Enclosure 1

DOE Response to Outstanding EPA Concerns for Shielded Containers

DOE Response to Outstanding EPA Concerns for Shielded Containers

EPA Concerns

The U. S. Environmental Protection Agency (EPA) originally approved the emplacement of shielded container assemblies at the Waste Isolation Pilot Plant (WIPP) with the condition that, "*Prior to shipping shielded containers to WIPP, the U. S. Department of Energy (DOE) must demonstrate a consistent complex-wide procedure to ensure that the shielded containers containing remote-handled (RH) waste remain below the Land Withdrawal Act surface dose rate limit for contact handled (CH) waste of 200 millirem per hour (mrem/hr). The procedure will be evaluated for technical adequacy as part of the Agency's waste characterization inspection and approval process. No shielded containers may be shipped to WIPP from any RH TRU site until the EPA inspects and approves the implemented procedure.*" (EPA letter from J. Edwards to E. Ziemianski dated Aug 8, 2011). The Department of Energy (DOE) responded to this condition by letter from J. Franco to J. Edwards dated May 16, 2013 that included the proposed complex-wide dose rate measurement procedure. The DOE then provided a physical demonstration of the procedure during actual shielded container loading, closure and monitoring operations at the Argonne National Laboratory on June 13, 2013. Based on the DOE's initial written response and the physical procedural demonstration, the EPA requires additional documentation to (1) adequately address the measurement uncertainty relative to the 200 mrem/hr surface dose rate limit for the shielded containers, (2) ensure that the DOE's dose rate measurement procedure captures the maximum surface dose rate on the shielded container, and (3) provide an explanation of the dose reduction modeling used to help determine payload contents of the shielded containers that will ensure a maximum dose rate limit of less than 200 mrem/hour on the outside surface of a loaded shielded container.

EPA Measurement Uncertainty Concern

The EPA prepared a Technical Support Document (TSD), *Review of DOE Planned Change Request for Shielded Containers for Remote-Handled Transuranic Waste* (EPA, 2010), in support of the EPA's review of a Planned Change Request for the emplacement of Shielded Containers submitted by the DOE (DOE, 2007). The TSD identifies the EPA's concerns with measurement uncertainty relative to shielded containers:

> *"DOE surface dose rate measurement procedures for photons and neutrons should specifically address uncertainties to ensure that the legal limit of 200 mrem/hr is not exceeded. In addition, DOE should develop site-wide procedures to ensure that surface dose rate measurements are conducted consistently at all TRU waste generator sites. EPA recognizes that these issues are not relevant to the SC design; rather they are implementation issues. However, they must be addressed as part of any waste disposal program utilizing shielded containers."* (EPA, 2010, Section 10.4)

DOE Response to Measurement Uncertainty Concern

The Nuclear Regulatory Commission (NRC) external radiation standards for radioactive material transportation packages are found in 10 CFR 71.47, "External radiation standards for all packages" and are derived directly from the Department of Transportation's (DOT) 49 CFR 173.441, "Radiation level limitations and exclusive use provisions". Both regulations state that:

"each package of radioactive materials offered for transportation must be designed and prepared for shipment so that under conditions normally incident to transportation, the radiation level does not exceed 2 millisieverts (mSv)/hour (200 mrem/hour) at any point on the external surface of the package."

With regard to transportation package radiation limits, the DOT notes that the limits apply to *"help to ensure that transport personnel do not receive significant doses, even when frequently handling a large number of packages."* (DOT 2008, Section VI.C)

Additionally, the NRC maintains a Health Physics Positions (HPPOS) Database that is a compilation of NRC staff positions on a wide range of topics involving radiation protection (health physics). HPPOS-223 PDR-9111220129(1990), "Consideration of Measurement Uncertainty When Measuring Radiation Levels Approaching Regulatory Limits" states:

"The NRC position is that the result of a valid measurement obtained by a method that provides a reasonable demonstration of compliance or noncompliance should be accepted and that the uncertainty inherent in that measured value need not be considered in determining compliance or non-compliance with a regulatory limit. Thus, only the measured value (and not the sum of the measured value and its uncertainty) need be less than the value of the limit to demonstrate compliance with the limit."

The NRC position continues to be cited as referenced in licensee submittals accepted by the NRC as recently as April 2013 (see reference for Donald C. Cook Nuclear Plant). A copy of the NRC position paper is included with this submittal.

The surface dose measurement process at the generator sites is controlled by procedure CCP-TP-081, *Shielded Container Assembly Loading*, from the Central Characterization Program (CCP). Details of this process are presented in Enclosure 3 of this response. The instrument calibration process at the generator sites is in compliance with ANSI N323-1997, *American National Standard Radiation Protection Instrumentation Test and Calibration, Portable Survey Instruments*, and is controlled by each site's radiation control program that is designed to comply with DOE requirements. The instrument calibration process includes periodic calibration of instrumentation using a National Institute of Standards and Technology (NIST) traceable source and daily source checks. The CCP works with each site's Radiological Control Technicians (RCTs) to ensure that they understand this procedure and the proper technique to perform measurements on the entire surface of the shielded container. This is further explained in the discussion of "DOE Response to Maximum Dose Rate Concern" below.

<u>EPA Maximum Dose Rate Concern</u>

Based on review of the initial dose rate measurement procedure (CCP-TP-081, *Shielded Container Assembly Loading*) provided on May 16, 2013, it was not clear to the EPA how the DOE would ensure that maximum dose rate would be captured on the outside of the shielded container.

<u>DOE Response to Maximum Dose Rate Concern</u>

The physical demonstration on June 13, 2013 showed that, in practice, dose rate measurements are taken over the entire outer surface of the shielded container. The following discussion provides an in-depth description of how the measurements are conducted. The revised CCP procedure, CCP-TP-081, *Shielded Container Assembly Loading*, is included as Attachment 1.

The WIPP TRU Waste Acceptance Criteria compliance for a surface dose rate measurement on an individual container is met at the generator sites. The CCP procedure describes the process for determining the maximum surface dose rate of a shielded container by dividing the total surface into 14 sections and recording the maximum dose rate in each of the 14 sections. The surface dose rate measurement of record is then the maximum value of the 14 individual values. This approach provides comprehensive coverage of the entire surface and avoids the possibility that 14 individual point measurements could miss a hot spot.

The surface of the shielded container is divided into 14 sections for surface dose measurement. The cylindrical surface of the container is divided into four quadrants with three sections (top, middle, and bottom) per quadrant, or a total of 12 sections on the cylindrical surface. The top and bottom of the container are two additional sections, for a total of 14 sections. Within each section, the generator site RadCon technician will search for the (local) maximum radiation dose rate and record this value. The maximum of the 14 values for the individual sections is taken as the dose rate of record for the WDS. Procedure CCP-TP-081, *Shielded Container Assembly Loading*, is consistent with this approach. The CCP procedure governing surface dose measurements for the DOE complex will be modified to require the RadCon technician to search for the local maximum within each section. Recent data from measurement of surface dose rates for two shielded container assemblies (SCAs) using the CCP procedure are listed in Table 1.

