Department of Energy
Carlsbad Field Office
P. O. Box 3090
Carlsbad, New Mexico 88221

March 29, 2024

Mr. Ricardo Maestas, Acting Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87508-6303

Subject: Class 2 Permit Modification Request, Waste Isolation Pilot Plant Hazardous Waste Facility Permit Number: NM4890139088-TSDF

Reference: Permittees' correspondence CBFO:ERCD:MG:JV:22-0278 to Rick Shean, Chief, Hazardous Waste Bureau, New Mexico Environment Department, dated January 12, 2023, subject: Class 1* Permit Modification Notification Requiring Prior Agency Approval, Waste Isolation Pilot Plant Hazardous Waste Facility Permit Number: NM4890139088-TSDF

Dear Mr. Maestas:

The purpose of this letter is to provide you with the Class 2 Permit Modification Request for the following items:

- Addition of Four New Shielded Containers
- Revise Site Recertification Audit Scheduling from Annual to Graded Approach

This modification was previously submitted to the New Mexico Environmental Department (NMED) as a Class 1* Permit Modification Notification Requiring Prior Agency Approval, in accordance with 20.4.1.900 New Mexico Administrative Code (incorporating 40 Code of Federal Regulations 270.42(a)) as indicated in the referenced letter. This letter also withdraws the referenced Class 1* Permit Modification Notification Requiring Prior Agency Approval.

We certify under penalty of law that this document and all attachments were prepared under our direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on our inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of our knowledge and belief, true, accurate, and complete. We are aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions, please contact Mr. Michael Gerle at (575) 988-5372.

Sincerely,

MARK BOLLINGER
Digitally signed by MARK BOLLINGER
Date: 2024.03.29 10:06:24 -06'00'

Mark Bollinger
Manager
Carlsbad Field Office

KENNETH HARRAWOOD (Affiliate)
Digitally signed by KENNETH HARRAWOOD (Affiliate)
Date: 2024.03.28 14:02:41 -06'00'

Ken Harrawood
Program Manager
Salado Isolation Mining Contractors, LLC

Enclosure

CBFO:ERCD:MG:AF:24-0241

240318

cc: w/enclosure
M. McLean, NMED *ED
A. Donahue, NMED ED
*ED denotes electronic distribution

cc: w/o enclosure
B. Forinash, CBFO ED
G. Basabilvazo, CBFO ED
E. Garza, CBFO ED
M. Gerle, CBFO ED
M. Navarrete, CBFO ED
A. Ward, CBFO ED
R. Flynn, SIMCO ED
S. Strong, SIMCO ED
J. Alba, LATA ED
R. Chavez, LATA ED
R. J. Chavez, LATA ED
M. Cook, LATA ED
J. Haschets, LATA ED
W. Jaco, LATA ED
M. Jones, LATA ED
A. McAfee, LATA ED
R. Salness, LATA ED
M. Serrano, LATA ED
A. Urquidez, LATA ED
*ED denotes electronic distribution

Class 2 Permit Modification Request

Addition of Four New Shielded Containers

and

Revise Site Recertification Audit Scheduling from Annual to Graded Approach

Waste Isolation Pilot Plant
Carlsbad, New Mexico

WIPP Permit Number - NM4890139088-TSDF

April 2024

Item 1

Class 2 Permit Modification Request

Addition of Four New Shielded Containers

Waste Isolation Pilot Plant
Carlsbad, New Mexico

WIPP Permit Number - NM4890139088-TSDF

April 2024

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Acronyms/Abbreviations/Units

CFR	Code of Federal Regulations
CH	contact-handled
DOE	United States Department of Energy
HWDU	Hazardous Waste Disposal Unit
in	inch(es)
mrem/hr	millirem per hour
NRC	Nuclear Regulatory Commission
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
Permit	Waste Isolation Pilot Plant Hazardous Waste Facility Permit
PMR	Permit Modification Request
RH	remote-handled
SER	Safety Evaluation Report
TRU	transuranic
WHB	Waste Handling Building
WIPP	Waste Isolation Pilot Plant

Overview of the Permit Modification Request

This document contains a Class 2 Permit Modification Request (**PMR**) for the Waste Isolation Pilot Plant (**WIPP**) Hazardous Waste Facility Permit (**Permit**), Permit Number NM4890139088-TSDF.

This PMR is being submitted by the U.S. Department of Energy (**DOE**) and Nuclear Waste Partnership LLC, collectively referred to as the Permittees, in accordance with Permit Part 1, Section 1.3.1. (20.4.1.900 New Mexico Administrative Code [**NMAC**] incorporating Title 40 of the Code of Federal Regulations [**CFR**] §270.42(b)). The modification provides the following Permit changes:

- The addition of four new shielded containers to support and continue the management of remote-handled (**RH**) transuranic (**TRU**) mixed waste as contact-handled (**CH**) TRU mixed waste at the WIPP facility.

This PMR adds four new shielded containers to the Permit (SC-30G2, SC-30G3, SC-55G1, and SC-55G2). On April 28, 2022, the Nuclear Regulatory Commission (**NRC**) issued an updated certificate of compliance for the HalfPACT shipping container, which includes the four new shielded containers, to certify that the packaging and contents meet the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, *Packaging and Transportation of Radioactive Material*. The additional shielded containers support the continued management of RH TRU mixed waste as CH TRU mixed waste at the WIPP facility.

The addition of these four new shielded containers does not affect the use of the permitted shielded container (subsequently referred to as SC-30G1). This PMR does not impact the RH TRU mixed waste disposal capacity limits for individual Hazardous Waste Disposal Units (**HWDUs**). The storage capacities of the Parking Area Container Storage Unit and the Waste Handling Building Container Storage Unit are also not affected. This modification does not alter the TRU mixed waste management standards[1] already authorized by the Permit at the WIPP facility (i.e., RH TRU mixed waste received in shielded containers will be managed and stored as CH TRU mixed waste in accordance with 40 CFR Part 264, Subpart I).

The modification to the Permit and related supporting documents are provided in this PMR. The changes to the text of the Permit have been identified using red text and double underline and a ~~strikeout~~ font for deleted information. Direct quotations are indicated by italicized text.

Changes to Permit text, tables, and figures are described in Section 1 and the Table of Changes in Appendix A. The exact Permit changes are shown in Appendix B in redline/strikeout. The changes described in this PMR do not reduce the ability of the Permittees to provide continued protection to human health and the environment. The following information specifically addresses how compliance has been achieved with Permit Part 1, Section 1.3.1. for submission of this Class 2 PMR.

[1] 40 CFR Part 264, Subpart I - Use and Management of Containers

1. 20.4.1.900 NMAC (incorporating 40 CFR 270.42(b)(1)(i)) requires the applicant to describe the exact change to be made to the permit conditions and supporting documents referenced by the Permit.

The exact changes to Permit text, figures, and tables are described in Appendix A and Appendix B of this PMR. The changes are summarized below and include a brief explanation of why the change is needed:

- Revised Permit Part 3, Section 3.3.1.8., *Shielded Container**:
    - to demonstrate that the gross internal volume of each shielded container varies
    - to correct the context from singular to plural
    - to add a new table (Table 3.3.1.8) to add the respective volume for each shielded container
- Revised Permit Part 4, Section 4.3.1.8., *Shielded Container,* to address how shielded containers will be received in Type B shipping packages at the WIPP facility.
- Revised Permit Attachment A1, Section A1-1b(2), *RH TRU Mixed Waste Containers,* to reduce redundancy. Shielded containers (SC-30G1) and the new containers are in Table A1-1, which is cited in Section A1-1b(2).
- Revised Permit Attachment A1, Section A1-1c(1), *Waste Handling Building Container Storage Unit (WHB Unit), CH TRU Mixed Waste, TRUPACT-II and HalfPACT Management,* to add the new shielded containers.
- Revised Permit Attachment A1, Section A1-1c(1), *Waste Handling Building Container Storage Unit (WHB Unit), HalfPACT Type B Packaging,* to add the new shielded containers.
- Revised Permit Attachment A1, Section A1-1c(1), *Waste Handling Building Container Storage Unit (WHB Unit), Facility or Containment Pallets,* to add the new shielded containers.
- Revised Permit Attachment A1, Section A1-1d(2), *CH TRU Mixed Waste Handling,* to add the new shielded containers.
- Revised Permit Attachment A1, Section A1-1d(4), *Handling Waste in Shielded Containers,* to add the new shielded containers.
- Revised Permit Attachment A1, Table A1-1, *TRU Mixed Waste Containers*[a], to add the new shielded containers and their corresponding metrics.
- Revised Permit Attachment A1, Table A1-2, *Waste Handling Equipment Capacities,* to add the new shielded containers and their corresponding metrics.
- Revised Permit Attachment A2, Section A2-2a(1), *CH TRU Mixed Waste Handling Equipment, Facility Pallets,* to add the new shielded containers.
- Revised Permit Attachment A2, Table A2-1, *CH TRU Mixed Waste Handling Equipment Capacities:*

    - to add the new shielded containers and corresponding metrics
    - to make the weight capacity consistent with facility documentation
    - to make the gross weight consistent with the CH-TRAMPACT.
- Revised Permit Attachment A3, Section A3-3, *Waste Handling Building Traffic,* to add the new shielded containers.
- Revised Permit Attachment C, Section C-5a(1), *WWIS Description*, to add the new shielded containers.
- Revised Permit Attachment C, Section C-5b(2), *Examination of the EPA Uniform Hazardous Waste Manifest and Associated Waste Tracking Information*, to add the new shielded containers.
- Revised Permit Attachment E, Table E-1, *Inspection Schedule/Procedures,* to add inspection for the Shielded Container Assembly (**SCA**) Handler.
- Revised Permit Attachment M, Figures, *List of Figures,* to update the figure title.
- Revised Permit Attachment M, Figures, Figure M-11, *Typical Shielded Container,* to update the figure to a range of dimensions and update the figure title.

2. 20.4.1.900 NMAC (incorporating 40 CFR 270.42(b)(1)(ii)), requires the applicant to identify that the modification is a Class 2 modification.

On November 1, 2012, the New Mexico Environment Department (**NMED**) approved a Class 2 PMR that authorized the use of the shielded container for management of RH TRU mixed waste as CH TRU mixed waste at the WIPP facility. The shielded container was added to Permit Part 3, Section 3.3.1, as an acceptable storage container and Permit Part 4, Section 4.3.1. as an acceptable disposal container. This initial shielded container is currently described in Permit Attachment A1, Section A1-1b(2) and illustrated in Permit Attachment M, Figure M-11.

The four new shielded containers (i.e., SC-30G2, SC-30G3, SC-55G1, and SC-55G2) are similar to the approved SC-30G1 in that they provide the shielding necessary for RH TRU mixed waste to be managed, stored, and disposed of as CH TRU mixed waste at the WIPP facility using waste management practices already included in the Permit. The four new shielded containers differ in their dimensions, weights, and shielding material thicknesses (refer to Appendix C for a comparison of the shielded containers). The SC-30G1 shielded container is currently authorized in the Permit for the management of RH TRU mixed waste as CH TRU mixed waste; therefore, no different management practices or management standards are required for the addition of the four new shielded containers.

The four new shielded containers will be managed and stored in an existing unit (i.e., the Waste Handling Building Container Storage Unit). No additional unit is required. The four new shielded containers are subject to the same management standards as the permitted SC-30G1 shielded container pursuant to 40 CFR Part 264, Subpart I, *Use and Management of Containers*. No change in management standards is required. The Waste Handling Building Container Storage Unit is currently and has previously received RH TRU mixed waste within a shielded container in the CH portion of the unit (i.e., the unit has previously received this type of waste). Lastly, RH TRU mixed waste within a shielded container is currently and has previously been disposed of in underground HWDUs at the WIPP facility. Based on this, the addition of four new shielded

containers to the Permit is a Class 1 modification requiring prior NMED approval in accordance with 40 CFR §270.42, Appendix I, Item F.4.b, which states:

> *"Storage or treatment of different wastes in containers…That do not require the addition of units or a change in the treatment process or management standards, and provided that the units have previously received wastes of the same type...[1]1"*

However, pursuant to 40 CFR §270.42(a)(3), the Permittees may elect to follow the procedures in 40 CFR §270.42(b) for Class 2 modifications instead of the Class 1 procedures. Therefore, the Permittees are electing to follow the Class 2 procedures in 40 CFR §270.42(b) pursuant to 40 CFR §270.42(a)(3).

3. 20.4.1.900 NMAC (incorporating 40 CFR 270.42(b)(1)(iii)), requires the applicant to explain why the modification is needed.

The changes described in this PMR are needed to add four new shielded containers to the Permit to support and continue the management of RH TRU mixed waste as CH TRU mixed waste at the WIPP facility. This modification involves adding new text to the Permit, changing existing text in the Permit, and changing existing Permit figures and tables, as appropriate.

A previous Class 2 PMR, approved by the NMED on November 1, 2012, allowed the Permittees to handle, store, and dispose RH TRU mixed waste as CH TRU mixed waste at the WIPP facility by shielding the penetrating radiation to achieve CH TRU radiation levels on the surface of the container. Shielded containers were developed as a method to expedite packaging and shipment of RH TRU mixed waste by reducing the time required to handle and process RH TRU mixed waste by personnel. However, the current shielded container (SC30-G1) can only handle a portion of the RH TRU mixed waste inventory at the generator/storage sites due to its size and its radiation shielding material limitations.

This PMR adds four new shielded containers to the Permit (SC-30G2, SC-30G3, SC-55G1, and SC-55G2) as TRU mixed waste storage and disposal containers. These containers provide the shielding necessary for RH TRU mixed waste to be managed, stored, and disposed as CH TRU mixed waste. These four new shielded containers were approved by the Nuclear Regulatory Commission (**NRC**) as part of a recent revision to the certificate of compliance for the HalfPACT[1]. These containers are robust and safe as demonstrated by rigorous testing and analysis, which is discussed in the NRC Safety Evaluation Report (**SER**). The determination of gross internal volumes for each shielded container is provided in Appendix D. The revised certificate of compliance approval letter, Certificate of Compliance Revision Number 10 for the HalfPACT, and the NRC SER Revision Number 10 are provided in Appendix E. The four new shielded containers also comply with the United States Department of Transportation Type 7A specifications.

Although these four new shielded containers will be loaded with RH TRU mixed waste, the lead and steel construction reduces the dose rate at the outer surface to less than 200 millirem per

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[1] Nuclear Regulatory Commission (NRC). 2022. Certification of Compliance No. 9279 for HalfPACT Shipping Package, Docket No. 71-9279. Revision 10. April 28, 2022. NRC Storage and Transportation Licensing Branch, Division of Fuel Management, Office of Nuclear Material Safety and Safeguards. Washington, D.C.

hour (**mrem/hr**), allowing the containers to be managed, stored, and disposed as CH TRU mixed waste. Only shielded containers with a surface dose rate of less than 200 millirem per hour are authorized for shipment to WIPP as CH TRU mixed waste in HalfPACT shipping packages. Container radiological surface surveys are performed at the generator/storage sites prior to shipment to verify compliance with this requirement.

These four shielded containers are similar to the permitted SC-30G1 shielded container, which is described in Permit Attachment A1, Section A1-1b(2) and shown in Figure M-11. The differences are primarily in size, weight, and shielding thickness. The Class 2 PMR, which added the SC-30G1 shielded container along with respective management practices to the Permit, was approved by the New Mexico Environment Department (**NMED**) on November 1, 2012. This authorized the Permittees to use the SC-30G1 shielded container to manage RH TRU mixed waste as CH TRU mixed waste since it met the surface dose rate of less than 200 mrem/hr, thereby meeting the definition of CH waste in Permit Part 1, Section 1.5.1. The four new shielded containers are similar in that they provide the shielding necessary for RH TRU mixed waste to be managed, stored, and disposed as CH TRU mixed waste.

The four shielded containers differ in their exterior dimensions, weights, and shielding material thicknesses (refer to Appendix C for illustrations). The SC-30G2 and SC-30G3 shielded containers contain an internal 30-gallon (4.0 cubic feet) waste container. The SC-55G1 and SC-55G2 shielded containers contain an internal 55-gallon (7.4 cubic feet) waste container. The gross internal volumes of the four new shielded containers are shown as a new table (Permit Table 3.3.1.8) in the redline/strikeout portion of this PMR (refer to Appendix B). The four new shielded container internal volumes are based on the same calculation methodology used to determine the gross internal volume of the permitted SC-30G1 shielded container. The Determination of Gross Internal Volumes for Each Shielded Container is included in Appendix E.

Descriptions of the four new shielded containers, with their approximate dimensions, are provided below. As shown in the descriptions, these containers are extremely robust. The four new shielded containers are either configured as a two-pack or a single unit within the HalfPACT Shipping Package. The four new shielded containers and their respective inner containers will be vented in accordance with Permit Attachment A1, Section A1-1d.

- SC-30G2 Shielded Container
    - The SC-30G2 shielded container has an overall diameter of approximately 24.5-inches (**in.**) and an overall height of approximately 36.625-in. The SC-30G2 nominally has 1.5-in. (1.40-in. minimum) of lead shielding between 0.30-in. thick inner and outer shells. The shells attach to an upper flange and a 3-in. thick steel base. The base integrates a 21.5-in. diameter, 0.50-in. thick lower lead plate, and a 20-in. diameter, 0.70-in. thick upper lead plate. The 3.89-in. thick steel lid integrates a 19.5-in. diameter, 0.75-in. thick lead plate. The lid also utilizes a 4-in. diameter, 0.25-in. thick lead disk that aligns under the vent port feature. The lid bolts to the container. A gasket of silicone rubber is used for lid closure. The empty weight of the SC-30G2 is approximately 2,610 pounds. The SC-30G2 accommodates a 30-gallon steel drum, which will contain RH TRU mixed waste.

- The SC-30G2 is configured as a two-pack on a circular pallet surrounded by radial and axial dunnage components and will be transported as a two-pack configuration within the HalfPACT package.

- SC-30G3 Shielded Container

  - The SC-30G3 shielded container has an overall diameter of approximately 28-in. and an overall height of 42.25-in. The SC- 30G3 has a 2.75-in. minimum of lead shielding between 0.50-in. thick inner and outer shells. The shells connect to an upper flange and a 5.75-in. thick steel base. The base integrates a 23-in. diameter, 0.75-in. thick lower lead plate, and a 20-in. diameter, 1.75-in. thick upper lead plate. The 6.79-in. thick steel lid integrates a 19-in. diameter, 2.25-in. thick lead plate. The lid also integrates a 23.5-in. outside diameter, 17.75-in. inside diameter, 0.75-in. thick lead ring. The lid is bolted to the container. A gasket of silicone rubber is used for lid closure. The empty weight of the SC-30G3 is approximately 5,750 pounds. The SC-30G3 accommodates a 30-gallon steel drum, which will contain RH TRU mixed waste.

  - The SC-30G3 is configured as a lateral single unit on a circular pallet surrounded and supported by upper and lower lateral dunnage components and will be transported as one single unit within the HalfPACT package.

- SC-55G1 Shielded Container

  - The SC-55G1 shielded container has an overall diameter of approximately 29.375-in. and an overall height of approximately 40.5-in. The 2.20-in. thick steel sidewall connects to a 2.35-in. thick steel base. The 2.40-in. thick steel lid integrates a 4-in. diameter, 0.40-in. thick lead disk that is aligned under the vent port feature. The lid is bolted to the container. A gasket of silicone rubber is utilized for lid closure. The empty weight of the SC-55G1 is approximately 2,810 pounds. The SC-55G1 accommodates a 55-gallon steel drum, which will contain RH TRU mixed waste.

  - The SC-55G1 is configured as a two-pack on a circular pallet surrounded by radial dunnage components and will be transported as a two-pack configuration within the HalfPACT package.

- SC-55G2 Shielded Container

  - The SC-55G2 shielded container has an overall diameter of approximately 31-in. and an overall height of approximately 45.75-in. The SC-55G2 nominally has 2-in. (1.98-in. minimum) of lead shielding between 0.50-in. thick inner and outer shells. The shells connect to an upper flange and a 4.25-in. thick steel base. The base integrates a 27-in. diameter, 0.75-in. thick lower lead plate, and a 24.5-in. diameter, 1.00-in. thick upper lead plate. The 5.76-in. thick steel lid integrates a 23.75-in. diameter, 1.50-in. thick lead plate. The lid also integrates a 26.625-in. outside diameter, 21.625-in. inside diameter, 0.50-in. thick lead ring. The lid is bolted to the container. A gasket of silicone rubber is utilized for lid closure. The empty weight of the SC-55G2 is approximately 5,900 pounds. The SC-55G2 accommodates a 55-gallon steel drum, which will contain RH TRU mixed waste.

- The SC-55G2 is configured as a lateral single unit on a circular pallet surrounded and supported by upper and lower lateral dunnage components and will be transported as one single unit within the HalfPACT package.

The four new shielded containers are subject to the same management standards as the permitted SC-30G1 shielded container pursuant to 40 CFR Part 264, Subpart I, *Use and Management of Containers*. Therefore, there is no change in management standards. The management of the four new shielded containers will not differ from the management standards of the permitted SC-30G1 shielded container. Pursuant to Permit Part 3, Section 3.3.1.8., the four new shielded containers will be managed, stored, and disposed as CH TRU mixed waste, but will be counted towards the RH TRU mixed waste volume limits. Pursuant to Permit Part 4, Table 4.1.1, footnote 3, the "*Final TRU Mixed Waste Volume is calculated based on the gross internal volume of the outermost disposal containers*," the volume of waste emplaced in the four new shielded containers will be designated as RH TRU mixed waste in the WIPP Waste Information System and will also be tracked and reported by DOE internally pursuant to the Land Withdrawal Act TRU waste volume capacity limit.

When the four new shielded containers are loaded and secured onto facility pallets, they will be transported safely into the underground. The four new shielded containers will be unloaded from the facility pallet and emplaced directly on the disposal room floor in a safe and stable configuration pursuant to Permit Attachment A2, Section A2-2b, Geologic Repository Process Description, CH TRU *Mixed Waste Emplacement*.

The shielded container information added to Permit Attachment A1, Table A1-2, Waste Handling Equipment Capacities, demonstrates that the equipment capacities can support the maximum gross weights of the respective shielded container/container configurations listed therein. As shown in Appendix C, the equipment capacities are more than sufficient to handle the new containers/container configurations listed. As shown in the table, three pack assembly of the currently authorized SC-30G1 is nearly the same weight (6,780 lbs) as the heaviest new container configuration listed (SC-55G1, 6,820 lbs.) SC-30G1 containers have been safely received/managed using the applicable equipment listed in Table A1-2.

For laterally shipped single units (i.e., the SC-30G3 and the SC-55G2), a lifting attachment and overhead crane will be used to move the lateral single units onto the Waste Handling Building (**WHB**) floor. The containers will be rotated 90 degrees via an upender (SCA Handler) and secured onto a facility pallet. This handler is similar to the TDOP Upender currently in Permit Attachment D, Table D-1, *Emergency Equipment Maintained at the Waste Isolation Pilot Plant*, and listed in Permit Attachment E, Table E-1. When ready for waste emplacement, the facility pallet is transported into the underground HWDU using the facility transfer vehicle. Once in the underground HWDU, a forklift will load the shielded container(s) and place them onto the floor of the underground HWDU as described in Permit Attachment A2, Sections A2-2a(1) and A2-2b.

The RH TRU mixed waste that will be packaged within these four new shielded containers is included in the inventory for the WIPP facility and will have undergone the required characterization as RH TRU mixed waste specified in the WIPP Waste Analysis Plan. Remote-handled TRU mixed waste streams for shipment and disposal in the four new shielded containers will be selected based on the requirement to keep the radiation dose rate at the external surface of the shielded containers below 200 mrem/hr in accordance with Permit Part 1, Section 1.5.1. The RH waste disposal capacity limits for individual underground HWDUs at

the WIPP facility are not affected by this PMR. Similarly, the storage capacities of the Parking Area Container Storage Unit and the Waste Handling Building Container Storage Unit remain unaffected. This modification does not alter the TRU mixed waste management practices already authorized by the Permit at the WIPP facility.

The Permittees have determined that most of the RH TRU mixed waste inventory stored at generator/storage sites can be safely shipped and disposed at the WIPP facility by utilizing four new shielded containers, which have larger internal volumes and/or additional shielding material than the permitted SC-30G1 shielded container. This is important to the Permittees because RH TRU mixed waste processing in the RH portion of the WIPP facility is currently suspended. The following are the reasons RH TRU mixed waste processing was suspended and RH TRU mixed waste emplacement in boreholes was not performed in Panel 7:

- The RH emplacement equipment was contaminated and abandoned in Room 6 of Panel 7.

