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CCP-TP-513

Revision 1

CCP
Procedure for Dimensional or Gravimetric Measurements for Radiological Characterization OF Remote-Handled Transuranic Waste

EFFECTIVE DATE: 12/06/2010

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PRINTED NAME

APPROVED FOR USE

RECORD OF REVISION

Revision Number	Date Approved	Description of Revision
0	09/15/2010	Initial issue.
1	12/06/2010	Revised to add steps 4.1.1[A] through 4.1.5[K] for the determination of length or weight of reactor fuel segments. Added definition of Acceptable Difference, Radiological Documentation Package, and Calculation Package.

TABLE OF CONTENTS

LIST OF ATTACHMENTS

1.0 PURPOSE

This procedure specifies instructions for performing dimensional and gravimetric measurements and describes the assembly of the Radiological Documentation Package for the radiological characterization of containers of distinct waste of reactor fuel segments or other irradiated waste materials using physical measurement of the discrete pieces. Each completed Attachment 1 documents the measurement results for waste placed in a single container or package. One or more of these containers may be placed into the larger or final container. Each Radiological Documentation Package encompasses the characterization of one final waste container. The radiological characterization approach is discussed in detail in the waste stream specific Radiological Characterization Technical Report.

1.1 Scope

This procedure applies to personnel responsible for the dimensional and gravimetric measurement and assembly of the radiological characterization documentation package, data review, and validation for the waste container.

This procedure is designed to obtain measurement data in conjunction with Host site facility operating procedures that address the use of the facilities for waste management operations and may be performed during visual examination (VE) of the waste. All Host site requirements for health, safety, and operations in the work place will be addressed in a Host site procedure.

2.0 REQUIREMENTS

2.1 References

Baseline Documents

- DOE/WIPP-02-3214, *Remote-Handled TRU Waste Characterization Program Implementation Plan*

Referenced Documents

- CCP-QP-002, *CCP Training and Qualification Plan*
- CCP-QP-005, *CCP TRU Nonconforming Item Reporting and Control*
- CCP-QP-008, *CCP Records Management*
- CCP-QP-016, *CCP Control of Measuring and Test Equipment*
- CCP-TP-500, *CCP Remote-Handled Waste Visual Examination*

2.2 Training Requirements

2.2.1 Technical personnel identified in this procedure will be trained and qualified in accordance with CCP-QP-002, *CCP Training and Qualification Plan*, prior to performing this procedure.

2.3 Precautions and Limitations

2.3.1 If a condition adverse to quality is identified, the individual(s) identifying the condition shall initiate a nonconformance report (NCR) in accordance with CCP-QP-005, *CCP TRU Nonconforming Item Reporting and Control*.

2.4 Definitions

2.4.1 **Measurement Acceptance** – Measurement shall be made to a tenth of an inch or tenth of a gram.

2.4.2 **Calibration Due Date** – The last date that the measurement equipment is in calibration.

2.4.3 **Acceptable Difference** – Acceptable difference between the Acceptable Knowledge (AK) record and measured length (s) or weight obtained for the purpose of fuel specimen verification. Acceptable Difference shall be documented in a memo to the Site Project Manager (SPM).

2.4.4 **Calculation Package** – Documents the ORIGEN calculation of the estimated activity.

2.4.5 **Radiological Documentation Package** – Documents the calculation of the radionuclide distribution for container.

3.0 RESPONSIBILITIES

3.1 Visual Examination Operator (VEO)

3.1.1 Performs the dimensional or gravimetric measurement(s).

3.1.2 Records the measurement results on Attachment 1, Container Measurement Data.

3.1.3 Ensures completed Dimensional and Gravimetric Measurement Batch Data Report (BDR) including Attachment 1 and AK documentation used for Acceptable Difference determination is provided to CCP Records.

3.2 Remote-Handled Waste Technical Staff

3.2.1 Calculates the radiological characterization for waste container and generates a calculation package documenting the characterization.

3.2.2 Assembles the Radiological Documentation Package.

NOTE

The Independent Technical Reviewer (ITR) is someone, other than the Remote-Handled Waste Technical Staff, who is qualified to have performed the work.