Table 1. Measurement of Surface Dose Rates for Two Shielded Container Assemblies

	Total Dose Rate* (mrem/hour)	
Location	AE1241SC	AE1242SC
SCA Top	6.7	36.7
SCA Bottom	4.9	16.2
Quadrant 1, Sector 1	7.9	52.1
Quadrant 1, Sector 2	7.7	82.9
Quadrant 1, Sector 3	6.3	78.7
Quadrant 2, Sector 1	16.0	58.7
Quadrant 2, Sector 2	13.3	90.3
Quadrant 2, Sector 3	5.8	39.1
Quadrant 3, Sector 1	12.0	33.0
Quadrant 3, Sector 2	9.0	46.6
Quadrant 3, Sector 3	3.8	35.0
Quadrant 4, Sector 1	6.1	33.1
Quadrant 4, Sector 2	4.2	66.3
Quadrant 4, Sector 3	4.9	63.6
Maximum on SCA	16.0	90.3

*Total dose rate is the sum of the beta/gamma and neutron dose rates. Neutron dose rate was less than 0.5 mrem/hour for all measurements.

The surface dose rate measurement of record is performed on a single container at the generator site prior to it being placed in a payload assembly. At the WIPP, radiation dose rate surveys are performed, in accordance with approved procedures, on the payload assemblies at 30 centimeters for the purpose of determining radiological posting for worker safety (i.e., 10 CFR 835, *Occupational Radiation Protection*). WIPP RadCon technicians survey the entire payload assembly; individual containers are not surveyed at the WIPP.

EPA Request for Explanation of Dose Reduction Modeling

The EPA requested that the DOE provide an explanation of the dose reduction modeling used to help determine payload contents of the shielded containers to ensure a maximum dose rate limit of less than 200 mrem/hour on the outside surface of a loaded shielded container.

DOE Explanation of Dose Reduction Modeling

The CCP has modeled the shielding capability of the shielded container with the goal of defining an administrative maximum surface dose rate for potential 30-gallon containers to be loaded into a shielded container assembly (SCA). The shielding capability is expressed as a dose reduction factor (DRF), which is defined as the unshielded surface dose rate on the 30-gallon drum divided by the dose rate on the surface of the shielded container.

The DRF was derived from calculations with the Monte Carlo N-Particle (MCNP5) software. MCNP5 can simulate particle interactions involving neutrons, photons, and electrons and is primarily used for the simulation of nuclear processes. Multiple models were created with MCNP5 to simulate a variety of homogenous and heterogeneous source configurations. The most restrictive model postulated that all the activity is concentrated in a single point source located at the inside edge of the 30-gallon container, although this configuration is not typical of RH waste. This model has a DRF of 25. Due to operational efficiencies and ALARA concerns of potentially having to remove a 30-gallon container from a SCA if the surface dose rate Measurement of Record exceeds 200 mrem/hr, the proposed DRF for container evaluation is currently reduced by an additional 20%, down to a DRF of 20, to provide defense-in-depth that removal of a 30-gallon container from an SCA will not be necessary. This dose reduction model is applied by taking the highest measured surface dose rate of the unshielded 30-gallon container and dividing it by the DRF of 20. If the result is less than 200 mrem/hour, then that RH container becomes a candidate to load into a SCA for shipment.

For the two SCAs loaded to date, the calculated DRFs from actual measurements are 26 and 34, respectively. These higher DRFs validate the conservatism in the MCNP5 model. The DOE may modify the administrative DRF as warranted as additional data is collected to ensure optimal loading efficiency for future SCAs. Given the conservatism in the MCNP5 modeling parameters, source distribution, and operational efficiencies implemented, the DOE never expects to load waste into a SCA that would exceed a surface dose rate of 200 mrem/hr.

References

DOE (U.S. Department of Energy), 1993. 10 CFR 835, *Occupational Radiation Protection. Federal Register*, vol. 58 (December 14, 1993).

DOE (U.S. Department of Energy), 2007. *Transmittal of Planned Change Request on Shielded Containers*. Letter from Dr. David C. Moody, Manager, Carlsbad Field Office, to Mr. Juan Reyes, U.S. Environmental Protection Agency, Washington, D.C.. November 15, 2007.

DOE (U.S. Department of Energy), 2013. Letter Dated May 16, 2013, from Mr. Jose Franco, Manager, Carlsbad Field Office, U.S. Department of Energy, Carlsbad, N.M. to Mr. Jonathan Edwards, Director, Radiation Protection Division, U.S. Environmental Protection Agency, Washington, D.C.

DOT (U.S. Department of Transportation), 2008. Radioactive Material Regulations Review. U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Washington, D.C.. December 2008. A copy of this document is available at: http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/RAM_Regulations_Review_12-2008.pdf

EPA (U.S. Environmental Protection Agency), 2010. *Review of DOE Planned Change Request for Shielded Containers for Remote-Handled Transuranic Waste*. Final Draft. U.S. Environmental Protection Agency, Office of Radiation and Indoor Air, Center for Waste Management and Regulations, Washington, D.C.. December 29, 2010.

EPA (U.S. Environmental Protection Agency), 2011. Letter Dated August 8, 2011, from Mr. Jonathan Edwards, Director, Radiation Protection Division, U.S. Environmental Protection Agency, Washington, D.C. to Mr. Edward Ziemianski, Acting Manager, Carlsbad Field Office, U.S. Department of Energy, Carlsbad, N.M..

ICRP (International Commission on Radiological Protection), 1991. *1990 Recommendations of the International Commission on Radiological Protection*, ICRP Publication 60, Annals of the ICRP 21 (1-3). Pergamon Press, Elmsford, New York.

NRC (U.S. Nuclear Regulatory Commission), 1990. *Consideration of Measurement Uncertainty When Measuring Radiation Levels Approaching Regulatory Limits*. Memorandum from John W. N. Hickey, Chief, Operations Branch, Division of Industrial and Medical Nuclear Safety, Office of the Nuclear Material Safety & Safeguards, and LeMoine J. Cunningham, Chief, Radiation Protection Branch, Division of Radiation Protection and Emergency Preparedness, Office of Nuclear Reactor Regulation, U.S. Nuclear Rgulatory Commission, Washington, D.C.. August 3, 1990. A copy of the memorandum is available at: http://www.nrc.gov/about-nrc/radiation/protects-you/hppos/hppos223.html

Donald C. Cook Nuclear Plant Units 1 and 2
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
http://pbadupws.nrc.gov/docs/ML1312/ML13121A118.pdf

Information about the MCNP5 code can be found at http://mcnp.lanl.gov/. The Office of Export Control Policy and Cooperation has required that the MCNP User Manual be removed from all publicly accessible websites. Contact the Radiation Safety Information Computational Center in Oak Ridge, Tennessee for more information.