- There were no RH emplacement boreholes in Panel 7 beyond Room 6. Drilling boreholes was not feasible due to the low ventilation rates and the use of continuous filtration for the exhaust coming out of Panel 7. Furthermore, radiological contamination necessitated the use of personnel protective equipment including respirators to perform work in Panel 7. Drilling boreholes and managing RH TRU mixed waste was not feasible from a safety perspective under these conditions and therefore RH TRU mixed waste emplacement was not performed in Panel 7.

- The new RH TRU mixed waste emplacement equipment for canisters in boreholes requires new procedures, training, and a formal start-up process.

Remote-handled TRU mixed waste emplacement in boreholes has been suspended since 2014. The program for emplacing RH TRU mixed waste in boreholes is being re-engineered (e.g., new equipment, plans and procedures) and is planned to resume. Therefore, it is important to optimize the use of shielded containers in Panel 8 to efficiently utilize the disposal space available in the WIPP repository and to facilitate RH TRU inventory reductions at the generator/storage sites. Shielded containers provide an additional option, in addition to RH TRU canisters, for generator/storage sites to package and ship their RH TRU inventory. Shielded containers are not meant to replace canisters but meant to provide an additional option for generator/storage sites.

The four new shielded containers will allow the generator/storage sites to proceed with their RH TRU mixed waste shipments for disposal at the WIPP facility. This will allow the Permittees to emplace RH TRU mixed waste in active waste panels during the suspension of RH TRU mixed waste activities.

4. 20.4.1.900 NMAC (incorporating 40 CFR 270.42 (b)(1)(iv)), requires the applicant to provide the applicable information required by 40 CFR 270.13 through 270.21, 270.62 and 270.63.

The regulatory crosswalk describes those portions of the WIPP Permit that are affected by this PMR. Where applicable, regulatory citations in this modification request reference Title 20, Chapter 4, Part 1, NMAC, revised December 1, 2018, incorporating 40 CFR Parts 264 and 270.

40 CFR §§270.16 through 270.23, 270.62, 270.63, and 270.66 are not applicable at the WIPP facility. Consequently, they are not listed in the regulatory crosswalk table.

5. 20.4.1.900 NMAC (incorporating 40 CFR 270.11(d)(1) and 40 CFR 270.30(k)), requires that any person signing under paragraph a and b must certify the document in accordance with 20.4.1.900 NMAC.

The transmittal letter for this PMR contains the signed certification statement in accordance with Permit Part 1, Section 1.9.

Regulatory Crosswalk

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the Permit or Permit Application	Yes	No
§270.13		Contents of Part A permit application	Attachment B, Part A		✓
§270.14(b)(1)		General facility description	Attachment A		✓
§270.14(b)(2)	§264.13(a)	Chemical and physical analyses	Attachment C		✓
§270.14(b)(3)	§264.13(b)	Development and implementation of waste analysis plan	Attachment C		✓
	§264.13(c)	Off-site waste analysis requirements	Attachment C		✓
§270.14(b)(4)	§264.14(a-c)	Security procedures and equipment	Part 2.6		✓
§270.14(b)(5)	§264.15(a-d)	General inspection requirements	Attachment E		✓
	§264.174	Container inspections	Attachment E	✓	
§270.23(a)(2)	§264.602	Miscellaneous units inspections	Attachment E		✓
§270.14(b)(6)		Request for waiver from preparedness and prevention requirements of Part 264 Subpart C	NA		✓
§270.14(b)(7)	264 Subpart D	Contingency plan requirements	Attachment D		✓
	§264.51	Contingency plan design and implementation	Attachment D		✓
	§264.52 (a) & (c-f)	Contingency plan content	Attachment D		✓
	§264.53	Contingency plan copies	Attachment D		✓
	§264.54	Contingency plan amendment	Attachment D		✓
	§264.55	Emergency coordinator	Attachment D		✓
	§264.56	Emergency procedures	Attachment D		✓
§270.14(b)(8)		Description of procedures, structures, or equipment for:	Part 2.10		✓
§270.14(b)(8)(i)		Prevention of hazards in unloading operations (e.g., ramps and special forklifts)	Part 2.10		✓
§270.14(b)(8)(ii)		Runoff or flood prevention (e.g., berms, trenches, and dikes)	Part 2.10		✓
§270.14(b)(8)(iii)		Prevention of contamination of water supplies	Part 2.10		✓
§270.14(b)(8)(iv)		Mitigation of effects of equipment failure and power outages	Part 2.10		✓
§270.14(b)(8)(v)		Prevention of undue exposure of personnel (e.g., personal protective equipment)	Part 2.10		✓
§270.14(b)(8)(vi) §270.23(a)(2)	§264.601	Prevention of releases to the atmosphere	Part 4 Attachment A2 Attachment N		✓
	264 Subpart C	Preparedness and Prevention	Part 2.10		✓
	§264.31	Design and operation of facility	Part 2.10		✓
	§264.32	Required equipment	Part 2.10 Attachment D		✓
	§264.33	Testing and maintenance of equipment	Attachment E		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the Permit or Permit Application	Yes	No
	§264.34	Access to communication/alarm system	Part 2.10		✓
	§264.35	Required aisle space	Part 2.10		✓
	§264.37	Arrangements with local authorities	Attachment D		✓
§270.14(b)(9)	§264.17(a-c)	Prevention of accidental ignition or reaction of ignitable, reactive, or incompatible wastes	Part 2.10		✓
§270.14(b)(10)		Traffic pattern, volume, and controls, for example: Identification of turn lanes Identification of traffic/stacking lanes, if appropriate Description of access road surface Description of access road load-bearing capacity Identification of traffic controls	Attachment A3	✓	
§270.14(b)(11)(i) and (ii)	§264.18(a)	Seismic standard applicability and requirements	Part B, Rev. 6 Chapter B		✓
§270.14(b)(11)(iii-v)	§264.18(b)	100-year floodplain standard	Part B, Rev. 6 Chapter B		✓
	§264.18(c)	Other location standards	Part B, Rev. 6 Chapter B		✓
§270.14(b)(12)	§264.16(a-e)	Personnel training program	Part 2 Attachment F		✓
§270.14(b)(13)	264 Subpart G	Closure and post-closure plans	Attachment G & H		✓
§270.14(b)(13)	§264.111	Closure performance standard	Attachment G		✓
§270.14(b)(13)	§264.112(a-b)	Written content of closure plan	Attachment G		✓
§270.14(b)(13)	§264.112(c)	Amendment of closure plan	Attachment G		✓
§270.14(b)(13)	§264.112(d)	Notification of partial and final closure	Attachment G		✓
§270.14(b)(13)	§264.112(e)	Removal of wastes and decontamination/dismantling of equipment	Attachment G		✓
§270.14(b)(13)	§264.113	Time allowed for closure	Attachment G		✓
§270.14(b)(13)	§264.114	Disposal/decontamination	Attachment G		✓
§270.14(b)(13)	§264.115	Certification of closure	Attachment G		✓
§270.14(b)(13)	§264.116	Survey plat	Attachment G		✓
§270.14(b)(13)	§264.117	Post-closure care and use of property	Attachment H		✓
§270.14(b)(13)	§264.118	Post-closure plan; amendment of plan	Attachment H		✓
§270.14(b)(13)	§264.178	Closure/containers	Attachment G		✓
§270.14(b)(13)	§264.601	Environmental performance standards-Miscellaneous units	Attachment G		✓
§270.14(b)(13)	§264.603	Post-closure care	Attachment G		✓
§270.14(b)(14)	§264.119	Post-closure notices	Attachment H		✓
§270.14(b)(15)	§264.142	Closure cost estimate	NA		✓
	§264.143	Financial assurance	NA		✓
§270.14(b)(16)	§264.144	Post-closure cost estimate	NA		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the Permit or Permit Application	Yes	No
	§264.145	Post-closure care financial assurance	NA		✓
§270.14(b)(17)	§264.147	Liability insurance	NA		✓
§270.14(b)(18)	§264.149-150	Proof of financial coverage	NA		✓
§270.14(b)(19)(i), (vi), (vii), and (x)		Topographic map requirements Map scale and date Map orientation Legal boundaries Buildings Treatment, storage, and disposal operations Run-on/run-off control systems Fire control facilities	Attachment B Part A		✓
§270.14(b)(19)(ii)	§264.18(b)	100-year floodplain	Attachment B Part A		✓
§270.14(b)(19)(iii)		Surface waters	Attachment B Part A		✓
§270.14(b)(19)(iv)		Surrounding Land use	Attachment B Part A		✓
§270.14(b)(19)(v)		Wind rose	Attachment B Part A		✓
§270.14(b)(19)(viii)	§264.14(b)	Access controls	Attachment B Part A		✓
§270.14(b)(19)(ix)		Injection and withdrawal wells	Attachment B Part A		✓
§270.14(b)(19)(xi)		Drainage on flood control barriers	Attachment B Part A		✓
§270.14(b)(19)(xii)		Location of operational units	Attachment B Part A		✓
§270.14(b)(20)		Other federal laws Wild and Scenic Rivers Act National Historic Preservation Act Endangered Species Act Coastal Zone Management Act Fish and Wildlife Coordination Act Executive Orders	Attachment B Part A		✓
§270.15	§264 Subpart I	Containers	Attachment A1	✓	
	§264.171	Condition of containers	Attachment A1		✓
	§264.172	Compatibility of waste with containers	Attachment A1		✓
	§264.173	Management of containers	Attachment A1	✓	
	§264.174	Inspections	Attachment E Attachment A1	✓	
§270.15(a)	§264.175	Containment systems	Attachment A1	✓	
§270.15(c)	§264.176	Special requirements for ignitable or reactive waste	Part 2		✓
§270..15(d)	§264.177	Special requirements for incompatible wastes	Part 2		✓
	§264.178	Closure	Attachment G		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the Permit or Permit Application	Yes	No
§270.15(e)	§264.179	Air emission standards	Part 4 Attachment N		✓
§270.23	264 Subpart X	Miscellaneous units	Attachment A2		✓
§270.23(a)	§264.601	Detailed unit description	Attachment A2	✓	
§270.23(b)	§264.601	Hydrologic, geologic, and meteorologic assessments	Part 5 Attachment L		✓
§270.23(c)	§264.601	Potential exposure pathways	Part 4 Attachment A2 Attachment N		✓
§270.23(d)		Demonstration of treatment effectiveness	NA		✓
	§264.602	Monitoring, analysis, inspection, response, reporting, and corrective action	Part 2 Part 4 Part 5 Attachment A2 Attachment N		✓
	§264.603	Post-closure care	Attachment H Attachment H1		✓
	264 Subpart E	Manifest system, record keeping, and reporting	Part 2 Attachment C		✓

Appendix A

Table of Changes

Table of Changes

Affected Permit Section	Explanation of Change
Part 3, Section 3.3.1.8, *Shielded Container**	Modified the language from: “Each shielded container has a gross internal volume of 7.4 ft^3 (0.21 m^3).” To: “The gross internal volume of each shielded container is specified in Table 3.3.1.8.”
	Modified the language from: “Shielded containers contain RH TRU mixed waste, but shielding will allow it to be managed and stored as CH TRU mixed waste.” to: “Shielded containers contain RH TRU mixed waste, but shielding allows them to be managed and stored as CH TRU mixed waste.”
	Added Table 3.3.1.8, *Gross Internal Volumes for Shielded Containers*. Table 3.3.1.8 contains two columns, labeled: [Shielded Container] and [Gross Internal Volume] with the respective rows beneath the column headers to indicate the gross internal volume of each shielded container.
Part 4, Section 4.3.1.8, *Shielded Container*	Modified the language from: “Shielded containers are configured as a three-pack.” to: “Shielded containers are configured as either a three-pack, a two-pack, or a single unit.”
	Added the following language: “The SC-30G1 is configured as a three-pack. The SC-30G2 and SC-55G1 are configured as two-packs. The SC-30G3 and SC-55G2 are configured as single units.”
Attachment A1, Section A1-1b(2), *RH TRU Mixed Waste Containers*	Removed the following language: “The shielded container is constructed with approximately one inch of lead shielding on the sides and approximately three inches of steel on the top and bottom of the container and is used to emplace RH TRU mixed waste; however, the shielding allows it to be managed and stored in accordance with CH TRU mixed waste handling practices.”
Attachment A1, Section A1-1c(1), *Waste Handling Building Container Storage Unit (WHB Unit), CH TRU Mixed Waste, TRUPACT-II and HalfPACT Management*	Modified the language from: “Once unloaded from the CH package, CH TRU mixed waste containers (seven-packs, three-packs, four-packs, SWBs, or TDOPs) are placed in one of two positions on the facility pallet or on a containment pallet.” to: “Once unloaded from the CH package, CH TRU mixed waste containers (seven-packs (55-gal drums), three-packs (100-gal drums), four-packs (85-gal drums), SWBs, or TDOPs) or shielded containers (three-packs (SC30G1), two-packs (SC-30G2 or SC-55G1), or single units (SC-30G3 or SC-55G2)) are placed in one of two positions on the facility pallet or on a containment pallet.”
	Modified the language from: “In addition, four CH Packages, containing up to eight seven-packs, three-packs, four-packs, SWBs, or four TDOPs, may occupy positions at the TRUDOCKs.” to: “In addition, four CH Packages, containing up to eight seven-packs (55-gal drums), eight three-packs (100-gal drums), eight four-packs (85-gal drums), eight SWBs, four three-packs of shielded containers (SC-30G1), four two-packs of shielded containers (SC-30G2 or SC-55G1), four single units of shielded containers (SC-30G3 or SC-55G2), or four TDOPs, may occupy positions at the TRUDOCKs.”

Affected Permit Section	Explanation of Change
Attachment A1, Section A1-1c(1), *Waste Handling Building Container Storage Unit (WHB Unit), HalfPACT Type B Packaging*	Removed "or" before "three shielded containers." Added the following language "… (SC-30G2 or SC-55G1), or one shielded container (SC-30G3 or SC-55G2)."
Attachment A1, Section A1-1c(1), *Waste Handling Building Container Storage Unit (WHB Unit), Facility or Containment Pallets*	Replaced the following language "…seven-packs, four-packs, or three-packs of drums…" with "…different drum types (i.e., 55-gal, 85-gal, and 100-gal)…"
	Modified the language from: "The facility pallet can accommodate up to four seven-packs, four three-packs, or four-packs of drums; four SWBs (in two stacks of two units); two TDOPs; one SLB2; or two shielded container three-pack assemblies." to: "The facility pallet can accommodate up to four seven-packs (55-gal drums) four three-packs (100-gal drums), four four-packs (85-gal drums), two three-packs of shielded container assemblies (SC-30G1), two two-packs of shielded container assemblies (SC-30G or SC-55G1), two single units of shielded container assemblies (SC-30G3 or SC-55G2), four SWBs (in two stacks of two units), two TDOPs, or one SLB2.
	Added the following language to the second paragraph "… a single shielded container…"
Attachment A1, Section A1-1d(2), *CH TRU Mixed Waste Handling*	Modified the language from: "The TRUPACT-II may hold up to two seven-packs, two four-packs, and two three-packs of drums; two SWBs; or one TDOP. A HalfPACT may hold seven 55-gal (208-L) drums, one SWB, three shielded containers, or four 85-gal drums." to: "The TRUPACT-II may hold up to two seven-packs (55-gal drums), two four-packs (85-gal drums), and two three-packs (100-gal drums); two SWBs; or one TDOP. A HalfPACT may hold seven 55-gal (208-L) drums, one SWB, three shielded containers (SC-30G1), two shielded containers (SC-30G2 or SC-55G1), one shielded container (SC-30G3 or SC-55G2), or four 85-gal drums."
	Modified the language from: "Each facility pallet has two recessed pockets to accommodate two sets of seven-packs (see Figure M-21), two sets of four-packs, two sets of three-packs; two sets of SWBs stacked two-high; two TDOPs; two shielded container assemblies, or three-packs; or any combination thereof." to: "Each facility pallet has two recessed pockets to accommodate two sets of seven-packs (55-gal drums) (see Figure M-21), two sets of four-packs (85-gal drums), two sets of three-packs (100-gal drums); two sets of SWBs stacked two-high; two TDOPs; a set of three-packs of shielded containers (SC-30G1), a set of two-packs of shielded containers (SC-30G2 or SC-55G1), a set of single unit shielded containers (SC-30G3 or SC-55G2); or any combination thereof."
Attachment A1, Section A1-1d(4), *Handling Waste in Shielded Containers*	Modified the language from: "Shielded containers are received as three-pack assemblies in HalfPACTs." to: "Shielded containers are received as either a three-pack assembly, a two-pack assembly, or a single unit within a HalfPACT."
	Replaced the following language: "shielded container assembly and place them on…" with: "…contents of the HalfPACT to allow placement of the shielded containers onto…"

Affected Permit Section	Explanation of Change
	Modified the following language from: “Once the shielded container assembly is on the facility pallet…” to: “Once the three-pack or two-pack of shielded containers or a single unit of shielded containers are on the facility pallet…”
	Modified the following language from: “Up to two three-pack assemblies of shielded containers are placed on a facility pallet.” to: “Up to two three-packs of shielded containers or two two-packs of shielded containers or two single units are placed onto a facility pallet.”
Attachment A1, Table A1-1, *TRU Mixed Waste Containers*[a]	Replaced the description from the row labeled “Shielded Containers” with “SC-30G1[b]”
	Added rows for the remaining shielded containers with their corresponding metrics (i.e., SC-31G1, SC-30G2, SC-30G3, SC-55G1, SC-55G2)
	Added footnote b “SC = Shielded Container”
Attachment A1, Table A1-2, *CH TRU Mixed Waste Handling Equipment Capacities*	Removed the row labeled “Shielded container” and the respective data.
	Added “(SC-30G1)” to the row labeled “Three-pack of shielded containers” and replaced the corresponding weight with “6,780”
	Added the following rows to Table A1-2: Two-pack of shielded containers (SC-30G2) with a weight of 6,320 Shielded container single unit (SC-30G3) with a weight of 6,300 Two-pack of shielded containers (SC-55G1) with a weight of 6,820 Shielded container single unit (SC-55G2) with a weight of 6,500
Attachment A2, Section A2-2a(1), *CH TRU Mixed Waste Handling Equipment, Facility Pallets*	Modified the language from: “The facility pallet is a fabricated steel unit designed to support seven-packs, three-packs, or four-packs of drums, standard waste boxes (**SWBs**), ten-drum overpacks (**TDOPs**), or a standard large box 2 (**SLB2**).” to: “The facility pallet is a fabricated steel unit designed to support different drum types (i.e., 55-gal, 85-gal, and 100-gal), standard waste boxes (**SWBs**), ten-drum overpacks (**TDOPs**), shielded containers, or a standard large box 2 (**SLB2**). The facility pallet accommodates up to four seven-packs (55-gal drums), four three-packs (100-gal drums), or four four-packs (85-gal drums); two three-packs of shielded containers (SC-30G1); two two-packs of shielded containers (SC-30G2 or SC 55G1); two single units of shielded containers (SC-30G3 or SC-55G2)”
Attachment A2, Table A2-1, *CH TRU Mixed Waste Handling Equipment Capacities*	Replaced the weight capacity in the row labeled “Facility Transfer Vehicle” from “26,000” to “30,000”
	Replaced the gross weight in the row labeled “Four-pack of 85-gal (322L) drums” from “4,500” to “4,000”
	Removed the row labeled “Shielded container” and the respective data

Affected Permit Section	Explanation of Change
	Added “(SC-30G1)” to the row labeled “Three-pack of shielded containers” and replaced the corresponding weight with “6,780”
	Added the following rows to Table A2-1: Two-pack of shielded containers (SC-30G2) with a gross weight of 6,320 Shielded container single unit (SC-30G3) with a gross weight of 6,300 Two-pack of shielded containers (SC-55G1) with a gross weight of 6,820 Shielded container single unit (SC-55G2) with a gross weight of 6,500
Attachment A3, Section A3-3, *Waste Handling Building Traffic*	Modified the language from: “A HalfPACT may hold seven 55-gal drums, one SWB, four 85-gal drums, or three shielded containers.” to: “A HalfPACT may hold seven 55-gal drums, one SWB, four 85-gal drums, or one three-pack of shielded containers (SC-30G1), one two-pack of shielded containers (SC-30G2 or SC-55G1), one single shielded container (SC-30G3 or SC-55G2).”
	Replaced the following language: “…shielded container assemblies…” with “…shielded containers (SC-30G1), two two-packs of shielded containers (SC-30G2 or SC-55G1), two single units of shielded containers (SC-30G3 or SC-55G2).”
Attachment C, Section C-5a(1), *WWIS Description*	Modified the language from “This report will contain the container identification numbers (IDs) of every container in the shipment, listed by Shipping Package number and by assembly number (for seven-packs, four-packs, and three-packs), for every assembly in the Shipping Package.” to: “This report will contain the container identification numbers (IDs) of every container in the shipment, listed by Shipping Package number and by assembly number (for seven-packs, four-packs, three-packs, two-packs, and single units), for every assembly in the Shipping Package.”
Attachment C, Section C-5b(1), *Examination of the EPA Uniform Hazardous Waste Manifest and Associated Waste Tracking Information*	Modified the language from “…(for seven-packs, four-packs, three-packs, and five-drum carriages)…” to “…for seven-packs, four-packs, three-packs, two packs, single units, and five-drum carriages)…”
	Modified the language from “…(or one container in a bound seven-pack, four-pack, or three-pack)…” to “…(or one container in a bound seven-pack, four-pack, three-pack, two-pack, or single unit)…”
Attachment E, Table E-1, *Inspection Schedule/Procedures*	Added new line for “SCA Handler” inspection with the following specific information: added “SCA” to the System/Equipment Name column, “Waste Operations" to Responsible Organization column, “Preoperational[c]” to Inspection Frequency column, and the “WP-05-WH1450 Inspecting for Mechanical Operability[m] and Deterioration[b] to the Procedure Number and Inspection Criteria[h] column.
Attachment M, *Figures*, *List of Figures*	Modified the language for Figure M-11 from: “Typical Shielded Container” to: “Range of Typical Shielded Container Dimensions"
Attachment M, *Figures*, Figure M-11, *Typical Shielded Container*	Modified the language on Figure M-11 from: “Typical Shielded Container” to: “Range of Typical Shielded Container Dimensions"

Affected Permit Section	Explanation of Change
	Replaced the vertical measurement of “36 in” with “35-46 in”
	Replaced the horizontal measurement of “23 in” with 23-31 in”

Appendix B

Revised Permit Text

PART 3 – CONTAINER STORAGE

3.3 CONDITION OF CONTAINERS

3.3.1. Acceptable Storage Containers

3.3.1.8 Shielded Container

~~Each shielded container has a~~ The gross internal volume of ~~7.4 ft^3 (0.21 m^3)~~each shielded container is specified in Table 3.3.1.8. Shielded containers contain RH TRU mixed waste, but shielding ~~will allow it~~allows them to be managed and stored as CH TRU mixed waste. For the purpose of this Permit, shielded containers will be managed, stored, and disposed as CH TRU mixed waste, but will be counted towards the RH TRU mixed waste volume limits.

Table 3.3.1.8 - Gross Internal Volumes for Shielded Containers

Shielded Container	Gross Internal Volume
SC-30G1	7.4 ft^3 (0.21 m^3)
SC-30G2	8.3 ft^3 (0.24 m^3)
SC-30G3	11.4 ft^3 (0.33 m^3)
SC-55G1	10.4 ft^3 (0.30 m^3)
SC-55G2	16.1 ft^3 (0.46 m^3)

PART 4 – GEOLOGIC REPOSITORY DISPOSAL

4.3 DISPOSAL CONTAINERS

4.3.1. Acceptable Disposal Containers

4.3.1.8. Shielded Container

Shielded containers are configured as either a three-pack, a two-pack, or a single unit. The SC-30G1 is configured as a three-pack. The SC-30G2 and SC-55G1 are configured as two-packs. The SC-30G3 and SC-55G2 are configured as single units.

ATTACHMENT A1

CONTAINER STORAGE

A1-1b(2) RH TRU Mixed Waste Containers

Remote-handled (**RH**) TRU mixed waste containers include RH-TRU 72-B Canisters, which are received at the WIPP facility loaded singly in an RH-TRU 72-B cask; Facility Canisters, which are used to configure 55-gal (208-L) drums for emplacement; shielded containers, which are received in HalfPACTs; and 55-gal (208-L) drums, which are received in a CNS 10-160B cask. The RH TRU mixed waste containers are constructed of steel. ~~The shielded container is constructed with approximately one inch of lead shielding on the sides and approximately three inches of steel on the top and bottom of the container and is used to emplace RH TRU mixed waste; however, the shielding allows it to be managed and stored in accordance with CH TRU mixed waste handling practices.~~ A summary description of each RH TRU mixed waste container type is provided in Table A1-1, and the containers are illustrated in Figures M-9 through M-11. The maximum loaded, or gross, weights of these containers are listed in Tables A1-2 and A1-3.