NOTE

RH Technical Staff must have the following qualifications to perform the work:

B.S. Nuclear Engineering or the equivalent knowledge and experience to perform assigned tasks, including:

- Calculation of reactor neutron spectra
- Generate ORIGEN or equivalent software format cross sections
- Perform ORIGEN or equivalent software isotope generation and depletion calculations
- Ensure that appropriate samples are collected and analyzed from waste
- Perform shielding calculation of waste containers

3.3 Independent Technical Reviewer

3.3.1 Reviews the collected data and ensures the documentation is complete and technically reasonable.

3.3.2 Completes Attachment 3, ITR Checklist.

3.4 Site Project Manager (SPM)

3.4.1 Reviews and approves the Radiological Documentation Package and completes Attachments 4 and 6, SPM Checklist.

3.5 CCP Records Custodian

3.5.1 Receives, processes, and transmits completed Dimensional/Gravimetric Batch Data Report and Radiological Documentation Package, in accordance with CCP-QP-008, *CCP Records Management*.

3.5.2 Receives and processes Attachments 4 and 6, in accordance with CCP-QP-008.

4.0 PROCEDURE

VEO

4.1 Dimensional and/or Gravimetric Measurement

NOTE

Procedural steps below can be performed during VE of the container if the waste stream requires dimensional or gravimetric measurements.

A separate Attachment 1 will be used for each container or inner package used to contain measured waste.

Dimensions will be recorded in inches out to one tenth of an inch.

Weights will be recorded in grams (g) one tenth of a g.

Two qualified VEOs are required to perform dimensional and/or gravimetric measurement operations.

4.1.1 Obtain a copy of Attachment 1, Container Measurement Data, and record the following information:

[A] Date

[B] Container Number

4.1.2 Obtain a copy of the AK information (e.g., FEW Tracking Form) that describes the waste items scheduled for packaging into the waste container from the Host Facility.

4.1.3 Determine the type of measurements (e.g. length or weight) and equipment (e.g. ruler or scale) required to obtain measurements **AND** mark N/A beside all measure types and equipment on Attachment 1 that are **NOT** applicable.

4.1.4 **IF** using a ruler to obtain measurements, verify the calibration of the ruler is current, **AND** perform the following steps:

[A] **IF** the ruler calibration has expired,
THEN DO **NOT** use and have the ruler recalibrated, **OR** use a ruler whose calibration has **NOT** expired.

[B] Record the Ruler Identification Number on Attachment 1.

[C] Record the Ruler Calibration Due Date on Attachment 1.

[D] Document Ruler check acceptability (YES/NO) on Attachment 1.

4.1.5 If using a balance to obtain measurements, verify the balance is operational by performing the following steps:

[A] Verify the calibration of the balance is current.

[B] **IF** the balance calibration has expired, **THEN** DO **NOT** use and have the balance recalibrated, **OR** use a balance whose calibration has **NOT** expired.

[C] Record the Balance Identification Number on Attachment 1.

[D] Record the Balance Calibration Due Date on Attachment 1.

[E] Verify the calibration of the verification check weight is current.

[F] **IF** the verification check weight calibration has expired, **THEN** DO **NOT** use and have the weight recalibrated, **OR** use a check weight whose calibration has **NOT** expired.

[G] Record the Check Weight Identification Number on Attachment 1.

[H] Verify balance is operating.

[I] Place check weight on the balance.

[J] Verify balance is reading within 2.0 percent of the weight of the check weight (acceptable calibration tolerance of the check weight).

[K] **IF** the indicated weight of the check weight is **NOT** equal to or within 2.0 percent of the weight of the check weight, **THEN** weigh the check weight a second time.

[L] Verify balance is reading within 2.0 percent of the weight of the check weight.

[M] **IF** the second weighing is performed and also fails, **THEN** use another operational balance and **GO TO** step 4.1.5[A].

[N] Document scale check acceptability (YES/NO) on Attachment 1.

4.1.6 Inspect each waste item and proceed as follows:

[A] Measure or weigh the item to the nearest tenth of an inch or tenth of a gram, as applicable AND compare result(s) obtained with AK documentation.

[B] **IF** the measured results and the AK documentation are within the Acceptable Difference limits (defined in the memo to SPM),
THEN record the AK ID Number (e.g., AG ID Number) and measurements on Attachment 1.

[C] **IF** the measured results and the AK documentation are outside of the Acceptable Difference limits,
THEN have Host site personnel remove the waste item from the packaging inventory **AND** continue operations with the next waste item scheduled for packaging into the waste container.