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Consideration of Measurement Uncertainty When Measuring Radiation Levels Approaching Regulatory Limits

HPPOS-223 PDR-9111220129

Title: Consideration of Measurement Uncertainty When Measuring Radiation Levels Approaching Regulatory Limits

See the memorandum from J. W. N. Hickey and L. J. Cunningham to M. R. Knapp (and others) dated August 3, 1990. The memo states that as with any regulation, limits must be given as exact, precise values. The method of demonstrating compliance with these limits is usually left to the regulated person. Any method that provides a reasonable demonstration of compliance will be accepted. The NMSS and NRR Offices became aware of a letter transmitting a notice of violation that appeared to send an incorrect message to licensees. The incorrect message was that licensees must consider inherent uncertainties when measuring radiation levels approaching regulatory limits and must establish procedural limits that are less than the regulatory limits by an amount that equals (or exceeds) the "instrument error." That message is incorrect.

The following statement was made by the NRC in response to a petition for rule making with regard to limits for surface radiation levels of packages prepared for transport (44 FR 22233, April 13, 1979): "As with any regulation, the (safety) limits must be given as exact, precise values. The methods of demonstrating compliance with these limits are usually left to the regulated person. Any method which provides a reasonable demonstration of compliance will be accepted. In most cases, exact measured values are not required." This statement is still valid.

All measurements are inherently imprecise and inaccurate to some degree. Inevitably, there will be cases involving transportation of radioactive materials in which a valid measurement by the shipper shows a radiation level below the limit and a valid measurement by the receiver shows a radiation level above the limit. Without evidence that the shipper's measurement is invalid, there is no reason to assume that the shipper's measurement is incorrect and, consequently, that the shipper had inadequate control over shipping of packages.

The NRC position is that the result of a valid measurement obtained by a method that provides a reasonable demonstration of compliance or of noncompliance should be accepted and that the uncertainty inherent in that measured value need not be considered in determining compliance or non-compliance with a regulatory limit. Thus, only the measured value (and not the sum of the measured value and its uncertainty) need be less than the value of the limit to demonstrate compliance with the limit. Conversely, only the measured value (and not the measured value less its uncertainty) need be greater than the value of the limit to demonstrate non-compliance with the limit.

Regulatory references: None

Subject codes: 6.6, 7.1, 12.7

Applicability: All

Page Last Reviewed/Updated Thursday, March 29, 2012

Enclosure 2

Shielded Container Process Flow and Process Narrative

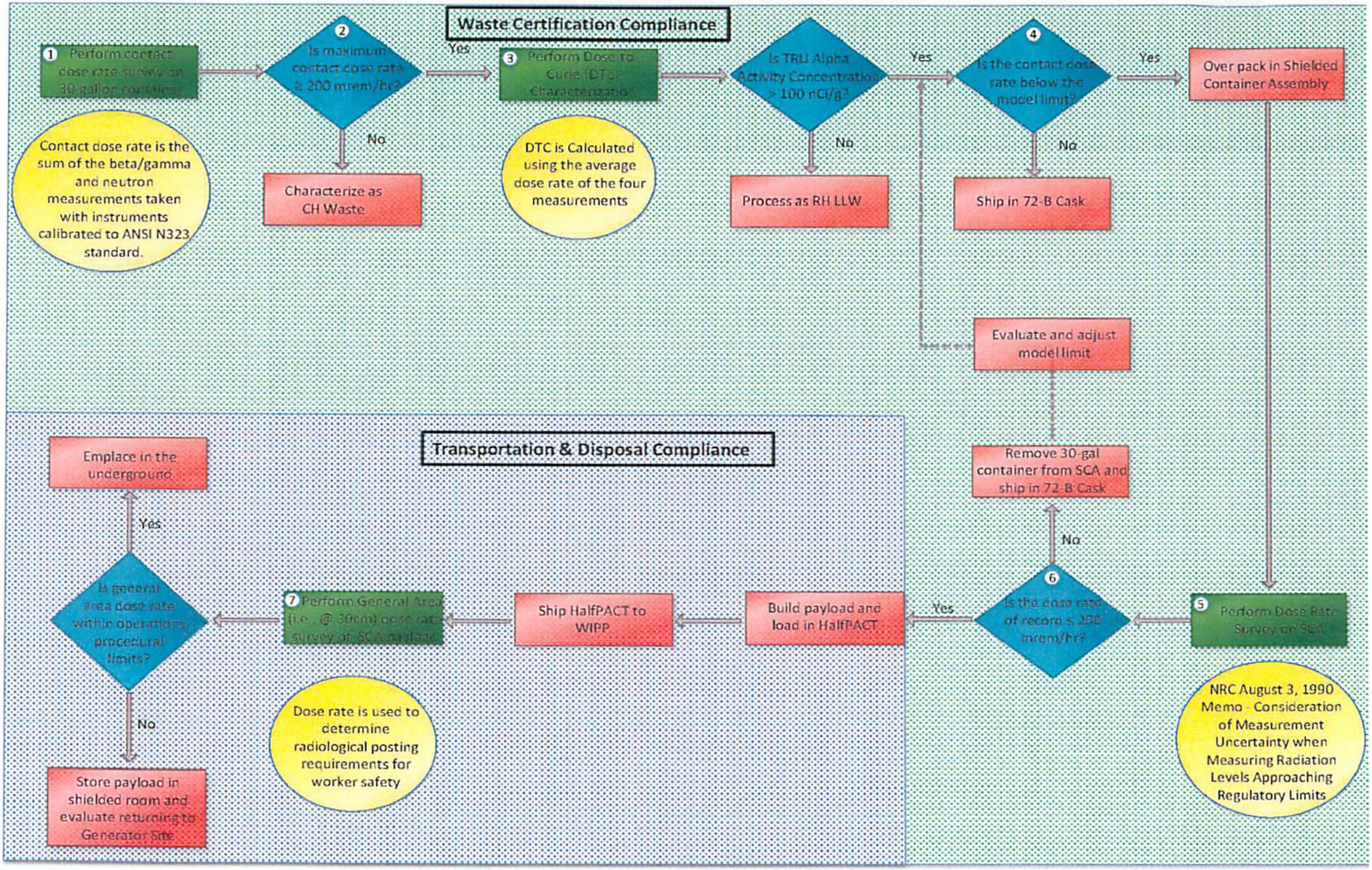
Enclosure 2 – Shielded Container Process Flow and Process Narrative

The following process narrative provides details of the demonstration of surface dose rate measurements at the Argonne National Laboratory on June 13, 2012. This process generated the data presented in Table 1 in the main body of this response. A process flow diagram is also provided, after the process narrative.