A1-1c(1) Waste Handling Building Container Storage Unit (WHB Unit)

CH TRU Mixed Waste

- TRUPACT-II and HalfPACT Management

  Once unloaded from the CH package, CH TRU mixed waste containers (seven-packs (55-gal drums), three-packs (100-gal drums), four-packs (85-gal drums), SWBs, or TDOPs) or shielded containers (three-packs (SC30G1), two-packs (SC-30G2 or SC-55G1), or single units (SC-30G3 or SC-55G2)) are placed in one of two positions on the facility pallet or on a containment pallet. The waste containers are stacked, on the facility pallets (one- or two-high, depending on weight considerations). Waste on containment pallets are stacked one-high. The use of facility or containment pallets elevates the waste at least 6 inches (**in.**) (15 centimeters (**cm**)) from the floor surface. Pallets of waste are then maintained in the CH Bay Storage Area of the WHB Unit for normal storage.

  In addition, four CH packages, containing up to eight seven-packs (55-gal drums), eight three-packs (100-gal drums), eight four-packs (85-gal drums), eight SWBs, four three-packs of shielded containers (SC-30G1), four two-packs of shielded containers (SC-30G2 or SC-55G1), four single units of shielded containers (SC-30G3 or SC-55G2) or four TDOPs, may occupy positions at the TRUDOCKs. If waste containers are left in this area, they will be in the CH package with or without the shipping container lids removed.

HalfPACT Type B Packaging

The HalfPACT (Figure M-18) is a right cylindrical shipping container 8 ft (2.4 m) in diameter and 7.6 ft (2.3 m) high. It is an NRC-certified Type B package designed to meet the applicable requirements of 10 CFR Part 71 and has successfully completed rigorous container-integrity

tests. The payload consists of approximately 7,600 lb (3,500 kg) gross weight in up to seven 55-gal (208-L) drums, one SWB, four 85-gal (322-L) drums, ~~or~~ three shielded containers (SC-30G1), two shielded containers (SC-30G2 or SC-55G1), or one shielded container (SC-30G3 or SC-55G2).

Facility or Containment Pallets

The facility pallet is a fabricated steel unit designed to support ~~seven-packs, four-packs, or three-packs of drums~~different drum types (i.e., 55-gal, 85-gal, and 100-gal), SWBs, TDOPs, an SLB2, or shielded container assemblies. The facility pallet can accommodate up to four seven-packs (55-gal drums), four three-packs (100-gal drums), ~~or~~ four four-packs ~~of drums~~(85-gal drums), two three-packs of shielded container assemblies (SC-30G1), two two-packs of shielded container assemblies (SC-30G or SC-55G1), two single units of shielded container assemblies (SC-30G3 or SC-55G2),~~;~~ four SWBs (in two stacks of two units)~~;~~, two TDOPs~~;~~, or one SLB2~~; or two shielded container three-pack assemblies~~. Loads are secured to the facility pallet during transport to the emplacement area. Facility pallets are shown in Figure M-21. Fork pockets in the side of the pallet allow the facility pallet to be lifted and transferred by forklift to prevent direct contact between TRU mixed waste containers and forklift tines. This arrangement reduces the potential for puncture accidents. Facility pallets may also be moved by facility transfer vehicles. WIPP facility operational documents define the operational load of the facility pallet to ensure that the rated load of a facility pallet is not exceeded.

Containment pallets are fabricated units having a containment capacity of at least ten percent of the volume of the containers and designed to support a minimum of either a single drum, a single SWB, a single shielded container, or a single TDOP. The pallets have a rated load capacity of equal to or greater than the gross weight limit of the container(s) to be supported on the pallet. Loads are secured to the containment pallet during transport. A typical containment pallet is shown in Figure M-22. Fork pockets in the side of the pallet allow the containment pallet to be lifted and transferred by forklift. WIPP facility operational documents define the operational load of the containment pallet to assure that the rated load of a containment pallet is not exceeded.

A1-1d(2) CH TRU Mixed Waste Handling

The TRUPACT-II may hold up to two seven-packs (55-gal drums), two four-packs (85-gal drums), and two three-packs ~~of drums~~(100-gal drums); two SWBs; or one TDOP. A HalfPACT may hold seven 55-gal (208-L) drums, one SWB, three shielded containers (SC-30G1), two shielded containers (SC-30G2 or SC-55G1), one shielded container (SC-30G3 or SC-55G2), or four 85-gal drums. The TRUPACT-III holds a single SLB2. An overhead bridge crane or Payload Transfer Station is used to remove the contents of the CH package and place them on a facility pallet.

Each facility pallet has two recessed pockets to accommodate two sets of seven-packs (55-gal drums) (see Figure M-21), two sets of four-packs (85-gal drums), two sets of three-packs (100-gal drums),~~;~~ two sets of SWBs stacked two-high,~~;~~ two TDOPs~~; two shielded container assemblies, or three-packs~~; a set of three-packs of shielded containers (SC-30G1), a set of two-packs of shielded containers (SC-30G2 or SC-55G1), a set of single unit shielded containers

(SC-30G3 or SC-55G2); or any combination thereof. Each facility pallet will accommodate one SLB2. Each stack of waste containers is secured prior to transport underground. A forklift or the Facility Transfer Vehicle will transport the loaded facility pallet to the conveyance loading room located adjacent to the Waste Shaft. The conveyance loading room serves as an air lock between the CH Bay and the Waste Shaft, preventing excessive air flow between the two areas. The Facility Transfer Vehicle is driven onto the Waste Shaft Conveyance deck, where the loaded facility pallet is transferred to the Waste Shaft Conveyance, and the Facility Transfer Vehicle is backed off. Containers of CH TRU mixed waste (55-gal (208-L) drums, SWBs, 85-gal (322-L) drums, 100-gal (379-L) drums, and TDOPs) or shielded container assemblies can be handled individually, if needed, using the forklift and lifting attachments (i.e., drum handlers, parrot beaks).

A1-1d(4) Handling Waste in Shielded Containers

Shielded containers are received as either a three-pack ~~assemblies~~assembly, a two-pack assembly, or a single unit ~~in~~within a HalfPACT~~s~~. An overhead bridge crane is used to remove the ~~shielded container assembly and place them on~~ contents of the HalfPACT to allow placement of the shielded containers onto a facility pallet. The containers are visually inspected for physical damage and leakage to ensure they are in good condition prior to storage. Waste containers are also checked for external radiological surface contamination through the use of swipes and radiation monitoring equipment, consistent with radiological control procedures pursuant to 10 CFR Part 835. If a primary waste container is not in good condition, the Permittees will either overpack the container with another approved container, repair/patch the container in accordance with appropriate standards and guidance (e.g., 40 CFR §173.28), return the container to the generator, or send the HalfPACT to a third-party contractor. If local decontamination activities are opted for, the work will be conducted in the WHB Unit, consistent with radiological control procedures.

Once the three-pack or two-pack of shielded container~~s~~ ~~assembly is~~ or single unit of shielded containers are on the facility pallet, the TRU mixed waste container identification numbers are verified in accordance with Permit Attachment C, Section C-5b(1). Inconsistencies will be resolved as discussed in Section A1-1d(2) of this Permit Attachment. Up to two three-pack~~s~~ ~~assemblies~~ of shielded containers or two two-packs of shielded containers or two single units are placed on~~to~~ a facility pallet. The use of facility pallets elevates the waste at least 6 in. (15 cm) from the floor surface. Pallets of waste are then maintained in the CH Bay Storage Area of the WHB Unit for normal storage or are transported to the conveyance loading room as described in Section A1-1d(2).

TABLES

Table A1-1
TRU Mixed Waste Containers[a]

DESCRIPTION	VOLUME		DIMENSIONS (inches)			LINER	USE FOR DERIVED WASTE	FIGURE
	CUBIC FEET	CUBIC METERS	LENGTH	WIDTH OR DIAMETER	HEIGHT			
55-gal (208-L) drum	7.4	0.21	N/A	24	35	Optional	Yes	M-3
Standard waste box	66.3	1.88	71	54	36	No	Yes	M-4
Ten-drum overpack	160	4.5	N/A	72	73	No	Yes, in under-ground	M-5
85-gal (322-L) drum	11.4	0.32	N/A	26	36	Optional	Yes	M-6
100-gal (379-L) drum	13.4	0.38	N/A	32	35	Optional	No	M-7
Standard large box 2	261	7.39	108	69	73	No	No	M-8
Facility canister	31.4	0.89	N/A	28	117	No	No	M-9
RH TRU canister	31.4	0.89	N/A	26	120	Insert optional	No	M-10
~~Shielded container~~SC-30G1[b]	7.4	0.21	N/A	23	36	1 inch of lead shielding	No	M-11
SC-30G2[b]	8.3	0.24	N/A	24.5	36.625	1.5 inch of lead shielding	No	M-11
SC-30G3[b]	11.4	0.33	N/A	28	42.25	2.75 inch of lead shielding	No	M-11

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SC-55G1[b]	10.4	0.30	N/A	29.375	40.5	2.20 inch of steel shielding	No	M-11
SC-55G2[b]	16.1	0.46	N/A	31	45.75	2 inch of lead shielding	No	M-11

N/A Not applicable to drums

[a] TRU mixed waste containers may also be used to overpack waste containers that, upon removal from the shipping package, have been determined to be leaking or not in good condition.

[b] "SC" = Shielded Container

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Table A1-2
CH TRU Mixed Waste Handling Equipment Capacities

CAPACITIES FOR EQUIPMENT (lb)	
CH Bay overhead bridge crane	12,000
Surface forklifts	26,000 (CH Bay forklift) 70,000 (TRUPACT-III Handler forklift)
Facility Pallet	25,000
LIft Fixture	10,000
Facility Transfer Vehicle	30,000
Yard Transfer Vehicle	60,000
MAXIMUM GROSS WEIGHTS OF CONTAINERS (lb)	
Seven-pack of 55-gal (208-L) drums	7,000
Four-pack of 85-gal (322-L) drums	4,000
Three-pack of 100-gal (379-L) drums	3,000
Ten-drum overpack	6,700
Standard waste box	4,000
Standard large box 2	10,500
~~Shielded container~~	~~2,260~~
Three-pack of shielded containers (SC-30G1)	~~7,000~~6,780
Two-pack of shielded containers (SC-30G2)	6,320
Shielded container single unit (SC-30G3)	6,300
Two-pack of shielded containers (SC-55G1)	6,820
Shielded container single unit (SC-55G2)	6,500
MAXIMUM NET EMPTY WEIGHTS OF EQUIPMENT (lb)	
TRUPACT-II	13,140
HalfPACT	10,500
TRUPACT-III	43,600
Lift Fixture	2,500
Facility pallet	4,120

ATTACHMENT A2

GEOLOGIC REPOSITORY

A2-2a(1) CH TRU Mixed Waste Handling Equipment

Facility Pallets

The facility pallet is a fabricated steel unit designed to support ~~seven-packs, three-packs, or four-packs of drums~~different drum types (i.e., 55-gal, 85-gal, and 100-gal), standard waste boxes (**SWBs**), ten-drum overpacks (**TDOPs**), shielded containers, or a standard large box 2 (**SLB2**)~~,~~. The facility pallet accommodates up to four seven-packs (55-gal drums), four three-packs (100-gal drums), or four four-packs ~~of drums~~(85-gal drums); two three-packs of shielded containers (SC-30G1); two two-packs of shielded containers (SC-30G2 or SC 55G1); two single units of shielded containers (SC-30G3 or SC-55G2); four SWBs (in two stacks of two units); two TDOPs; or one SLB2. Loads are secured to the facility pallet during transport to the emplacement area. Facility pallets are shown in Figure M-21. Fork pockets in the side of the pallet allow the facility pallet to be lifted and transferred by forklift to prevent direct contact between TRU mixed waste containers and forklift tines. This arrangement reduces the potential for puncture accidents. WIPP facility operational documents define the operational load of the facility pallet to ensure that the rated load of a facility pallet is not exceeded.

Table A2-1
CH TRU Mixed Waste Handling Equipment Capacities

Capacities for Equipment (lb)	
Facility Pallet	25,000
Facility Transfer Vehicle	~~26,000~~30,000
Underground transporter	28,000
Underground forklift	12,000
SLB2 forklift	36,000
Maximum Gross Weights of Containers (lb)	
Seven-pack of 55-gal (208-L) drums	7,000
Four-pack of 85-gal (322-L) drums	~~4,500~~4,000
Three-pack of 100-gal (379-L) drums	3,000
Ten-drum overpack	6,700
Standard waste box	4,000
Standard large box 2	10,500
~~Shielded container~~	~~2,260~~
Three-pack of shielded containers (SC-30G1)	~~7,000~~6,780
Two-pack of shielded containers (SC-30G2)	6,320
Shielded container single unit (SC-30G3)	6,300
Two-pack of shielded containers (SC-55G1)	6,820
Shielded container single unit (SC-55G2)	6,500
Maximum Net Empty Weights of Equipment (lb)	
TRUPACT-II	13,140
HalfPACT	10,500
TRUPACT-III	43,600
Facility pallet	4,120

ATTACHMENT A3

TRAFFIC PATTERNS

A3-3 Waste Handling Building Traffic

The TRUPACT-II may hold up to two 55-gallon (**gal**) drum seven-packs, two 85-gal drum four-packs, two 100-gal drum three-packs, two standard waste boxes (**SWBs**), or one ten-drum overpack (**TDOP**). A HalfPACT may hold seven 55-gal drums, one SWB, four 85-gal drums, or ~~three~~one three-pack of shielded containers (SC-30G1), one two-pack of shielded containers (SC-30G2 or SC-55G1), one single shielded container (SC-30G3 or SC-55G2). The TRUPACT-III holds a single standard large box 2 (**SLB2**). A six-ton overhead bridge crane or Facility Transfer Vehicle with a transfer table is used to remove the contents of the CH package. Waste containers are surveyed for radioactive contamination and decontaminated or returned to the CH package, as necessary.

Each facility pallet accommodates four 55-gal drum seven-packs, four SWBs, four 85-gal drum four-packs, four 100-gal drum three-packs, two TDOPs, an SLB2, or two three-packs of shielded containers (SC-30G1) ~~assemblies~~, two two-packs of shielded containers (SC-30G2 or SC-55G1), two single units of shielded containers (SC-30G3 or SC-55G2). Waste containers are secured to the facility pallet prior to transfer. A forklift or facility transfer vehicle transports the loaded facility pallet into the air lock at the Waste Shaft (Figure M-60). The facility transfer vehicle is driven onto the waste shaft conveyance deck, where the loaded facility pallet is transferred to the waste shaft conveyance and downloaded for emplacement.

ATTACHMENT C

WASTE ANALYSIS PLAN

C-5a(1) WWIS Description

The WWIS will generate the following:

- Shipment Summary Report

  This report will contain the container identification numbers (**IDs**) of every container in the shipment, listed by Shipping Package number and by assembly number (for seven-packs, four-packs, ~~and~~ three-packs, two-packs, and single units), for every assembly in the Shipping Package. This report is used by the Permittees to verify containers in a shipment and will be generated on a shipment basis.

C-5b(1) Examination of the EPA Uniform Hazardous Waste Manifest and Associated Waste Tracking Information

Upon receipt of a TRU mixed waste shipment, the Permittees will make a determination of EPA Uniform Hazardous Waste Manifest completeness and sign the manifest to allow the driver to depart. For CH TRU mixed waste, the Permittees will then make a determination of waste shipment completeness by checking the unique, bar-coded identification number found on waste containers holding TRU mixed waste against the WWIS database after opening the Shipping Package.

The WWIS links the bar-coded identification numbers of containers in a specific waste shipment to the waste assembly (for seven-packs, four-packs, three-packs, two-packs, single units, and five-drum carriages) and to the shipment identification number, which is also written on the EPA Hazardous Waste Manifest.

For shipments in the RH-TRU 72B cask, the identification number of the single payload container is read during cask-to-cask transfer in the Transfer Cell and then checked against the WWIS database. For shipments in the CNS 10-160B cask, the Permittees will make a determination of waste shipment completeness by checking the unique identification number found on each container holding TRU mixed waste in the Hot Cell against the WWIS database after unloading the cask.

Generators electronically transmit the waste shipment information to the WWIS before the TRU mixed waste shipment is transported. Once a TRU mixed waste shipment arrives, the Permittees verify the identity of each cask or container (or one container in a bound seven-pack, four-pack, ~~or~~ three-pack, two-pack, or single unit) using the data already in the WWIS.

ATTACHMENT E

Table E-1

Inspection Schedule/Procedures

System/Equipment Name	Responsible Organization	Inspection[a] Frequency	Procedure Number and Inspection Criteria[h]
Uninterruptible Power Supply (Central UPS)	Facility Operations	Daily	WP 04-ED1542 Inspecting for Mechanical Operability[m] and Deterioration[b] with no malfunction alarms. Results of this inspection are recorded on EA04AD3008-20-0
TDOP Upender	Waste Operations	Pre-evolution[p]	WP 05-WH1010 Pre-evolution Checks and Operating Instructions, Inspecting for Mechanical Operability[m] and Deterioration[b]
Waste Handling Cranes	Waste Operations	Preoperational[c]	WP 05-WH1407 Inspecting for Mechanical Operability[m], Deterioration[b], and Leaks/Spills
Waste Hoist	Underground Operations	Preoperational[c]	WP 04-HO1003 Inspecting for Deterioration[b], Safety Equipment, Communication Systems, and Mechanical Operability[m], Leaks/Spills, in accordance with MSHA requirements
Bolting Robot	Waste Operations	Preoperational [c]	WP 05-WH1203 Mechanical Operability[m]
SCA Handler	Waste Operations	Preoperational [c]	WP 05-WH1450 Inspecting for Mechanical Operability[m] and Deterioration[b]

ATTACHMENT M

FIGURES

LIST OF FIGURES

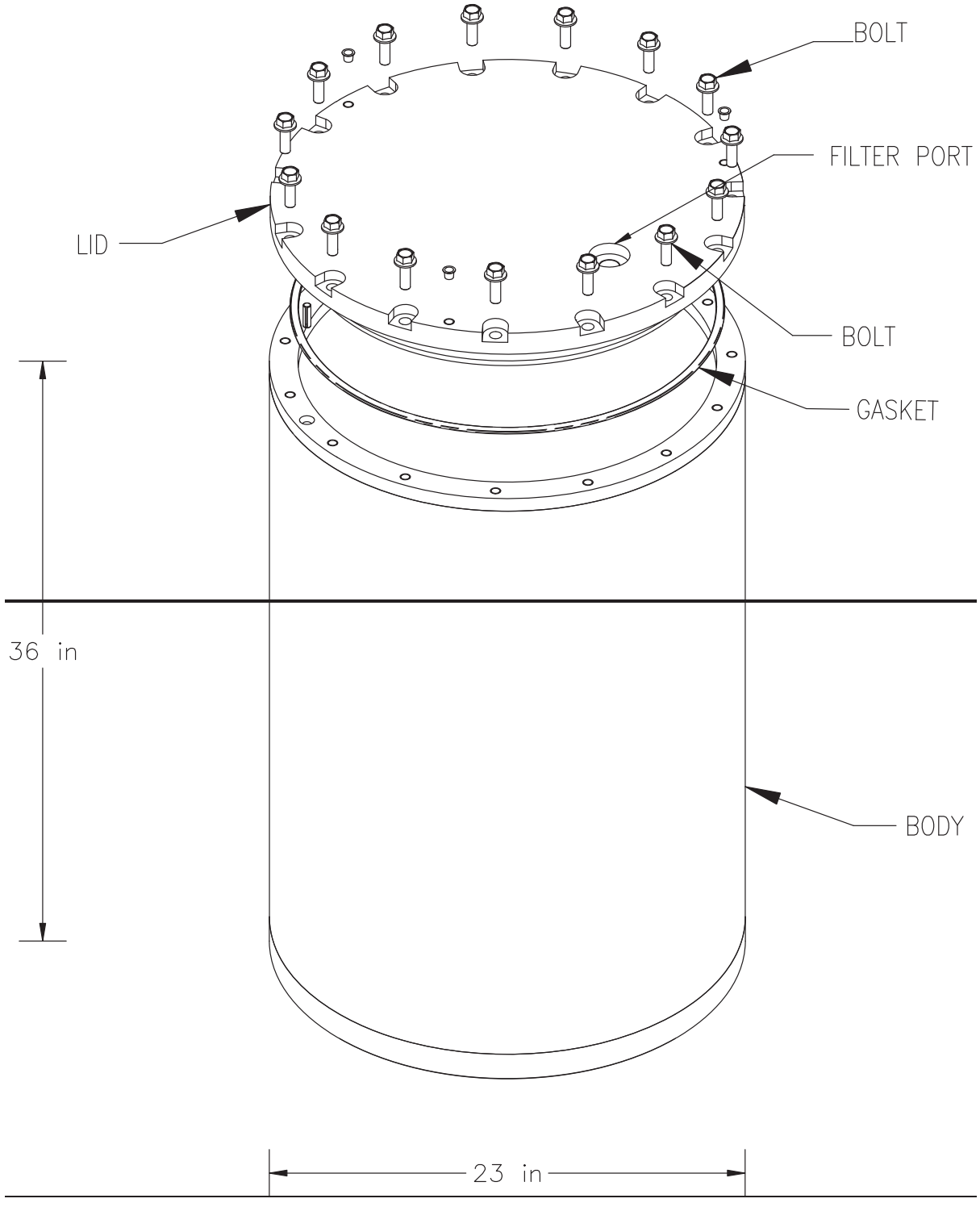

Figure M-11
Typical Shielded Container

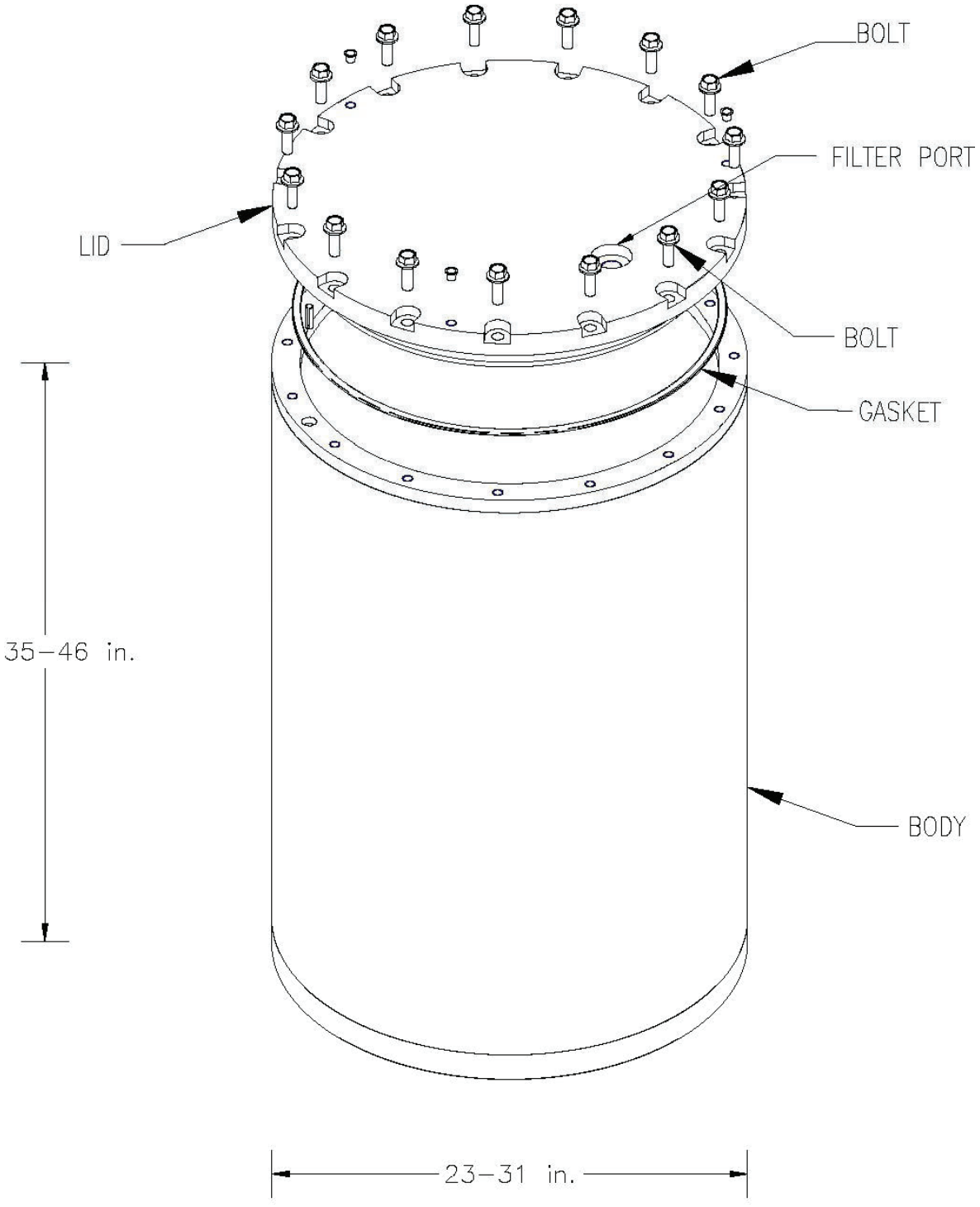

Figure M-11
Range of Typical Shielded Container Dimensions

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Appendix C

Comparison of Shielded Containers

Shielded Container Information

Parameter	Current Permit	Shielded Container Configuration			
	SC-30G1	SC-30G2	SC-30G3	SC-55G1	SC-55G2
– Overall Shielded Container Configuration –					
· Quantity per HalfPACT	3	2	1	2	1
· Payload Drum Size	30-Gallon	30-Gallon	30-Gallon	55-Gallon	55-Gallon
– Shielded Container Component Weights –					
· Container Body (lb)	1,423	2,175	4,870	2,405	4,865
· Container Lid (lb)	303	435	880	405	1,035
· Container Tare (lb)	1,726	2,610	5,750	2,810	5,900
· Payload Drum & Contents (lb)	534	550	550	600	600
· Container Gross (lb)	2,260	3,160	6,300	3,410	6,500
· Pallet and Dunnage (lb)	820	940	1,300	700	1,100
· HalfPACT Package Total (7,600-lb Limit)	7,600	7,260	7,600	7,520	7,600
– Shielded Container Component Approximate Dimensions and Sizes –					
· Outside Diameter (in)	23	24.5	28	29.38	31
· Outside Height (in)	35.75	36.63	42.25	40.5	45.75
· Payload Cavity Diameter (in)	20.38	20.38	20.38	25	25
· Payload Cavity Height (in)	29.75	29.75	29.75	35.75	35.75
· Base Thickness (in)	3	3	5.75	2.38	4.25
· Lid Thickness (in)	3	3.88	6.75	2.38	5.75
· Shielding Thickness (in)	1	1.5	2.75	2.20	2
· Wall plus Shielding Thickness (lead and/or steel) (in)	1.31	2.13	3.75	2.20	3

