3.1).

TRAMPAC. TRUPACT-II Authorized Methods for Payload Control. Documentation describing allowable methods for payload control to assure TRUPACT-II payloads meet all of the TRUPACT-II shipping requirements and limits. For each of the limits and requirements, sites must select and implement one or more of the allowable methods. This information is documented in Section 6.0 of this document.

Transportation Certification Official (TCO). The person (In Traffic Management organization) who affirms by signature that the Bill of Lading and Uniform Hazardous Waste Manifest are accurate according to DOE regulations. Certifies that the shipment meets transportation requirements of EPA, WIPP-WAC, WIPP-WAP, and DOE.

Transuranic Waste (TRU Waste). Radioactive waste containing alpha-emitting radionuclides having atomic numbers greater than 92 and half-lives greater than 20 years in concentrations greater than 100 nCi/g at the time of assay.

TRU isotope. An isotope of any element having an atomic number greater than uranium (i.e., 92).

TRU Mixed Waste. TRU waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and RCRA, respectively. For the purposes of this document, TRU waste is used to collectively reference mixed (RCRA) and non mixed wastes when controls for both waste types are the same. When it is necessary to discriminate, the wastes are specifically referenced as "mixed" or "straight" TRU waste.

TRUCON. TRUPACT-II Content Codes document developed to show wastes characterized and grouped together for controlling the payload (authorized contents) in a TRUPACT-II, (refer to DOE WIPP 89-004).

TRUPACT-II Authorized Method for Payload Control (TRAMPAC). The TRAMPAC is the governing document for payload shipments in the TRUPACT-II. (TRAMPAC, section 1.0).

TRUPACT-II Package. NRC approved Type B package loaded with TRUPACT-II standard waste boxes (SWB), 55-gallon drums or ten drum overpack.

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9.1

Definitions (continued)

TRUPACT-II Payload. 55-gallon drums, SWBs, or ten drum overpack loaded into the TRUPACT-II.

TRUPACT-II Trailer. The trailer used to ship TRU waste in TRUPACT II packages to the designated disposal facility.

Twist and Tape. A method of bag closure for waste consisting of gathering the neck of the bag, twisting tightly, and wrapping tightly with plastic tape. Often called "pigtail."

Validation. An activity that demonstrates or confirms that a process, item, data set, or service satisfies the requirements defined by the user. Data validation requirements for the TWCP include signature release and are described in the WIPP-WAP

Verification. The act of authenticating or formally asserting the truth that a process, item, data set or service is, in fact, that which is claimed. Data verification is the process used to confirm that all review and validation procedures have been completed. Data verification requirements for the TWCP are described in the WIPP-WAP.

Volatile Organic Compounds (VOCs). For the purposes of the TWCP, those gas VOCs listed in the WIPP-WAP (Table B3-2 and the target VOCs listed in Table B3-4) and any additional compounds tentatively identified by the VOC analytical procedures used to satisfy WIPP-WAP requirements.

Waste Acceptance Criteria. Waste acceptance criteria ensure that CH-TRU waste is managed and disposed of in a manner that protects human health and safety and the environment.

Waste Analysis Plan. Sites are required to implement the applicable requirements of the WIPP-WAP.

Waste and Environmental Management System (WEMS). A computer database used to perform waste package inventory, tracking, and control functions.

Waste Certification. Activities associated with waste characterization and records required to certify that the waste meets the WIPP-WAC.

Waste Certification Official (WCO). The person(s) who affirms by signature that waste meets all WIPP-WAC criteria for off-site shipment. Ensures independent oversight is conducted to verify that quality assurance requirements and waste disposal site waste acceptance criteria are satisfied.

Waste Characterization. The process of determining that TRU waste meets the requirements of the WIPP-WAC by the acceptable performance of the activities defined by the CBFO-approved site-specific plans.

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9.1 Definitions (continued)

Waste Inspection (WI). An RFETS function that provides inspection services. Waste Inspection ensures conformance to applicable waste acceptance and certification criteria. The Waste Inspector assesses package integrity, drum or box contents conformance, and package documentation, labeling, and marking.

Waste Item. Waste that is placed or packaged for placement into a waste package.

Waste Material Type. Further divisions of Waste Types based on G values (flammable gas generation potential), bagging, and packaging configurations.

Waste Package. The waste, the waste package, and any absorbent that is intended for disposal as a unit.

Waste Stream. Material from a waste generating process whose known or measured characteristics fall within a pre-established range of specific chemical and physical characteristics.

Waste Stream and Residue Identification and Characterization (WSRIC). A program designed to verify waste streams at RFETS through the collection of process knowledge, analytical data, data management, and WSRIC Building Book production. These books are reference documents for operating personnel and are used as aids in the characterization of RFETS wastes.

Waste Type. Physical types of waste such as solidified inorganics, solid inorganics, solidified organics or solid organics.

WIPP Waste Acceptance Criteria (WIPP-WAC). Criteria developed for the safe handling, packaging, and acceptance of TRU waste at the WIPP.

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9.2 Acronyms

AFGC	Allowable flammable gas concentration
AK	Acceptable Knowledge
ALARA	As Low As Reasonably Achievable
ANSI	American National Standard Institute
ASTM	American Society for Testing and Materials
Bq	Becquerel
BWRBB	Backlog Waste Reassessment Baseline Book
C of C	Certificate of Compliance
C&I	Certification and Inspection
CBFO	Carlsbad Field Office (current abbreviation)
CC	Component Checkout
CCA	Compliance Certification Application
CCC	Chemical Constituent Code
CCR	Code of Colorado Regulations.
CDPHE	Colorado Department of Public Health & Environment
CFR	Code of Federal Regulations
CH-TRU	Contact Handled Transuranic
Ci	Curie
cpm	Counts per minute
CPR	Combustibles, plastics, and rubber
CVSA	Commercial Vehicle Safety Alliance
DAC	Drum age criteria
DCF	Document Change Form
DH	Decay Heat
DOE	United States Department of Energy
DOT	United States Department of Transportation
dpm	Disintegration(s) per minute
DQO	Data Quality Objective
DU	Depleted Uranium
EPA	Environmental Protection Agency
EPA HWN	EPA Hazardous Waste Number
e-TRAMPAC	Electronic-TRAMPAC
EU	Enriched Uranium

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9.2 Acronyms (continued)

FGE	Fissile Gram Equivalent
FI	Flammability index
FRAM	Fixed Energy Response Function Analysis with Multiple Efficiencies
GC/MS	Gas Chromatography/Mass Spectroscopy
GGTP	Gas Generation Testing Program Quality Assurance Project Plan
QAPjP	
HWN	Hazardous waste number
HWRM	Hazardous Waste Requirements Manual
ICV	Inner Containment Vessel
ID	Identification
IDC	Item Description Code
KH	Kaiser-Hill
LANL	Los Alamos National Laboratory
LDR	Land Disposal Restriction
LLD	Lower Limit of Detection
LLW	Low-Level Waste
LSA	Low Specific Activity (as defined by 49 CFR 173.403[n]).
M&TE	Measuring and test equipment
MDC	Minimum Detectable Concentration
MDL	Minimum Detection Limit
MLEL	Mixture Lower Explosive Limit
MPCC	Multi-purpose passive/active neutron crate counter
mrem/hr	milliroentgen(s) equivalent man per hour
MS	Mass Spectrometry, or Matrix Spike
m/s/mf	Moles per second per mole fraction

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9.2 Acronyms (continued)

NA	Not applicable
NBL	New Brunswick Laboratory
nCi/g	NanoCuries per gram
NCR	Nonconformance Report
NDA	Nondestructive Assay
NDE	Nondestructive Examination
NDT	Nondestructive Testing
NIST	National Institute of Science and Technology.
NMC	Neutron Multiplicity Counter
NMED	New Mexico Environmental Department
NMMA	Nuclear Material Management Area
NRC	U.S. Nuclear Regulatory Commission
OCA	Outer Containment Assembly
OPCTCD	Overpack Payload Container Transportation Certification Document
PA	Protected Area
PADC	Passive/Active Drum Counter
PAN	Passive Active Neutron
PATCD	Payload Assembly Transportation Certification Document
PCP	Process Control Plan
PCTCD	Payload Container Transportation Certification Document
PM	Project Manager
PNCC	Passive neutron coincidence counting
POC	Pipe Overpack Component
ppm	Parts per million
PQAO	Project Quality Assurance Officer
PQPs	Process Qualification Plans
QA	Quality Assurance
QAO	Quality Assurance Objective
QAPD	Quality Assurance Program Document
QC	Quality Control

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9.2 Acronyms (continued)

RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
rem	Roentgen equivalent man
RFETS	Rocky Flats Environmental Technology Site
RFFO	Rocky Flats Field Office
RIDS	Records Inventory Disposition Schedule
RMS	Root Mean Square
RSD	Relative standard deviation
RSP	Radiological Safety Practices
RT	Room temperature
RTR	Real-Time Radiography
SAR	Safety Analysis Report
SDRM	Site Document Requirements Manual
SGS	Segmented Gamma Scanner
SME	Subject Matter Expert
SNM	Special Nuclear Material
SO	Systems Operability
SOP	Standard Operating Procedure
SQA	Software Quality Assurance
STP	Standard temperature and pressure
SuperHENC	Super High Efficiency Neutron drum and box counter
SWB	Standard Waste Box for the TRUPACT-II.
SVOC	Semivolatile Organic Compound

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9.2 Acronyms (continued)

TCO	Transportation Certification Official
TDOP	Ten Drum Overpack
TGS	Tomographic Gamma Scanner
TIC	Tentatively identified compound
TID	Tamper Indicating Device
TIP	Training Implementation Plan (see PLN-97-007)
TMU	Total Measurement Uncertainty
TPM	Training Program Manual (see MAN-094-TPM)
TRAMPAC	TRUPACT-II Authorized Methods for Payload Control
TRIFID	Transuranic Isotopic Fraction Interrogation Device
TRU	Transuranic Waste
TRUCON	TRUPACT-II Content Codes
TRUPACT-II	Transuranic Package Transporter-II
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage, and Disposal Facility
TWCP	TRU Waste Characterization Program Quality Assurance Project
QAPjP	Plan (see 95-QAPjP-0050)
TWMM	TRU Waste Management Manual (1-MAN-008-WM-001)
UCL	Upper confidence limit
VE	Visual Examination
VOC	Volatile Organic Compound
VV	Visual Verification
WAC	Waste Acceptance Criteria
WCF	WSRIC Change Form
WCL	Waste Component Limits
WCO	Waste Certification Official
WCR	WSRIC Change Request
WEMS	Waste and Environmental Management System
WG	Weapons Grade
WGI	Waste Generating Instruction
WI	Waste Inspection

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9.2

Acronyms (continued)

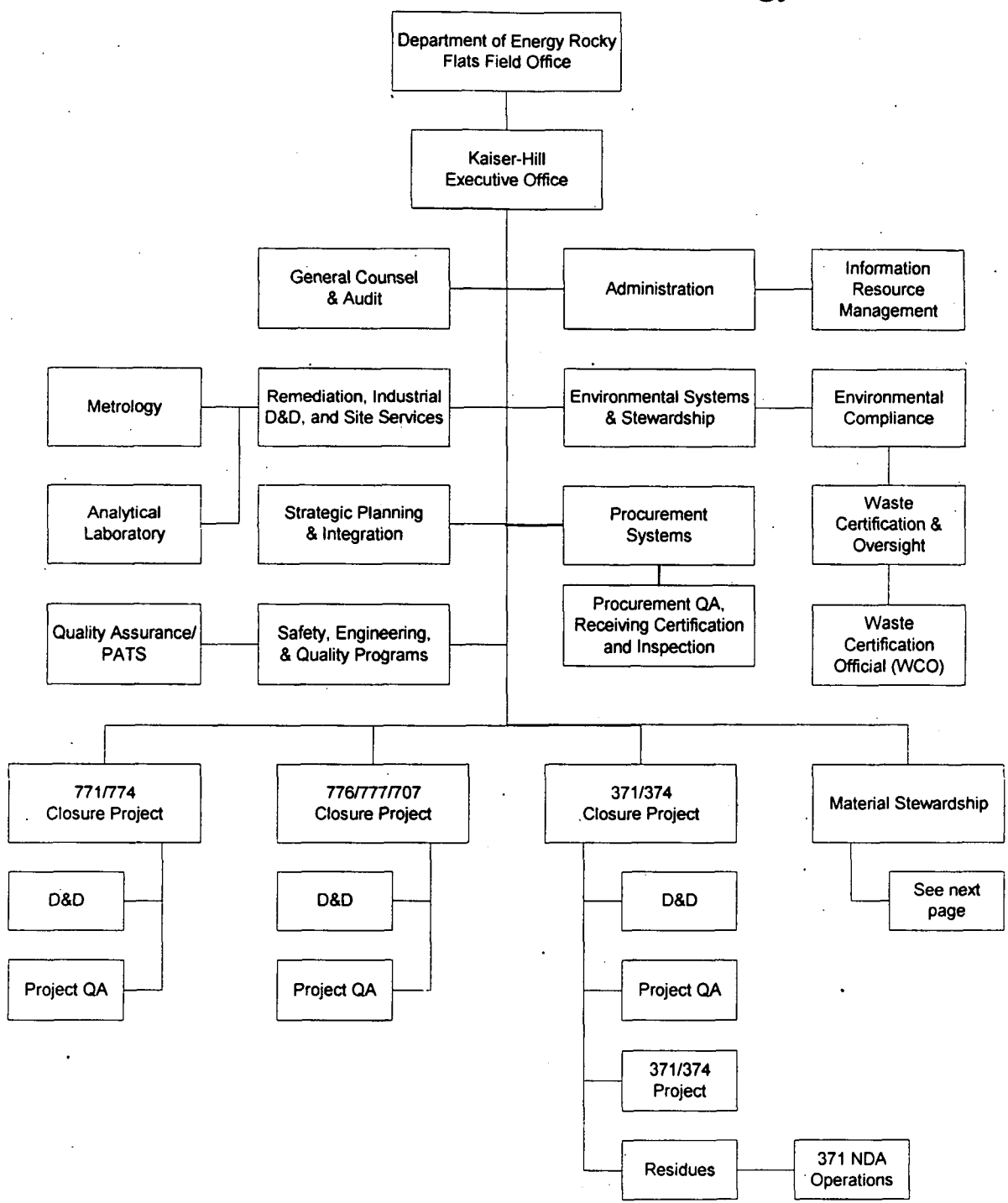
WIPP	Waste Isolation Pilot Plant
WIPP-WAC	Waste Isolation Pilot Plant Waste Acceptance Criteria
WIPP-WAP	Waste Isolation Pilot Plant Waste Analysis Plan
WNCR	Waste Nonconformance Report
WRG	Waste Requirements Group
WSPFs	Waste Stream Profile Forms
WSRIC	Waste Stream and Residue Identification and Characterization
W/RT	Waste/Residue Traveler (form number RF-47386)
WWIS	WIPP Waste Information System

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APPENDIX 1
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RFETS ORGANIZATIONAL CHARTS

Rocky Flats Environmental Technology Site



NOTES:

- The RFETS organization presented here is simplified to illustrate TWCP-related functions
- The organizational structure here is subject to change. Updates are made commensurate with changes to the TWMM.