1) Up to two 7-gallon paint cans filled with sized-reduced material from the Argonne East Remote Handled Debris Material (AERHDM) waste stream are out loaded from the Alpha Gamma Hot Cell Facility (AGHCF) into a 30-gallon container, a lid is emplaced and a lever-lock closure ring installed. The 30-gallon container is then placed onto the dose-to-curie (DTC) turntable and dose rate instrument jig. Argonne National Laboratory (ANL) radiological control technicians (RCTs) using dose rate instruments calibrated to ANSI N323, measure the neutron and beta/gamma contact dose rates in four quadrants at 90 degree intervals around the drum and record the results on ANL RH-TRU Dose to Curie Survey Log for 331 Shell (form ESH-39B).
2) CCP-TP-506, *CCP Preparation of the Remote-Handled Transuranic Waste Acceptable Knowledge Characterization Reconciliation Report,* directs the Site Project Manager (SPM) to confirm the maximum contact dose rate meets the Remote-Handled (RH) waste determination Data Quality Objectives (DQOs) surface dose rates of ≥ 200 mrem/hr and ≤ 1000 rem/hr and document it in the Characterization Reconciliation Report (CRR).
3) The DTC dose rate meter is positioned at 1 meter from the outside of the container at mid container height. Four dose rate measurements are obtained in 90 degree intervals around the drum and recorded on the Container Data Sheet in accordance with CCP-TP-504, *CCP Dose-to-Curie Survey Procedure for Remote-Handled Transuranic Waste.* The average of these four measurements is used in the Waste Container Dose-to-Curie Conversion Record.
4) Understanding the need to ensure that the SCA contact dose rate is < 200 mrem/hr and as a best management practice (i.e., improved operation efficiency by reducing the risk of having to unpack the SCA due to exceeding 200 mrem/hr on contact), the CCP has modeled the shielding capability of the SCA and will apply an administrative maximum limit for the 30-gallon container contact dose rate measurement based on the SCA shielding dose reduction factor, DRF, (i.e., unshielded contact dose rate on the 30-gallon drum divided by the shielded contact dose rate on the SCA) derived from Monte Carlo N-Particle (MCNP5) software. MCNP5 is modeling software with the capability to simulate particle interactions involving neutrons, photons, and electrons and is primarily used for the simulation of nuclear processes. Specific areas of application include radiation protection and shielding. The most restrictive case modeled (i.e., smallest DRF or least shielding protection) used a model where all the source radioactivity was placed in a small localized spot on the inside wall of the 7-gallon paint can inside the 30-gallon container, mimicking a drum with extreme heterogeneous surface dose rates. This case resulted in a DRF of 25 compared to using a homogeneous source distribution (source radioactivity evenly distributed through-out the 7-gallon paint can) which yielded a higher DRF of 28. The CCP then applied an additional 20% conservatism to the most restrictive heterogeneous DRF value of 25 by reducing the DRF by 5, from 25 down to 20 (i.e. 5/25 = 20%) resulting in an administrative limit for the 30-gallon container contact dose rate around 4,000 mrem/hr (200 mrem/hr x 20 DRF= 4,000 mrem/hr).

5) Once the 30-gallon container is loaded into the SCA, lid installed and bolts torqued, contact dose rate measurements of the SCA are performed in accordance with generator site radiological survey procedures and in conjunction with CCP-TP-081, *Shielded Container Assembly Loading*. CCP-TP-081 defines using the orientation of the filter vent to identify four quadrants and three sections vertically in each quadrant in addition to the top and bottom of the container (14 measurements in total). Each separate location is completely surveyed, and the highest contact dose rate measurement (sum of beta/gamma and neutron) for each location is recorded on the Shielded Container Assembly Contact Dose Rate Survey form and verified to be ≤ 200 mrem/hr. The highest dose rate measured becomes the Measurement of Record.
6) If the contact dose rate of measurement is > 200 mrem/hr, the 30-gallon container is removed from the SCA and shipped in a 72-B cask. Also following the ISMS model for continuous improvement, the dose reduction factor model will also be re-evaluated to determine if the administrative limit for the 30-gallon contact dose rate needs to be adjusted to minimize a >200 mrem/hr contact measurement from happening again.
7) After HalfPACT arrives at WIPP, RCTs perform general area gamma dose rate survey around perimeter of HalfPACT as Outer Containment Vessel (OCV) and Inner Containment Vessel (ICV) lids are being raised and another survey of the SCA(s) once freed of the lids. A gamma and neutron dose rate survey at 30 centimeters is performed when the SCA payload is unloaded. Dose rates obtained at 30 centimeters from the payload assembly are used to determine radiological positing requirements per WP 12-HP1500, *Radiological Posting and Access Control*, for worker safety (i.e., 10 CFR 835).

Shielded Container Assembly Process Flow



Enclosure 3

CCP Shielded Container Assembly Loading

Controlled
Copy

CCP-TP-081

Revision 2

CCP
Shielded Container Assembly Loading

EFFECTIVE DATE: 07/23/2013

Mike Ramirez
PRINTED NAME

APPROVED FOR USE

RECORD OF REVISION

Revision Number	Date Approved	Description of Revision
0	02/07/2013	Initial issue.
1	04/16/2013	Revised to work in conjunction with DOE/WIPP 02-3184, *CH Packaging Operations Manual,* when preparing Shielded Container Assembly payloads for loading into a HalfPACT.
2	07/23/2013	Revised Section 4.5[Q] to clarify that the entire shielded container assembly is divided into sectors and surveyed; the highest contact dose measurements (both beta/gamma and neutron) for each sector are recorded in Attachment 2, Shielded Container Assembly Contact Dose Rate Survey.

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1.0 PURPOSE

This procedure provides technical requirements and instructions for loading 30-gallon vented payload drums into the Shielded Container Assembly (SCA) for shipment in the HalfPACT shipping packaging for the Central Characterization Program (CCP).

This procedure shall be used when shipping SCAs from any waste generating site within the U.S. Department of Energy (DOE) complex to ensure radiation contact dose rate measurements are standardized in terms of geometry and protocol and remain consistent among the various waste generating sites. "Contact dose rate" measurements are taken with the detection instrument in direct contact with the surface of the SCA. While radiological surveys may be performed in accordance with site-specific procedures, contact dose rate measurements for both gamma and neutron radiation shall be performed in accordance with Section 4.5 of this procedure.