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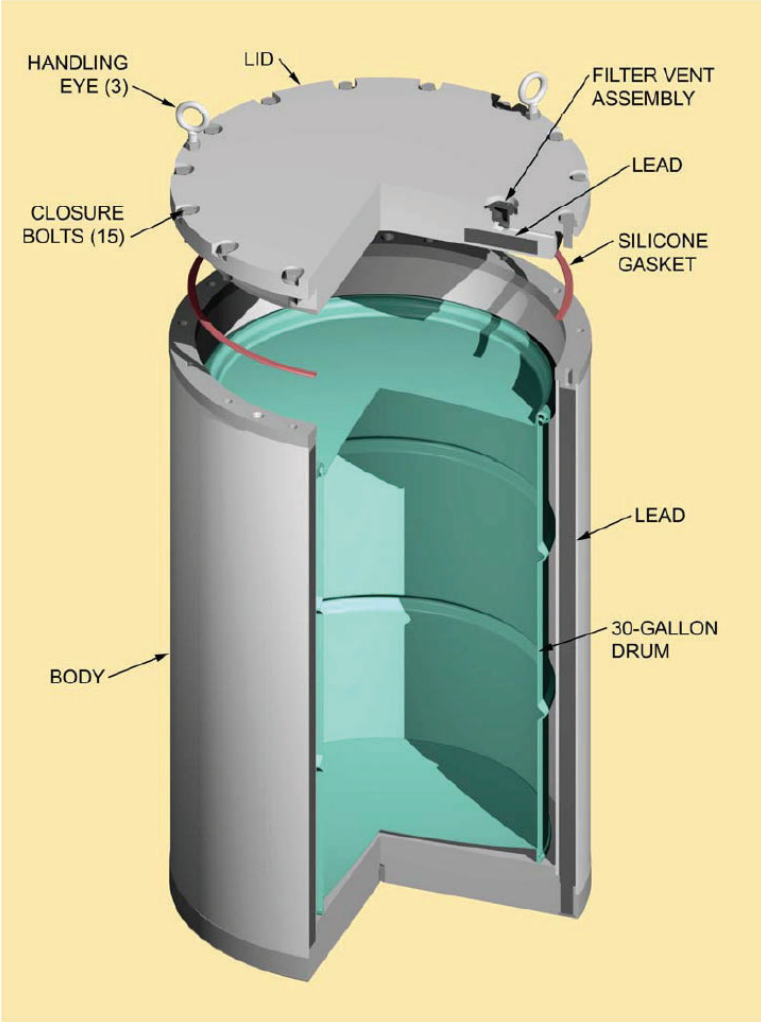
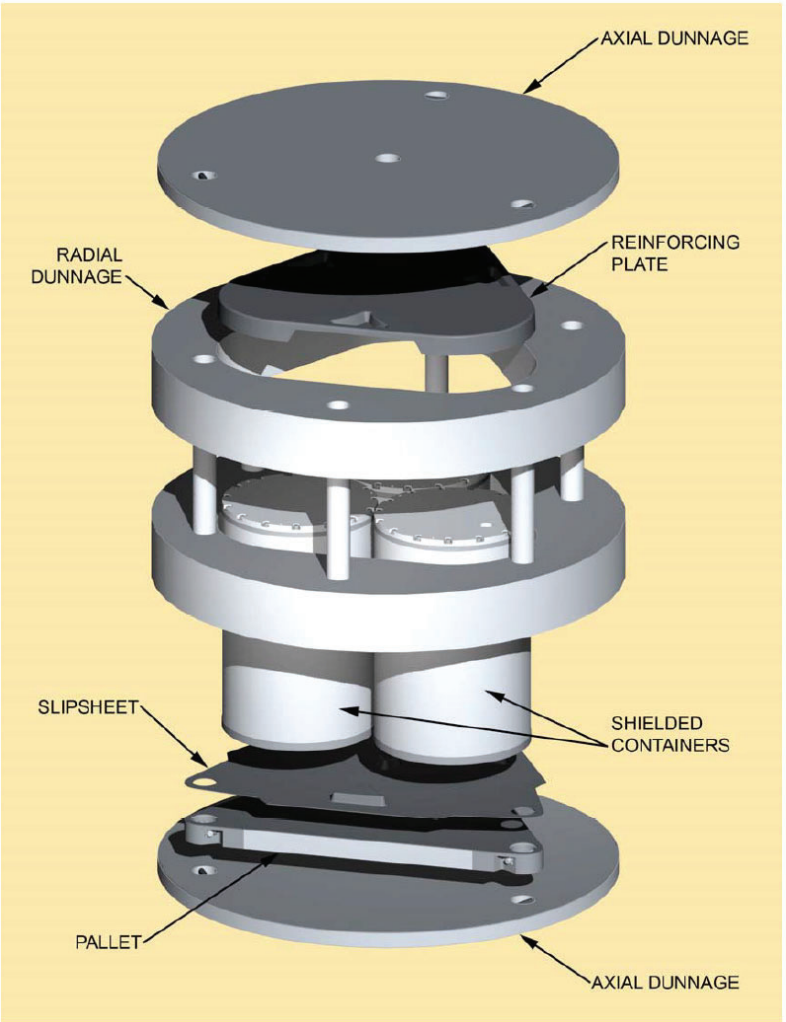
SC-30G1 Shielded Container and Container Assembly

(Authorized under the current Permit)

[The NMED approved a Class 2 PMR on November 1, 2012]





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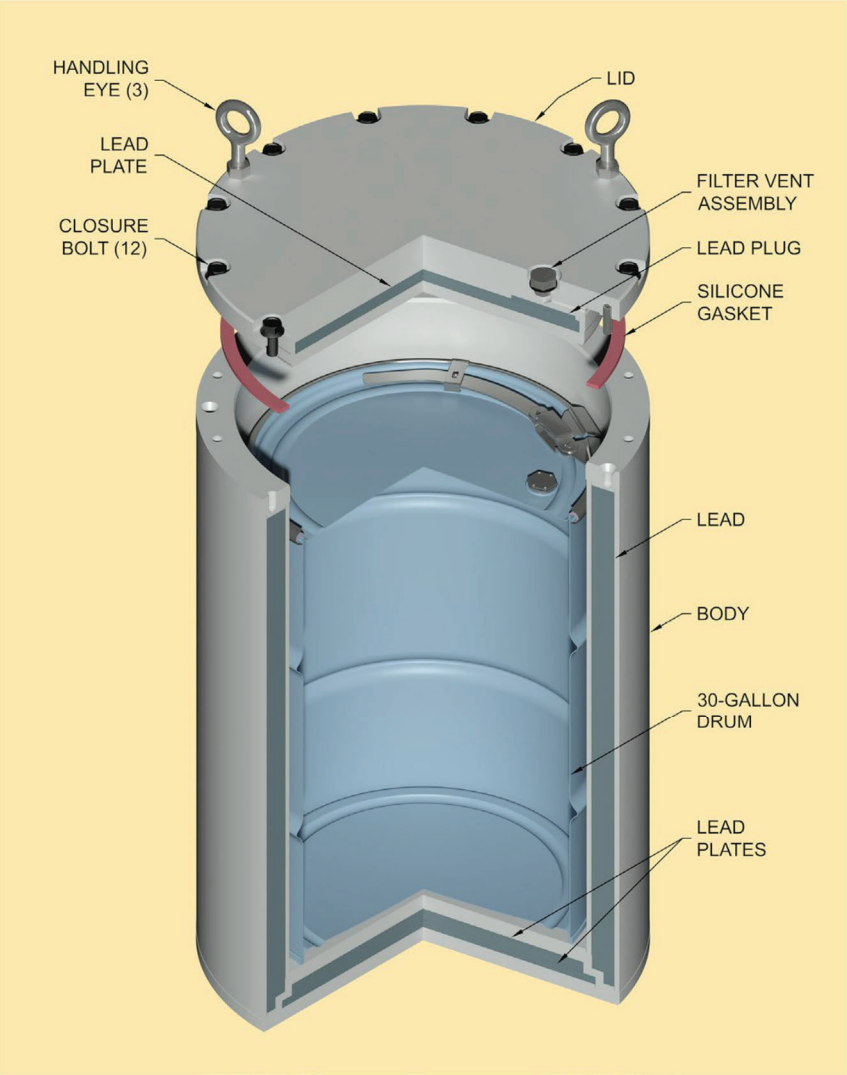
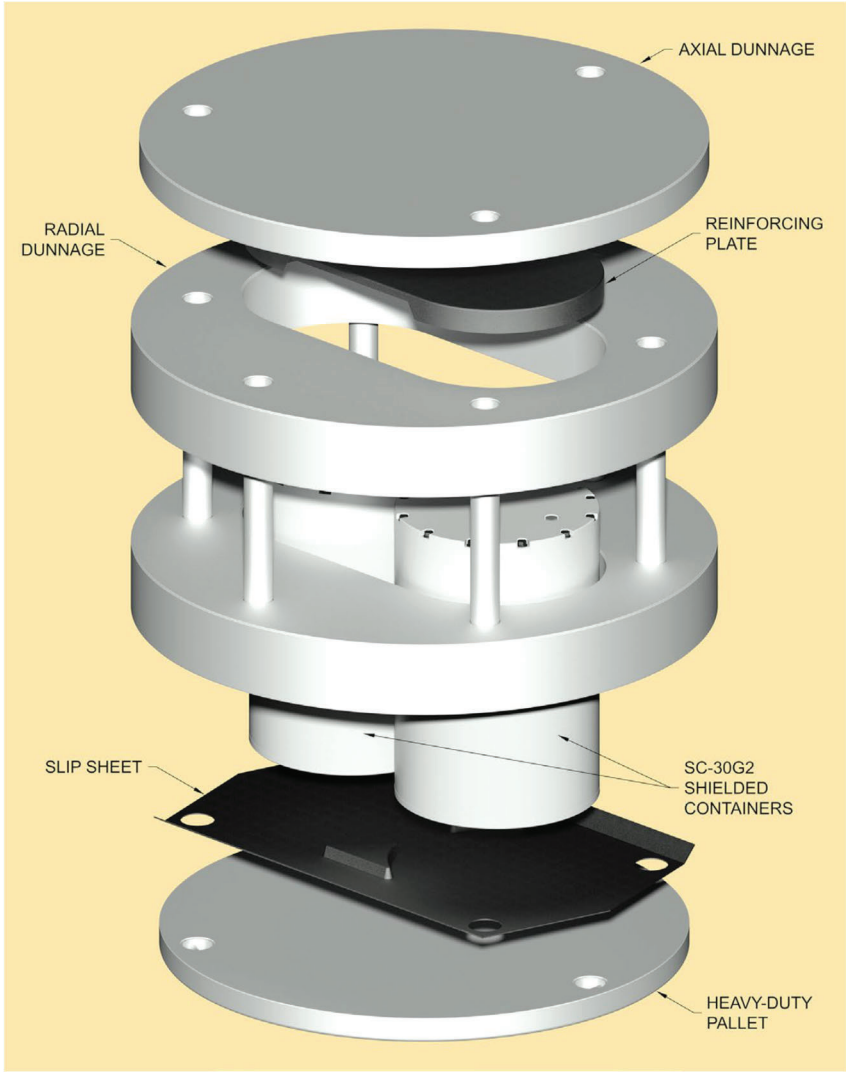
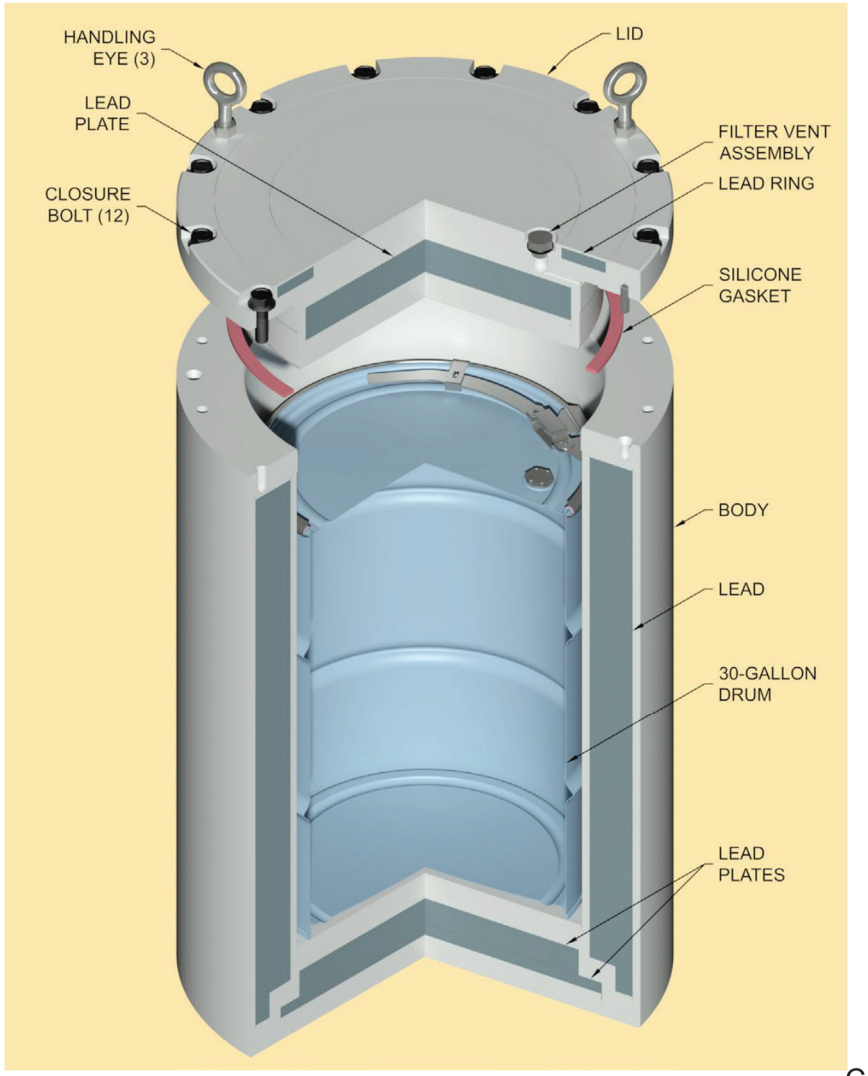
New SC-30G2 Shielded Container and Container Assembly

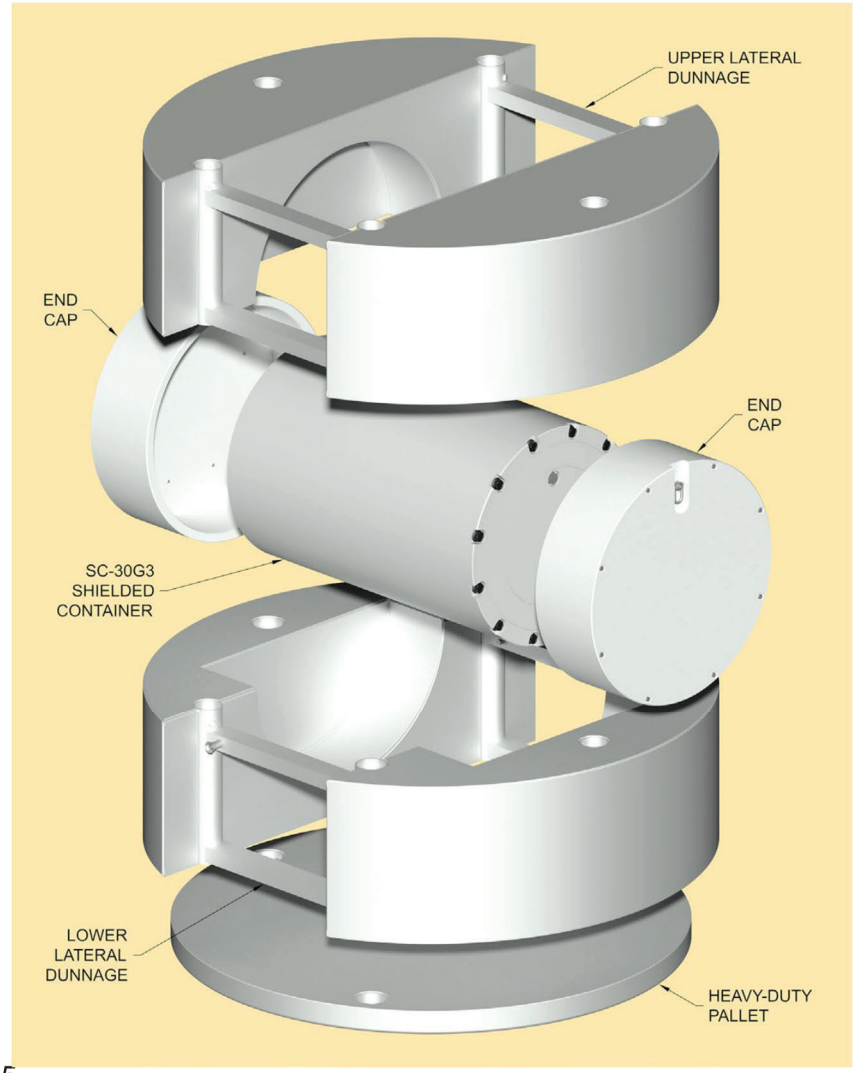




240318

New SC-30G3 Shielded Container and Container Assembly





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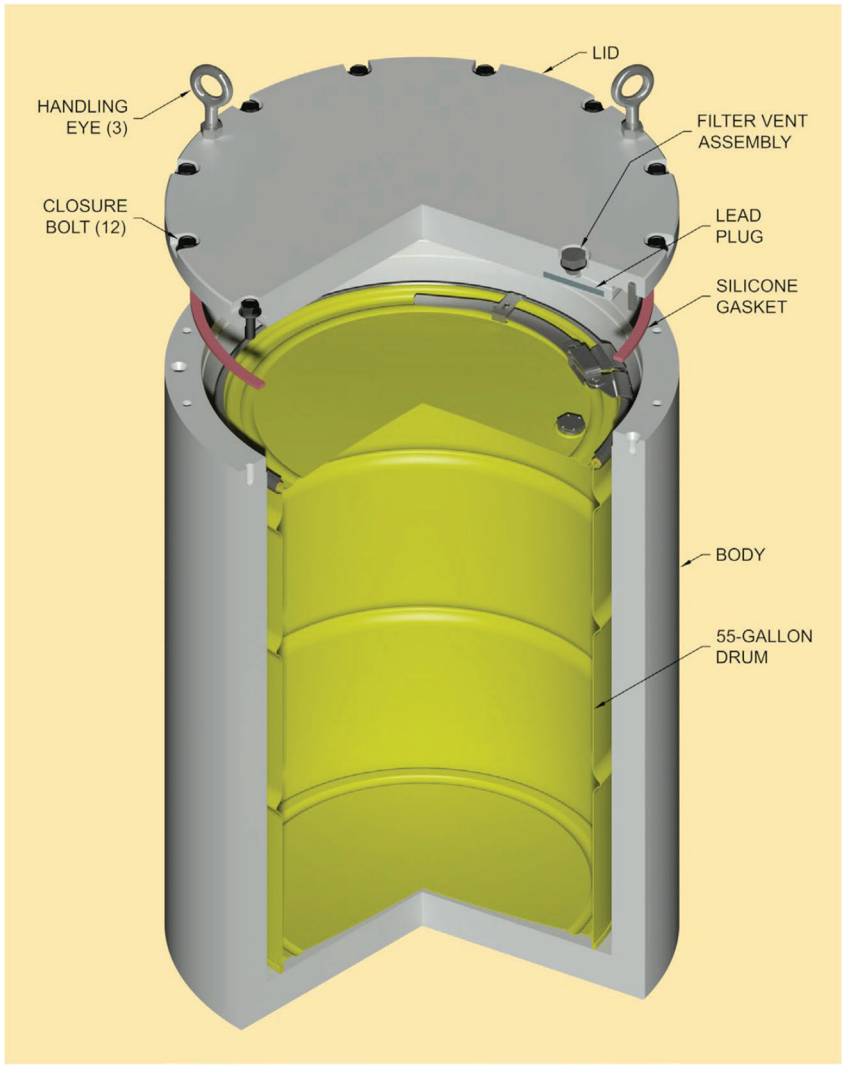
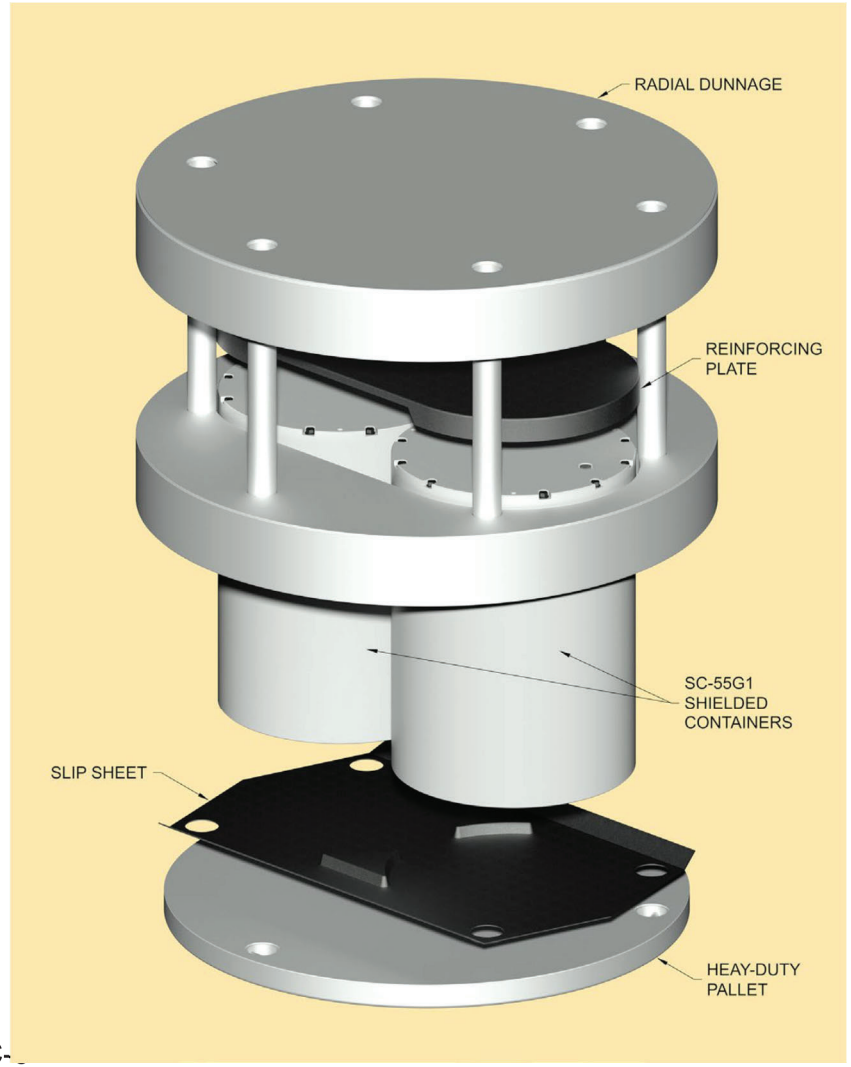
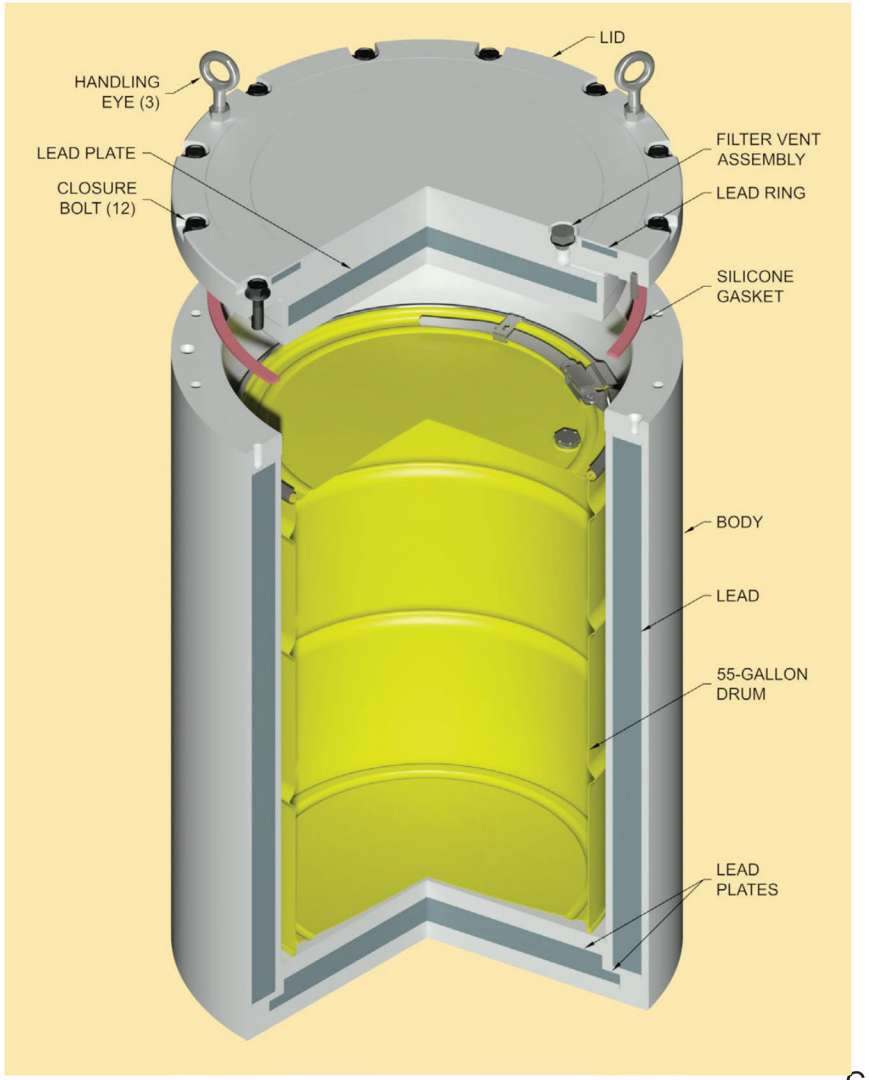
New SC-55G1 Shielded Container and Container Assembly