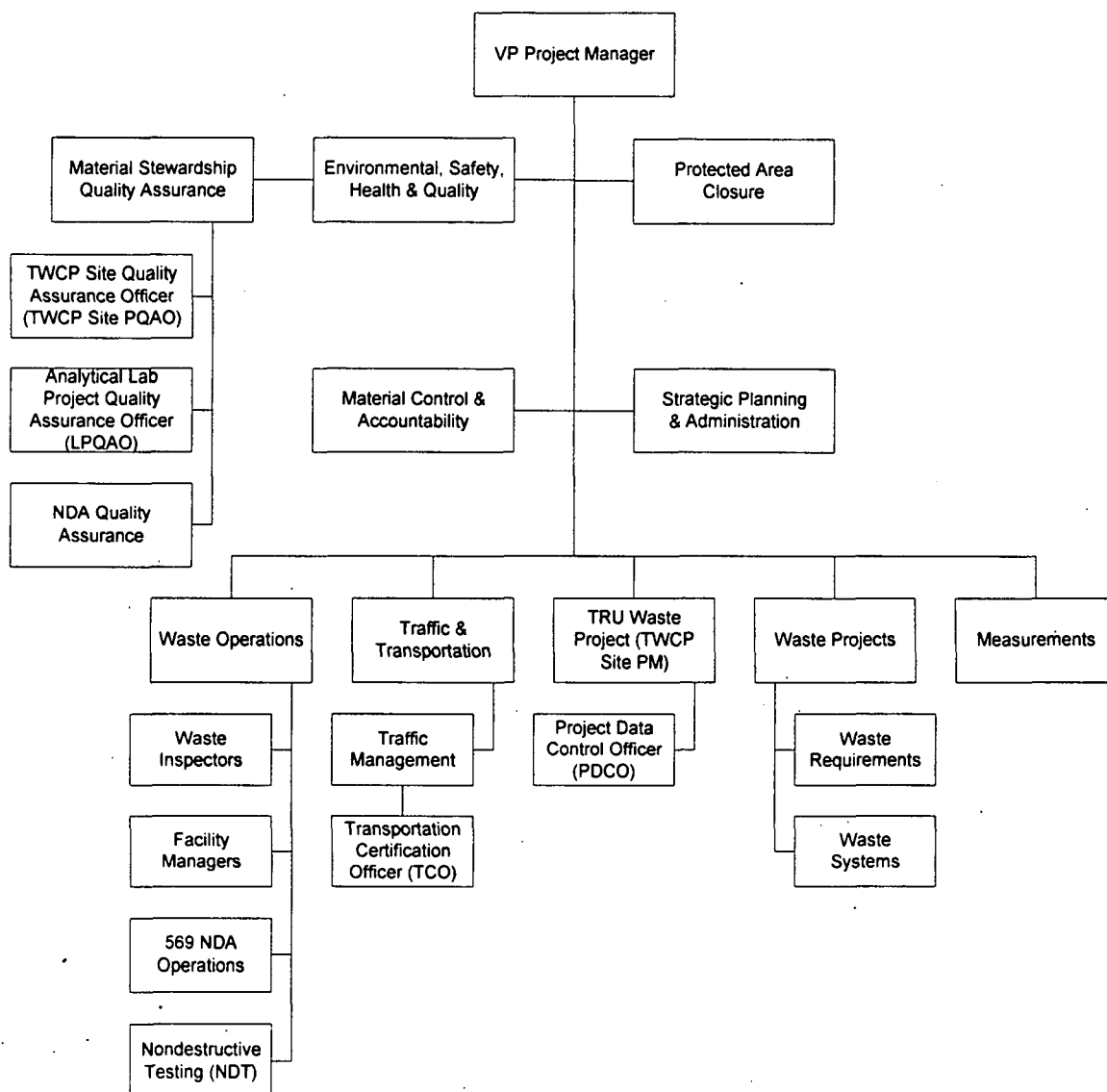
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RFETS ORGANIZATIONAL CHARTS (continued)

Material Stewardship



NOTES:

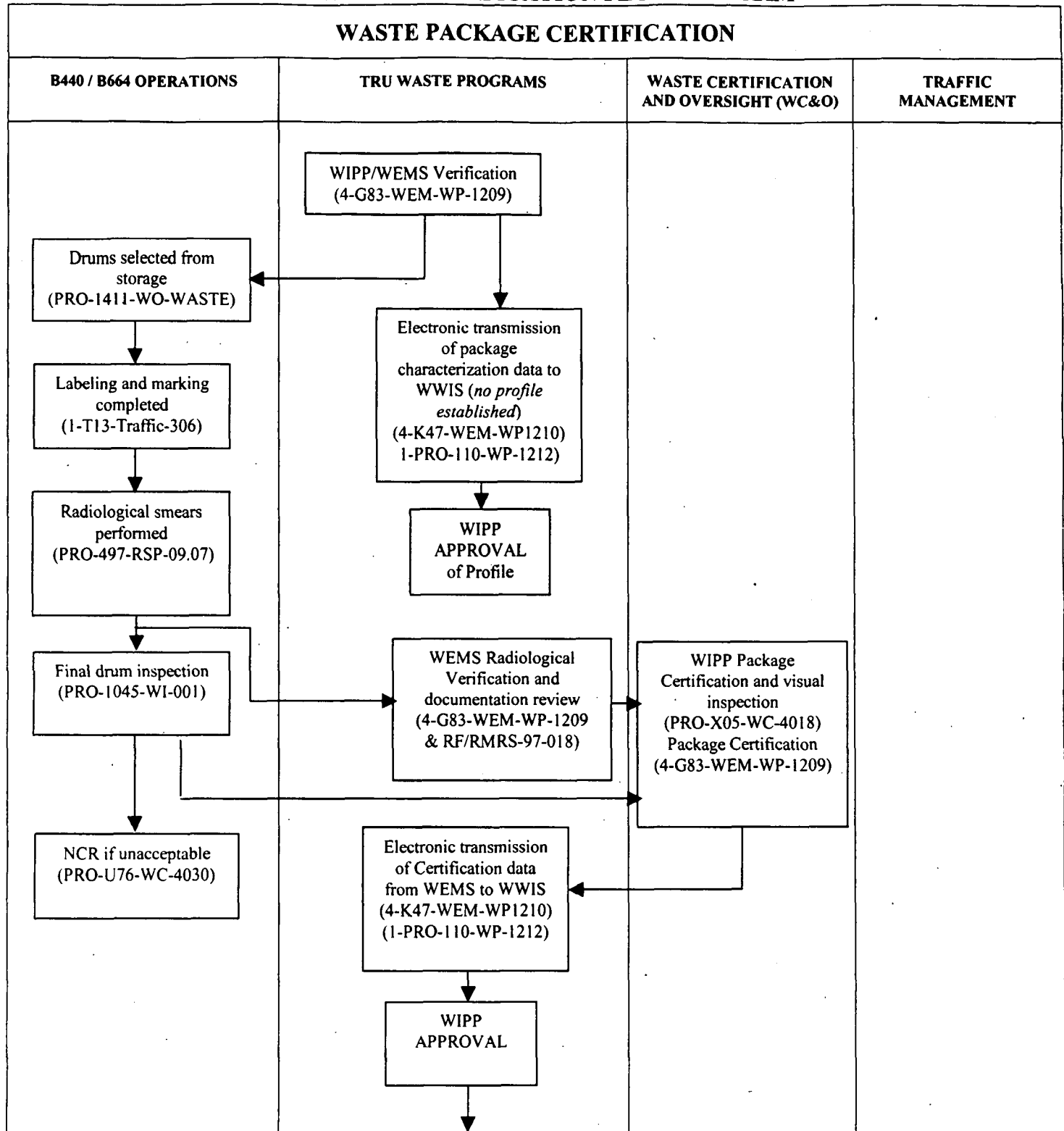
- The RFETS organization presented here is simplified to illustrate TWCP-related functions
- The organizational structure here is subject to change. Updates are made commensurate with changes to the TWMM.

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APPENDIX 2

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WASTE CERTIFICATION FLOW DIAGRAM

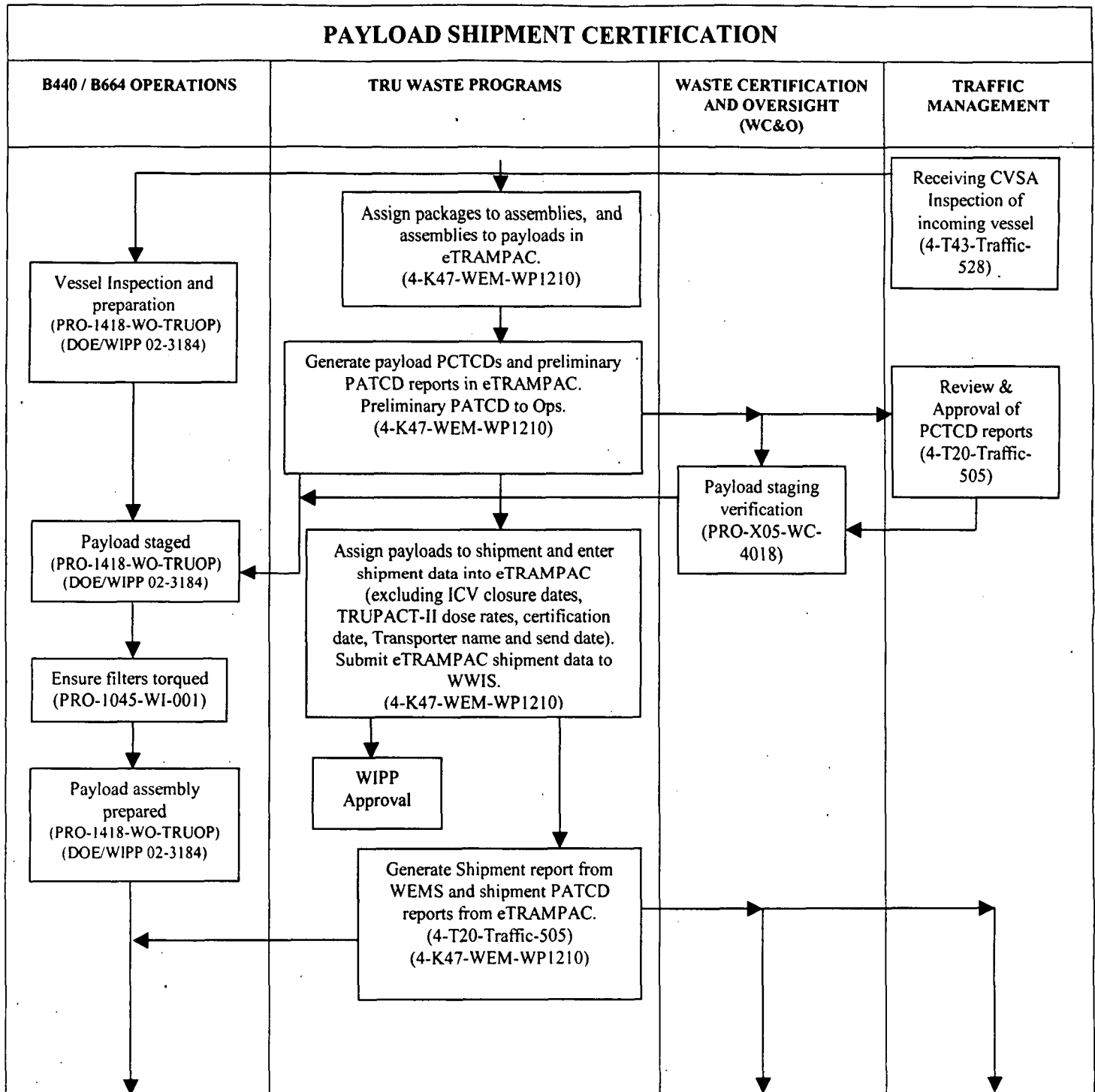


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WASTE CERTIFICATION FLOW DIAGRAM (continued)