4.1.7 Ensure packaging of the waste container is complete and the container is stored with reasonable protection from tampering.

4.1.8 Certify measurements obtained for the contents of the container by performing the following:

VEO 1

[A] Print name, sign, **AND** date Attachment 1.

VEO 2

[B] Print name, sign, **AND** date Attachment 1.

[C] Forward Attachment 1 to ITR.

4.1.9 Batch Data Report Preparation

NOTE

A Testing BDR will contain Attachment 1s for no more than 20 containers.

BDR numbering will be as follows: RH, site, process, year, next sequential number to start back at one at the beginning of the new calendar year (e.g., RHANLDG10001).

VEO

4.1.10 Complete Attachment 2, Dimensional/Gravimetric Measurement Batch Data Report Cover Sheet

4.1.11 Assemble the following data for the BDR:

[A] Attachment 1 for each container, AK documentation [e.g., FEW Tracking Form (s)]

[B] Attachment 3, Dimensional/Gravimetric Measurement Independent Technical Reviewer Checklist

[C] NCR, if applicable

[D] Paginate the BDR.

[E] Submit the assembled BDR to the ITR.

ITR

4.1.12 Enter the BDR Number on Attachment 3, **AND** document on Attachment 3.

4.1.13 Review the BDR to the criteria in Attachment 3, **AND** document on Attachment 3.

4.1.14 Print name, sign, and date Attachment 3.

4.1.15 Submit the BDR to the Facility Records Custodian/Records Custodian.

Facility Records Custodian/Records Custodian

4.1.16 Receive, process, and transmit the completed BDR in accordance with CCP-QP-008.

SPM

4.1.17 Obtain a copy of BDR from CCP Records.

4.1.18 Enter the BDR Number on Attachment 4.

4.1.19 Review the BDR to the criteria in Attachment 4, **AND** document on Attachment 4.

4.1.20 Print name, sign, and date Attachment 4.

4.1.21 Forward the completed Attachment 4 to the Facility Records Custodian/Records Custodian

Remote-Handled Waste Technical Staff

4.2 Develop Calculation Package of the Waste Container

4.2.1 Obtain the Dimensional/Gravimetric Measurement BDR and VE BDR for containers to develop calculation package.

4.2.2 Verify the measurement recorded is within measurement acceptance.

4.2.3 If measurement recorded is not within measurement acceptance initiate NCR in accordance with CCP-QP-005, if applicable.

4.2.4 Verify the measurement result is within the Acceptable Difference.

4.2.5 If measurement result is not within the Acceptable Difference initiate NCR in accordance with CCP-QP-005, if applicable.

4.2.6 Calculate the radionuclide activity estimates for each fuel piece loaded into the waste container based on the measurements recorded and radionuclide inventory information obtained through ORIGEN2.2 analyses and applicable calculation package is referenced in container specific calculation package.

4.2.7 Sum the radionuclide activity estimates for the container.

4.2.8 Calculate the mass for each radionuclide based on the measurement recorded and radionuclide inventory information obtained through ORIGEN2.2 analyses and applicable calculation package is referenced in container specific calculation package.

4.2.9 Calculate the total uncertainty for each radionuclide reported for the waste container.

4.2.10 Print the summary sheet, Waste Container Radiological Characterization Record (includes the summary of the radionuclide activity, mass, uncertainty, fissile gram equivalent (FGE), plutonium-equivalent curie (PE-Ci), watts, Transuranic (TRU) Alpha Activity, TRU Alpha Activity Concentration, Total Pu-239 Equivalent Activity, Total Pu-239 FGE, Total Decay Heat, and volume activity to input in the WIPP Waste Information System/Waste Data System).

4.2.11 Print the calculation package.

4.2.12 Sign each page of the calculation package

4.2.13 Assemble the calculation package to include on every page the calculation number, pagination, and the final waste container number.

4.2.14 Assemble Radiological Documentation Package to include:

- Waste Container Radiological Characterization Record
- Calculation package
- Attachment 1
- NCR, if applicable
- Attachment 5, Remote-Handled Waste Technical Staff ITR Checklist

4.2.15 Forward assembled Radiological Documentation Package to ITR.

ITR

NOTE
The ITR performing the review of the calculation package is qualified as an RH Technical Staff.