1.1 Scope

This procedure implements the requirements of Waste Isolation Pilot Plant (WIPP) Procedure SCA-MAN-0001, *Shielded Container Assembly Handling and Operation Manual.*

2.0 REQUIREMENTS

2.1 References

Baseline Documents

- Title 40 *Code of Federal Regulations* (CFR), *Protection of Environment*, Part 262, *Standards Applicable to Generators of Hazardous Waste*
- Title 40 CFR Part 262 § 262.31, *Labeling*
- Title 40 CFR Part 262 § 262.32, *Marking*
- Title 40 CFR Part 761, *Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and use Prohibitions;* § 761.40 *Marking of PCB's and PCB Items*
- Title 49 CFR, *Transportation*, Part 172, *Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements,* Subpart D, *Marking* § 172.300 through 172.338
- Title 49 CFR, Part 172, Subpart E, *Labeling* § 172.400 through 172.450
- *Title 49 CFR 173.474, Quality Control for Construction of Packaging*
- *Title 49 CFR 178.3, Marking of Packagings*
- *Title 49 CFR 178.350, Specification 7A; General Packaging, Type A*
- *SCA-REP-0001, Shielded Container Assembly Type A Evaluation Report*
- CCP-PO-002, *CCP Transuranic Waste Certification Plan*
- CCP-PO-003, *CCP Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPAC)*
- CCP-TP-033, *CCP Shipping of CH TRU Waste*
- DOE/WIPP 02-3183, *CH Packaging Program Guidance*

- NRC Docket 71-9279, Certificate of Compliance for Model Number HalfPACT Package
- Safety Analysis Report for the HalfPACT Shipping Package
- SAR Drawing 163-008, *Shielded Container*
- DOE/WIPP 02-3122, *Contact-Handled Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant*
- CH-TRU Payload Appendices
- DOE/WIPP 01-3194, *CH-TRU Waste Content Codes (CH-TRUCON)*
- SCA-QGR-0001, *Q-List and Quality Control Assessments for the Shielded Container Assembly*
- DOE/WIPP 02-3184, *CH Packaging Operations Manual*

Referenced Documents

- Title 10 CFR, *Energy*, Chapter III, *Department of Energy*, Part 835, *Occupational Radiation Protection Appendix D*
- Title 40 CFR § 761.40 *(Subpart C-Marking of PCBs and PCB Items)*
- CCP-PO-003, *CCP Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPAC)*
- CCP-QP-002, *CCP Training and Qualification Plan*
- CCP-QP-005, *CCP TRU Nonconforming Item Reporting and Control*
- CCP-QP-008, *CCP Records Management*
- SCA-MAN-0001, *Shielded Container Assembly Handling and Operation Manual*
- DOE/WIPP 02-3184, *CH Packaging Operations Manual*
- DOE/WIPP 11-3384, *CBFO Approved Filter Vents*

2.2 Training Requirements

2.2.1 CCP Personnel performing 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 Equipment List

- 3/4-inch socket (for closure bolts)
- 6 or 12 point socket (appropriate size for filter vent installation)
- Ratchet Drive Wrench
- Calibrated torque wrenches
- SCA Lift Assembly (Nuclear Waste Partnership [NWP] Drawing 163-L-024)
- ½-13 UNC tap
- RH-TRU Drum Handling Slings/Bags, or suitable rigging (one per SCA)

NOTE

For sealing the threads of the filter vent, a thread sealant tape or compound is recommended. However, a liquid anaerobic thread sealant is acceptable.

2.4 Recommended Supplies

- Denatured or isopropyl Alcohol
- General purpose adhesive remover (e.g., 50/50 Naptha and Xylene)
- Multipurpose spray adhesive (e.g, 3M™ Super 77)
- Touch-up paint (e.g., aerosol enamel, white)
- Thread lubricant
- Soft lint-free cloths

2.5 Recommended Spare Parts (Available from Seller, referenced drawing SCA-DWG-0001)

- Flange hex head cap screws (1/2-13UNC x 1-1/2 in. long)
- Lid seals (silicone sponge)
- Protective plugs (1/2 and 3/4 pipe)
- Filter vents

2.6 Precautions and Limitations

2.6.1 Removable surface contamination on the outer surfaces of the SCA shall **NOT** exceed the values in Title 10 CFR, *Energy*, Chapter III, *Department of Energy*, Part 835, *Occupational Radiation Protection Appendix D* (20 disintegrations per minute [dpm]/100 square centimeters [cm^2] alpha, 200 dpm/100cm^2 beta/gamma).

2.6.2 The SCA has an approximate empty weight of 1,726 pounds (lb.), and is designed for a maximum gross shipping weight of 2,260 lb. The maximum content weight is 450 lb.

2.6.3 Prior to constructing the SCA assembly in DOE/WIPP-02-3184, *CH Packaging Operations Manual* each SCA shall be surveyed individually. Instructions for this radiological survey are provided in Section 4.5.

2.6.4 The Transportation Certification Official (TCO) shall be notified if any of the following radiological survey criteria are exceeded:

[A] Radiation contact dose rates exceed 200 millirem per hour (mrem/hr) at contact (beta+gamma+neutron).

[B] Alpha contamination survey results exceed 20 dpm/100 cm^2.

[C] Beta/gamma contamination survey results exceed 200 dpm/100 cm^2.

2.6.5 The SCA shall not be used to store, contain, or transport contents other than the contents for which the packaging was designed.

2.6.6 SCAs should be stored indoors whenever possible. If outdoor storage is unavoidable, then the SCAs should be covered and stored on blocks to prevent corrosion and the ingress of water. In addition, the filter vent port shall be vented in a way which precludes the ingress of water and debris.

2.6.7 Observers shall be kept at a safe distance from the SCA while it is being lifted or moved.

2.6.8 Structural modifications shall not be made to the SCA.

2.6.9 If hardware replacement is required, replacement hardware shall meet the requirements of the assembly/manufacturing drawing.

2.6.10 Use only recommended solvents and adhesives, or as approved by the Packaging Engineer. Ensure the products are site approved. Follow product manufacturer's health and safety guidelines for the use of their product, as well as site-specific health and safety guidelines.

2.6.11 The SCA shall be equipped with one user-supplied filter vent in accordance with Section 2.5 of CCP-PO-003, *CCP Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPAC)*.

2.6.12 The SCA is not designed to interface with a forklift, and should only be lifted or transported by forklift when on a shipping pallet.

2.6.13 The SCA is designed to be lifted only with the SCA Lift Assembly, including when removing the SCA from the shipping pallet.