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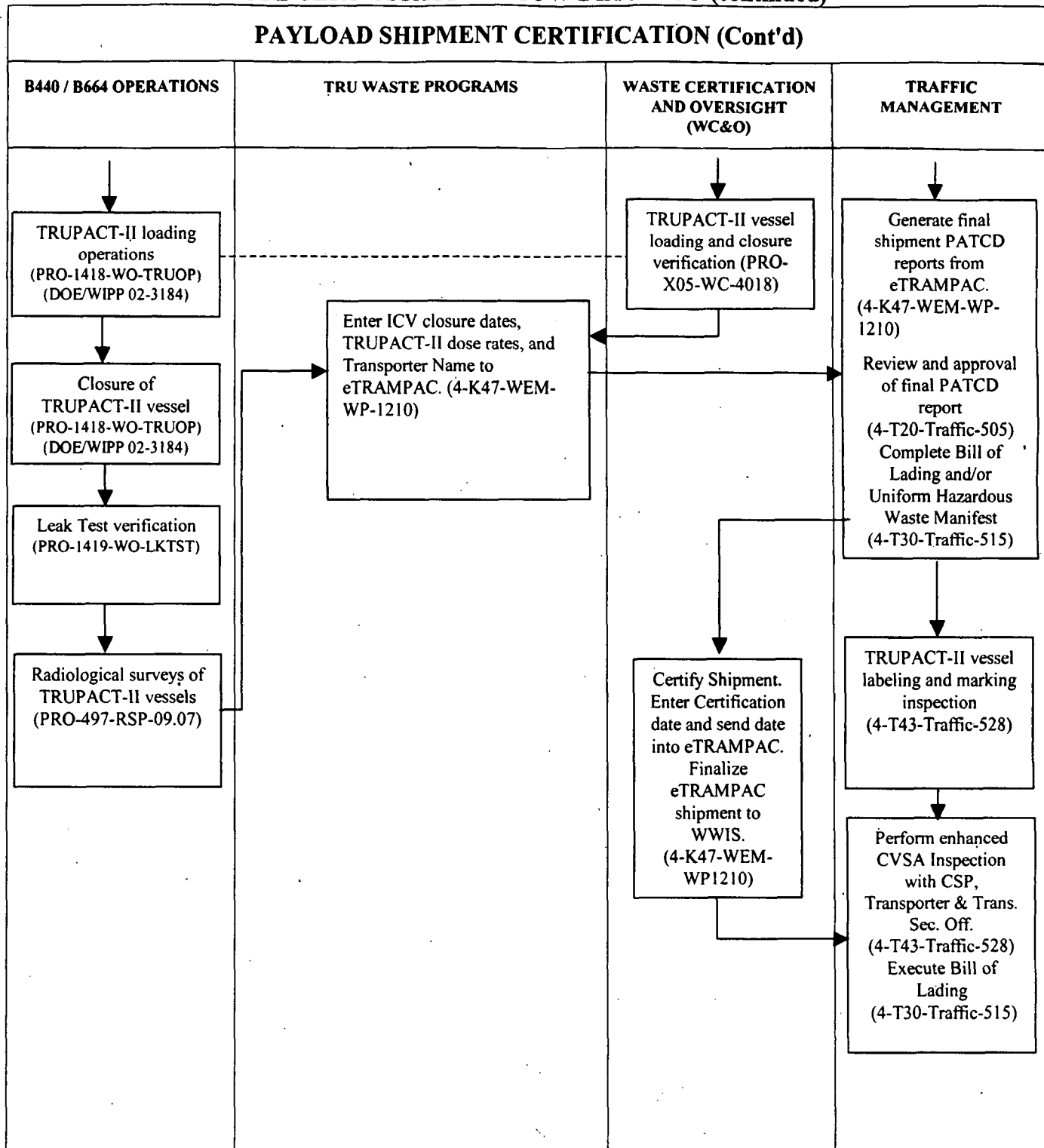
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WASTE CERTIFICATION FLOW DIAGRAM (continued)



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Visual examination of 100% of the payload package exterior is conducted to determine if the payload package meets the criteria of Section 5.2.1. RFETS incorporates the questions and criteria contained in the following checklist into PRO-1045-WI-001, Solid Radioactive Waste Inspection. This payload package inspection is performed and documented as a part of the TRUPACT-II loading process. Any YES answer on the inspection checklist will result in the inspector discontinuing the inspection, marking the payload package as unacceptable for shipment, and removal of the payload package from the shippable inventory. Before the rejected package can be shipped, it must undergo appropriate corrective actions (e.g., evaluation, repackaging, overpacking, etc.), as applicable. All packages must have an acceptable and complete inspection checklist documenting that it meets the DOT 7A criteria.

PAYLOAD PACKAGE INTEGRITY CHECKLIST

PACKAGE EXAMINATION		DISCUSSION OF CRITERIA	COMPLIANCE	
1.	Is the payload package obviously degraded?	Obviously degraded means clearly visible and potentially significant defects in the payload package or payload package surface.	YES	NO
2.	Is there evidence that the payload package is, or has been, pressurized?	Pressurization can be indicated by a fairly uniform expansion of the sidewalls, bottom or top. Past pressurization can be indicated by a notable outward deflection of the bottom or top. Verify that the drum is not warped.	YES	NO
3.	Is there any potentially significant rust or corrosion such that wall thinning, pin holes, or breaches are likely or the load bearing capacity is suspect?	Rust shall be assessed in terms of its type, extent, and location. Pitting, pocking, flaking, or dark coloration characterizes potentially significant rust or corrosion. This includes the extent of the payload package surface area covered, thickness, and, if it occurs in large flakes or built-up (caked) areas. Rusted payload packages may not be accepted if: • Rust is present in caked layers or deposits • Rust is present in the form of deep metal flaking, or built-up areas of corrosion products. In addition, the location of rust should be noted; for example on a drum: top lid; filter region; locking chine; top one-third, above the second rolling hoop; middle one-third, between the first and second rolling hoops; bottom one-third, below the second rolling hoop; and on the bottom. Payload packages may still be considered acceptable if the signs of rust show up as: • Some discoloration on the payload package • If rubbed would produce fine grit or dust or minor flaking (such that wall thinning does not occur).	YES	NO

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PAYLOAD PACKAGE INTEGRITY CHECKLIST (continued)

PACKAGE EXAMINATION		DISCUSSION OF CRITERIA	COMPLIANCE	
4.	Are any of the following apparent? • wall thinning • pin holes • breaches	Wall thinning, pin holes, and breaches can be a result of rust/corrosion (see discussion for #3).	YES	NO
5.	Are there any split seams, tears, obvious holes, punctures (of any size), creases, broken welds, or cracks?	Payload packages with obvious leaks, holes or openings, cracks, deep crevices, creases, tears, broken welds, sharp edges or pits, are either breached or on the verge of being breached. Verify that there is no warpage that could cause the package to be unstable or prevent it from fitting properly in the TRUPACT-II.	YES	NO
6.	Is the load-bearing capacity suspect?	The load-bearing capacity could be reduced for excessive rust (see discussion for #3), wall thinning (see discussion for #4), breaches, cracks, creases, broken welds, etc. (see discussion for #5).	YES	NO
7.	Is the payload package properly closed?	Inspect the fastener and fastener ring (chine) if applicable for damage or excessive corrosion. Check the alignment of the fastener to ensure that it is in firm contact around the entire lid and the payload package will not open during transportation.	YES	NO
8.	Are there any dents, scrapes, or scratches that make the payload package's structural integrity questionable or prevent the top and bottom surfaces from being parallel?	Deep gouges, scratches, or abrasions over wide areas are not acceptable. If top and bottom surfaces are not parallel, this would indicate that the package is warped. Dents should be less than ¼ inch deep by 3 inches long and between ½ inch to 6 inches wide. All other dents must be examined to determine impact of structural integrity.	YES	NO
9.	Is there discoloration which would indicate leakage or other evidence of leakage of material from the payload package?	Examine the payload package regions near vents, top lid fittings, bottom fittings, welds, seams and intersections of one or more metal sheets or plates. Payload packages must be rejected if evidence of leakage is present.	YES	NO
10.	Is the payload package bulged?	For the purposes of this examination, bulging is indicated by: • A fairly uniform expansion of the sidewalls, bottom, or top (e.g., in the case of a drum, either the top or bottom surface protrudes beyond the planar surface of the top or bottom ring, • A protrusion of the side wall (e.g., in the case of a drum, beyond a line connecting the peaks of the surrounding rolling hoops or a line between a surrounding rolling hoop and the bottom or top ring), or • Expansion of the sidewall (e.g., in the case of a drum, such that it deforms any portion of a rolling hoop).	YES	NO

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APPENDIX 4

NONDESTRUCTIVE ASSAY

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A4.0 NONDESTRUCTIVE ASSAY**A4.1 Introduction**

RFETS implements a variety of nondestructive assay (NDA) techniques to assay TRU waste consisting of a broad range of waste matrices packaged in numerous packaging configurations. RFETS NDA systems include:

- Calorimetric assay can counters and TRIFID gamma isotopic systems
- Segmented Gamma-Ray Scanner (SGS) drum counter and associated TRIFID gamma isotopic system
- Tomographic Gamma-Ray Scanner (TGS) drum and can counters and associated Fixed Energy Response Function Analysis with Multiple Efficiencies (FRAM) gamma isotopic system
- Passive/active neutron drum counter and associated FRAM gamma isotopic system
- Super High Efficiency Neutron drum and box counter (SuperHENC) and SGEAS gamma isotopic system
- Multi-purpose passive/active neutron crate counter (MPCC) and GEAS gamma isotopic system [not yet certified]

RFETS also has NDA data generated from several other NDA systems, that are no longer in operation. These NDA systems are certified to DOE/WIPP-069, Revision 7, Change Notice 2 and include:

- Canberra IQ3 Drum Counter
- Canberra Passive Neutron Drum Counter
- SGS Can Counters
- Neutron Multiplicity Can Counter
- LANL Mobile TGS Drum Counter.

The Waste Isolation Pilot Plant (WIPP) requires radiological characterization data to:

- track the WIPP radionuclide inventory, by isotopic activity and mass, for those radionuclides listed in Section 3.3.1 of the WIPP-WAC (i.e., ^{241}Am , ^{238}Pu , ^{239}Pu , ^{240}Pu , ^{242}Pu , ^{233}U , ^{234}U , ^{238}U , ^{90}Sr , and ^{137}Cs),

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A4.1 Introduction (continued)

- demonstrate that each payload package disposed of at the WIPP contains TRU waste as specified in Section 3.3.3 of the WIPP-WAC (i.e., waste contains greater than 100 nCi/g of TRU radionuclides), and
- verify that applicable transportation and facility limits on individual payload packages and assemblies for FGE, PE-Ci, and decay heat are not exceeded, as specified in Sections 3.3.2, 3.3.4 and 3.3.6 of the WIPP-WAC.

The radioassay process quantifies at least one of the more prevalent radionuclides known to be present in the waste. The remaining listed radionuclides present in the waste in significant quantities are identified by direct measurement of isotopic ratios as discussed in Section A4.2. The isotopic ratios are then used to quantify radionuclides based on the assay value. Table A4.1-1, WIPP Isotopes, lists the RFETS NDA systems that are used to assay TRU waste and describes how each of the WIPP-tracked radionuclides will be quantified.

The requisite data on isotopic ratios and quantities are derived from AK (see Section A4.2), radioassay or both using CBFO approved NDA techniques, instruments and procedures. RFETS has technically justified that the AK and/or radioassay techniques, instruments and procedures used:

- are appropriate for the specific waste stream and waste content code descriptions being assayed, and
- result in unbiased values for the cumulative activity and mass of the WIPP radionuclide inventory.

This justification is contained in the instrument-specific qualification plans listed in Table A4.1-2, RFETS NDA Instrument Qualification

NDA equipment is operated and data managed in accordance with approved written operating procedures. Table A4.1-3, RFETS NDA Operating and Data Management Procedures, lists the operating and data management procedures for RFETS NDA systems.

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A4.1 Introduction (continued)

Existing radioassay data collected prior to the implementation of a quality assurance program pursuant to 40 CFR §194.22(a)(1) may only be qualified in accordance with an alternate methodology that is approved by CBFO and employs one or more of the following methods:

- peer review in accordance with NRC NUREG-1297, Peer Review for High-Level Nuclear Waste Repositories,
- corroborating data,
- confirmatory testing (i.e., testing made on a representative sub-population of payload packages within a waste stream), or
- demonstrating the equivalence of an alternate QA program as described in the QAPD, Section 5.4.

Proposals for alternative approaches to identification and quantification of radioisotopes (e.g., qualification of isotopic ratio AK on a waste stream basis) must be submitted to CBFO for review and approval. CBFO will report such proposals to EPA for consideration prior to issuing approval.

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Table A4.1-1, WIPP Isotopes

NDA SYSTEMS	²⁴¹ Am	²³⁸ Pu	²³⁹ Pu	²⁴⁰ Pu	²⁴² Pu	²³³ U ^a	²³⁴ U ^b	²³⁸ U ^c	⁹⁰ Sr ^d	¹³⁷ Cs ^d
Cal/Gamma	Meas.	Meas.	Meas.	Meas.	Calc.	AK	Calc.	N/A	AK	AK
569 PADC	Meas.	Calc.	Meas.	Meas.	Calc.	AK	Calc.	Meas.	AK	AK
SGS Drum	Meas.	Calc.	Meas.	Calc.	Calc.	AK	Calc.	Meas.	AK	AK
SuperHENC	Meas.	Calc.	Meas.	Meas.	Calc.	AK	Calc.	Meas.	AK	AK
TGS	Meas.	Meas.	Meas.	Meas.	Calc.	AK	Calc.	Meas.	AK	AK
MPCC	Meas.	Calc.	Meas.	Meas.	Calc.	AK	Calc.	Meas.	AK	AK

- ^a. As described in RF/RMRS-97-018, RFETS TRU Waste Acceptable Knowledge Supplemental Information, ²³³U was processed at RFETS, however, it was kept under strict control, and was not present in the plutonium and uranium waste streams. Several of the counters have reported ²³³U in the past, however, all of the numbers reported were actually artifacts of the peak detection software. Although those counters still look for ²³³U, expert review eliminates the initially reported values.
- ^b. As described in RF/RMRS-97-018, RFETS TRU Waste Acceptable Knowledge Supplemental Information, ²³⁴U was not processed at RFETS, however, it is present in small quantities in enriched uranium (EU) and depleted uranium (DU). Since none of the counters are able to detect ²³⁴U in small quantities, ²³⁴U is calculated by a controlled spreadsheet based upon the estimated percent of ²³⁴U present in each measurement, with the ITR having first determined whether the uranium is present as enriched (EU) or depleted (DU). The ITR determination is reviewed by the Technical Supervisor to ensure accuracy and technical defensibility.
- ^c. The cal/gamma systems have TRIFID isotopic systems that are not set up to report radionuclide peaks as high as the ²³⁸U peak. As described in RF/RMRS-97-018, RFETS TRU Waste Acceptable Knowledge Supplemental Information, certain waste streams identified by Item Description Codes (IDCs) have EU and DU associated with them. Cal/gamma procedures list the IDCs that are not accepted to be measured, thereby restricting the measurement of material from waste streams potentially containing EU and DU.
- ^d. As described in RF/RMRS-97-018, RFETS TRU Waste Acceptable Knowledge Supplemental Information, RFETS TRU waste does not contain ⁹⁰Sr or ¹³⁷Cs.