4.3 Review Calculation Package of the Radiological Characterization of Waste Container

4.3.1 Complete the package number line on the ITR Checklist, Attachment 5.

4.3.2 Review the calculation package to the criteria of Attachment 5.

4.3.3 Sign, AND date each page of the calculation package.

4.3.4 Print name, sign, AND date Attachment 5.

4.3.5 Submit the Radiological Documentation Package to CCP Records in accordance with CCP-QP-008.

CCP Records Custodian

4.4 Receive and process completed Radiological Documentation Package in accordance with CCP-QP-008.

SPM

4.5 Validate Radiological Documentation Package

4.5.1 Obtain a copy of BDR from CCP Records.

4.5.2 Record Radiological Documentation Package number on Attachment 6.

4.5.3 Review the Radiological Documentation Package to the criteria of Attachment 6, AND document on Attachment 6.

4.5.4 Print name, sign, AND date Attachment 6.

4.5.5 Submit the completed Attachment 6 to the CCP Records Custodian in accordance with CCP-QP-008.

CCP Records Custodian

4.6 Receive and process Radiological Documentation Package in accordance with CCP-QP-008.

5.0 RECORDS

5.1 Records generated during the performance of this procedure are maintained as quality assurance (QA) records in accordance with CCP-QP-008. The records are the following:

5.1.1 QA/Lifetime

[A] Dimensional/Gravimetric Measurement Batch Data Report

[A.1] Attachment 1, Container Measurement Data for each inner container, if applicable, and associated AK documentation

[A.2] Attachment 3, ITR Checklist Dimensional/Gravimetric

[A.3] Attachment 4, SPM Checklist Dimensional/Gravimetric

[A.4] Copy of NCRs, if applicable

[B] Radiological Documentation Package, including:

[B.1] Attachment 1, Container Measurement Data for each inner container, if applicable, and associated AK documentation

[B.2] Attachment 5, ITR Checklist Radiological Documentation Package

[B.3] Attachment 6, SPM Checklist Radiological Documentation Package

[B.4] Copy of NCRs, if applicable

[B.5] Calculation package

Attachment 1 – Container Measurement Data

FACILITY NAME:		
DATE:		
Container Number:		
RULER N/A ☐	**BALANCE** N/A ☐	
Ruler Identification Number:	**Balance Identification Number:**	
Ruler Calibration Due Date:	**Balance Calibration Due Date:**	
	Check Weight ID:	
Ruler Check Acceptable: YES ☐ NO ☐	**Balance Check Acceptable:** YES ☐ NO ☐	
AK ID Number	**Length** (inches) N/A ☐	**Weight** (grams) N/A ☐

_____ _____

VEO 1 Printed Name/Signature/Date **VEO 2** Printed Name/Signature/Date

Attachment 2 – Dimensional/Gravimetric Batch Data Report Cover Sheet

Batch Data Report No: _____ Date:_____

	Waste Container ID Number:
1	
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Attachment 3 – Dimensional/Gravimetric Independent Technical Reviewer Checklist

Batch Data Report No: _____

Description of Criteria Reviewed	Criteria Met (Check One)
ITR Checklist	
Was the correct revision of the operating procedure used?	☐ YES ☐ NO
Were all the transcription errors corrected?	☐ YES ☐ NO
Were the measurement data recorded to 0.1 of an inch or gram?	☐ YES ☐ NO
Was the equipment used for measurement verified to be calibrated and within the calibration date?	☐ YES ☐ NO
Is all raw data recorded clearly, legibly, and accurately?	☐ YES ☐ NO
Have all the Quality Assurance Objectives (QAOs) for Dimensional or Gravimetric measurement been met? Precision – Measurement equipment shall be maintained according to manufacturer's recommendation. Balance shall be calibrated and maintained according to manufacturer's recommendation. Accuracy – Balance redout shall be 2 percent of the check weight. The length measurement shall be 0.1 of an inch verified by a second operator. Completeness – Every quantity or item of fuel test specimen loaded into container is measured. Comparability QAO – Not applicable Representativeness – Not applicable	☐ YES ☐ NO
The Batch Data Report is complete.	☐YES ☐NO
Any NCRs generated are contained in the BDR.	☐YES ☐N/A
Comments:	
ITR Approval Printed Name Signature Date	