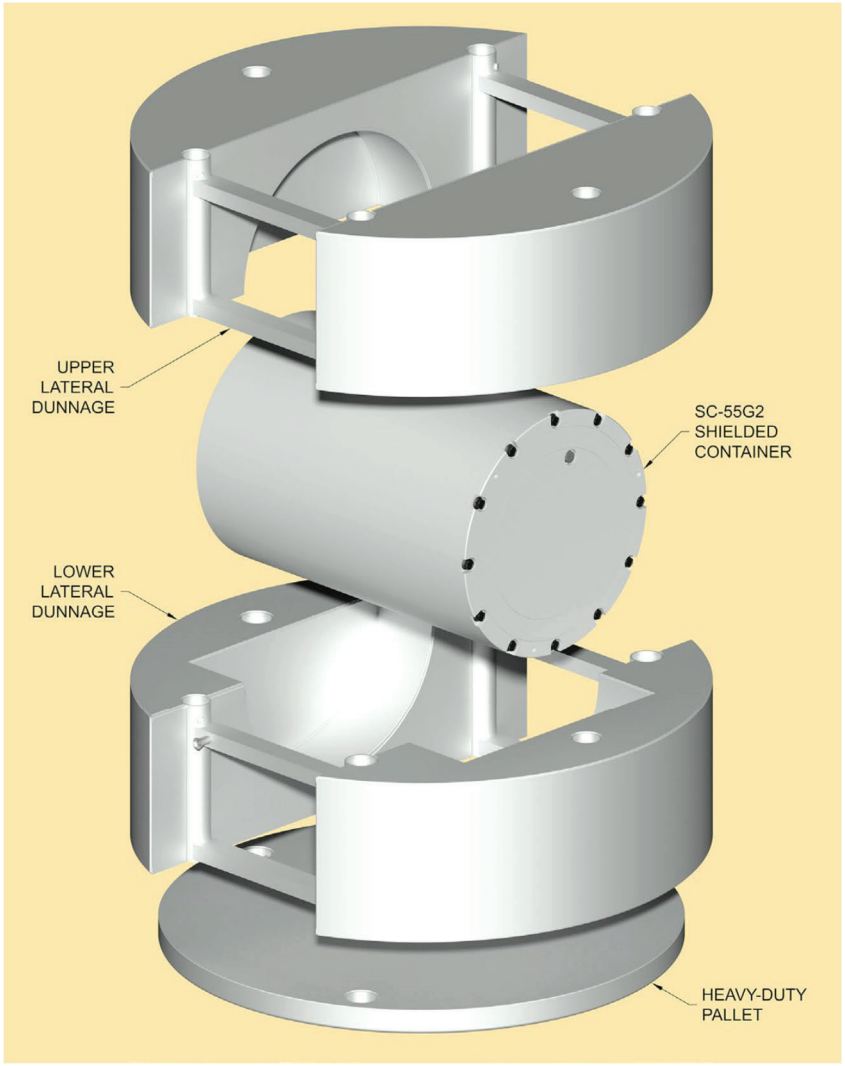




240318

New SC-55G2 Shielded Container and Container Assembly





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Appendix D

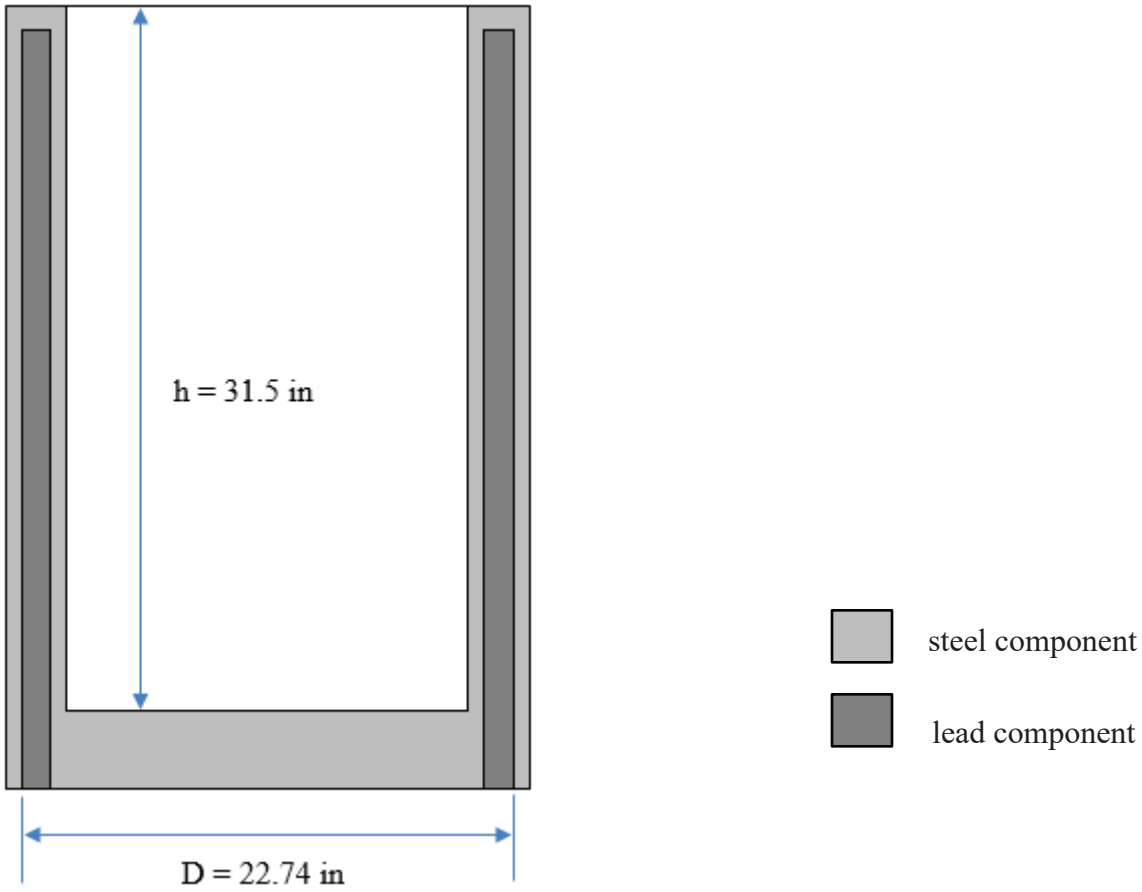
Determination of Gross Internal Volumes for Each Shielded Container

SC-30G1 Shielded Container

(Authorized under the Permit)

[The NMED approved a Permit modification on November 1, 2012]

The SC-30G1 shielded container has an overall diameter of approximately 23-in. and an overall height of approximately 35.75-in. The SC-30G1 body side wall is constructed of 1-in. nominal lead integrated with 0.3-in. nominal steel. The SC-30G1 base is constructed of 3-in. steel. The SC-30G1 has an internal cavity height of approximately 31.5-inches. The SC-30G1 accommodates a 30-gallon steel drum, which will contain RH TRU mixed waste.



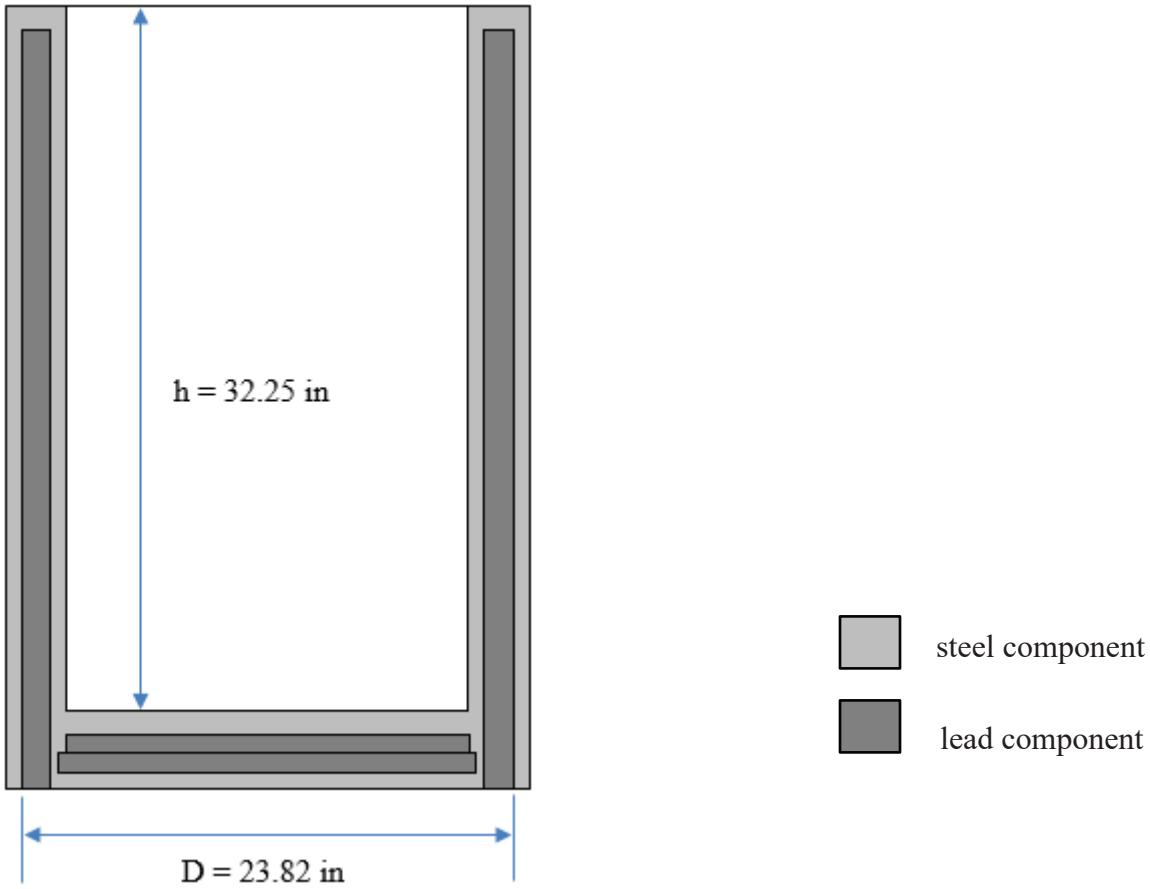
$$\text{Volume} = [(\pi) \times \left(\frac{D}{2}\right)^2 \times (h)] \times \left(\frac{(1\text{ ft})^3}{(12\text{ in})^3}\right)$$

$$\text{Volume} = [(3.14) \times \left(\frac{22.74\text{ in}}{2}\right)^2 \times (31.5\text{ in})] \times \left(\frac{(1\text{ ft})^3}{(12\text{ in}) \times (12\text{ in}) \times (12\text{ in})}\right)$$

Volume = 7.4 ft^3

New SC-30G2 Shielded Container

The SC-30G2 shielded container has an overall diameter of approximately 24.5-in. and an overall height of approximately 36.625-in. The SC-30G2 nominally has 1.5-in. (1.40-in. minimum) of lead shielding between 0.30-in. thick inner and outer shells. The shells attach to an upper flange and a 3-in. thick steel base. The base integrates a 21.5-in. diameter, 0.50-in. thick lower lead plate, and a 20-in. diameter, 0.70-in. thick upper lead plate. The SC-30G2 has an internal cavity height of approximately 32.25-inches. The SC-30G2 accommodates a 30-gallon steel drum, which will contain RH TRU mixed waste.



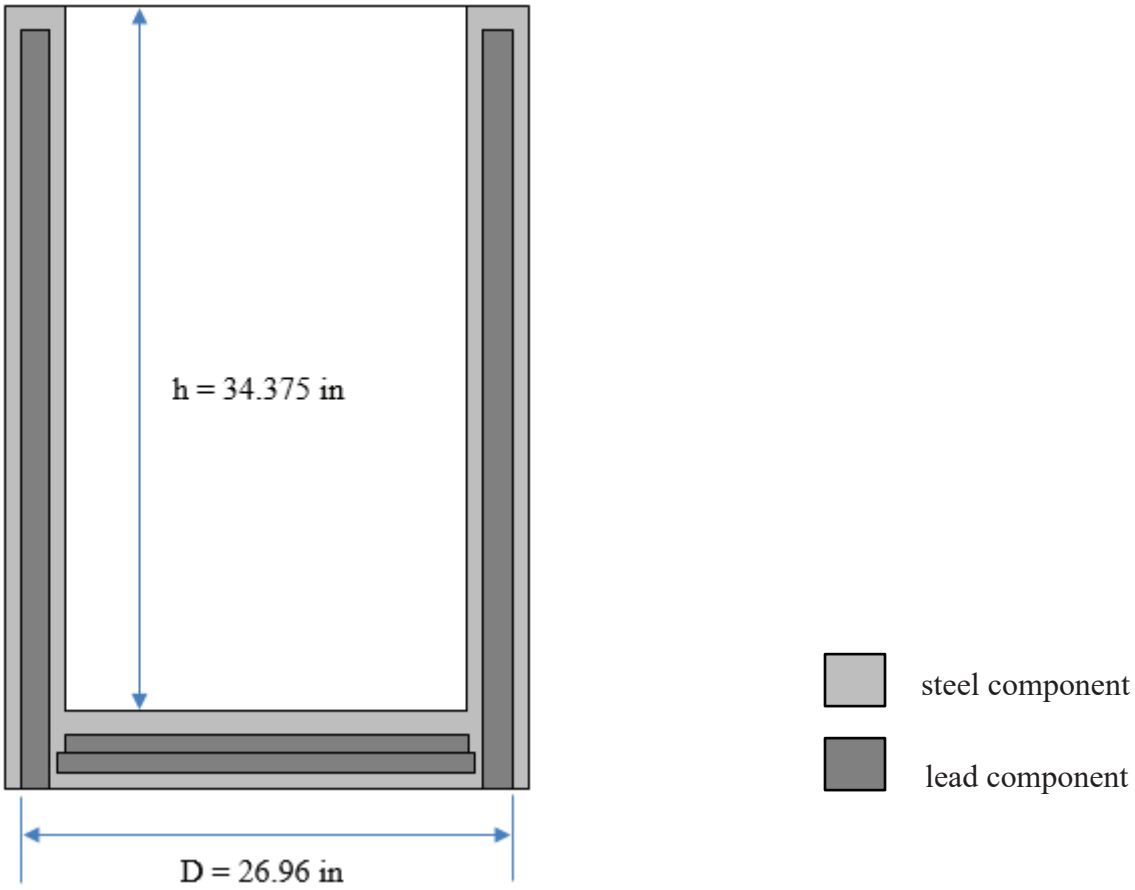
$$\text{Volume} = [(\pi) \times \left(\frac{D}{2}\right)^2 \times (h)] \times \left(\frac{(1\text{ ft})^3}{(12\text{ in})^3}\right)$$

$$\text{Volume} = [(3.14) \times \left(\frac{23.82\text{ in}}{2}\right)^2 \times (32.25\text{ in})] \times \left(\frac{(1\text{ ft})^3}{(12\text{ in}) \times (12\text{ in}) \times (12\text{ in})}\right)$$

Volume = 8.3 ft^3

New SC-30G3 Shielded Container

The SC-30G3 shielded container has an overall diameter of approximately 28-in. and an overall height of 42.25-in. The SC- 30G3 has a 2.75-in. minimum of lead shielding between 0.50-in. thick inner and outer shells. The shells connect to an upper flange and a 5.75-in. thick steel base. The base integrates a 23-in. diameter, 0.75-in. thick lower lead plate, and a 20-in. diameter, 1.75-in. thick upper lead plate. The SC-30G3 has an internal cavity height of approximately 34.375-inches. The SC-30G3 accommodates a 30-gallon steel drum, which will contain RH TRU mixed waste.



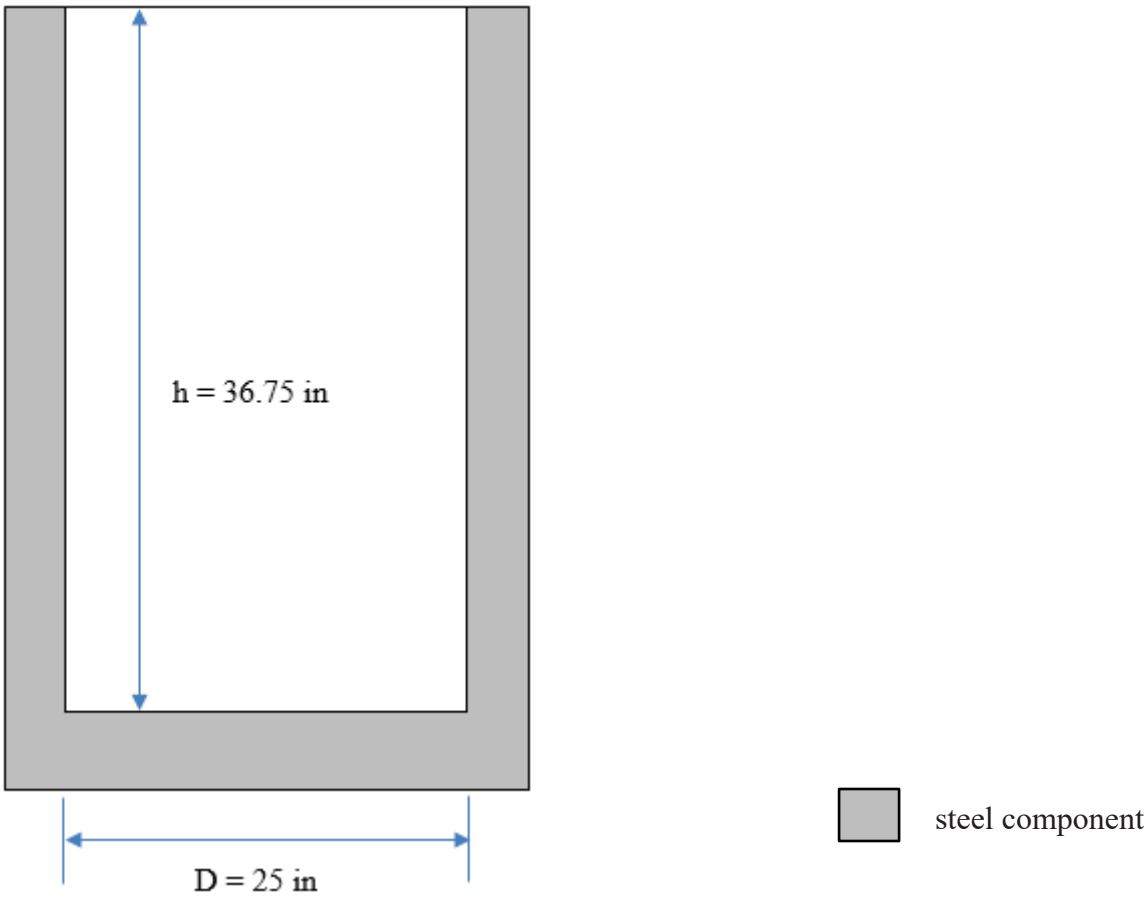
$$\text{Volume} = [(\pi) \times \left(\frac{D}{2}\right)^2 \times (h)] \times \left(\frac{(1\text{ ft})^3}{(12\text{ in})^3}\right)$$

$$\text{Volume} = [(3.14) \times \left(\frac{26.96\text{ in}}{2}\right)^2 \times (34.375\text{ in})] \times \left(\frac{(1\text{ ft})^3}{(12\text{ in}) \times (12\text{ in}) \times (12\text{ in})}\right)$$

Volume = 11.4 ft^3

New SC-55G1 Shielded Container

The SC-55G1 shielded container has an overall diameter of approximately 29.375-in. and an overall height of approximately 40.5-in. The 2.20-in. thick steel sidewall connects to a 2.35-in. thick steel base. The SC-55G1 has an internal cavity height of approximately 36.75-inches. The SC-55G1 accommodates a 55-gallon steel drum, which will contain RH TRU mixed waste.