Table A4.1-2, RFETS NDA Instrument Qualification

NDA SYSTEMS	Qualification Plans
Cal/Gamma	Rocky Flats Environmental Technology Site Non-Destructive Assay Calorimetry and Gamma Spectrometry Laboratories Calorimeter Qualification Plan
569 PADC	PADC Calibration/Validation Plan
SGS Drum	SGS Drum Counter Calibration/Validation Plan
SuperHENC	SuperHENC WIPP Calibration/Validation Plan
TGS	00-NDA-TGS-001, Qualification Plan for the Skid Mounted Tomographic Gamma Scanner (TGS) 00-NDA-TGS-002, Qualification Plan for the Tomographic Gamma Scanner (TGS) 00-NDA-TGS-003, Qualification Plan for the 569TGS04 Tomographic Gamma Scanner (TGS) Building 569 00-NDA-TGS-004, Qualification Plan for the 371TGS05 Tomographic Gamma Scanner (TGS) Building 371
MPCC	MPCC Qualification Plan

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Table A4.1-3, RFETS NDA Operating and Data Management Procedures

NDA SYSTEMS	Operating Procedures
Cal/Gamma	PRO-1298-ISOAN-37, Gamma-Ray Isotopic Analysis of Plutonium-Bearing Solids in Building 371 Cal/Gamma Laboratory PRO-1299-AIRBATH-37, Calorimetry Using the ANTECH Airbath System in Building 371 Cal/Gamma Laboratory
569 PADC	PRO-666-PADC569, Operating Building 569 Passive/Active Drum Counter PRO-1092-FRAM-569, Operating Building 569 FRAM Gamma Spectroscopy System
SGS Drum	PRO-174-WO-5227, Operating the Building 371 SGS Drum Counter
SuperHENC	PRO-957-SuperHENC, Operating the Super High Efficiency Neutron Coincidence (SuperHENC) Counter Mobile Assay System
TGS	PRO-1006-TGS-569-01, Setup and Calibration of Building 569 Drum Tomographic Gamma Scanner (TGS) PRO-1007-TGS-569-02, Operating Building 569 Drum Tomographic Gamma Scanner PRO1386-TGS-371, Setup & Calibration of B371 Can TGS PRO-1392-TGS-371, Operating B371 Tomographic Gamma Scanning (TGS) Can Counters PRO-701-TGS-371, Setup and Calibration for the Skid Mounted Tomographic Gamma Scanner (TGS) PRO-687-TGS-371, Operating the Tomographic Gamma Scanner (TGS)
MPCC	PRO-1433-664-MPCC, Operating the MPCC in B664
REVIEW LEVEL	NDA Data Management Procedures
Data Generation	PRO-845-NDA-008, Data Review and Validation for Nondestructive Assay Measurement Systems
Data Generation	PRO-1302-WIPPDATA-371, Data Review and Validation for Calorimetric Assay for WIPP-TRU Waste Characterization Program in Building 371 Cal/Gamma Laboratory
Project	PRO-940-WIPP-010, WIPP TRU Waste Characterization Project Level Data Review and Reporting

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A4.2 Radionuclide Isotopic Ratios

Establishing isotopic ratios for use in quantifying radionuclides is performed by direct measurement of the packages using WIPP-certified systems. RFETS may opt to qualify AK as permitted by 40 CFR §194.22(b) by performing confirmatory testing using WIPP-certified radioassay systems. When RFETS performs direct measurements of isotopic ratios, it is expected that all packages in the waste stream are measured, with the understanding that, in some cases, valid data may not be obtainable for given packages for technical reasons (e.g., lack of sufficient signal or poor counting statistics). All such instances are documented and appropriately dispositioned by the Measurements organization. For those few waste packages for which direct measurement does not yield useable isotopic ratio information, AK may be used. Table A4.2-1 displays which RFETS NDA systems routinely measure the isotopic ratios for each package and which use confirmatory testing.

Confirmatory testing is performed by comparing the ratio of the measured ^{240}Pu results to the measured ^{239}Pu results to a pre-established acceptance criteria. Cases where confirmatory testing fails to confirm AK isotopic ratios are documented in a nonconformance report (NCR) in accordance with 1-A65-ADM-15.01, Control of Nonconforming Items.

A4.2.1 Methods for Confirmation of Isotopic Ratio AK

As a minimum, to confirm existing AK data, it is necessary to compare ratios of the two most prevalent radionuclides in the isotopic mix. For weapons grade plutonium, these are typically ^{239}Pu and ^{240}Pu .

Because RFETS has performed chemical operations to separate ^{241}Am from plutonium, it is not possible to use AK to relate ^{241}Am to a measurement of a plutonium isotope. Consequently, every RFETS NDA technique directly measures the ^{241}Am content in each waste package.

For weapons grade waste, isotopic ratio values for ^{238}Pu can be assumed to be valid in AK data if the values for ^{239}Pu and ^{240}Pu have been confirmed. Because ^{242}Pu cannot be measured using NDA methods, the contribution of ^{242}Pu isotopic ratio is calculated by correlation techniques.

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A4.2.1 Methods for Confirmation of Isotopic Ratio AK (continued)

Every RFETS NDA system used to assay TRU waste directly measures the ^{235}U content of each waste package. If ^{235}U is measured in a waste package, then PRO-845-NDA-008, Data Review and Validation for Nondestructive Assay Measurement Systems, directs the Independent Technical Reviewer to determine whether the measured ^{235}U is part of Enriched Uranium (EU) or Depleted Uranium (DU). Once the uranium is determined to be either EU or DU, then AK information regarding the relative abundance of ^{234}U , ^{235}U , and ^{238}U in EU and DU is used to calculate both ^{234}U and ^{238}U concentrations based on the measured ^{235}U results; however, all relevant information must be included in the AK record. Since the TRIFID gamma isotopic systems associated with calorimetric assay can counters do not detect the gamma energies necessary to identify ^{238}U , it is not possible to determine whether uranium in packages counted on these systems is EU or DU. Therefore, it is not possible to calculate the ^{234}U and ^{238}U associated with a measured ^{235}U result. Consequently, packages that are assayed using calorimetric assay and that have measured ^{235}U results, must be re-measured on a WIPP qualified NDA system that allows the determination of whether uranium is EU or DU.

Based on AK, neither ^{233}U , ^{90}Sr , or ^{137}Cs are present in measurable amounts in RFETS TRU waste streams. Therefore, RFETS NDA systems are not required to detect and/or quantify these isotopes. Some RFETS NDA systems have the ability to detect ^{233}U and ^{137}Cs . Any reported results for these isotopes will be handled as a discrepancy in accordance with Section A4.2.2.3.

A4.2.2 AK Documentation

The use of AK information concerning the radiological composition of a waste stream will be documented either in the AK summary report for the waste characterization of the waste stream or in another controlled document approved by the TWCP Site PM. Should this information be contained in AK package(s) prepared to meet other general waste characterization requirements, it need not be duplicated in other controlled documents that address the radiological properties of the waste stream. RFETS AK information is assembled and maintained in accordance with PRO-484-WIPP-003, Collection, Review, and Confirmation of Acceptable Knowledge Documentation. The following discussion is included for the sake of completeness.

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A4.2.2.1 Required Elements

This section identifies the required radiological information that RFETS must maintain for a waste stream. RFETS may use AK to delineate the distribution of the 10 WIPP-tracked radioisotopes within a TRU waste stream and the presence or absence of isotopes. The type and quantity of supporting documentation may vary by waste stream and shall be compiled in a written record that shall include a summary identifying all sources of information used to delineate the waste stream's isotopic distribution. The basis and rationale for the delineation shall be clearly summarized in an AK report and traceable to referenced documents. Assumptions made in this delineation shall be identified. The following information shall be included as part of the AK written record:

- map of the site with the areas and facilities involved in TRU mixed waste generation, treatment, and storage identified;
- facility mission description as related to radionuclide-bearing materials and their management, e.g., routine weapons production, fuel research & development and experimental processes;
- description of the specific site locations (such as the area or building) and operations relative to the isotopic composition of the TRU wastes they generated, e.g., plutonium recovery, weapons fabrication, pyrochemical operations and waste incineration;
- waste identification or categorization schemes used at the facility relevant to the waste material's isotopic distribution, e.g., the use of codes that correlate to a specific isotopic distribution, and a description of the isotopic composition of each waste stream;
- information regarding the waste's physical and chemical composition that could affect the isotopic distribution, e.g., processes used to remove ingrown ^{241}Am or alter its expected contribution based solely on radioactive decay kinetics;
- statement of all numerical adjustments applied to derive the material's isotopic distribution, e.g., scaling factors, decay/ingrowth corrections and secular equilibrium considerations; and
- specification of the isotopic ratios for the 10 WIPP-tracked radionuclides (^{241}Am , ^{238}Pu , ^{239}Pu , ^{240}Pu , ^{242}Pu , ^{233}U , ^{234}U , ^{238}U , ^{90}Sr , and ^{137}Cs) and, if applicable, the radionuclides that comprise 95% of the radiological hazard on a waste stream, waste stream subpopulation, or package basis.

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A4.2.2.2 Supplemental AK Information

RFETS shall obtain supplemental AK information, dependent on availability. The amount and type of this information cannot be mandated, but RFETS shall collect information as appropriate to support the Site's contention regarding the waste's isotopic distribution. This information will be documented in RF/RMRS-97-018, RFETS TRU Waste Acceptable Knowledge Supplemental Information.

A4.2.2.3 Discrepancy Resolution

If there is a discrepancy between AK information related to isotopic ratios or composition, RFETS will evaluate the sources of the discrepancy to determine if the discrepant information is credible. Discrepancies between AK information related to isotopic ratios or composition will be evaluated by the Measurements organization and reported to the TRU Waste project office in accordance with PRO-845-NDA-008 and PRO-1302-WIPPDATA-371. Information that is not credible or information that is limited in its applicability to WIPP characterization will be identified as such and the reasons for dismissing it will be justified in writing. Limitations concerning the information will be documented in the AK record and summarized in the AK report. In the event that the discrepancy cannot be resolved, RFETS will perform direct measurements for the impacted population of packages.

If discrepancies result in a change to the original determinations, the AK will be updated in accordance with PRO-484-WIPP-003, Collection, Review, and Confirmation of Acceptable Knowledge Documentation.

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Table A4.2-1, Determination of Radionuclide Isotopic Ratios

NDA Systems	Method for Determining Radionuclide Isotopic Ratios
Cal/Gamma	Measurement
569 PADC	Confirmation Testing
SGS Drum	Confirmation Testing
SuperHENC	Confirmation Testing
TGS	Measurement
MPCC	Confirmation Testing

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A4.3 Data Quality Objectives

The data quality objectives for WIPP certifiable radiological characterization data are established in Section 3.3 of the WIPP-WAC. They are summarized in Table A4.3-1 as they apply to individual payload packages.

There are no stipulated data quality objectives for PE-Ci or individual isotope activities (except as they impact the requirements listed above). However, at a minimum, radioassay programs must be capable of identifying and reporting the presence or absence of:

- the ten radionuclides identified in WIPP-WAC Section 3.3.1 for tracking of the WIPP radionuclide inventory,
- ^{235}U , in order to calculate FGE, as required in WIPP-WAC Section 3.3.2 for compliance with transportation requirements, and
- other radionuclides whose presence contribute to 95% of the radioactive hazard, as specified in WIPP-WAC Section 3.3.1, for compliance with transportation requirements.

In support of the above requirements, RFETS must evaluate, document and technically justify the following determinations.

Lower Limit of Detection: The LLD for each radioassay system must be determined. Instruments performing TRU/low-level waste discrimination measurements must have an LLD of 100 nCi/g or less. RFETS specific environmental background and package specific interferences must be factored into LLD determinations. The LLD is that level of radioactivity which, if present, yields a measured value greater than the critical level with a 95% probability, where the critical level is defined as that value which measurements of the background will exceed with 5% probability. Because the LLD is a measurement-based parameter, it is not feasible to calculate LLDs for radionuclides that are not determined primarily by measurement (e.g., ^{90}Sr). In such cases, RFETS shall derive the equivalent of an LLD, (i.e., a reporting threshold for a radionuclide(s), when it is technically justified). This value may be based on decay kinetics, scaling factors or other scientifically based relationships and must be adequately documented in site records. For purposes of reporting radionuclide data in the WWIS, this value will be the equivalent of an LLD. The description of the methodology used to determine the LLD for each radionuclide, or a discussion of why a LLD is not technically justified for a specific radionuclide is contained in KH-NDA2002-LLD, Technical Report for the Determination of Lower Limit of Detection (LLDs) for WIPP and Other Reported Isotopes for NDA Measurement Systems.

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A4.3 Data Quality Objectives (continued)

Total Measurement Uncertainty: The method used to calculate the TMU for the quantities in Table A4.3-1 must be documented and technically justified for each CBFO certified radioassay system. Compliance with this requirement will be evaluated in reviews of the TMU documentation package for each assay system by CBFO. The discussions of TMU are presented in either a stand alone TMU Report or included in the Qualification Report for each assay system. Table A4.3-2, RFETS NDA Qualification Documents, list the Calibration, Validation, Qualification, and TMU Reports for each system.