2.7 Prerequisites Actions

2.7.1 Verify equipment pre-operational inspections have been completed using site-specific procedures.

3.0 RESPONSIBILITIES

3.1 Host Site Supervisor

3.1.1 Supervises preparation of the loading area by Host site personnel.

3.1.2 Coordinates loading activities.

3.2 Shielded Container Assembly SCA Loading Operator (LO)

3.2.1 Prepares the SCA for loading.

3.2.2 Loads the SCA per Waste Certification Official (WCO) loading instructions.

3.2.3 Completes and signs Attachment 1.

3.3 Radiological Control

3.3.1 Performs radiation and contamination surveys of loaded SCA.

3.3.2 Provides completed Radiological Survey Reports to TCO.

3.4 Peer Verifier

3.4.1 Verifies containers to be loaded into SCA match the container numbers listed on Attachment 1.

3.4.2 Reviews and signs Attachment 1.

3.5 Transportation Certification Official (TCO)

3.5.1 Interfaces with Host site personnel when listed radiation/contamination values are exceeded.

3.5.2 Interfaces with Host site personnel when container integrity issues arise.

3.5.3 Assists in nonconformance report (NCR) generation/resolution from issues arising from packaging issues.

3.5.4 Reviews and signs Attachment 1.

3.5.5 Reviews and signs Attachment 2, Shielded Container Assembly Contact Dose Rate Survey.

3.6 Waste Certification Official (WCO)

3.6.1 Selects waste containers for SCA.

3.6.2 Provides Host site personnel with loading instructions for SCA.

3.6.3 Assists in disposition of NCRs.

4.0 PROCEDURE

SCA Loading Operator

4.1 Preparing Shielded Container Assembly for Loading

NOTE

New SCAs shall be shipped from the fabricator assembled on a shipping pallet with six (6) of the closure bolts installed wrench-tight in the lid, one on either side of the three lift interface points on the lid. The balance of the closure bolts and the seal are bagged separately and shipped inside the SCA.

NOTE

Labels may be installed at any time prior to step 4.2.

NOTE

During inspections, if damage, distortion, or corrosion is found that could compromise the confinement or shielding, then the supervisor/TCO will be contacted, and a NCR will be generated in accordance with CCP-QP-005, *CCP TRU Nonconforming Item Reporting and Control.*

4.1.1 Initial Inspection

[A] Obtain SCA Loading Instructions from WCO.

[B] Verify absence of a HOLD TAG.

[C] Inspect all accessible exterior surfaces of the SCA for damage.

[D] Record SCA identification (ID) on Attachment 1 (from WCO Loading Instruction).

[E] Verify the SCA Lid and Body Serial Numbers match, AND record the SCA Serial Number on Attachment 1.

NOTE

The SCA is designed to be lifted only with the SCA Lift Assembly, including when removing the SCA from the shipping pallet.

[F] Remove the protective plugs from each of the three lifting point threaded holes on the SCA lid, and inspect the condition of the threads. If any threads have minor deformation or discontinuity, correct the condition by using a ½-13UNC-2B bottoming tap, or plug tap to a minimum depth of ¾-inch.

[G] Verify six of the closure bolts are installed wrench-tight in the lid, one on either side of the three lift interface points on the lid.

CAUTION

Abrupt stops or starts while lowering the SCA or Lid MUST be avoided to prevent damage to the SCA, Lid or Lift Assembly.

[H] Attach the SCA Lift Assembly to the lid by inserting each of the three lift studs into each of the threaded lift interface points on the SCA lid.

[I] Rotate each lift stud handle in the clockwise direction until hand-tight.

[J] Attach the crane hook **OR** suitable rigging to the SCA Lift Assembly.

[K] Lift the SCA and place it on the SCA Survey Stand.

[L] Inspect the bottom of the SCA after it is positioned on the SCA Survey Stand.

[M] If needed, remove the crane/rigging from the SCA Lift Assembly.

4.1.2 Lid Removal

[A] Remove the six remaining closure bolts from the lid, and store in a manner that will preclude damage or loss.

[B] Ensure the crane/rigging is attached to the SCA Lift Assembly.

CAUTION

Pinch points are present between lid and body. In order to avoid injury, hands and fingers must be kept clear of these areas.

[C] Raise the crane to lift the SCA lid straight up from the SCA body.

[D] Store the lid in a manner that will preclude damage to the lid and allow for maintenance and inspection.

[E] If needed, remove the crane/rigging from the SCA Lift Assembly.

[F] If required by the site, survey the interior of the SCA per site specific procedures.

4.1.3 Maintenance and Inspection of SCA

[A] Ensure all assembly components are present:

[A.1] Body assembly (1 each)

[A.2] Lid assembly (1 each)

[A.3] Seal (1 each)

[A.4] Closure bolts (15 each)

[A.5] Protective plugs for lifting points (3 each)

[A.6] Protective plug for vent port

[B] The SCA has been assembled with the seal installed on the lid. Replace it with a new seal if the seal is damaged or shows signs deformation or deterioration (Refer to Attachment 3, SCA Lid Seal Replacement Instructions).

[C] Inspect the threads in each of the 15 closure bolt holes in the body flange. If any threads have minor deformation or discontinuity (foreign material, burrs, cross thread, weld spatter, etc.), the user may correct the condition by using a ½-13 UNC-2B bottoming tap, or plug tap to a minimum depth of ¾-inch.

[D] Inspect all interior and exterior surfaces of the SCA for signs of damage, distortion, or corrosion. If such conditions exist to the extent that confinement or shielding could be compromised, tag or label the unit as unusable and segregate away from conforming units.

[E] Ensure that the SCA interior is dry and no moisture (free standing liquid) is present.

4.1.4 Filter Vent Installation

NOTE
The SCA shall be equipped with one user-supplied filter vent per DOE/WIPP 11-3384, *CBFO Approved Filter Vents*, in accordance with Section 2.5 of CCP-PO-003.

NOTE
The approved filter vent for use in a SCA, is the Ultra Tech 9400.

[A] Ensure protective cap is removed from filter vent port.

[B] Install the filter vent per the following:

[B.1] Record Filter Vent Type Number, Filter Vent Serial Number, and Filter Vent Installation Date on Attachment 1.

[B.2] Apply a generous amount of pipe thread sealant compound or sealant tape to the threads of the filter vent to be installed.

[B.3] Install filter vent into the threaded port and torque to 21 in-lb.

[B.4] Remove all excess sealant from the exterior of the SCA.

[B.5] Record Torque Wrench Serial Number and Calibration Due Date on Attachment 1.

[C] **WHEN** maintenance and inspections are completed satisfactorily,
THEN print name, sign and date Attachment 1.

4.2 Marking and Labeling

NOTE
Each SCA shall be labeled with a unique ID number that includes a site identifier as a prefix.

[A] Ensure the following labels are clearly marked on each SCA:

[A.1] A minimum of three SCA ID numbers shall be placed at approximately equal intervals around the circumference of the SCA and approximate center of the SCA.

[A.2] Unique ID Number (Barcode), minimum of three.