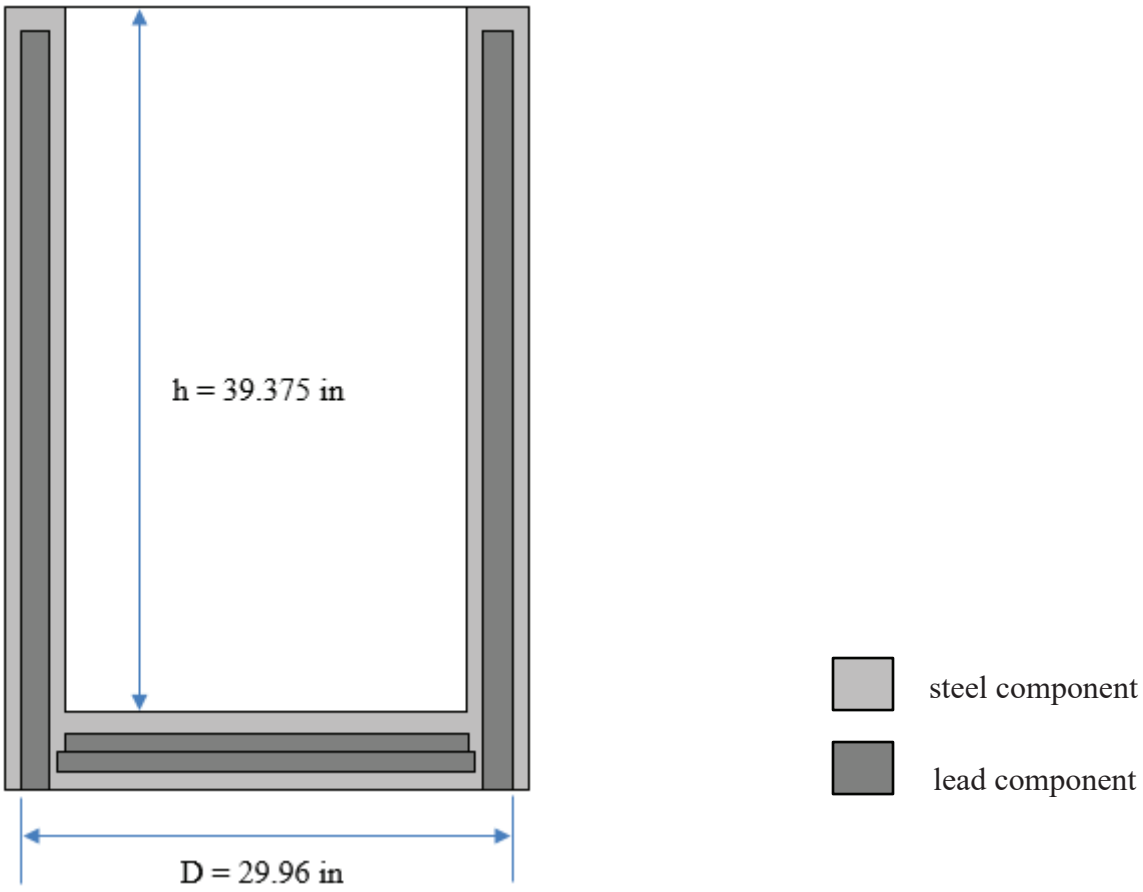
$$\text{Volume} = [(\pi) \times \left(\frac{D}{2}\right)^2 \times (h)] \times \left(\frac{(1\ \text{ft})^3}{(12\ \text{in})^3}\right)$$

$$\text{Volume} = [(3.14) \times \left(\frac{25\ \text{in}}{2}\right)^2 \times (36.75\ \text{in})] \times \left(\frac{(1\ \text{ft})^3}{(12\ \text{in}) \times (12\ \text{in}) \times (12\ \text{in})}\right)$$

Volume = 10.4 ft^3

New SC-55G2 Shielded Container

The SC-55G2 shielded container has an overall diameter of approximately 31-in. and an overall height of approximately 45.75-in. The SC-55G2 nominally has 2-in. (1.98-in. minimum) of lead shielding between 0.50-in. thick inner and outer shells. The shells connect to an upper flange and a 4.25-in. thick steel base. The base integrates a 27-in. diameter, 0.75-in. thick lower lead plate, and a 24.5-in. diameter, 1.00-in. thick upper lead plate. The SC-55G2 has an internal cavity height of approximately 39.375-inches. The SC-55G2 accommodates a 55-gallon steel drum, which will contain RH TRU mixed waste.



$$\text{Volume} = [(\pi) \times \left(\frac{D}{2}\right)^2 \times (h)] \times \left(\frac{(1\text{ ft})^3}{(12\text{ in})^3}\right)$$

$$\text{Volume} = [(3.14) \times \left(\frac{29.96\text{ in}}{2}\right)^2 \times (39.375\text{ in})] \times \left(\frac{(1\text{ ft})^3}{(12\text{ in}) \times (12\text{ in}) \times (12\text{ in})}\right)$$

Volume = 16.1 ft^3

Appendix E

NRC Documents

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 28, 2022.

Mr. T. E. Sellmer, Manager
Packaging and Information Systems
Nuclear Waste Partnership, LLC
P.O. Box 2078
Carlsbad, NM 88221

SUBJECT: REVISION NO. 26 OF CERTIFICATE OF COMPLIANCE NO. 9218 FOR THE MODEL NO. TRUPACT-II AND REVISION NO. 10 OF CERTIFICATE OF COMPLIANCE NO. 9279 FOR THE MODEL NO. HALFPACT TRANSPORT PACKAGES (EPIDS L-2021-LLA-0033 AND L-2021-LLA-0034)

Dear T.E. Sellmer:

As requested by your applications dated February 23, 2021 [Agencywide Documents Access and Management System (ADAMS) Accession No. ML22055A629], and supplemented on June 24, 2021 (ADAMS Accession No. ML21175A366), October 6, 2021 (ADAMS Accession No. ML21279A181), November 18, 2021 (ADAMS Accession No. ML21322A121); January 28, 2022 (ADAMS Package Accession No. ML22103A064), February 24, 2022 (ADAMS Accession No. ML22055A629) and March 14, 2022 (ADAMS Package Accession No. ML22091A163); enclosed is Certificate of Compliance (CoC) No. 9218 for the Model No. TRUPACT-II package, Revision 26, and CoC No. 9279 for the Model No. HalfPACT package, Revision 9. The certificate for the Model No. HalfPACT package has been renewed for a 5-year term. Also enclosed is the staff's safety evaluation report.

Upon removal of Enclosures 4 and 5, this document is uncontrolled.

The approval constitutes authority to use the package for shipment of radioactive material and for the package to be shipped in accordance with the provisions of 49 CFR 173.471.

If you have any questions regarding this certificate, please contact me or Norma Garcia Santos of my staff at Norma.GarciaSantos@nrc.gov.

Sincerely,

Yoira K. Diaz Sanabria, Chief
Storage and Transportation Licensing Branch
Division of Fuel Management
Office of Nuclear Material Safety
and Safeguards

Docket Nos. 71-9218 and 71-9279
EPIDs L-2021-LLA-0033
and L-2021-LLA-0034

Enclosures:
1. CoC No. 9218, Rev. 26
2. CoC No. 9279, Rev. 10
3. Safety Evaluation Report
4. Registered Users,
CoC No. 9218, Rev. 26
5. Registered Users,
CoC No. 9279, Rev. 10

cc w/encls 1-3:
R. Boyle, U.S. DOT
J. Shuler, U.S. DOE, c/o L. F. Gelder

NRC FORM 618
(8-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE		PAGES
9279	10	71-9279	USA/9279/B(U)F-96	1	OF	7

2. PREAMBLE

a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."

b. This certificate does not relieve the consignor from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or into which the package will be transported.

3. THIS CERTIFICATE IS ISSUED ON THE BASIS OF A SAFETY ANALYSIS REPORT OF THE PACKAGE DESIGN OR APPLICATION

a. ISSUED TO *(Name and Address)*

Department of Energy
Washington, DC 20586

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Nuclear Waste Partnership, LLC application dated February 24, 2022, as supplemented.

4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.

(a) Packaging

(1) Model No.: HalfPACT Waste Shipping Container

(2) Description

A stainless steel and polyurethane foam insulated shipping container designed to provide single containment for shipment of contact-handled transuranic waste. The packaging consists of an unvented, 1/4-inch thick stainless steel inner containment vessel (ICV), positioned within an outer confinement assembly (OCA) consisting of an unvented 1/4-inch thick stainless steel outer confinement vessel (OCV), an approximate 8-inch thick layer of polyurethane foam, a 1/4-inch thick layer of ceramic fiber paper and a 1/4 to 3/8-inch thick outer stainless steel shell. The package is a right circular cylinder with outside dimensions of approximately 94 inches diameter and 92 inches height. The package weighs not more than 18,100 pounds when loaded with the maximum allowable contents of 7,600 pounds.

The OCA has a domed lid which is secured to the OCA body with a locking ring. Although not part of the containment boundary, the OCV confinement seal is provided by an optional butyl rubber O-ring. The OCV is equipped with a seal test port and a vent port.

The ICV is a right circular cylinder with domed ends. The outside dimensions of the ICV are approximately 74 inches diameter and 69 inches height. The ICV lid is secured to the ICV body with a locking ring. The ICV containment seal is provided by a butyl rubber O-ring. The ICV is equipped with a seal test port and vent port. Aluminum

5. (a) (2) Description (continue)

spacers are placed in the top and bottom domed ends of the ICV during shipping. The cavity available for the contents is a cylinder of approximately 73 inches diameter and 45 inches height.

(3) Drawings

The packaging is constructed and assembled in accordance with the following Nuclear Waste Partnership, drawings:

(i) Drawing No. 707-SAR, “HalfPACT Packaging SAR Drawing,” sheets 1-12, Rev. 10;
(ii) Drawing No. 163-001, “Standard Pipe Overpack SAR Drawing,” sheets 1-3, Rev. 9;
(iii) Drawing No. 163-002, “S100 Pipe Overpack SAR Drawing,” sheets 1 and 2, Rev. 6;
(iv) Drawing No. 163-003, “S200 Pipe Overpack SAR Drawing,” sheets 1 and 2, Rev. 5;
(v) Drawing No. 163-004, “S300 Pipe Overpack SAR Drawing,” sheet 1, Rev. 3;
(vi) Drawing No. 163-006, “Compacted Puck Drum Spacers SAR Drawing,” sheet 1, Rev. 2; (Spacers needed for the purpose of maintaining subcriticality in 55-, 85-, and 100-gallon drums);
(vii) Drawing No. 163-009, “Criticality Control Overpack SAR Drawing,” sheets 1-2, Rev. 2;
(viii) Drawing No. 163-008, “SC-30G1 Shielded Container SAR Drawing,” sheets 1-6, Rev. 4;
(ix) Drawing No. 163-010, “SC-30G2 Shielded Container SAR Drawing,” sheets 1-7, Rev. 1;
(x) Drawing No. 163-011, “SC-30G3 Shielded Container SAR Drawing,” sheets 1-8, Rev. 1;
(xi) Drawing No. 163-012, “SC-55G1 Shielded Container SAR Drawing,” sheets 1-5, Rev. 0; and
(xii) Drawing No. 163-013, “SC-55G2 Shielded Container SAR Drawing,” sheets 1-4, Rev. 1.

5. (b) Contents

(1) Type and form of material

Byproduct, source, and special nuclear material in the form of dewatered, solid or solidified materials and wastes. Materials must be packaged in one of the following payload containers:

(i) 55-gallon drum,
(ii) standard waste box (SWB),
(iii) 85-gallon drum,
(iv) standard pipe overpack,
(v) S100 pipe overpack,
(vi) S200 pipe overpack,
(vii) S300 pipe overpack,
(viii) 100-gallon drum,
(ix) criticality control overpack (CCO),
(x) SC-30G1 shielded container,
(xi) SC-30G2 shielded container
(xii) SC-30G3 shielded container
(xiii) SC-55G1 shielded container
(xiv) SC-55G2 shielded container

The payload containers are described in Section 2.9, “Payload Container/Assembly Configuration Specifications,” of the CH-TRAMPAC, Rev. 6. Explosives, corrosives (pH less than 2 or greater than 12.5), nonradioactive pyrophorics, and compressed gases are prohibited. Within a payload container radioactive pyrophorics must not exceed 1 percent by weight and residual liquids must not exceed 1 percent by volume. Flammable organics and methane are limited along with hydrogen to ensure the absence of flammable gas mixtures in TRU waste payloads as described in Chapter 5.0 of the CH-TRAMPAC, Rev. 6. For payloads of content code LA 154 and SQ 154, the absence of flammable gas mixtures is ensured as described in Appendix 6.12 of the CH-TRU Payload Appendices, Rev. 5. For payload configurations with unvented heat-sealed bag layers, the absence of flammable gas mixtures is ensured as described in Appendix 6.13 of the CH-TRU Payload Appendices, Rev. 5. For Analytical Category payload containers containing puck drums, the absence of flammable gas mixtures is ensured as described in Appendix 6.14 of the CH-TRU Payload Appendices, Rev. 5.

(2) Maximum quantity of material per package

The package contents are limited to 7,600 pounds, including the weight of the payload containers and any other components of the payload assembly. Table 1 (below) includes the maximum gross weight for a payload container.

5. (b) (2) Maximum quantity of material per package (continue)

Table 1. Maximum gross weight for a payload container

Type of Payload Container	Maximum Gross Weight
6-inch standard pipe overpack	328 pounds
12-inch standard pipe overpack	547 pounds
S100 pipe overpack	550 pounds
S200 pipe overpack	547 pounds
S300 pipe overpack	547 pounds
100-gallon drum	1,000 pounds
55-gallon drum	1,000 pounds
85-gallon drum	1,000 pounds
SWB	4,000 pounds
CCO	350 pounds
Shielded container SC-30G1	2,260 pounds
Shielded container SC-30G2	3,160 pounds
Shielded container SC-30G3	6,300 pounds
Shielded container SC-55G1	3,410 pounds
Shielded container SC-55G2	6,500 pounds

Table 2. Maximum number of payload containers per package and authorized packaging configurations

Type of Payload Container	Maximum Number of Payload Containers per Package
standard pipe overpack	7
S100 pipe overpack	7
S200 pipe overpack	7
S300 pipe overpack	7
100-gallon drum	3
55-gallon drum	7
85-gallon drum	4
SWB	1
CCO	7
Shielded container SC-30G1	3
Shielded container SC-30G2	2
Shielded container SC-30G3	1
Shielded container SC-55G1	2
Shielded container SC-55G2	1

5. (b) (2) Maximum quantity of material per package (continue)

Fissile material not to exceed the limits specified in CH-TRAMPAC, Rev. 6, Section 3.1, "Nuclear Criticality." Table 3 (below) includes limits related to CCOs and pipe overpacks.

Table 3. Maximum Fissile Gram Equivalent (FGE) in CCOs and pipe overpacks and associated additional controls/limits.

	Parameters			
	Non-machine compacted material		Machine compacted material	
Payload Containers	**Maximum FGE of ^{239}Pu**	**Additional limits/controls**	**Maximum FGE of ^{239}Pu**	**Additional limits/controls**
CCO	380	≤ 1% by weight Be/BeO*	380	≤ 1% by weight Be/BeO and ≤ 2,000 grams plastic
Pipe Overpack	200	for Be/BeO > 1 wt%, Be/BeO must be chemically or mechanically bound to the fissile material	200	≤ 1% by weight Be/BeO
Shielded containers	325	≤ 1% by weight Be/BeO	245	≤ 1% by weight Be/BeO

* Be means beryllium and BeO means beryllium oxide.

All payloads shall meet the activity limits specified in CH-TRAMPAC, Rev. 6, Section 3.3, "Activity Limits." The payload is limited to 10^5 A_2 quantities.

Maximum decay heat per package not to exceed 30 watts. Decay heat per payload container not to exceed the values in Table 5.2-1 of the CH-TRAMPAC, Rev. 6, "List of Approved Alphanumeric Shipping Categories, Maximum Allowable Hydrogen Gas Generation Rates, and Maximum Allowable Wattages," or calculated for approved shipping categories in accordance with the methodology specified in Section 5.2.3 of the CH-TRAMPAC, Rev. 6. For content code LA 154 and SQ 154 payloads, decay heat per payload container not to exceed the values determined as specified in Appendix 6.12 of CH-TRU Payload Appendices, Rev. 5.

(c) Criticality Safety Index: 0.0

6. Physical form, chemical properties, chemical compatibility, configuration of waste containers and contents, isotopic inventory, fissile content, decay heat, weight and center of gravity, and radiation dose rate must be determined and limited in accordance with CH-TRAMPAC, Rev. 6.

7. Each payload container must be assigned to a shipping category in accordance with Section 5.1, "Payload Shipping Category" of CH-TRAMPAC, Rev. 6. Each payload container and payload assembly must not exceed the allowable wattage in accordance with Section 5.2.3, "Hydrogen Gas Generation Rate and Decay Heat Limits for Analytical Category," or must be tested for gas generation in accordance with Section 5.2.5, "Unified Flammable Gas Test Procedure," of CH-TRAMPAC, Rev. 6. For a payload made up of payload containers with different (nonequivalent) shipping categories, the flammability index of each payload container must not exceed 50,000 in accordance with CH-TRAMPAC, Rev. 6, Section 6.2.4, “Mixing of Shipping Categories,” and Appendix 2.4 of the CH-TRU Payload Appendices, Rev. 5, “Mixing of Shipping Categories and Determination of the Flammability Index.” For Analytical Category payload drums containing puck drums, the absence of flammable gas mixtures is ensured as described in Appendix 6.14 of the CH-TRU Payload Appendices, Rev. 5. Each content code LA 154 and SQ 154 payload container must be assigned to a shipping category in accordance with Appendix 6.12 of CH-TRU Payload Appendices, Rev. 5. Content code LA 154 and SQ 154 payload containers may only be assembled with other payload containers belonging to content code LA 154 and SQ 154, respectively, or dunnage in accordance with Appendix 6.12 of CH-TRU Payload Appendices, Rev. 5. For a payload of content code LA 154 or SQ 154 containers with different shipping categories, the flammability index of each payload container must not exceed 50,000 in accordance with Appendix 6.12 of CH-TRU Payload Appendices, Rev. 5.

8. Payload containers within a package shall be selected in accordance with Section 6.0, "Payload Assembly Requirements," of CH-TRAMPAC, Rev. 6. Payload containers of content code LA 154 and SQ 154 shall be assembled in accordance with Appendix 6.12 of CH-TRU Payload Appendices, Rev. 5.

9. Each payload container must be vented in accordance with Section 2.5, "Filter Vents," of CH-TRAMPAC, Rev. 6. Payload containers which were not equipped with filtered vents during storage must be aspirated in accordance with Section 5.3, "Venting and Aspiration," of CH-TRAMPAC, Rev. 6.

10. For close-proximity and controlled shipments meeting the conditions specified in Appendices 3.5 and 3.6, respectively, of CH-TRU Payload Appendices, Rev. 5, shipping periods of 20 days and 10 days may be applicable. The shipping period for any mode of transport is not to exceed 60 days. For content code LA 154 and SQ 154 shipments, the shipping period as defined in Appendix 6.12 of the CH-TRU Payload Appendices, Rev. 5 is not to exceed 5 and 10 days, respectively.

11. In addition to the requirements of Subpart G of 10 CFR Part 71:

    (a) Each package must be prepared for shipment and operated in accordance with the procedures described in Chapter 7.0, "Operating Procedures," of the application, as supplemented. For content code LA 154 and SQ 154 payloads, each package must be prepared for shipment and operated in accordance with the procedures described in Chapter 7.0 of the application, as modified by Appendix 6.12 of CH-TRU Payload Appendices, Rev. 5.

    (b) Each package must be tested and maintained in accordance with the procedures described in Chapter 8.0, "Acceptance Tests and Maintenance Program," of the application, as supplemented.

11. In addition to the requirements of Subpart G of 10 CFR Part 71 (continue):

    (c) All free-standing water must be removed from the inner containment vessel cavity and the outer confinement vessel cavity before shipment.

12. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.17.

13. Transport by air of fissile material is not authorized.

14. Revision 9 of this certificate may be used until April 30, 2023.

15. Expiration date: November 30, 2025.

REFERENCES

Nuclear Waste Partnership, LLC, application dated February 24, 2022.

As supplemented on: March 14, 2022.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Yoira K. Diaz Sanabria, Chief
Storage and Transportation Licensing Branch
Division of Fuel Management
Office of Nuclear Material Safety
and Safeguards

Date: April 28, 2022.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION REPORT

Model No. HalfPACT, Docket No. 71-9279
Certificate of Compliance No. 9279
Revision 10
Model No. TRUPACT-II, Docket No. 71-9218
Certificate of Compliance No. 9218
Revision 26

Enclosure 3
240318

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Revision 10
Model No. TRUPACT-II, Docket No. 71-9218
Certificate of Compliance No. 9218
Revision 26

SUMMARY

By letter dated February 23, 2021 (NWP, 2021a), and supplemented on June 24, 2021 (NWP, 2021b), October 6, 2021 (NWP, 2021c), November 18, 2021 (NWP, 2021d); January 28, 2022 (NWP, 2022a), February 24, 2022 (NWP, 2022b), and March 14, 2022 (NWP, 2022g); Nuclear Waste Partnership LLC (NWP thereafter), on behalf of the U.S. Department of Energy (DOE), submitted applications to revise Certificate of Compliance (CoC) No. 9218 for the Model No. TRUPACT-II package (TRUPACT-II) and CoC No. 9279 for the Model No. package HalfPACT (HalfPACT). The applicant requested administrative changes and to add shielded containers configurations as authorized content to the HalfPACT package. The purpose of this revision is to support future transport and disposal of waste to the Waste Isolation Pilot Plant (WIPP). The CoCs will reference consolidated application dated February 24, 2022.

U.S. Nuclear Regulatory Commission (NRC) staff reviewed the application, including its supplement, using the guidance in NUREG-2216, "Standard Review Plan for Transportation Packages for Spent Fuel and Radioactive Material" (NRC, 2020). Based on the statements and representations in the application, as supplemented, and the conditions listed below, the staff concludes that the packages meet the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 71, "Packaging and Transportation of Radioactive Material."

1. GENERAL INFORMATION EVALUATION

The objective of this general information evaluation is to verify that the applicant has provided an adequate description of the package to familiarize reviewers with the pertinent features of package. The drawings provided by the applicant, as these pertain to the proposed changes to the packages' Model Nos. TRUPACT-II and HalfPACT are sufficiently detailed and consistent with the package description to provide reasonable assurance that the transportation package can meet the regulations.

1.1 Purpose of the application

The applicant requested the following changes as part of this revision to the design of the Model Nos. TRUPACT-II and HalfPACT packages:

a) Model No. TRUPACT-II

Administrative changes:

(1) replacement of Figure 1.1-1 of the TRUPACT-II application with a color rendered version and

(2) clarification of weights related to the approved contents of the 55-gallon drum, 100-gallon drum, Standard Waste Box (SWB) and ten drum overpack (TDOP).

b) Model No. HalfPACT

Add shielded containers configurations, that provide gamma (γ) shielding, as authorized content. The shielded payload container designs (i.e., SC-30G2, SC-30G3, SC-55G1, and SC-55G2), along with the currently authorized SC-30G1 shielded container. The applicant also added the corresponding payload container fissile gram equivalent (FGE) limits to the allowed FGE per package for shielded containers in the HalfPACT package. The proposed contents are described, discussed, and evaluated in more detail in Sections 1.2.2, 5, and 6 of this safety evaluation report (SER)..

The applicant stated that the new shielded container designs will allow the WIPP emplacement of a portion of the DOE remote-handled transuranic (RH-TRU) waste inventory in stackable configurations instead of in RH-TRU removable lid canisters in excavated boreholes underground.

1.2 Package Design Information

1.2.1 Packaging

The applicant did not propose any changes to the packaging design of the Model Nos. TRUPACT-II and HalfPACT packages.

The TRUPACT-II and HalfPACT packaging is comprised of an outer confinement assembly (OCA) that provides a secondary confinement boundary when its optional O-ring seals are utilized, and an inner containment vessel (ICV) that provides the primary containment boundary and houses the shielded containers. Two aluminum honeycomb spacer assemblies are used within the ICV, one inside each ICV torispherical head. The honeycomb spacer assemblies provide adequate protection from the payload. A silicone wear pad is utilized at the interface between the bottom exterior of the ICV and the bottom interior of the OCA. An optional polyester foam annulus ring may be used in the annulus between the ICV and outer containment vessel (OCV), just below the OCV lower seal flange, to prevent debris from becoming entrapped between the vessels. Inside the ICV, the payload will be within 55-gallon drums, 85-gallon drums, 100-gallon drums, standard waste boxes, or a ten drum overpack.

1.2.2 Contents

The Model Nos. TRUPACT-II and HalfPACT are Type B packages used to transport radioactive material to the WIPP facility. The packages are designed to transport contact-handled transuranic (CH-TRU) waste materials and other authorized payloads such as tritium-contaminated materials that do not exceed 10^5 A_2 quantities. The applicant's proposed changes to the packages are briefly described in Section 1.1 of this SER. The "CH-TRU Payload Appendices," Revision 5, (NWP, 2022d) and "CH-TRAMPAC," Revision 6, (NWP, 2022c) include the description of the allowable contents in Model Nos. TRUPACT-II and HalfPACT packages.