Calibration Procedures and Frequencies: Each radioassay measurement system shall be calibrated before initial use. During calibration or re-calibration, system correction factors shall be established and algorithms adjusted such that the value of %R is set equal to 100%, i.e., the system is calibrated to 100%R. The range of applicability of system calibrations is specified in system-specific qualification reports (See Table A4-3.2, RFETS NDA Qualification Documents). The matrix/source surrogate waste combination(s) used for calibration shall be representative of the

- activity range(s) or gram loading(s), and
- relevant waste matrix characteristics (e.g., densities, moderator content, container size) planned for measurement by the system.

Calibration(s) are performed in accordance with consensus standards, when such standards exist. If consensus standards are not used, full documentation of the calibration technique must be provided to and approved by CBFO prior to performing WIPP related assays. Primary calibration standards are obtained from suppliers maintaining a nationally accredited measurement program. When primary standards are not available, the standards used are correlated with primary standards obtained from a nationally accredited measurement program. For calorimetry, calibration shall be performed in accordance with ANSI N15.54, Radiometric Calorimeters – Measurement Control Program.

NDA system calibration is documented in the system-specific Qualification Plan (See Table A4.1-2, RFETS NDA Instrument Qualification) and Qualification Report (See Table A4.3-2 RFETS NDA Qualification Documents).

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A4.3 Data Quality Objectives (continued)

Calibration Verification: Notwithstanding the need to calibrate individual components for replacement, changes or adjustments (e.g., energy calibration of a detector), verification of the radioassay measurement system's calibration shall be performed after any one of the following occurs:

- major system repairs and/or modifications
- replacement of the measurement system's components, (e.g., detector, neutron generator or supporting electronic components) that have the capacity to affect data
- significant changes to the system's software
- relocation of the system.

Calibration verification shall consist of demonstrating that the system is within the range of acceptable operation. Secondary standards can be used for the calibration verification if their performance has been correlated with calibration standards. If a verification of the measurement system's calibration or other test demonstrates that the system's response has significantly changed, a re-calibration of the system shall be performed.

NDA system calibration verification is documented in the system-specific Qualification Plan (See Table A4.1-2, RFETS NDA Instrument Qualification) and addenda to the Qualification Report (See Table A4.3-2 RFETS NDA Qualification Documents).

Calibration Confirmation: In order to confirm that the calibration of the NDA system was correctly established, the accuracy and precision of the system are determined after each calibration or re-calibration by performing replicate measurements of a non-interfering matrix. Calibration confirmation replicate measurements are performed on containers of the same nominal size as those in which actual waste is assayed and according to approved waste assay procedures. The number of replicate measurements performed shall be documented and technically justified. The replicate measurements are performed using nationally recognized standards, or certified standards derived from nationally recognized standards that span the range of use; meaning confirmation, at a minimum, the lower and upper thirds of the range of operation. The standards used to calculate accuracy are not the same as those used for the system calibration. Accuracy is reported as percent recovery (%R). The applicable range for accuracy shall not exceed $\pm 30\%$ on a non-interfering matrix. Precision is reported as percent relative standard deviation (% RSD). The % RSD shall not exceed the values listed in Table A4.3-3 for the corresponding number of replicate measurements in a non-interfering matrix.

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A4.3 Data Quality Objectives (continued)**Calibration Confirmation (continued)**

Measurement facilities may develop alternate limits for accuracy and precision subject to approval by CBFO prior to certification of waste.

NDA system calibration confirmation is documented in the system-specific Qualification Plan (See Table A4.1-2, RFETS NDA Instrument Qualification) and the Qualification Report (See Table A4.3-2 RFETS NDA Qualification Documents).

A4.3.1 MPCC System Qualification

RFETS is in the process of qualifying the Multi-Purpose Crate Counter. The MPCC is being qualified to the requirements in DOE/WIPP-069, Revision 7, Change Notice 2 using site-approved procedures. Qualification will be completed prior to the May 17, 2002 implementation date of the CH-WAC (DOE/WIPP-02-3122, Revision 0). RFETS will generate a simple gap analysis comparing the requirements contained in the old and new plans/procedures to demonstrate the adequacy of the plans/procedures put in effect prior to the implementation date of May 17, 2002. This gap analysis will be included in the system qualification report. The MPCC and associated methodology will not need to be specifically re-qualified under the CH-WAC (DOE/WIPP-02-3122, Revision 0) if the MPCC was correctly qualified (i.e., able to pass the initial certification audit) and no substantive differences are identified in the gap analysis. The operating procedures for this unit will be written in accordance with the CH-WAC (DOE/WIPP-02-3122, Revision 0). However, the data will not be validated until after the May 17, 2002 implementation date.

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Table A4.3-1, Data Quality Objectives for Radioassay

REQUIREMENT	DQO	CONFIDENCE ^a
TRU α -activity concentration > 100 nCi/g	$A > LLD$	NA%
Fissile mass ≤ 200 FGE (55-gallon drums)	$FGE + 2\sigma_{TMU}(FGE) \leq 200$	97.5 %
Fissile mass ≤ 325 FGE (SWBs and TDOPs)	$FGE + 2\sigma_{TMU}(FGE) \leq 325$	97.5 %
Decay heat $\leq$ TRAMPAC limit	$DH + 1\sigma_{TMU}(DH) \leq L_{TRAMPAC}$	84 %

^a Confidence means the statistical level of confidence that the limit is exceeded or not exceeded depending on the requirements of the individual data quality objectives. The confidence is derived from the specified DQOs which assume contributions to TMU are normally distributed.

Table A4.3-2, RFETS NDA Qualification Documents

NDA SYSTEMS	Qualification Documents
Cal/Gamma	Calorimeter-specific Qualification Reports (Instrument numbers AR02 through AR09, P2 through P10) Calorimetric Assay Total Measurement Uncertainty and Total Bias
569 PADC	569 PADC Qualification Report Package 569 PADC Total Measurement Uncertainty Report
SGS Drum	Demonstration of the Quality Assurance Objectives for Precision and Accuracy and Minimum Detectable Concentration for the Building 371 Segmented Gamma Scanner Total Measurement Uncertainty for the Building 371 Segmented Gamma Scanner ICN 371SGSDC01
SuperHENC	Calibration and Qualification Report Package for SuperHENC Mobile Assay Trailer (includes TMU Report) Supplemental Qualification Report for the Radioassay of Waste Packaged in 55-Gallon Drums Using the SuperHENC
TGS	Calibration and Qualification Report for Tomographic Gamma Scanning (TGS) Skid Mounted Can Counter 371TGS01 Calibration and Qualification Report for Tomographic Gamma Scanning (TGS) Skid Mounted Drum Counter 371TGS01(Drum) Calibration and Qualification Report for Tomographic Gamma Scanning (TGS) Can Counter 371TGS02 Calibration and Qualification Report for Tomographic Gamma Scanning (TGS) Can Counter 371TGS03 Calibration and Qualification Report for Tomographic Gamma Scanning (TGS) Can Counter 371TGS03 Determination of the Total Measurement Uncertainty for the RFETS Skid Mounted TGS and Can TGS Calibration and Qualification Report for Tomographic Gamma Scanning (TGS) Drum Counter 569TGS04 (includes TMU)
MPCC	MPCC Qualification Report (includes calibration and TMU)

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Table A4.3-3, Upper Limits for %RSD vs. Number of Replicates

NUMBER OF REPLICATES	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Max %RSD	1.8	6.6	10.0	12.3	14.0	15.2	16.2	17.1	17.7	18.3	18.8	19.3	19.7	20.0

Note: The values listed are derived from the measured standard deviation of the replicate measurements using

$$\frac{s}{\mu} * 100\% < \sqrt{\frac{(0.292)^2 * \chi^2_{0.05, n-1}}{n-1}} * 100\% \quad \text{where } s \text{ is the measured standard deviation, } n \text{ is the number of replicates,}$$

μ is the true value, $\chi^2_{0.05, n-1}$ is the critical value for the upper 5% tail of a one sided chi-squared distribution with $n-1$ degrees of freedom, and 0.292 corresponds to a 95% upper confidence bound on the true system precision limit of 29.2%.

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A4.4 Quality Control

To ensure that data of known and documented quality are generated RFETS implements a documented QA program. Any radioassay technique used for TRU waste must be performed in accordance with calibration and operating procedures that have been written, approved, and controlled by the site. The NDA operating procedures are listed in Table A4.1-3, RFETS NDA Operating and Data management Procedures. The RFETS QA program specifies qualitative and quantitative acceptance criteria for the QC checks of this program and corrective action measures to be taken when these criteria are not satisfied.

A4.4.1 General Requirements

Radioassay Training: Only appropriately trained and qualified personnel are allowed to perform radioassay and data validation/review. Standardized training requirements for radioassay personnel are based upon existing industry standardized training requirements (e.g., ASTM C1490, Standard Guide for Selection, Training and Qualification of Nondestructive Assay (NDA) Personnel; ANSI N15.54, Radiometric Calorimeters – Measurement Control Program) and meet the specifications in the QAPD. Requalification of radioassay personnel is based upon evidence of continued satisfactory performance and must be performed at least every two years. Personnel training and qualification is performed in accordance with PLN-97-007, TWCP Training Implementation Plan (TWCP TIP).

Software QC Requirements: All computer programs and revisions thereof used for radioassay meet the applicable requirements in the QAPD, Section 6.0. Compliance with the QAPD, Section 6.0 is documented in INS-246, TWCP QAPD Procedure Matrix. Software quality assurance for NDA systems is performed in accordance with PRO-548-SSOC-SQA, Software Management for Nondestructive Assay Systems.

Comparison Programs: RFETS participates in any relevant measurement comparison program(s) sponsored or approved by the CBFO. Such programs may be conducted as part of the NDA PDP or through other third parties. RFETS calorimetric assay systems participate in the Calorimetry Exchange Program sponsored by New Brunswick Laboratory. PDP participation at RFETS is done in accordance with PRO-108-PREP-01, Preparation of NDA Performance Demonstration Program Samples, and PRO-1405-PREP-02, Preparation of Boxed Waste Performance Demonstration Program (PDP) Samples for Nondestructive Assay.

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A4.4.2 NDA QC Requirements

RFETS implements, qualifies and operates NDA systems using standard operating procedures that implement assay procedures cited in various ASTM and ANSI standards and NRC standard practices and guidelines as referenced in the WIPP-WAC Appendix A.

Background Measurements: Background measurements are to be performed daily, unless otherwise approved by CBFO. Contributions to background due to radiation from nearby radiation producing equipment, standards or wastes must be carefully controlled or more frequent background checks must be performed. For calorimeters, basepower or baseline measurements shall be conducted at a frequency determined by RFETS and approved by CBFO.

Instrument Performance Measurements: Performance checks on calibrated and operable gamma and neutron NDA instruments are performed once per operational day. Performance checks include efficiency checks (when applicable), matrix correction checks and, for spectrometric instruments, peak position and resolution checks.

Both radioactive sources and surrogate waste matrix containers (both non-interfering and interfering) are used. At least once per operational week an interfering matrix is used to assess the long-term stability of the NDA instrument's matrix correction. Surrogate waste containers reflect the type of waste (e.g., debris, sludge, etc.) currently being assayed. To verify calibration, radioactivity standards are selected such that, over a six month period, the operating range of the assay system is tested in each applicable surrogate waste matrix. The use of interfering and non-interfering matrices provides a realistic assessment of the assay system's performance over time, and will assist measurement personnel in detecting potential problems relative to the matrices currently assayed by the measurement system. Interfering matrix measurement control checks are performed in accordance with PRO-731-MC-002, Measurement Control for NDA.

Interfering surrogate matrix containers are constructed in such a way that the waste characteristics do not change over time.

Radioactive sources are long-lived, easy to position relative to the detector(s), and of sufficient radioactivity to obtain good results with relatively short count times.

Performance checks for calorimetry are performed with electrical and/or heat standards traceable to a nationally accredited measurement program at a frequency determined by RFETS, consistent with ANSI N15.22-1987, Plutonium-Bearing Solids Calibration Techniques for Calorimetric Assay. This information is specified in site operating procedures and approved by CBFO.

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A4.4.2 NDA QC Requirements (continued)

Data Checks: Background (for calorimetry: baseline or base power) and performance measurements are reviewed and evaluated at least weekly to determine continued acceptability of the assay system and to monitor performance trends. If daily performance checks result in data that are outside the acceptable range, the required responses in Table A4.4-1 is followed.

A4.4.3 Radiochemistry QC Requirements

RFETS does not plan to implement any radiochemistry methods to characterize TRU waste. Therefore, no QC requirements for radiochemistry are presented.

Table A4.4-1, Range of Applicability

	ACCEPTABILITY RANGE ^a	REQUIRED RESPONSE
Acceptable Range	$ \text{Data} ^c \leq 2\sigma^b$	No action required.
Warning Range	$2\sigma^b < \text{Data} \leq 3\sigma^b$	The performance check standard shall be rerun no more than two times. If the rerun performance check(s) result in data within $\pm 2\sigma$, then the additional performance checks shall be documented and work may continue. If the system does not fall within $\pm 2\sigma$ after two rerun performance checks, then the required response for the Action Range shall be followed.
Action Range	$ \text{Data} > 3\sigma^b$	Work shall stop and the occurrence shall be documented and appropriately dispositioned (e.g., initiating a non-conformance report). The radioassay system shall be removed from service pending successful resolution of all necessary actions, and all assays performed since the last acceptable performance check are suspect, pending satisfactory resolution. Recalibration or calibration verification is required prior to returning the system back to service.

^a ANSI N15.36, Nondestructive Assay Measurement Control and Assurance.

^b "σ" – the standard deviation is only based on the reproducibility of the data check measurements themselves. This is not TMU.

^c Absolute value.

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A4.5 Data Management**RFETS Pre-DOE/WIPP-02-3122 Data Management**

The following describes data management at RFETS conducted as described in Revision 4 of this document, written to the requirements specified in DOE/WIPP-069, Revision 7, Change Notice 2.