Attachment 4 – Dimensional/Gravimetric Site Project Manager Checklist

Batch Data Report No: _____

Description of Criteria Reviewed	Criteria Met (Check One)
SPM Checklist	
Was the correct revision of the operating procedure used?	☐ YES ☐ NO
Were all the transcription errors corrected?	☐ YES ☐ NO
Were the measurement data recorded to 0.1 of an inch or gram?	☐ YES ☐ NO
Was the equipment used for measurement verified to be calibrated and within the calibration date?	☐ YES ☐ NO
Is all raw data recorded clearly, legibly, and accurately?	☐ YES ☐ NO
Have all the Quality Assurance Objectives (QAOs) for Dimensional or Gravimetric measurement been met? Precision – Measurement equipment shall be maintained according to manufacturer's recommendation. Balance shall be calibrated and maintained according to manufacturer's recommendation. Accuracy – Balance redout shall be 2 percent of the check weight. The length measurement shall be 0.1 of an inch verified by a second operator Completeness – Every quantity or item of fuel test specimen loaded into container is measured. Comparability QAO – Not applicable Representativeness – Not applicable	☐ YES ☐ NO
The Batch Data Report is complete.	☐YES ☐NO
Any NCRs generated are contained in the BDR.	☐YES ☐N/A
Comments:	
SPM Approval Printed Name Signature Date	

Attachment 5 – Remote-Handled Waste Technical Staff ITR Checklist

Radiological Documentation Package Number: _____

Description of Criteria Reviewed	Criteria Met (Check One)
ITR Checklist	
Waste Container Radiological Characterization Record is present.	☐ YES ☐ NO
Waste stream specific Radiological Characterization Technical Report been approved by CBFO.	☐ YES ☐ NO
Measurement acceptance criteria met.	☐ YES ☐ NO
Data generation and reduction were conducted in a technically correct manner in accordance with the methods described in the Radiological Characterization Technical Report.	☐ YES ☐ NO
Calculations have been verified.	☐ YES ☐ NO
Calibrated equipment used for measurement.	☐ YES ☐ NO
The conversion records are complete and show: • Total TRU activity concentration is greater than 100 nanocuries per gram (nCi/g).	☐ YES ☐ NO
• Remote-Handled Waste Technical Staff printed name, signature, and date.	☐ YES ☐ NO
Data reported in proper units.	☐ YES ☐ NO
The calculation package is complete.	☐YES ☐NO
The Data Quality Objectives for Gravimetric and Dimensional method have been met? Accuracy QAO – Fuel test specimen manufacturer design information is used for individual fuel pins in combination of the length measurement. Scaling factors developed from isotope depletion code such as ORIGEN. Precision QAO – Not applicable. Representativeness – The design information has to be representative for each specific fuel test specimen quantity loaded into container. Completeness QAO – Every quantity of fuel test specimen loaded into container is measured. Comparability QAO – Not applicable	☐YES ☐NO

Attachment 5 – ITR Checklist (Continued)

Description of Criteria Reviewed	Criteria Met (Check One)
ITR Checklist	
Any NCRs generated are contained in the Radiological Documentation Package.	☐YES ☐N/A
Comments:	
ITR Approval Printed Name Signature Date	

Attachment 6 – SPM Checklist

Radiological Documentation Package Number: _____

Description of Criteria Reviewed	Criteria Met (Check One)
The Independent Technical Review has been completed and signed.	☐ YES ☐ NO
The results are technically reasonable.	☐ YES ☐ NO
The correct revision of this procedure was used.	☐ YES ☐ NO
The Radiological Documentation Package is complete for this point of generation.	☐ YES ☐ NO
Waste stream specific Radiological Characterization Technical Report has been approved by CBFO.	☐ YES ☐ NO
The Data Quality Objectives for Gravimetric and Dimensional method have been met? Accuracy QAO – Fuel test specimen manufacturer design information is used for individual fuel pins in combination of the length measurement. Scaling factors developed from isotope depletion code such as ORIGEN. Precision QAO – Not applicable. Representativeness – The design information has to be representative for each specific fuel test specimen quantity loaded into container. Completeness QAO – Every quantity of fuel test specimen loaded into container is measured. Comparability QAO – Not applicable	☐ YES ☐ NO
Any NCRs generated are contained in the Radiological Documentation Package.	☐ YES ☐ NO ☐ N/A
Comments:	

Attachment 6 – SPM Checklist (Continued)

SPM Approval		
Printed Name	Signature	Date