The SC-30G2, SC-30G3, SC-55G1, and SC-55G2 containers provide gamma shielding. The applicant also renamed the "shielded container" previously authorized in HalfPACT's CoC, Revision 9, to "SC-30G1," and revised the quantity limit for the container. In Table 2.1-1 in the Contact-Handled Transuranic Waste Authorized Methods for Payload Control (CH-TRAMPAC), Revision 6, the applicant noted that the four new containers can be transported only in the HalfPACT package. Sections 5 and 6 of this SER include more detailed description of the shielded containers.

The maximum weight of the HalfPACT package is 18,100 lb. Tables 1 and 2 below include the maximum weight of the proposed payload and the maximum number of containers per package, respectively. Section 6 of the application includes a description of the FGE for the shielded container.

Table 1.1. Maximum number of payload containers per package and authorized packaging configurations

Type of Payload Container	Maximum Weight (lbs.)
SC-30G1	2,260
SC-30G2	3,160
SC-30G3	6.300
SC-55G1	3,410
SC-55G2	6,500

Table 1.2. Maximum number of shielded containers per shipment

Type of Payload Container	Maximum No. of Shielded Containers per Package
SC-30G1	3
SC-30G2	2
SC-30G3	1
SC-55G1	2
SC-55G2	1

The SER includes the evaluation of the proposed contents. The CONDITIONS section of this SER includes a summary of the changes to the certificates of the Model Nos. TRUPACT-II and HalfPACT.

1.3 Drawings

The applicant revised the following drawings:

1) Model Nos. TRUPACT-II and HalfPACT

   a) Drawing No. 163-001, "Standard Pipe Overpack SAR Drawing," sheets 1-3, Rev. 9;

   b) Drawing No. 163-009, "Criticality Control Overpack SAR Drawing," sheets 1 and 2, Rev. 2.

2) Model No. HalfPACT (in addition to the drawings in item No. 1)

a) Drawing No. 163-008, “SC-30G1 Shielded Container SAR Drawing,” sheets 1-6, Rev. 4;

b) Drawing No. 163-010, “SC-30G2 Shielded Container SAR Drawing,” sheets 1-7, Rev. 1;

c) Drawing No. 163-011, “SC-30G3 Shielded Container SAR Drawing,” sheets 1-8, Rev. 1;

d) Drawing No. 163-012, “SC-55G1 Shielded Container SAR Drawing,” sheets 1-5, Rev. 0; and

e) Drawing No. 163-013, “SC-55G2 Shielded Container SAR Drawing,” sheets 1-4, Rev. 1.

The staff updated the revision No. of Drawing No. 2077-500SNP, “TRUPACT-II Packaging SAR Drawing,” sheets 1-11, Rev. AA, in the certificate for the TRUPACT-II package.

The staff evaluated the changes to the drawings in Section 7 of this SER.

1.4 Evaluation Findings

The staff reviewed documentation provided by the applicant including package and packaging descriptions as well as design drawings to verify that statements presented by the applicant are acceptable for the review and approval of the revision of the CoCs for the Model Nos. TRUPACT-II and HalfPACT packages, as required by 10 CFR 71.33. Based on the review of the statements and representations provided by the applicant, the staff concludes that the package, packaging, and contents have been adequately described to meet the requirements of 10 CFR Part 71.

2. STRUCTURAL EVALUATION

The staff reviewed the proposed changes to the TRUPACT-II and HalfPACT shipping packages to verify that the applicant has performed acceptable structural evaluations demonstrating that the packages, as proposed, meet the requirements of 10 CFR Part 71 under both normal conditions of transport (NCT) and hypothetical accident conditions (HAC). For the TRUPACT-II package, the applicant proposed a series of administrative changes. For the HalfPACT package, the applicant proposed adding four new versions of shielded container designs as part of its authorized payload. The staff’s focus of this SER on the review of these new shielded container designs.

2.1 Structural Design

2.1.1 Description of Structures

Section 1 of this SER includes a description of the applicant’s proposed changes to the TRUPACT-II and HalfPACT packages. The applicant proposed administrative changes to the Model No. TRUPACT-II and adding new shielded containers as payload of the Model No. HalfPACT.

The applicant noted that the proposed administrative changes to the Model No. TRUPACT-II do not have an impact on the safety design basis. The staff reviewed the administrative changes described in the application and concludes that there are no safety implications related to the design basis. The staff finds that there are no structural design changes made in this application and the changes are administrative. Hence, further structural evaluation of the TRUPACT-II design is not necessary because the current structural evaluation is bounding.

In terms of the Model No. HalfPACT, the outer confinement assembly (OCA) and inner containment vessel (ICV) designs of the Model No. HalfPACT remain the same in this application.

In Appendix 1.3.1, "Packaging General Arrangements Drawings," of the application, the applicant provided licensing drawings with tolerances, dimensions, and welding symbology, as well as definitions, material designation, and associated standards for the new shielded containers. The applicant also described and detailed component descriptions and arrangement of components relative to each other. The applicant described the weight of the package with and without its contents in Table 2.2-1, "HalfPACT Weight and Center of Gravity," of the application. The weight of the shielded canisters is bounded by the weight used in the previous analysis.

The overall physical dimensions of the package are shown in the listed drawings in Appendix 1.3.1 of the application. The design basis maximum normal operating pressure (MNOP) of the package is 50 psig. A loaded HalfPACT package could be lifted using the pair of forklift pockets that are located at the base of the OCA body. The pockets are sized to accommodate forks up to 10 inches (in.) wide and up to 4 in. thick. An overhead crane could also be used to lift the loaded package, utilizing lifting straps, through the forklift pocket. The staff finds that the applicant provided sufficient information to characterize the HalfPACT design and finds the information to be acceptable.

The staff reviewed the structural design description of the HalfPACT package and concludes that the contents of the application satisfy the requirements of 10 CFR 71.31(a)(1)(c) and (a)(2), 71.33(a) and (b), and 10 CFR 71.35(a).

2.1.2 Design Criteria

A transportation package must be designed to meet the regulatory requirements of 10 CFR 71 design criteria of a transportation package and should be designated as those that affect the containment boundary which contribute to the overall structural performance of the package.

The applicant evaluated the HalfPACT package with a combination of analytical tools and physical drop testing. The acceptance criteria for analytical assessments are in accordance with Regulatory Guide 7.6, "Design Criteria for the Structural Analysis of Shipping Cask Containment Vessels," and the American Society of Mechanical Engineers (ASME), Boiler Pressure Vessel Code, Section III, Division 1. The acceptance criteria for empirical assessments are demonstrations that the containment boundary remains leak tight throughout NCT and HAC certification testing. The acceptance criteria for both analytical assessments and empirical assessments were reviewed and accepted in the previous certification by the staff.

Based on the review of the design criteria presented in Section 2.1.2 of the application, the staff finds that the structural design criteria for the HalfPACT package provide adequate structural integrity to meet the NCT and HAC requirements of 10 CFR 71.

2.1.3 Identification of Codes and Standards for Package Design

The applicant did not request changes to the codes and standards used in the design of the currently authorized SC-30G1. The same codes and standards are used in the four new shielded payload containers' (i.e., SC-30G2, SC-30G3, SC-55G1 and SC-55G2) designs. The staff reviewed Section 2.1, "Structural Design," of the HalfPACT application to verify that there were no changes to the codes and standards of the package. The staff concluded that these codes and standards continue to be appropriate for the intended purpose and are properly applied.

2.2 Weights and Centers of Gravity

The nominal weights and location of the center of gravity (CG) of the package components are provided in Tables 2.2-1, "HalfPACT Weight and Center of Gravity," of the application. These weights and CG are used for the structural evaluations to meet the NCT and HAC requirements of 10 CFR 71.

2.3 Materials

Section 7 of this SER includes the materials evaluation related to the proposed changes to the HalfPACT package.

2.4 General Requirements

2.4.1 Minimum Package Size

According to Section 2.4.1 of the HalfPACT application, the minimum package dimension is greater than 4 in. Therefore, the staff finds that the HalfPACT package satisfies the requirements of 10 CFR 71.43(a) for minimum size.

2.4.2 Tamper-Indicating Feature

The closure of the package is facilitated by the tamper-indicating seals. They are installed at one OCA lock bolt location and at the OCV vent port access plug, as delineated on the drawings in the HalfPact SAR Appendix 1.3.1, "Packaging General Arrangement Drawings." For the proposed package, the tamper-indicating feature is not changed from the previously approved certification. The staff reviewed the tamper-indicating feature description and finds that the HalfPACT package satisfies the requirements of 10 CFR 71.43(b) for a tamper-indicating feature.

2.4.3 Positive Closure

The positive closure of the package in the application has not been changed from the previously approved HalfPACT design certification. The staff reviewed the information provided about positive closure in Section 2.4.3 of the HalfPACT application and Appendices 4.7 through 4.10 of the CH-TRU Payload Appendices of the application and finds that the package satisfies the requirements of 10 CFR 71.43(c) for positive closure.

2.4.4 Package Valve

The applicant did not propose any changes to the previously approved valve designs of the package; as described in Section 2.4.5 of the HalfPACT and the TRUPACT-II applications, neither the OCV nor the ICV have valves. The staff reviewed the package closure description of the HalfPACT package and finds that it satisfies requirements of 10 CFR 71.43(e).

2.5 Lifting and Tie-Down Standards

2.5.1 Lifting Devices

The applicant described lifting and handling of the package in Section 2.5.1 of the HalfPACT and CH-TRU pay load Appendix 4.7 through 4.10. The method of lifting for the HalfPACT and lifting devices for the OCA and ICV lid have not been changed in this application. The design remains the same and is able to lift the weight of the proposed payloads while maintaining the minimum factor of safety of 3.0 per the requirements of 10 CFR 71.45(a).

The staff reviewed the lifting for the package and concludes that it satisfies the requirements of 10 CFR 71.45(a) for lifting.

2.5.2 Tie-Down Devices

The applicant did not change the tie-down design for the package. The safety margin of the package tie-down remains the same per 10 CFR 71.45(b).

The staff reviewed the tie-down requirements for the package and concludes that they satisfy the requirements of 10 CFR 71.45(b) for tie-down.

2.6 Normal Conditions of Transport

The applicant used the acceptance criteria for NCT to demonstrate that the lid cover closure remains secured and that the ICV is not breached during NCT. The applicant demonstrated that, under HAC, the SC-30G2, SC-30G3, SC-55G1, and SC-55G2 maintain both confinement and shielding integrity without loss of particulate or degradation of the shielding material. Therefore, the demonstrations for HAC conditions bound the results for NCT. The staff reviewed the application for the testing performed and concluded that the results for NCT continue to be valid and the structural performance of the package under NCT satisfies the requirements of 10 CFR 71.71.

2.7 Hypothetical Accident Conditions

2.7.1 Free Drop

Subpart F of 10 CFR 71 requires performing a 30-feet (30-ft) free drop test in accordance with the requirements of 10 CFR Part 71.73(c)(1). The applicant performed physical model testing for two shielded containers, SC-30G3 and SC-55G1). The applicant selected containers SC-30G3 and SC-55G1 as bounding over the containers SC-30G2 and SC-55G2 based on the following considerations:

a) similarity in size and weight as well as the quantity of containers that may be shipped within a HalfPACT package, and

b) the results of the physical testing for both DOT-7A Type A 4-foot drop tests and Type B HAC 30-foot drop tests for the container SC-30G1, which were performed in 2007, and reviewed and accepted by the staff in the previous certification.

In Section 4.8.3 of CH-TRU report, the applicant provided a description of the HAC tests, a structural evaluation of the tests, and figures of the test configurations for SC-30G3 and found the following:

a) *No apparent deformation or damage to the SC-30G3.*

Visual inspection. Post-test visual inspection of the interior and exterior surfaces of the SC-30G3 indicated no apparent global or localized deformation or damage to the SC-30G3. The solid, concrete-filled rolling hoops in the 30-gallon test payload drum left no visible deformation on the SC-30G3's inner shell, even though the payload drum was loaded to exceed the 6,300-lb. SC-30G3 gross weight.

b) *No impact to the integrity of the containment boundary.*

(1) **Visual inspection**. Post-test visual inspection of the HalfPACT ICV shell at its interface with payload dunnage components revealed no localized deformations that could compromise containment integrity of the HalfPACT package.

(2) **Ultraviolet scanning.** Subsequent to the performance of end and side drop testing, the flour/fluorescein mixture placed within the SC-30G3 was verified via ultraviolet scanning to be 100% retained throughout the testing, thereby confirming containment integrity of the SC-30G3.

c) *No significant impact to the integrity of the lead shield*

(1) **Shielding integrity tests**. Pre- and post-test shielding integrity tests coupled with destructive disassembly of SC-30G3 sidewalls showed no evidence of lead slump or significant changes to the shielding capabilities of the HalfPACT design.

(2) **Visual inspection**. Post-test visual inspection of the SC-30G3 wall cut-outs revealed some modest global and localized shell deformation, but the magnitudes were very limited, of no structural significance, and not coupled with measurable lead thinning, or reduction in shielding.

The staff reviewed the applicant's performance, results, and conclusions of the physical tests. The staff finds that the SC-30G3 under HAC maintained shielding integrity with little measurable damage to the HalfPACT package and concludes that the results of the tests are acceptable.

Additionally, in Section 4.9.3 of CH-TRU report, the applicant provided a description of the HAC tests, a structural evaluation of the tests, and figures of the test configurations for SC-55G1 and concluded the following:

a) *No apparent or significant damage or deformation to the SC-55G1.*

Visual inspection. Post-test visual inspection of the interior and exterior surfaces of the SC-55G1 indicated no apparent global damage and minimal localized deformation to the SC-55G1. The solid, concrete-filled rolling hoops in the 55-gallon test payload drum left no visible deformation of the SC-55G1 shells, even though the payload drums were loaded to exceed the 3,410-lb. SC-55G1 gross weight.

b) *No impact to the integrity of the containment boundary.*

(1) **Visual inspection**. Post-test visual inspection of the HalfPACT ICV shell at its interface with payload dunnage components revealed no localized deformations that could in any way compromise containment integrity.

(2) **Ultraviolet scanning**. Subsequent to the performance of end and side drop testing, the flour/fluorescein mixture placed within the SC-55G1 was verified via ultraviolet scanning to be 100% retained throughout the testing, thereby confirming confinement integrity of the SC-55G1.

The staff reviewed the applicant's performance of the physical tests and conclusion related to the SC-55G1. The staff concludes that the SC-55G1 will preserve its contents within the shielded boundary. Section 5 of this SER includes the shielding evaluation for the proposed content for the HalfPACT package. The staff finds the results of the tests to demonstrate the structural integrity of the package under HAC are acceptable.

Based on the applicant test methods and testing of the shielded containers, the staff finds that the HalfPACT package meets the requirements for free drop testing and concludes that the requirements of 10 CFR 71.73(c)(1) are met.

2.7.2 Crush

The crush test per 10 CFR 71.73(c)(2) is required only when the mass of the specimen is not greater than 1,100 lbs. (500 kg). This test is not applicable to the proposed change to the HalfPACT package, since the package weighs more than 1,100 lbs.

2.7.3 Puncture

The puncture drop test for the package has not been changed from the previously certified package design. Therefore, the staff concludes that they satisfy the standards of 10 CFR 71.73(c)(3).

2.7.4 Thermal

The thermal test for the package remains the same as previously certified package designs. Therefore, the staff concludes that it satisfies the regulatory requirements of 10 CFR 71.73(c)(4).

2.7.5 Immersion - Fissile Material

For fissile material, per 10 CFR 71.73(c)(5), the package shall be subject to the requirements on 10 CFR 71.55. If water in-leakage has not been assumed for criticality analysis, the package must be evaluated for immersion under a head of water of at least 3 ft. in the attitude for which maximum leakage is expected.

2.7.6 Immersion - All Packages

In accordance with 10 CFR 71.73(c)(6), an undamaged package is subjected to a water pressure equivalent to immersion under a head of water of at least 50 ft., or an equivalent external pressure load of 36.4 pounds force per square inch (psi) absolute (psia) (21.7 psi gauge +14.7 psi). The package design was previously evaluated for immersion in the certified design. Therefore, the staff concludes the previous evaluation for immersion is also applicable to this request and the package continues to satisfy the requirement in 10 CFR 71.73(c)(6).

2.7.7 Deep Water Immersion Test

Per 10 CFR 71.61, a Type B package containing more than 10^5 A_2 must be designed so that its undamaged containment system can withstand an external water pressure of 290 psi for a period of not less than 1 hour without collapse, buckling, or in-leakage of water. However, the package does not transport payloads with an activity of greater than 10^5 A_2, therefore, the requirement of10 CFR 71.61 does not apply.

2.8 Special Form

This section is not applicable since this application does not seek approval for transport of special form radioactive materials.

2.9 Fuel Rods

This section is not applicable since fuel rods are not included as an approved payload configuration.

2.10 Evaluation Findings

The staff reviewed the changes proposed by the applicant to the TRUPACT-II and HalfPACT packages. Based on a review of the statements and representations in the application and the responses to the staff's requests for additional information (RAI), the staff concludes that the structural design has been adequately described and evaluated and that the HalfPACT package has adequate structural integrity to meet the structural requirements of 10 CFR Part 71.

3. THERMAL EVALUATION

The objective of the thermal evaluation is to ensure that the applicant has adequately evaluated the thermal performance of the transportation package design under review for the thermal tests specified under NCT and HAC, and that the package design meets the thermal performance requirements of 10 CFR Part 71. The staff reviewed the proposed changes to the TRUPACT-II and HalfPACT packages to verify that the applicant has performed acceptable thermal

evaluations demonstrating that the packages, as proposed, meet the requirements of 10 CFR Part 71 under both NCT and HAC.

3.1 HalfPACT Package

The primary purpose of the application for the Model HalfPACT is to propose the addition of four new shielded container designs as authorized payload containers for the HalfPACT packaging (i.e., the SC-30G2, SC-30G3, SC-55G1, and SC-55G2 shielded containers, as described in Section 1.1 of this SER).

In the HalfPACT package application (NWP, 2022e), the applicant described package pressure increases for the proposed content configurations as specified in the following tables:

1) Table 3.4-8 with three SC-30G1 shielded containers,

2) Table 3.4-10 with two SC-30G2 shielded containers,

3) Table 3.4-11 with one SC-30G3 shielded container,

4) Table 3.4-12 with two SC-55G1 shielded containers, and

5) Table 3.4-13 with one SC-55G2 shielded container.

The applicant considered a 60-day duration (the maximum allowed shipping period that is in condition 10 of the CoC) in the evaluation of each configuration. The staff reviewed the decay heat per drum and the total decay heat per configuration or package provided by the applicant in Tables 3.4-8, and 3.4-10 through 3.4-13 of the HalfPACT application to confirm that the total decay heat per package configuration was below the 30 watts (W) limit described in Section 3.0 of the HalfPACT application and in condition 5(b)(2) of the CoC.

The staff also reviewed the pressure increase results at 60-day duration provided by the applicant in Tables 3.4-8, and 3.4-10 through 3.4-13. The staff determined that the pressure increase results at a 60-day duration meet the design pressure of 50 psi gauge (psig) described in Section 3.4.4.1 of the HalfPACT application.

3.1.1 Contact-Handled Transuranic (CH-TRU) Payload Appendices

The staff also reviewed the CH-TRU Payload Appendices, Revision 5 (NWP, 2022d), specifically, Sections 2.2.4, 4.5.4, 4.7.4, 4.8.4, 4.9.4, and 4.10.4. The applicant added to Section 2.2.4 of the CH-TRU Payload Appendices to address the four new shielded container designs within the load type resistance worksheets. The applicant specifically addressed, by name, the SG-30G1 shielded container in Section 4.5.4 of the CH-TRU Payload Appendices; there were no changes in calculated temperatures. The applicant added Sections 4.7.4, 4.8.4, 4.9.4, and 4.10.4 of the CH-TRU Payload Appendices to address the four new shielded container designs, SC-30G2, SC-30G3, SC-55G1, and SC-55G2, respectively.

In Section 4.7.4 of the CH-TRU Payload Appendices, the applicant described that the NCT thermal analysis was developed using the ANSYS® finite element analysis (FEA) code. The applicant's thermal model is a 3-D half-symmetric model of the HalfPACT with the SC-30G2 shielded container payload configuration. As described by the applicant, a temperature of -40 °C (-40 °F) will not negatively impact any of the materials of construction of the SC-30G2

shielded container payload. In Section 4.7.4.1 of the CH-TRU Payload Appendices and Section 3.2.3 of the calculation package No. SCA-CAL-0002 (NWP, 2021a; and ADAMS Accession No. ML21054A059), the applicant described NCT boundary conditions that were consistent with 10 CFR 71.71(b) and 10 CFR 71.71(c)(1). The applicant demonstrated that all packaging component and content temperatures remain below the allowable temperature limits. The applicant noted that the HAC fire analysis was not required as it was bounded by the previously approved HAC thermal analysis. The staff reviewed the justification that the previously approved HAC thermal analysis was bounding as described in Section 3.1.1 of the SCA-CAL-0002 calculation package. The staff found the justification to be accurate and, therefore, acceptable.

The applicant provided similar descriptions for the NCT thermal analysis, software, minimum temperature, boundary conditions, component temperatures, and HAC fire analysis in the following sections of the CH-TRU Payload Appendices:

a) Section 4.8.4 for the HalfPACT with the SC-30G3 shielded container,

b) Section 4.9.4 for the HalfPACT with the SC-55G1 shielded container, and

c) Section 4.10.4 for the HalfPACT with the SC-55G2 shielded container.

3.1.2 Thermal Analysis for the Four Shielded Container Designs

The applicant further described the thermal analysis for the four shielded container designs in the SCA-CAL-0002 calculation package. The applicant further described the NCT thermal analysis for each of the four shielded container designs, which used the ANSYS® FEA code. Figures 4-1 through 4-4 of the calculation package showed computer aided design (CAD) models of the HalfPACT package with the four different shielded container designs loaded. The applicant modeled heat transfer between the shielded container components by conduction and radiation and heat transfer between the package surface and the ambient by radiation and natural convection. The applicant summarized in Section 3.1.1 of the SCA-CAL-0002 calculation package that the materials of construction for the four new shielded container designs were the same as those used for the original SC-30G1 shielded container. Therefore, the staff finds the material properties to be acceptable, since these have been previously approved in Revision No. 5 of the CoC for the Model No. HalfPACT and documented in the corresponding SER (NRC, 2009).

The applicant summarized the temperature results in Tables 2-1 through 2-4 of the calculation package for the SC-30G2, SC-30G3, SC-55G1, and SC-55G2 shielded containers, respectively. The staff confirmed that all the NCT temperature results listed were below their maximum allowable temperature limits, which the staff finds to be acceptable. The applicant maintained that the shielded container designs were bounded by previously analyzed NCT cases (both cold and without solar insolation), and HAC fire analyses. The staff finds the applicant's discussion in Section 3.1.1 of the SCA-CAL-0002 calculation package to be accurate and, therefore, acceptable. The applicant also applied NCT boundary conditions of 38 °C (100 °F) ambient as required in 10 CFR 71.71(b) and insolation required by 10 CFR 71.71(c)(1) to their analysis models as described in the calculation package.

3.1.3 HalfPACT Accessible Surface Temperature

The applicant described the HalfPACT package OCA outer shell as the accessible surface during transport. The OCA outer shell maximum allowable temperature limit is 85 °C (185 °F) based on the maximum accessible surface temperature for exclusive use shipments in 10 CFR 71.43(g). The applicant calculated the HalfPACT package OCA outer shell temperature as 38.7 °C (101.6 °F) in still air and in the shade (shown in Table 3.5-1 of the HalfPACT application). Therefore, from a thermal perspective, the HalfPACT package, based on the aforementioned analysis results, can be transported as non-exclusive use, which has a maximum allowable temperature limit, in 10 CFR 71.43(g), of 50 °C (122 °F). However, see Section 5.1.1 of this SER for the shielding perspective on transport by exclusive use on the HalfPACT package.

3.1.4 HalfPACT Thermal Evaluation Summary

Based on the staff's review of the sections described above of the HalfPACT application, CH-TRU Payload Appendices, and the SCA-CAL-0002 calculation package, the staff concludes that the HalfPACT package with the four new shielded container configurations is consistent with the guidance in Section 3.4, "Review Procedures," of NUREG-2216 and continues to demonstrate that it meets the thermal requirements of 10 CFR Part 71.

3.2 TRUPACT-II Package

As stated in Section 3.1 of this SER, this application proposes the addition of four new shielded container designs as authorized payload containers for the HalfPACT packaging: the SC-30G2, SC-30G3, SC-55G1, and SC-55G2 shielded containers. The applicant described these new containers in Sections 5.5.6, 5.5.7, 5.5.8, and 5.5.9 of the TRUPACT-II package application, Revision 25, (NWP, 2022f) and stated that these proposed new shielded containers are only authorized for transport in the HalfPACT package. Therefore, the staff confirmed that there were no proposed changes necessitating a thermal evaluation for the TRUPACT-II package.