Separate testing report sheet(s) are generated for each sample in the testing batch that includes:

- Title Radioassay Data Sheet
- Method used for NDA (i.e., procedure identification)
- TRUCON, content code, Item Description Code, matrix parameter category, as applicable
- Date of NDA examination

Note: *IF isotopic information is measured,
 THEN individual isotopic information (grams) is reported.*

*IF default isotopic information is used,
 THEN weapons grade plutonium (grams) is reported.*

- Listing of weapons grade plutonium (grams) or individual radioisotopes present (grams) and associated uncertainty (grams) reported at the 95-percent confidence level
- QC replicate (yes/no)
- Operator signature/date
- Reviewer signature/date

The following items are not required to be included on the testing report sheet(s) because they are calculated by the WEMS database and reported to CBFO through the WWIS.

- Total Pu-239 FGEs (g) and associated uncertainty
- Total alpha activity and associated uncertainty (Curies)
- Listing of individual radioisotopes present (Curies) and associated uncertainty (Curies)
- TRU alpha activity concentration and associated uncertainty (nCi/g)
- Thermal power and associated uncertainty (W)

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A4.5 Data Management (continued)**RFETS Pre-DOE/WIPP-02-3122 Data Management (continued)**

These reporting items are calculated by the Waste Environmental Management System (WEMS) waste management computer database system from data reported and input for the mass (in grams) and uncertainty of radioactive material or isotopes present that is reported on individual radioassay data sheets. Consequently, from the listing of individual radioisotopes present (grams) and associated uncertainty (grams), as reported on radioassay data sheets, WEMS calculates total Pu-239 FGE and uncertainty, total alpha activity and uncertainty (curies), activity (in curies) of individual radioisotopes present and uncertainty, and thermal power and associated uncertainty (in watts).

Data Management Guidance

RFETS has generated data under the requirements of TWMM Revision 4, which largely implemented DOE/WIPP-069, Revision 7, Change Notice 2. This data may be in various stages of the data review, verification, validation, and reporting process on May 17, 2002, the date the CH-WAC (DOE/WIPP-02-3122, Revision 0) becomes effective.

Data that is completely through the data review, verification, validation, and reporting process on May 17, 2002, will be accepted as having met the requirements of the WAC (DOE/WIPP-069, Revision 7, Change Notice 2). No reconciliation with the requirements of the CH-WAC (DOE/WIPP-02-3122, Revision 0) needs to be performed.

For data that was collected and part way through the data review, verification, validation, and reporting process prior to May 17, 2002, the requirement for a replicate measurement was in effect, and weekly interfering matrix measurements were not required. Consequently, the site program office in reviewing and approving the data package on or after May 17, 2002, will indicate on the batch report and/or batch review checklist the use of replicates (required in DOE/WIPP-069, Revision 7, Change Notice 2) in lieu of the use of a weekly interfering surrogate waste matrix (required in DOE/WIPP-02-3122, Revision 0). Also, the associated radionuclides reported to the WWIS on or after May 17, 2002, need only include those radionuclides that were quantified by the NDA system. RFETS will identify in the Batch Data Report (such as in a case narrative or batch review checklist) the rationale for addressing these allowed variances from the requirements of the CH-WAC.

Data collected after May 17, 2002 will be managed in full compliance with the CH-WAC (DOE/WIPP-02-3122, Revision 0).

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A4.5.1 Data Review and Validation

All radioassay data is reviewed and approved by qualified personnel prior to being reported. At a minimum, the data must be reviewed by a technical reviewer and approved by the TWCP Site PM or designee(s). The validation process includes verification that the applicable quality controls specified in Section A4.4 have been met. Data validation procedures are listed in Table A4.1-3, RFETS NDA Operating and Data Management Procedures.

A4.5.2 Data Reporting

Radioassay data is reported to the TWCP Project Office on a testing batch basis. Batches are defined, for the purpose of the program, as a suite of waste containers undergoing radioassay using the same testing equipment. For NDA, RFETS shall specify the size of the testing batch as needed, without regard to waste matrix

The RFETS Measurements Organization is required to submit testing batch data reports for each testing batch to the TWCP Project Office on standard forms (either hard copy or electronic equivalent), as provided in approved site specific documentation. Radioassay testing batch data reports consist of the following:

- Testing facility name, testing batch number, container numbers included in that testing batch, and signature release by the TWCP Site PM or designee(s).
- Table of contents.
- Background and performance data or control charts for the relevant time period.
- Data validation per Section 5.3.2 of the QAPD and as described in RFETS procedures.
- Separate testing report sheet(s) for each container in the testing batch that includes:
 - title "Radioassay Data Sheet"
 - method used for radioassay (i.e., procedure identification)
 - date of radioassay
 - item description code (IDC)
 - masses of individual radioisotopes present and their associated TMUs (grams) reported at the Upper 95% Confidence Level (UCL₉₅). The radioassay data sheet will specify that the TMUs are reported as UCL₉₅.
 - operator signature/date
 - reviewer signature/date.

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A4.5.2 Data Reporting (continued)

Other radiological properties to be documented for each container include:

- decay heat expressed in Watts (W) and its associated TMU,
- total ^{239}Pu FGE expressed in grams (g) and its associated TMU,
- TRU alpha activity concentration expressed in curies/gram (Ci/g) and its associated TMU, and
- total ^{239}Pu equivalent activity expressed in curies (Ci).

These calculated quantities are calculated by and presented in the Waste and Environmental Management System (WEMS).

A4.5.3 Data and Records Retention

The following nonpermanent records are maintained by the Measurements organization or are forwarded to the site project office for maintenance, and are documented and retrievable by testing batch number, in accordance with the QAPD:

- testing batch reports
- all raw data, including instrument readouts, calculation records, and radioassay QC results
- all instrument calibration reports, as applicable.

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A4.6 Quality Characteristics Assessment

Per 40 CFR §194.22(c), there are five "quality characteristics" that have to be assessed. These quality characteristics and the method by which they are assessed are described in the following sections.

A4.6.1 Data Accuracy

Per 40 CFR §194.22(c)(1), Data Accuracy is defined as "the degree to which data agree with an acceptable reference or true value." For NDA methods, this quality characteristic is met and maintained as described in Section A4.4.2.

A4.6.2 Data Precision

Per 40 CFR §194.22(c)(2), Data Precision is defined as "a measure of the mutual agreement between comparable data gathered or developed under similar conditions expressed in terms of standard deviation." For NDA methods, this quality characteristic is met and maintained as described in Section A4.4.2.

A4.6.3 Data Representativeness

Per 40 CFR §194.22(c)(3), Data Representativeness is defined as "the degree to which data can accurately and precisely represent a characteristic of a population, a parameter, variations at a sampling point, or environmental conditions." For NDA, this quality characteristic for the waste stream is met and maintained through 100% measurement confirmation on a payload package basis. For NDA, since the entire waste package is subjected to measurement, representativeness pertaining to the actual measurement is not applicable.

A4.6.4 Data Completeness

Per 40 CFR §194.22(c)(4), Data Completeness is defined as "a measure of the amount of valid data obtained compared to the amount that was expected." For NDA methods, this quality characteristic is met and maintained by requiring 100% valid results. Any results indicating the NDA measurement was invalid require re-measurement.

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A4.6.5 Data Comparability

Per 40 CFR §194.22(c)(5), Data Comparability is defined as "a measure of confidence with which one data set can be compared to another." For NDA, this quality characteristic is addressed by ensuring that all data are produced under the same system of controls. These controls apply to all aspects of the data generation process, including: procurement of analytical instruments; calibration and operation of assay equipment according to industry standards; preparation and use of standardized instrument and data review procedures; and, training of equipment operators and technical/data review personnel to the QAPD, as specified in Section A4.4.1. All NDA systems and methods are approved by CBFO prior to use in generating waste characterization data. Additionally, comparison of measured data with AK derived or based values, as applicable, provides a means to assess comparability on a waste stream basis. Although no specific confidence level is specified, these controls provide comparability among all data generated under this program. RFETS shall participate in applicable measurement comparison programs as specified in Section A4.4.1

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NUMERIC PAYLOAD SHIPPING CATEGORY WORKSHEET

Container ID Number:							
Two Digit Waste Type Notation (XX) from Table 6-3							
G Value for Waste Material Type from Table 6-4		Four Digit G Value Notation (YYYY) from Table 6-4					
Confinement Layers	Packaging	Type	Number of Layers	Resistance Factor (Use One Column Only) ^a		Total Resistance Factor ^b	
				Column 1	Column 2		
	Inner Bag Layers	Filtered		From Table A5-2			
		Twist and Tape		23,989	17,922		
	Metal Can Layers	Slip-Top/Unsealed		0	0		
		Filtered		From Table A5-2			
	Liner Bag Layers	Filtered Drum Liner Bag		From Table A5-2			
		Twist and Tape Drum Liner Bag		2,142	2,142		
		Filtered SWB/Bin/TDOP Liner Bag		From Table A5-2			
		Fold and Tape SWB/ Bin/TDOP Liner Bag		1,257	1,257		
Rigid Drum Liner	Rigid Liner		From Table A5-2				
Choose Those That Apply	Payload Container	Pipe Component		From Table A5-3			
		55-Gallon Drum (or Pipe Overpack)		From Table A5-3			
		100-Gallon Drum		From Table A5-3			
		Bin Overpack		From Table A5-3			
		85-Gallon Drum Overpack - One 55-Gallon Drum		From Table A5-3			
		SWB - Direct Load		From Table A5-3			
		SWB Overpack - Four 55-Gallon Drums		From Table A5-3			
		TDOP - Direct Load		From Table A5-3			
	Load Type ^c	55-Gallon Drums or Pipe Overpacks		7,147			
		100-Gallon Drums		2,764			
		Direct Loaded SWBs or Bin Overpacks		1,430			
		SWB Overpacks Containing Up To Four 55-Gallon Drums per SWB; or 85-Gallon Overpacks of 55-Gallon Drums		5,718			
		Direct Loaded TDOP		980			
	Total Resistance Factor Sum						
	Divide Total Resistance Factor Sum by 100 and Round Up to Whole Number						÷ 100
Total Resistance Notation (ZZZZ) Report as Four Digits If Waste Type 20 and a metal can is the innermost layer of confinement, enter 0000.							
Payload Shipping Category (XX YYYY ZZZZ)							

^a Use Column 1 for the following six-digit notations (XX YYYY): 10 0160, 10 0130, 10 0040, and 20 0008. Use Column 2 for all other six-digit notations.

^b Multiply the "Number" by the appropriate "Resistance Factor" to obtain the "Total Resistance Factor."

^c See Appendix 3.6.13 of the TRUPACT-II Safety Analysis Report regarding the selection of the appropriate Load Type for overpacked configurations.

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NUMERIC PAYLOAD SHIPPING CATEGORY WORKSHEET (continued)

Filtered/Punctured Confinement Layers Resistance Worksheet

Packaging/Type	Minimum Filter Hydrogen Diffusivity/Minimum Puncture Diameter	Number of Layers	Resistance Factor ^a (Use One Column Only)		Number of Filters/Punctures	Total Resistance Factor ^b
			Column 1	Column 2		
Inner Bag Layers: Filtered	1.075×10^{-5} m/s/mf Filter		1,290	931		
	2.150×10^{-5} m/s/mf Filter		645	466		
	5.375×10^{-5} m/s/mf Filter		258	187		
	2.688×10^{-4} m/s/mf Filter		52	38		
	1.075×10^{-3} m/s/mf Filter		13	10		
Metal Can Layers: Filtered	1.9×10^{-6} m/s/mf Filter		7,294	5,264		
	3.7×10^{-6} m/s/mf Filter		3,746	2,703		
	7.4×10^{-6} m/s/mf Filter		1,873	1,352		
	1.85×10^{-5} m/s/mf Filter		750	541		
	9.25×10^{-5} m/s/mf Filter		150	109		
	3.7×10^{-4} m/s/mf Filter		38	28		
Liner Bag Layers: Filtered Drum Liner Bag	1.075×10^{-5} m/s/mf Filter		933	673		
	2.150×10^{-5} m/s/mf Filter		542	391		
	5.375×10^{-5} m/s/mf Filter		240	173		
	2.688×10^{-4} m/s/mf Filter		51	37		
	1.075×10^{-3} m/s/mf Filter		13	10		
Liner Bag Layers: Filtered SWB/Bin/TDOP Liner Bag	1.075×10^{-5} m/s/mf Filter		764	551		
	2.150×10^{-5} m/s/mf Filter		480	347		
	5.375×10^{-5} m/s/mf Filter		227	164		
	2.688×10^{-4} m/s/mf Filter		51	37		
	1.075×10^{-3} m/s/mf Filter		13	10		
Rigid Drum Liner:	0.3" Diameter Hole		197	197		
	0.375" Diameter Hole		126	126		
	0.75" Diameter Hole		32	32		
	1" Diameter Hole		18	18		
	2" Diameter Hole		5	5		

^a Use Column 1 for the following six-digit notations (XX YYYY): 10 0160, 10 0130, 10 0040, and 20 0008. Use Column 2 for all other six-digit notations.

^b Multiply the "Number of Layers" by the appropriate "Resistance Factor" and divide by the "Number of Filters/Punctures" to obtain the "Total Resistance Factor."

m/s/mf = Moles/second/mole fraction.