[A.3] Caution Radioactive Material label.

[A.4] When applicable, Hazardous Waste and U.S. Environmental Protection Agency (EPA) Hazardous Waste Number(s) label.

[A.5] When applicable, Polychlorinated Biphenyl (PCB) label in accordance with 40 CFR § 761.40 (*Subpart C-Marking of PCBs and PCB Items*).

4.3 Payload Loading/Handling

NOTE

The 30-gallon payload drum shall be loaded, closed, and vented in accordance with site operating procedures.

NOTE

The use of RH-TRU drum handling slings or bags, or suitable rigging shall be used to facilitate loading operations, and are an approved payload item.

NOTE

A 30-gallon waste drum with a bolted closure ring will not fit into the SCA. An internal lever-lock closure ring is required on the 30-gallon waste drum.

4.4 Loading 30-Gallon Drums

[A] Verify drum is equipped with an internal lever-lock closure ring. If the drum is not equipped with an internal lever-lock closure ring, notify TCO and WCO.

[B] Verify that the waste drum is vented.

[C] Record Container ID number of drum that is to be loaded into the SCA on Attachment 1.

[D] Verify Container ID Number of drum to be loaded into SCA match number on Attachment 1, **AND** initial Attachment 1.

Peer Verifier

[E] Verify Container ID Number of drum to be loaded into SCA matches number on Attachment 1, **AND** initial Attachment 1.

SCA Loading Operator

[F] Place specified 30-gallon drum in SCA using RH-TRU drum handling sling or bag, or suitable rigging as applicable.

Peer Verifier

[G] Print name, sign, and date Attachment 1.

4.5 SCA Closure

SCA Loading Operator

CAUTION
Pinch points are present between lid and body flange. In order to avoid injury, hands and fingers must be kept clear of these areas.

NOTE

The SCA is designed with two alignment pins installed in the lid, with corresponding alignment marks on the lid and body. Corresponding alignment marks are identified on the lid and body such that the lid can be installed in one orientation only.

[A] Ensure the SCA Lift Assembly and crane/rigging is attached to the lid.

[B] Lift the SCA lid and position the lid above the SCA body.

[C] Begin lowering while positioning the lid so that the alignment marks on the lid line up with the alignment marks on the body.

[D] Lower the lid onto the SCA body while maintaining alignment of the marks, until lid is fully seated on the body.

[E] If needed, remove the crane/rigging from the SCA Lift Assembly.

[F] Apply thread lubricating compound to the SCA closure bolts.

[G] Install each of the 15 closure bolts in the lid, and tighten until wrench-tight.

[H] Using a calibrated torque wrench, torque the closure bolts to 85 ± 10 ft-lb.

[I] Record torque wrench serial number and calibration due date on Attachment 1.

[J] Apply a tamper indicating seal between the lid and body flanges, when required.

[K] Record SCA closure date on Attachment 1.

[L] Ensure a SCA Lift Assembly, load cell, and crane/rigging is attached to the lid.

[M] Raise the SCA a few inches to obtain gross weight in pounds and record on Attachment 1.

[N] Record Load Cell serial number and Calibration Due Date on Attachment 1.

[O] Place SCA on survey stand, and remove the SCA Lift Fixture/crane/rigging from the SCA.

[P] Print name, sign, and date Attachment 1.

| [Q] Request radiation control technician (RCT) to perform dose rate and contamination survey of SCA per the following:

NOTE

| Prior to shipping the SCAs, a radiological survey of the entire external surface of each SCA shall be performed in accordance with DOE/WIPP 02-3184 using site-specific procedures and calibrated instrumentation. The survey shall include contact dose rate measurements for both beta/gamma and neutron radiation in accordance with this section. The maximum contact dose rate measurement for each SCA shall be verified to be ≤200mrem/hr and recorded on Attachment 2 as the contact dose rate of record.

| [Q.1] With the SCA on the SCA Survey Stand, identify the orientation of the filter vent. Refer to Attachment 2, Page 1 for contact dose rate measurement areas.

NOTE

The cylindrical body of the SCA is divided into four quadrants, each of which is subdivided into three areas as shown on Attachment 2, page 1. The top of the SCA and the bottom of the SCA are two more areas, for a total of fourteen (14) areas on each SCA. Each separate area is completely surveyed, and the highest contact dose rate measurement for each area is recorded on Attachment 2, page 2.

[Q.2] Use the orientation of the filter vent to identify the four quadrants of the SCA cylindrical body (Q1 - Q4). Contact dose rate measurements shall be taken at three areas in each quadrant (e.g., Q1-#1, #2, #3...) and at the top and the bottom of the SCA, such that the entire external surface of each SCA is surveyed.

[R] **IF** any of the following are exceeded, **THEN** notify the TCO:

[R.1] Radiation dose rate exceeds 200 mrem/hr at contact (beta + gamma + neutron).

[R.2] Alpha contamination survey results exceed 20 dpm/100 cm2.

[R.3] Beta/gamma contamination survey results exceed 200 dpm/100 cm2.

[S] Document survey results on Radiation Survey Report per Host site procedure in accordance with Title 10 CFR 835.

[T] RCT provide the Radiation Survey Report to the TCO.

TCO

[U] Record the highest contact dose rate measurement for each area in the corresponding block on Attachment 2, Page 2.

[V] Total the sum of each beta/gamma and neutron contact dose rate measurement for each area, and record in the appropriate block on Attachment 2, Page 2.

[W] Determine the highest of the total contact dose rate measurements, and verify it is ≤200 mrem/hr.

[X] Record the highest total contact dose rate measurement as the dose rate of record on Attachment 2, Page 2.

[Y] Sign and date Attachment 2 certifying the SCA is in compliance with the radiological dose rate limits.

[Z] Place SCA into staging area or payload (as required).

TCO

[AA] Print name, sign, and date Attachment 1 signifying completion of Attachment 1.

TCO or Designee

NOTE

E-mail notification can be made in lieu of Fax notifications. E-mail addresses can be obtained by contacting the WCO.

[BB] Fax copy of Attachment 1, Survey Report, and any Generator Site Documentation of SCA Gross Weight (if applicable) to WCO.

[CC] Provide copy of Attachment 1, Radiological Survey Report, and any Generator Site Documentation of SCA Gross Weight (if applicable) to TCO.

[DD] Submit Attachment 1, copy of Radiological Survey Report, and any Generator Site Documentation of SCA Gross Weight (if applicable) in accordance with CCP-QP-008, *CCP Records Management*.