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NUMERIC PAYLOAD SHIPPING CATEGORY WORKSHEET (continued)**Payload Container Resistance Worksheet^a**

Payload Container	Filter Type	Number of Filters on Container	Resistance Factor ^b (Use One Column Only)		Total Resistance Factor ^c
			Column 1	Column 2	
Pipe Component	1.9 x 10 ⁻⁶ m/s/mf Filter		7,294	5,264	
	3.7 x 10 ⁻⁶ m/s/mf Filter		3,746	2,703	
	7.4 x 10 ⁻⁶ m/s/mf Filter		1,873	1,352	
	1.85 x 10 ⁻⁵ m/s/mf Filter		750	541	
	9.25 x 10 ⁻⁵ m/s/mf Filter		150	109	
	3.7 x 10 ⁻⁴ m/s/mf Filter		38	28	
55-Gallon Drum (or Pipe Overpack)	1.9 x 10 ⁻⁶ m/s/mf Filter		7,294	5,264	
	3.7 x 10 ⁻⁶ m/s/mf Filter		3,746	2,703	
	7.4 x 10 ⁻⁶ m/s/mf Filter		1,873	1,352	
	1.85 x 10 ⁻⁵ m/s/mf Filter		750	541	
	9.25 x 10 ⁻⁵ m/s/mf Filter		150	109	
	3.7 x 10 ⁻⁴ m/s/mf Filter		38	28	
100-Gallon Drum	3.7 x 10 ⁻⁶ m/s/mf Filter		3,746	2,703	
	7.4 x 10 ⁻⁶ m/s/mf Filter		1,873	1,352	
	1.85 x 10 ⁻⁵ m/s/mf Filter		750	541	
	9.25 x 10 ⁻⁵ m/s/mf Filter		150	109	
	3.7 x 10 ⁻⁴ m/s/mf Filter		38	28	
Bin Overpack ^d (SWB Containing One Experimental Bin)	3.7 x 10 ⁻⁶ m/s/mf Filter		3,746	2,703	
	7.4 x 10 ⁻⁶ m/s/mf Filter		1,873	1,352	
	1.85 x 10 ⁻⁵ m/s/mf Filter		750	541	
	9.25 x 10 ⁻⁵ m/s/mf Filter		150	109	
	3.7 x 10 ⁻⁴ m/s/mf Filter		38	28	
85-Gallon Drum Overpack Containing One 55-Gallon Drum	3.7 x 10 ⁻⁶ m/s/mf Filter		7,490	5,406	
	7.4 x 10 ⁻⁶ m/s/mf Filter		3,746	2,703	
	1.85 x 10 ⁻⁵ m/s/mf Filter		1,499	1,082	
	9.25 x 10 ⁻⁵ m/s/mf Filter		300	217	
	3.7 x 10 ⁻⁴ m/s/mf Filter		75	55	

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NUMERIC PAYLOAD SHIPPING CATEGORY WORKSHEET (continued)

Payload Container Resistance Worksheet (continued)^a

Payload Container	Filter Type	Number of Filters on Container	Resistance Factor ^b (Use One Column Only)		Total Resistance Factor ^c
			Column 1	Column 2	
SWB – Direct Load ^d	3.7 x 10 ⁻⁶ m/s/mf Filter		1,873	1,352	
	7.4 x 10 ⁻⁶ m/s/mf Filter		937	676	
	1.85 x 10 ⁻⁵ m/s/mf Filter		375	271	
	9.25 x 10 ⁻⁵ m/s/mf Filter		75	55	
	3.7 x 10 ⁻⁴ m/s/mf Filter		19	14	
SWB Overpack Containing Up To Four 55-Gallon Drums	3.7 x 10 ⁻⁶ m/s/mf Filter		7,490	5,406	
	7.4 x 10 ⁻⁶ m/s/mf Filter		3,746	2,703	
	1.85 x 10 ⁻⁵ m/s/mf Filter		1,499	1,082	
	9.25 x 10 ⁻⁵ m/s/mf Filter		300	217	
	3.7 x 10 ⁻⁴ m/s/mf Filter		75	55	
TDOP – Direct Load	3.7 x 10 ⁻⁶ m/s/mf Filter		417	301	
	7.4 x 10 ⁻⁶ m/s/mf Filter		209	151	
	1.85 x 10 ⁻⁵ m/s/mf Filter		84	61	
	9.25 x 10 ⁻⁵ m/s/mf Filter		17	13	
	3.7 x 10 ⁻⁴ m/s/mf Filter		5	4	

- ^a See Appendix 3.6.13 of the TRUPACT-II Safety Analysis Report regarding the selection of payload packages for overpacked configurations.
- ^b Use Column 1 for the following six-digit notations (XX YYYY): 10 0160, 10 0130, 10 0040, and 20 0008. Use Column 2 for all other six-digit notations.
- ^c Divide the appropriate "Resistance Factor" by the "Number of Filters on Container" to obtain the "Total Resistance Factor."
- ^d Bin Overpack and SWB (direct load) configurations assume two filters on the payload package as the baseline (as described in Section 6.2.5.1 of the RFETS TRAMPAC Compliance Plan). The "Number of Filters on Container" for these configurations should be entered as the ratio of the total number of filters on the payload package divided by the baseline number of filters (2). For example, for an SWB (direct load) with 3 filters, the "Number of Filters on Container" would be 3 / 2.

m/s/mf = Moles/second/mole fraction.

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PAYLOAD ASSEMBLY TRANSPORTATION CERTIFICATION DOCUMENT (PATCD)*

IDENTIFICATION PARAMETERS

Shipment #: _____ Packaging OCA Body/Lid #: _____

Governing Payload Shipping Category: _____

Governing Payload Shipping Category Decay Heat Limit: _____

Governing Hydrogen/Flammable Gas Generation Rate Limit: _____

Type of Payload: ☐ 55-Gallon Drums ☐ Standard Pipe Overpacks ☐ S100 Pipe Overpacks
 ☐ S200 Pipe Overpacks ☐ 100-Gallon Drums ☐ SWBs
 ☐ SWB Overpacks ☐ Bin Overpacks ☐ TDOP

Date ICV Closed: _____

BOTTOM PAYLOAD ASSEMBLY COMPOSITION								
Container ID	Weight (lbs)	Error (lbs)	Decay Heat (watts)	Error (watts)	Fissile Mass (FGE)	2x Error (FGE)	Hydrogen/Flammable Gas Generation Rate	Flammability Index
Subtotal (A)								
Subtotal RMS Error (C)								

TOP PAYLOAD ASSEMBLY COMPOSITION								
Container ID	Weight (lbs)	Error (lbs)	Decay Heat (watts)	Error (watts)	Fissile Mass (FGE)	2x Error (FGE)	Hydrogen/Flammable Gas Generation Rate	Flammability Index
Subtotal (B)								
Subtotal RMS Error (D)								

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PAYLOAD ASSEMBLY TRANSPORTATION CERTIFICATION DOCUMENT (PATCD)^a

PAYLOAD TOTALS

Weight of Pallets, Reinforcing Plates, Slip Sheets, Guide Tubes, Adjustable Slings, etc. (E) _____

Total (A+B+E) Weight: _____ lbs	Total RMS Weight Error: _____ lbs
Total (A+B) Decay Heat: _____ Watts	Total RMS Decay Heat Error: _____ Watts
Total (A+B) Fissile Mass: _____ FGE	Total RMS Fissile Mass Error: _____ FGE

Bottom Assembly Weight plus Subtotal RMS Error (A+C) _____ lbs

Top Assembly Weight plus Subtotal RMS Error (B+D) _____ lbs

Total Weight plus Total RMS Error _____ lbs

Total Fissile Mass plus Total RMS Error _____ FGE

Total Decay Heat plus Total RMS Error _____ Watts

PAYLOAD CERTIFICATION PARAMETERS

	Initials
Decay Heat + Error of Each Analytical Category Payload Container ≤ Governing Limit	_____
Hydrogen/Flammable Gas Generation Rate of Each Test Category Payload Container ≤ Governing Limit	_____
Flammability Index of Each Payload Container ≤ 50,000	_____
Bottom Weight ≥ Top Weight	_____
Total Weight plus RMS Error ≤ <u>7,265</u> lbs	_____
Decay Heat plus RMS Error ≤ <u>40</u> Watts	_____
Fissile Mass (Pu-239 FGE) plus RMS Error ≤ _____ FGE	_____

I certify that the above payload assembly meets all the requirements for shipment as stated in the TRAMPAC, current revision. The payload assembly is approved for shipment.

_____ TRANSPORTATION CERTIFICATION OFFICIAL	/	_____ DATE
--	---	---------------

^aFollow instructions in Section 6.6.2.4 or 6.6.2.5 of the RFETS TRAMPAC Compliance Plan.

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PAYLOAD CONTAINER TRANSPORTATION CERTIFICATION DOCUMENT (PCTCD)
(ANALYTICAL PAYLOAD SHIPPING CATEGORY^a)

IDENTIFICATION PARAMETERS

Container ID # _____ Container Bar Code # _____

Shipping Category _____ Content Code _____

Direct Load Configurations ☐ 55-Gallon Drum ☐ 100-Gallon Drum ☐ SWB ☐ TDOP

Fixed Configurations ☐ Standard Pipe Overpack ☐ S100 Pipe Overpack ☐ S200 Pipe Overpack

☐ Bin Overpack ☐ 85-Gallon Drum Overpack

Overpacked Configurations ☐ SWB with 55-Gallon Drum(s) (SWB Overpack) ☐ TDOP with 55-Gallon Drum(s)

☐ TDOP with SWB Overpack ☐ TDOP with 85-Gallon Drum Overpack(s)

☐ TDOP with SWB ☐ TDOP with Bin Overpack

Certification Site _____

TRAMPAC TRANSPORTATION PARAMETERS

Parameter	Initials	Filter(s) Identification
Free liquids are <1% of payload container volume	_____	1. _____ 2. _____
Nonradioactive pyrophorics are not present	_____	
Radioactive pyrophorics are <1% (weight)	_____	3. _____ 4. _____
Explosives are not present	_____	
Corrosives are not present	_____	5. _____ 6. _____
Pressurized containers are not present	_____	
Sealed containers >4 liters are not present	_____	7. _____ 8. _____
55-Gallon drum liner (if present) is punctured/vented	_____	
Flammable VOCs are ≤ 500 ppm	_____	9. _____ 10. _____
Radiation Dose Rate is ≤ 200 mrem/hour	_____	

MEASURED PARAMETERS

Container Parameter	Value	Error	Value + 1x Error	Value + 2x Error	Limit
Weight (lbs.)					
Decay Heat (watts)					
Fissile Mass (FGE)					
Curie Limits (Ci) S100 Pipe Overpack or S200 Pipe Overpack only	Value + error meets limits for radionuclides listed in Appendix 2.3 (S100) or Appendix 2.4 (S200) of TRAMPAC _____ Yes/No				

UNVENTED WASTE PARAMETERS ONLY

Aspiration Method ☐ Option 1 ☐ Option 2A ☐ Option 2B ☐ Option 3	Aspiration Period (if applicable) _____ days
Option 1 Container closed time _____ months	Aspiration Table No. (if applicable) _____
Options 2A, 2B, or 3 Headspace H ₂ Concentration _____ mol%	Time Container Vented _____

I certify that the above container meets all the requirements for shipment as stated the TRAMPAC, current revision. The container is approved for shipment or overpacking.

TRANSPORTATION CERTIFICATION OFFICIAL _____

DATE _____

^aFollow instructions in Section 6.6.2.1 of the RFETS TRAMPAC Compliance Plan.

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**PAYLOAD CONTAINER TRANSPORTATION CERTIFICATION DOCUMENT (PCTCD)
(TEST PAYLOAD SHIPPING CATEGORY^a)**

IDENTIFICATION PARAMETERS

Container ID # _____ Container Bar Code # _____
Shipping Category _____ Content Code _____
Direct Load Configurations ☐ 55-Gallon Drum ☐ 100-Gallon Drum ☐ SWB ☐ TDOP
Fixed Configurations ☐ Standard Pipe Overpack ☐ S100 Pipe Overpack ☐ S200 Pipe Overpack
☐ Bin Overpack ☐ 85-Gallon Drum Overpack
Overpacked Configurations ☐ SWB with 55-Gallon Drum(s) (SWB Overpack) ☐ TDOP with 55-Gallon Drum(s)
☐ TDOP with SWB Overpack ☐ TDOP with 85-Gallon Drum Overpack(s)
☐ TDOP with SWB ☐ TDOP with Bin Overpack
Certification Site _____

TRAMPAC TRANSPORTATION PARAMETERS

Parameter	Initials	Filter(s) Identification
Free liquids are <1% of payload container volume	_____	1. _____ 2. _____
Nonradioactive pyrophorics are not present	_____	
Radioactive pyrophorics are <1% (weight)	_____	3. _____ 4. _____
Explosives are not present	_____	
Corrosives are not present	_____	5. _____ 6. _____
Pressurized containers are not present	_____	
Sealed containers >4 liters are not present	_____	7. _____ 8. _____
55-Gallon drum liner (if present) is punctured/vented	_____	
Flammable VOCs are ≤ 500 ppm	_____	9. _____ 10. _____
Radiation Dose Rate is ≤ 200 mrem/hour	_____	

MEASURED PARAMETERS

Container Parameter	Value	Error	Value + 1x Error	Value + 2x Error	Limit
Weight (lbs.)					
Fissile Mass (FGE)					

Curie Limits (Ci) S100 Value + error meets limits for radionuclides listed in
Pipe Overpack or S200 Appendix 2.3 (S100) or Appendix 2.4 (S200) of the TRAMPAC _____ Yes/No
Pipe Overpack only

TEST CRITERIA

UFGTP requirements met as documented in Attachment A of Appendix 5.7 of the TRAMPAC _____ Yes/No

I certify that the above container meets all the requirements for shipment as stated in the TRAMPAC, current revision. The container is approved for shipment or overpacking.

TRANSPORTATION CERTIFICATION OFFICIAL

DATE

^aFollow instructions in Section 6.6.2.2 of the RFETS TRAMPAC Compliance Plan.