[EE] Submit Attachment 2 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/Nonpermanent

[A] Attachment 1, SCA Loading Form (includes the following):

[A.1] Copy of Radiological Survey Report

[A.2] Copy of Generator Site Documentation of SCA Gross Weight (if applicable)

[B] Attachment 2, SCA Dose Rate Survey Form

Attachment 1 – Shielded Container Assembly Loading Form

SCA Inspection

Shielded Container Assembly ID: ______________________________

Shielded Container Assembly Serial Number: ______________________________

Filter Vent Type Number	Filter Vent Serial Number	Date Filter Vent Installed

Filter Vent
Torque Wrench Serial Number:______________________Cal Due Date:____________

Maintenance/Inspections Complete
SCA Loading Operator
Printed Name____________Signature____________________Date ____________

Container ID Number	Operator Initials	Peer Verifier Initials

Peer Verifier – Waste Container ID Number loaded into SCA matches Container ID Number listed above.
Printed Name ________________Signature______________Date_______________

SCA Lid Closure Bolts
Torque Wrench Serial Number:______________________Cal Due Date:____________

SCA Closure Date:______________

Gross Weight in pounds (lbs.) :________________

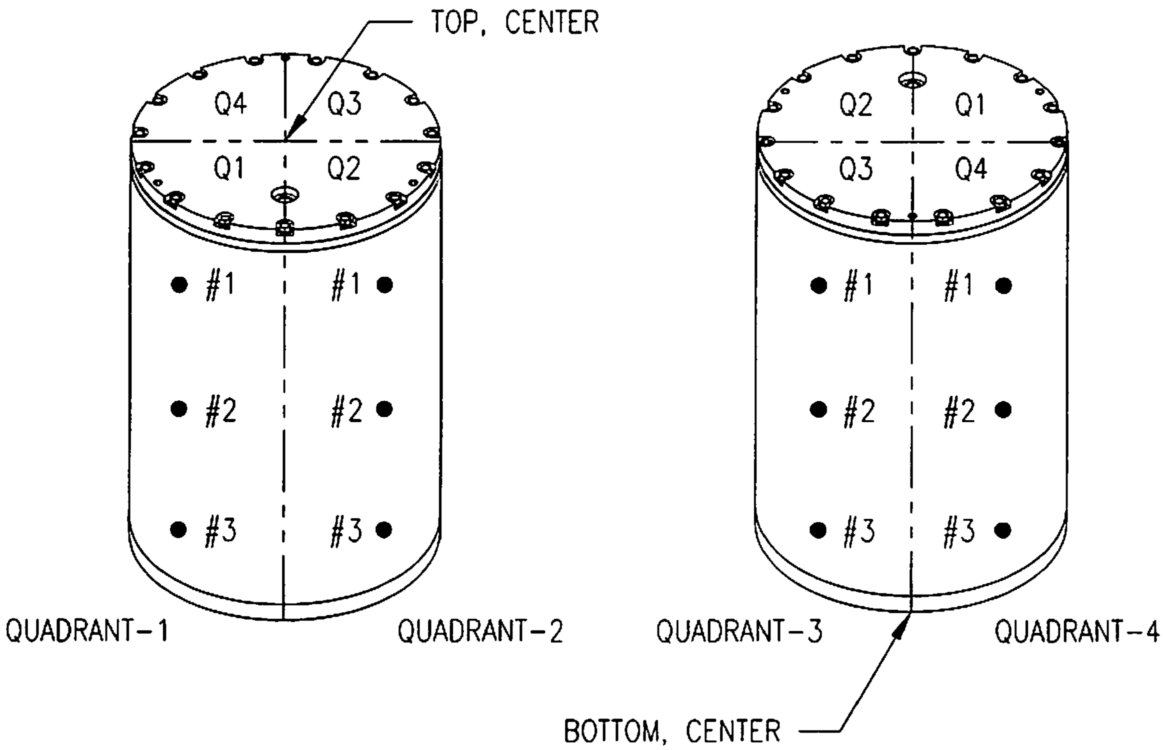
Load Cell Serial Number:____________________ Calibration Due Date:_____________

SCA Loading Operator
Printed Name ________________Signature______________Date _______________

Transportation Certification Official
Printed Name ________________Signature______________Date_______________

Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey

SCA CONTACT DOSE RATE SURVEY AREAS



Attachment 2 – Shielded Container Assembly Contact Dose Rate Survey (Continued)

Shielded Container Assembly Contact Dose Rate Survey Form

Shielded Container Assembly ID:________________

Record highest contact dose rate measurements for beta/gamma and neutron. Sum the two values and record the total does rates.

Contact Dose Rate Measurement	Beta/Gamma (mrem/hr)	Neutron (mrem/hr)	Total Dose Rate
SCA Top			
SCA Bottom			
SCA Q1 #1			
SCA Q1 #2			
SCA Q1 #3			
SCA Q2 #1			
SCA Q2 #2			
SCA Q2 #3			
SCA Q3 #1			
SCA Q3 #2			
SCA Q3 #3			
SCA Q4 #1			
SCA Q4 #2			
SCA Q4 #3			

Verify the highest total contact dose rate measurement is ≤200 mrem/hr on the external surface of the SCA, and record as the contact dose rate of record:____________________mrem/hr.

I certify that the contact dose rate data recorded is correct.

______________________________ / __________

Transportation Certification Official (or designee) Date

Attachment 3 – SCA Lid Seal Replacement Instructions

1. Remove the SCA lid according to Subsection 4.1.2.

CAUTION

Steps associated with lid seal replacement present potential eye hazards. Safety glasses with side shields are required while performing lid seal replacement activities.

2. Invert the SCA lid, or place the lid on a suitably configured lid stand to gain access to the seal recess.

3. Remove the existing seal, if present, by manually stripping the seal from the lid flange.

4. If necessary, clean the seal seating area as follows:

   a. Remove any residual seal components or adhesive using a flexible spatula, putty knife, or similar tool, taking care not to scratch the sealing surface.

   b. Apply a liberal amount of low intensity cleaning solvent, such as denatured alcohol or a general purpose adhesive remover containing a mixture of Naptha and Xylene. Use of acetone or other strong solvents should be avoided as they will remove the paint/coating.

NOTE

Prior to seal installation, verify that the seal shelf life has not expired.

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5. Place the seal in the seal recess in the SCA lid with the protective tape side of the seal against the lid.

6. Peel approximately four to six inches of the protective backing away from the seal adhesive.

7. Tear the protective backing in two, and fold back in either direction away from the exposed adhesive.

8. Place the seal (exposed adhesive side toward lid) into the seal recess in the lid. DO NOT stretch the seal during installation.

9. Continue to peel the protective backing away from the adhesive while guiding the seal into the seal recess until seal installation is complete.

Attachment 3 – SCA Lid Seal Replacement Instructions (Continued)

10. Once installed, ensure the seal is in full contact with, and adhered to the lid with no detrimental buckling or creasing of the seal that limits full adhesion.