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OVERPACK PAYLOAD CONTAINER TRANSPORTATION CERTIFICATION DOCUMENT (OPCTCD)¹

IDENTIFICATION PARAMETERS

Overpack Container ID # _____ Overpack Container Bar Code # _____

Governing Payload Shipping Category Number _____

Governing Decay Heat Limit

Governing Hydrogen/Flammable Gas Generation Rate Limit

Overpack Container Type ☐ SWB ☐ TDOP

Overpacked Container Type(s): ☐ 55-Gallon Drum ☐ SWB ☐ SWB Overpack

☐ 85-Gallon Drum Overpack ☐ Bin Overpack

Weight Limit _____ (lbs) Fissile Mass Limit _____ FGE _____

Certification Site _____ Content Code _____

TRAMPAC TRANSPORTATION PARAMETERS

Radiation Dose Rate ≤ 200 mrem/hour	INITIALS
--	----------

Filter Identification	1.	2.	3.	4.	5.
-----------------------	----	----	----	----	----

6. _____ 7. _____ 8. _____ 9. _____ 10. _____

OVERPACKED CONTAINER MEASURED PARAMETERS

[illegible]

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**OVERPACK PAYLOAD CONTAINER TRANSPORTATION CERTIFICATION DOCUMENT
(OPCTCD)^a**

CERTIFICATION OF COMPLIANCE	INITIALS
Total weight + weight error $\leq$ limit	_____
Total fissile mass + 2x fissile mass error $\leq$ limit	_____
Decay heat + decay heat error $\leq$ decay heat limit of governing payload shipping category for each analytical category payload container	_____
Hydrogen/flammable gas generation rate $\leq$ hydrogen/flammable gas generation rate limit of governing payload shipping category for each test category payload container	_____

I certify that the above container meets all the requirements for shipment as stated in the TRAMPAC, current revision. The overpack is approved for shipment or overpacking.

TRANSPORTATION CERTIFICATION OFFICIAL

DATE

^aFollow instructions in Section 6.6.2.3 of the RFETS TRAMPAC Compliance Plan.

*Use Column 1 for the following six-digit notations (XX YYYY): 10 0160, 10 0130, 10 0040, and 20 0008. Use Column 2 for all other six-digit notations.

m/s/mf = Moles/second/mole fraction (see the TRUPACT-II SAR, Appendix 1.3.5).

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TRUPACT-II TRANSPORTATION REQUIREMENTS MATRIX FOR RFETS

TRAMPAC Requirement Requirement (Section Number)	RFETS TRU Waste Management Manual Section Title and Number	RFETS Controlling Procedure/Document	
		Procedure/Document Number	Title
2.0 CONTAINER AND PHYSICAL PROPERTIES			
2.1 Container Description	Container Descriptions (6.2.1)	1-M12-WO-4034	Solid Radioactive Waste Packaging Requirements Manual
		PRO-J44-RC&I-6600	Procured Items Inspection and Certification
		MAN-134-PPM	Procurement Program Manual.
		1-V51-COEM-DES-210	Site Engineering Process Procedure
		PRO-1034-PEQA	Procurement Engineering and Quality Assurance
		4-D99-WO-1100	Solid Radioactive Waste Packaging Procedure
		1-PRO-079-WGI-001	Waste Characterization, Generation, and Packaging
		PRO-1045-WI-001	Solid Radioactive Waste Inspection
		PRO-X05-WC-4018	Transuranic (TRU) Waste Certification
2.2 Dunnage	Dunnage (6.2.2)	4-K47-WEM-WP1210	WEMS Offsite Shipping Module
2.3 Container/Assembly Weight and Center of Gravity	Container/Assembly Weight (6.2.3)	1-M12-WO-4034	Solid Radioactive Waste Packaging Requirements Manual
		4-G83-WEM-WP-1209	WEMS Waste Package Verification and Certification
		PRO-1045-WI-001	Solid Radioactive Waste Inspection
		4-T20-Traffic-505	Certifying Authorized Payloads for TRUPACT-II
		MAN-092-M&TEM	Measuring and Test Equipment Management Manual
	Container/Assembly Center of Gravity (6.2.3)	4-K47-WEM-WP1210	WEMS Offsite Shipping Module
4-K14-TPO-WO-5032		Preparing the TRUPACT-II Drum and Standard Box Shipment in Building 664	

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2.4 Container Marking	Container Marking (6.2.4)	1-T13-Traffic-306	Labeling and Marking TRUPACT Packages
		PRO-X05-WC-4018	Transuranic (TRU) Waste Certification
2.5 Filter Vents	Filter Vents (6.2.5)	MAN-134-PPM	Procurement Program Manual
		1-V51-COEM-DES-210	Site Engineering Process Procedure
		PRO-1034-PEQA	Procurement Engineering and Quality Assurance
		PRO-1045-WI-001	Solid Radioactive Waste Inspection
		4-D99-WO-1100	Solid Radioactive Waste Packaging Procedure
2.6 Liquids	Liquids (6.2.6)	1-M12-WO-4034	Solid Radioactive Waste Packaging Requirements Manual
		4-D99-WO-1100	Radioactive Waste Packaging Procedure
		1-PRO-079-WGI-001	Waste Characterization, Generation, and Packaging
		PRO-1031-WIPP-1112	TRU/TRM Waste Visual Verification (V ²) and Data Review
		PRO-U76-WC-4030	Control of Waste Nonconformances
		5-NDT-TC-1A	Training, Qualification, and Certification of Nondestructive Testing Personnel
		4-H80-776-ASRF-007	Visual Examination for Confirmation of RTR ¹
		PRO-986-VE440	Visual Examination Operations For Building 440
		PRO-1471-VE-771	Visual Examination for Confirmation of RTR
		95-QAPjP-0050	Rocky Flats Environmental Technology Site TRU Waste Characterization Program Quality Assurance Project Plan (QAPjP)
2.7 Sharp or Heavy Objects	Sharp or Heavy Objects (6.2.7)	1-M12-WO-4034	Solid Radioactive Waste Packaging Requirements Manual
		4-D99-WO-1100	Solid Radioactive Waste Packaging Procedure
		1-PRO-079-WGI-001	Waste Characterization, Generation, and Packaging

¹ This procedure is inactive as of November 6, 2001.

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2.8 Sealed Containers	Sealed Containers (6.2.8)	1-M12-WO-4034	Solid Radioactive Waste Packaging Requirements Manual
		4-D99-WO-1100	Solid Radioactive Waste Packaging Procedure
		1-PRO-079-WGI-001	Waste Characterization, Generation, and Packaging
		PRO-1031-WIPP-1112	TRU/TRM Waste Visual Verification (V ²) and Data Review
		95-QAPjP-0050	Rocky Flats Environmental Technology Site TRU Waste Characterization Program Quality Assurance Project Plan (QAPjP)
3.0 NUCLEAR PROPERTIES REQUIREMENTS			
3.1 Nuclear Criticality	Nuclear Criticality (6.3.1)	RF/RMRS-97-018	RFETS TRU Waste Acceptable Knowledge Supplemental Information
		4-G83-WEM-WP-1209	WEMS Waste Package Verification and Certification
		PRO-X05-WC-4018	Transuranic (TRU) Waste Certification
		4-T20-Traffic-505	Certifying Authorized Payloads for TRUPACT-II
		1-MAN-008-WM-001	Transuranic (TRU) Waste Management Manual
3.2 Radiation Dose Rates	Radiation Dose Rates (6.3.2)	1-M12-WO-4034	Solid Radioactive Waste Packaging Requirements Manual
		1-C80-WO-1102-W/RT	Waste/Residue Traveler Instructions
4.0 CHEMICAL PROPERTIES REQUIREMENTS			
4.1 Pyrophoric Materials	Pyrophorics (6.4.1)	4-D99-WO-1100	Solid Radioactive Waste Packaging Procedure
		1-M12-WO-4034	Solid Radioactive Waste Packaging Requirements Manual
		PRO-1031-WIPP-1112	TRU/TRM Waste Visual Verification (V ²) and Data Reporting
		RF/RMRS-97-018	RFETS TRU Waste Acceptable Knowledge Supplemental Information

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4.2 Explosives, Corrosives, and Compressed Gases	Explosives, Corrosives, and Compressed Gases (6.4.2)	1-M12-WO-4034	Solid Radioactive Waste Packaging Requirements Manual
		4-D99-WO-1100	Solid Radioactive Waste Packaging Procedure
		MAN-071-IWCP	Integrated Work Control Program Manual
		1-PRO-079-WGI-001	Waste Characterization, Generation, and Packaging
		PRO-1031-WIPP-1112	TRU/TRM Waste Visual Verification (V ²) and Data Review
		95-QAPjP-0050	Rocky Flats Environmental Technology Site TRU Waste Characterization Program Quality Assurance Project Plan (QAPjP)
4.3 Chemical Composition	Chemical Composition (6.4.3)	PRO-X05-WC-4018	Transuranic (TRU) Waste Certification
		95-QAPjP-0050	Rocky Flats Environmental Technology Site TRU Waste Characterization Program Quality Assurance Project Plan (QAPjP)
4.4 Chemical Compatibility	Chemical Compatibility (6.4.4)	PRO-X05-WC-4018	Transuranic (TRU) Waste Certification
5.0 GAS GENERATION REQUIREMENTS			
5.1 Payload Shipping Category	Assignment of Shipping Category to an Individual Payload Package (6.5.1.2.1)	1-PRO-079-WGI-001	Waste Characterization, Generation, and Packaging
		1-M12-WO-4034	Solid Radioactive Waste Packaging Requirements Manual
		4-D99-WO-1100	Solid Radioactive Waste Packaging Procedure
		PRO-1031-WIPP-1112	TRU/TRM Waste Visual Verification (V ²) and Data Review
		4-G83-WEM-WP-1209	WEMS Waste Package Verification and Certification
		PRO-X05-WC-4018	Transuranic (TRU) Waste Certification
		95-QAPjP-0050	Rocky Flats Environmental Technology Site TRU Waste Characterization Program Quality Assurance Project Plan (QAPjP)

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5.1 Payload Shipping Category (continued)	Compliance With Specific Requirements for Total Resistance (6.5.1.2.3)	1-PRO-079-WGI-001	Waste Characterization, Generation, and Packaging
		4-D99-WO-1100	Solid Radioactive Waste Packaging Procedure
		1-M12-WO-4034	Solid Radioactive Waste Packaging Requirements Manual
		4-H80-776-ASRF-007	Visual Examination for Confirmation of RTR ¹
		PRO-986-VE440	Visual Examination Operations For Building 440
		PRO-1471-VE-771	Visual Examination for Confirmation of RTR
		1-C80-WO1102-W/RT	Waste/Residue Traveler Instructions
		PRO-1045-WI-001	Solid Radioactive Waste Inspection
		95-QAPjP-0050	Rocky Flats Environmental Technology Site TRU Waste Characterization Program Quality Assurance Project Plan (QAPjP)
5.2 Compliance with Flammable (Gas/VOC) Concentration Limits (Analytical/Test Category)	Determination of Flammable Volatile Organic Compounds Concentration (6.5.2.1)	L-4146-O	Headspace Gas Sampling of Waste Containers
		L-4231-D	Headspace Gas Sampling and Analysis Using an Automated Manifold
		L-4111-X	GC/MS Determination of Volatile Organics Waste Characterization
		4-G83-WEM-WP-1209	WEMS Waste Package Verification and Certification
	Analytical Category Compliance (6.5.2.2)	4-G83-WEM-WP-1209	WEMS Waste Package Verification and Certification
		PRO-X05-WC-4018	Transuranic (TRU) Waste Certification
		4-T20-Traffic-505	Certifying Authorized Payloads for TRUPACT-II

¹ This procedure is inactive as of November 6, 2001.

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5.2 Compliance with Flammable (Gas/VOC) Concentration Limits (Analytical/Test Category) (continued)	Test Category Compliance – Measurement (6.5.2.3.1)	L-4146-O	Headspace Gas Sampling of Waste Containers
		L-4231-D	Headspace Gas Sampling and Analysis Using an Automated Manifold
		L-4111-X	GC/MS Determination of Volatile Organics Waste Characterization
		4-G83-WEM-WP-1209	WEMS Waste Package Verification and Certification
		PRO-X05-WC-4018	Transuranic (TRU) Waste Certification
	Test Category Compliance – Full-Drum Testing (6.5.2.3.2)	RS-020-001	Gas Generation Testing Program Quality Assurance Project Plan
		L-4146-O	Headspace Gas Sampling of Waste Containers
		L-4231-D	Headspace Gas Sampling and Analysis Using an Automated Manifold
		L-4111-X	GC/MS Determination of Volatile Organics Waste Characterization
		LATA-MGSSID-001	LATA Program Interface Document for the Mobile Gas Generation Sampling System for use at the Rocky Flats Environmental Technology Site (RFETS)
		4-G83-WEM-WP-1209	WEMS Waste Package Verification and Certification
		PRO-X05-WC-4018	Transuranic (TRU) Waste Certification
5.3 Venting and Aspiration	Venting and Aspiration (6.5.3)	PRO-1141-WP-4701	Waste Characterization Gas Sampling
		4-G83-WEM-WP-1209	WEMS Waste Package Verification and Certification
6.0 PAYLOAD ASSEMBLY REQUIREMENTS			
6.1 Requirements	Payload Assembly Requirements (6.6.1)	PRO-077-WIPP-005	Management of Waste Information Prior to Transmittal to the Waste Records Center

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Appendix 6.1, Procedure for Certification of Individual Payload Containers	Procedure for Qualifying Individual Payload Packages (Analytical) (6.6.2.1)	PRO-X05-WC-4018	Transuranic (TRU) Waste Certification
		4-T20-Traffic-505	Certifying Authorized Payloads for TRUPACT-II
	Procedure for Qualifying Individual Payload Packages (Test) (6.6.2.2)	PRO-X05-WC-4018	Transuranic (TRU) Waste Certification
		4-T20-Traffic-505	Certifying Authorized Payloads for TRUPACT-II
	Procedure for Certification of Overpack Payload Packages (6.6.2.3)	PRO-X05-WC-4018	Transuranic (TRU) Waste Certification
		4-T20-Traffic-505	Certifying Authorized Payloads for TRUPACT-II
Appendix 6.2, Procedure for Assembly and Certification of a CH-TRU Payload	Procedure for Assembly and Certification of a TRUPACT-II Payload of Same Shipping Category (6.6.2.4)	PRO-X05-WC-4018	Transuranic (TRU) Waste Certification
		4-T20-Traffic-505	Certifying Authorized Payloads for TRUPACT-II
Appendix 6.3, Mixing of Shipping Categories and Determination of Flammability Index	Procedure for Assembly and Certification of a TRUPACT-II Payload of Different Shipping Categories (6.6.2.5)	PRO-X05-WC-4018	Transuranic (TRU) Waste Certification
		4-T20-Traffic-505	Certifying Authorized Payloads for TRUPACT-II