3.3 Evaluation Findings

Based on a review of the statements and representations in the application, the NRC staff concludes that the HalfPACT thermal design has been adequately described and evaluated, and that the thermal performance of the package meets the thermal requirements of 10 CFR Part 71.

4. CONTAINMENT EVALUATION

The objective of the NRC's containment evaluation is to verify that the applicant has adequately evaluated the performance of transportation packages for radioactive material and that the packages (packaging together with any contents) meet the containment requirements in 10 CFR Part 71.

4.1 HalfPACT Package

The primary purpose of the application is to propose the addition of four new shielded container designs (i.e., SC-30G2, SC-30G3, SC-55G1, and SC-55G2) as authorized contents for the HalfPACT packaging. The staff reviewed Chapters 4, 7, and 8 of the HalfPACT package

application and confirmed that there were no proposed changes necessitating a containment evaluation for the HalfPACT package.

The staff also reviewed the report No. HPT-REP-0001, "Regulatory Hypothetical Accident Condition Type B Testing for the HalfPACT Shielded Container Payloads," Revision 0 (NWP, 2021a; and ADAMS Accession No. ML21054A060), that describes Type B HAC 30-ft. drop testing for the four proposed shielded containers. The applicant selected the SC-55G1 and SC-30G3 designs as the bounding payload for this request. A key test observation presented by the applicant was that there were no localized deformations at the interface of the HalfPACT ICV shell (the containment boundary) with the payload dunnage components that could in any way compromise containment integrity.[1] In addition, the HalfPACT OCA, which serves as secondary confinement, had energy absorbing polyurethane foam (normally in place when presented for transport) conservatively omitted from the tests. The staff finds this conservatism to be acceptable.

The staff also reviewed the HalfPACT Drawing No. 163-001, Revision 9, (NWP, 2022e), which described removal of leak testing of each pipe component. The staff finds this to be acceptable as the pipe is not the containment boundary for the HalfPACT package.

Therefore, based on the staff's review of the HalfPACT application, as described above, the staff concludes that the HalfPACT package continues to satisfy and comply with the containment requirements in 10 CFR Part 71.

4.2 TRUPACT-II Package

As stated in Section 4.1 of this SER, this application proposes the addition of four new shielded container designs as authorized payload containers for the HalfPACT packaging: the SC-30G2, SC-30G3, SC-55G1, and SC-55G2 shielded containers. The applicant described these new containers in Sections 5.5.6, 5.5.7, 5.5.8, and 5.5.9 of the TRUPACT-II package application, Revision 25 and stated that these proposed new shielded containers are only authorized for transport in the HalfPACT package. Therefore, the staff confirmed that there were no proposed changes necessitating a containment evaluation for the TRUPACT-II package.

4.3 Evaluation Findings

Based on review of the statements and representations in the application, the NRC staff concludes that the HalfPACT package has been adequately described and evaluated to demonstrate that it satisfies the containment requirements of 10 CFR Part 71.

[1] Section 2.7.1 of this SER also includes a discussion regarding the integrity of the containment boundary as it relates to the physical tests and structural evaluation.

5. SHIELDING EVALUATION

The objectives of the shielding review are the following:

1) confirm that the packages meet the external radiation requirements in 10 CFR Part 71.

2) evaluate the proposed shielding design changes as part of this application to ensure they meet the 10 CFR Part 71 regulatory requirements for external radiation under NCT and HAC.

The staff considered whether the changes had any impacts on the shielding capabilities of the packages. Section 1 of this SER includes a summary of the changes requested by the applicant. The staff performed a review of the package shielding designs following the guidance in NUREG-2216, "Standard Review Plan for Transportation Packages for Spent Fuel and Radioactive Material," (NRC, 2020). The following subsections of this SER chapter document the staff's evaluation of the shielding design of this application.

5.1 Description of Shielding Design

In Table 2.1-1 in the CH-TRAMPAC, Revision 6, the applicant noted that the four new containers, SC-30G2, SC-30G3, SC-55G1, and SC-55G2, can be transported only in the HalfPACT package. Therefore, the staff focused its review on the proposed changes to the HalfPACT package design.

5.1.1 HalfPACT Overpack

The HalfPACT overpack includes the following components:

a) an outer confinement assembly (OCA)

   (1) provides both free drop and thermal protection.

   (2) serves as a secondary confinement boundary when optional O-ring seals were utilized.

b) an inner containment vessel (ICV), which is composed of two torispherical heads, serves as the containment boundary.

c) an aluminum honeycomb spacer assembly, inside each ICV torispherical head, serves to attenuate impact loads.

The applicant provided Drawing Number 707-SAR, "HalfPACT Packaging SAR Drawing," for the HalfPACT design in Appendix 1.3.1, "Packaging General Arrangement Drawings" of the HalfPACT application. Except for distance attenuation, the packaging structures and components provided neither significant gamma nor significant neutron shielding. Chapter 5.0 of the TRUPACT-II application includes the shielding evaluation for the new proposed contents (i.e., SC-30G2, SC-30G3, SC-55G1, and SC-55G2 shielded containers) for the HalfPACT

package. The evaluations consider both NCT and HAC regulatory dose rate limits under exclusive use requirements.

5.1.2 Shielded Containers

The various waste containers provided the primary shielding function. The applicant provided drawings showing the waste container details in Revision 8 of the HalfPACT application (NWP, 2022e).

Table 5.1. Height, diameter, and minimum lead thickness of shielded containers SC-30G2, SC30-G3, SC-55G1, and SC-55G2.

Shielded Container ID	Approximate height	Approximate diameter	Minimum Thickness of Lead Shield
SC-30G2	36.625	24.5	1.4
SC-30G3	42.25	28	2.75
SC-55G1	40.5	29.375	No lead shield
SC-55G2	45.15	31	1.98

5.1.2.1 SC-30G1 Shielded Container

The applicant renamed the “shielded container” to “SC-30G1.” The “shielded container” was used as an overpack for 30-gallon drums and was approved as authorized in Revision 9 of the HalfPACT’s CoC. The applicant designed the HalfPACT to transport three SC-30G1 containers at one time. The staff reviewed the drawings provided in this application and verified that there was no change in the shielding design of the previously approved container and the overpack. On this basis, the staff did not perform further review of the shielding design of the SC-30G1 container.

5.1.2.2 SC-30G2 Shielded Container

The SC-30G2, which was used as an overpack for 30-gallon drums, consisted of a twin-shell, carbon steel cylindrical structure with both a base and a lid. The applicant designed the HalfPACT to transport two SC-30G2 containers at one time. The SC-30G2 shielded container had an overall diameter of approximately 24.5-in. and an overall height of approximately 36.625 in. The SC-30G2 nominally had 1.5 in. (1.40-in. minimum) of lead shielding between 0.30-in. thick inner and outer shells. The shells attached to an upper flange and a 3-in. thick steel base. The base integrated a 21.5-in. diameter, 0.50-in. thick lower lead plate, and a 20-in. diameter, 0.70-in. thick upper lead plate. The 3.89-in. thick steel lid integrated a 19.5-in. diameter, 0.75-in. thick lead plate. The lid also utilized a 4-in. diameter, 0.25-in. thick lead disk that was aligned under the vent port feature. The applicant depicted the SC-30G2 container design as well as associated dunnage assembly in Drawing No. 163-010 (NWP, 2022e).

5.1.2.3 SC-30G3 Shielded Container

The SC-30G3, which was used as an overpack for 30-gallon drums, consisted of a twin shell, carbon steel cylindrical structure with both a base and a lid. The applicant designed the HalfPACT to transport one SC-30G3 container at one time. The SC-30G3 shielded container had an overall diameter of approximately 28-in. and an overall height of 42.25-in. The SC-30G3 had 2.75-in., minimum, of lead shielding between 0.50-in. thick inner and outer shells. The shells connected to an upper flange and a 5.75-in. thick steel base. The base integrated a

23-in. diameter, 0.75-in. thick lower lead plate, and a 20-in. diameter, 1.75-in. thick upper lead plate. The 6.79-in. thick steel lid integrated a 19-in. diameter, 2.25-in. thick lead plate. The lid also utilized a 23.5-in. outside diameter, 17.75-in. inside diameter, 0.75-in. thick lead ring. The applicant depicted the SC-30G3 container design as well as associated dunnage assembly in Drawing Number 163-011 (NWP, 2022e).

5.1.2.4 SC-55G1 Shielded Container

The SC-55G1, which was used as an overpack for 55-gallon drums, consisted of a carbon steel cylindrical structure with both a base and a lid. The applicant designed the HalfPACT to transport two SC-55G1 containers at one time. The SC-55G1 shielded container had an overall diameter of approximately 29.375-in. and an overall height of approximately 40.5-in. The 2.20-in. thick sidewall is connected to a 2.35-in. thick steel base. The 2.40-in. thick steel lid integrated a 4-in. diameter, 0.40-in. thick lead disk that was aligned under the vent port feature. The applicant depicted the SC-55G1 container design as well as associated dunnage assembly in Drawing Number 163-012 (NWP, 2022e).

5.1.2.5 SC-55G2 Shielded Container

The SC-55G2, which was used as an overpack for 55-gallon drums, consisted of a twin-shell, carbon steel cylindrical structure with both a base and a lid. The applicant designed the HalfPACT to transport one SC-55G2 container at one time. The SC-55G2 shielded container had an overall diameter of approximately 31-in., and an overall height of approximately 45.75-in. The SC-55G2 nominally had 2 in. (1.98-in. minimum) of lead shielding between 0.50-in. thick inner and outer shells. The shells connected to an upper flange and a 4.25-in. thick steel base. The base integrated a 27-in. diameter, 0.75-in. thick lower lead plate, and a 24.5-in. diameter, 1.00-in. thick upper lead plate. The 5.76-in. thick steel lid integrated a 23.75-in. diameter, 1.50-in. thick lead plate. The lid also utilized a 26.625-in. outside diameter, 21.625-in. inside diameter, 0.50-in. thick lead ring. The applicant depicted the SC-55G2 container design as well as associated dunnage assembly in Drawing Number 163-013 (NWP, 2022e).

5.1.3 Summary Tables of Maximum External Radiation Levels

The applicant summarized the maximum dose rates for the HalfPACT package, under NCT and HAC, when loaded with each of the new four new containers in Tables 5.1-8 to Table 5.1-11 of the TRUPACT-II application (NWP, 2022f). The applicant reported that the maximum NCT dose rates are 100.84 mrem per hour (mrem/hr) on the HalfPACT surface and 9.99 mrem/hr two meters from the HalfPACT package. The applicant also reported that the maximum HAC dose rate was 298.72 mrem/hr.

5.1.4 Conclusion

The staff reviewed the drawings and text describing the package shielding features. Staff determined that there is sufficient information describing the shielding features, materials, and dimensions with tolerances. The staff reviewed the dose rates in TRUPACT-II SAR Tables 5.1-8 to Table 5.1-11 (NWP, 2022f) and determined that they meet the regulatory dose rate requirement for NCT in 10 CFR 71.47(b) and HAC in 10 CFR 71.51(a)(2). Therefore, staff found that the applicant sufficiently described the package's shielding capabilities.

5.2 Radioactive Materials and Source Terms

5.2.1 Contents and Radiation Sources

The applicant designed the HalfPACT to transport material contaminated with transuranic elements (i.e., elements in the periodic table having atomic numbers higher than uranium) such as neptunium (Np), plutonium (Pu), and americium (Am). The material ranged in size from fine powders to concrete and it could either be directly loaded into the shielded containers or loaded into metal cans which were placed inside the shielded containers. The radiation emitted by transuranic elements included alpha particles, gamma radiation, and neutrons. The applicant used one particle per second of cobalt-60 (^{60}Co) as a concentrated gamma source and one particle per second of californium-252 (^{252}Cf) as the concentrated neutron source for analyzing the different payloads. In Section 5.2.2 of the TRUPACT-II application (NWP, 2022f), the applicant explained that they also reduced the ^{252}Cf specific activity to be consistent with the ^{252}Cf specific activity in Table 3.1-2 of the CH-TRAMPAC (NWP, 2022c). The applicant used this value as the maximum activity in Tables 5.4-6 to 5.4-15 of the TRUPACT-II application. The applicant asserted that updating the ^{252}Cf specific activity value had no impact on the safety basis because it resulted in no changes to the energy-based activity limits.

5.2.2 Activity Limits

5.2.2.1 Activity Limit Determination

Because a multitude of radionuclides can comprise TRU waste, the applicant used a "response function method" to demonstrate compliance with 10 CFR 71.47 and 71.51. In developing the response functions, the applicant back calculated the allowable content quantity based on the dose rates prescribed in 10 CFR 71.47 and 71.51 for a waste content with a specific radioactivity and specific geometric source distribution. Therefore, using the packaging models described in Section 5.3, "Shielding Model," of the application for the TRUPACT-II package (NWP, 2022f), the applicant performed calculations to determine the maximum activity that can be contained in the shielded containers transported in the HalfPACT. Since the results in Section 5.4, "Shielding Evaluation," of the TRUPACT-II application showed that the two-meter NCT dose rate limits were the most restrictive, the applicant determined the maximum activity that would satisfy these limits.

To determine the activity limit for each of the packaging and payload configurations considered in Section 5.4, "Shielding Evaluation," of the TRUPACT-II application, the applicant evaluated the following two source configurations:

(1) **Concentrated Source** – activity in a 1-in. diameter by 1-in. high stub-cylinder centered in the packaging payload cavity under NCT evaluations or located adjacent to the packaging payload cavity inner surface nearest the detector under HAC evaluations.

(2) **Distributed Source** – activity homogenously distributed in a right-circular cylinder either centered within the packaging payload cavity or centered within the payload container confinement boundary.

The applicant selected Zirconium (z=40) as the source region material for both concentrated and distributed sources after performing multiple Monte Carlo N-Particle (MCNP) calculations with various materials. Based on the results of these calculations, the applicant determined that Zirconium was conservative for gamma calculations and inconsequential to neutron calculations.

The applicant calculated dose rates for the range of discrete gamma [0.15 to 10 mega electron volt (MeV)] and neutron (0.1 to 15 MeV) energies listed in Table 5.5-1 of the TRUPACT-II application with a source strength of one particle per second (par/s) (NWP, 2022f). The applicant determined the maximum allowed gamma and neutron activity in par/s for each discrete energy by multiplying the modeled source strength by the ratio of the dose rate limit (10 mrem/hr) to the calculated dose rate. The applicant also conservatively increased the calculated dose rate by the statistical error associated with the calculated dose rate as explained in Section 5.4.5 of this SER.

Although the concentrated source dose rates were determined for a one gram per cubic centimeter (1 g/cm^3) source density (i.e., unit density), the applicant applied them to all concentrated gamma and neutron sources. The applicant determined the distributed source dose rates for a range of source densities from 0.5 to 8 g/cm^3 for each discrete gamma and neutron energy listed in Table 5.5-1 of the TRUPACT-II application (NWP, 2022f). For each density value, the applicant used the available payload cavity size and the maximum allowed content weight to determine the distributed source size. To conservatively model the source (i.e., minimize the effects of self-attenuation and distance), the applicant maintained the source region diameter at 0.125 in. less than the payload cavity inside diameter and varied the source height based on an assumed content density ranging between 0.5 and 8 g/cm^3.

For distributed gamma sources, the applicant utilized a density correction factor (DCF) to make the distributed gamma unit-density source dose rates applicable to any source density. As a result, the allowable activity for the distributed gamma source differed from the concentrated gamma source due to both distance and material attenuation effects. For distributed neutron sources, the applicant did not use a DCF with the unit-density source since Zirconium does not significantly attenuate neutrons. Therefore, the distributed neutron source allowable activity differed from the concentrated neutron source allowable activity solely due to distance attenuation effects.

To determine the gamma DCFs, the applicant calculated the maximum allowable activity for gamma energies in the range of 0.5 to 2.0 MeV over the 0.5 to 8 g/cm^3 density range. Then, the applicant took the ratio of the maximum activity for the non-unit-density source to the maximum activity for the unit-density source to calculate the gamma DCF. To facilitate DCF calculations for any content density, the applicant developed third order polynomial curve-fits for the shielded containers using the smallest DCF calculated for each energy listed in Table 5.5-1 of the TRUPACT-II application at each source density (NWP, 2022f). The applicant provided the third order polynomial curve fit for each shielded container in Sections 5.5.6 to 5.5.9 of the TRUPACT-II application. Based on this scheme, the applicant developed the maximum source term limits for distributed and concentrated sources in the HalfPACT package loaded with each of the four shielded containers in Tables 5.5-16 to 5.5-22 of the TRUPACT-II application. These tables also included information on the dose rate for each gamma or neutron energy band.

5.2.2.2 Qualifying the Contents for Transport

The applicant requires package users to qualify the contents presented for transport by referencing “CH-TRAMPAC” in Section 7.1.4 of the HalfPACT application (NWP, 2022e). The “CH-TRAMPAC” (NWP, 2022c) directs package users to estimate the radionuclide quantity in each payload container by any of the following approaches:

(1) a direct measurement,

(2) a review of records for the individual payload container,

(3) a summation of assay (i.e., a radiation measurement technique that determines the quantity of nuclear material in TRU wastes) results from individual packages in a payload container, or

(4) a direct measurement on a representative sample of a waste stream (e.g., solidified inorganics).

The package user used the radiation measured to calculate the radionuclide quantities and the total quantity of ^{239}Pu fissile gram equivalent. In addition, "CH-TRAMPAC" specified that each payload would only be acceptable for shipment if the determined activity plus the error (i.e., one standard deviation) met the limits specified in Section 5.5.10 of the TRUPACT-II application (NWP, 2022f).

5.2.3 Staff Evaluation

The staff reviewed "A Handbook of Decay Data for Application to Radiation Dosimetry and Radiological Assessments" (DOE, 1981). The staff determined that ^{60}Co photons reasonably approximate the more energetic photons emitted by transuranic elements. In addition, the staff evaluated the neutron source strength of ^{252}Cf to other actinides. The staff found that ^{252}Cf had a higher source strength in the energy ranges which provides the greatest contribution to dose. The staff also determined that reducing the ^{252}Cf specific activity from 540 Curies per gram (Ci/g) to 536 Ci/g caused a very slight increase in the ^{252}Cf source strength. The staff multiplied the new source strength by the response functions reported in Section 5.4.4 of the TRUPACT-II application. The staff found that reducing the ^{252}Cf specific activity is acceptable since it did not increase the predicted dose rates. Therefore, for the reasons stated above, staff found that the applicant's description of the radioactive material and the source strength acceptable.

The staff previously reviewed and approved the applicant's "response function" approach for calculating dose rates as documented in a June 19, 2013, SER (NRC, 2013). The staff reviewed the current application and found the applicant's "response function" approach also appropriate for this application. In addition, the staff found the applicant's use of Zirconium as the material for both the concentrated and distributed sources consistent with the study "Best Practices for Shielding Analyses of Activated Metals and Spent Resins from Reactor Operation," September 4, 2020 (https://doi.org/10.2172/1669765).

The staff also reviewed the applicant's approach for calculating DCFs in the current application, and found it to be identical to the approach approved in the June 19, 2013, SER. The applicant stated that DCF value uncertainties are addressed by including the error associated with MCNP calculated dose rates (NWP, 2021c).

The staff concludes that the applicant's DCF approach acceptable for this application. The applicant's "response function" approach calculated activity limits, which satisfied the dose rate requirements. In Section 5.5.10, "Determination of Acceptable Activity," of the TRUPACT-II application, the applicant provided steps for ensuring the allowable waste quantity loaded into the package did not exceed the calculated activity limits. Staff found these instructions to be clear and specific. For these reasons, the staff has reasonable assurance that the

composition and quantity of radioactivity loaded into the package will not exceed the regulatory dose limits in 10 CFR 71.47 and 71.51.

5.3 Shielding Model and Model Specifications

5.3.1 HalfPACT Overpack

The staff had previously reviewed the HalfPACT overpack and found the model acceptable (NRC, 2013). Staff determined that the proposed changes did not impact the HalfPACT overpack. As a result, staff found the modeling assumptions associated with the HalfPACT overpack remain acceptable.

5.3.2 Shielded Containers

For the NCT shielding model, the applicant varied the number of shielded containers in the model according to Table 1. The applicant modeled undamaged containers and showed in Appendix 2.10.3, Section 2.10, of the HalfPACT application that damage to the containers under NCT was negligible (NWP, 2022e). Within each shielded container, the applicant modeled a 1-in. diameter by 1-in. long Zirconium stub-cylinder source in the center of the shielded container cavity. The applicant took no credit for the attenuation provided by the material from the payload drum loaded into the shielded container (see Table 1 of this SER). In addition, the applicant took no credit for self-shielding by the waste contents within the payload drum loaded inside the containers (i.e., the applicant modeled the space inside the containers as void). The applicant took credit for the presence of the dunnage materials surrounding the containers by centering the containers within the HalfPACT overpack in the shielding model. However, the applicant took no credit for radiation attenuation by the dunnage materials.

For the HAC shielding model, the applicant utilized the NCT shielding model with the following changes. For the SC-30G1 shielded container, the applicant reduced the lead thickness from 0.94 to 0.85 in. to account for localized damage and deformation to the outer shell and lead shielding. The applicant also reduced the thickness of the carbon steel lid and base from 3.0 to 2.5 in. For all other shielded containers, the applicant reduced the radial inner shell, lead and outer shell thicknesses by ten percent to account for localized damage and deformation. The applicant also reduced the thicknesses of all carbon steel lid and base components by ten percent (10%). For all shielded containers, the applicant located the source adjacent to the container inner shell surface nearest the detector and translated the containers radially to the inner wall of the HalfPACT ICV.

5.3.3 Material Properties

The applicant modeled carbon steel, Type 304 stainless steel, lead, and rigid urethane foam, with densities of 7.8526 g/cm^3, 8.0128 g/cm^3, 11.3500 g/cm^3, and 0.1322 g/cm^3, respectively in the shielding models. Table 5.3-1 of the TRUPACT-II application summarized the composition of each of these attenuating materials (NWP, 2022f). The applicant also modeled Zirconium at 1 g/cm^3 in the source region for the concentrated 1-in. stub-cylinder. The applicant chose Zirconium after performing multiple calculations with various materials. The applicant noted that these calculations showed that Zirconium was a conservative choice for gamma calculations and inconsequential for neutron calculations.

5.3.4 Lead Gap Evaluation

During post-test destructive disassembly of some shielded containers, the applicant found axial gaps in the lead in the sidewall that were believed to have formed during the lead pouring process. Although the largest measured axial gap was 0.318 in., the applicant evaluated axial gaps as great as 0.5 in. in the sidewall lead column. The applicant evaluated the impact on dose rates from a 0.5-in. gap at the bottom of the sidewall lead column as well as a 0.5-in. gap at the top of the sidewall lead column. Since the applicant associated the axial gaps with the fabrication process, the applicant re-evaluated the previously calculated NCT dose rates, as well as the HAC dose rates, for the SC-30G2, SC-30G3, and the SC-55G2. The applicant determined that a 0.5 inches gap caused the two-meter HalfPACT package dose rates to exceed the regulatory limits with the greatest dose rate increase for the SC-30G2 design. Therefore, the applicant chose to reduce the content source term loaded into the SC-30G2, SC-30G3, and SC-55G2 shielded containers to address the possibility of lead gaps. The applicant did not revise the dose rates reported in Tables 5.4-11 to 5.4-15 of the TRUPACT-II application (NWP, 2022f).

5.3.5 Evaluation of Normal Conditions of Transport and Hypothetical Accident Conditions

Since the shielded containers experienced neither significant damage nor significant deformation from NCT tests, the staff determined that the shielded container models used by the applicant to calculate the NCT dose rates reasonably depict the NCT package configurations. The staff found modeling the source as Zirconium acceptable for the following reasons:

a) it shields gammas less effectively compared to other materials associated with the HalfPACT package (e.g., steel) and

b) it does not attenuate neutrons significantly.

The staff determined that modeling the shielded container payload cavity as void to calculate both photon and neutron dose rates is conservative because this eliminates material attenuation and produces higher dose rates.

In evaluating the assumption of centering the radiation source within the shielded container, the staff reviewed the following information:

a) a response to a request for additional information dated March 27, 2013, referenced by the applicant (NWP, 2013).

In the 2013 response, the applicant chose to reduce the content source term loaded into shielded containers by 10% to address potential source term reconfiguration during NCT. The applicant implemented this penalty by modifying step No. 10 in Section 5.5.10 of the TRUPACT-II application (NWP, 2022f) and Section 3.3.2.1 of CH-TRAMPAC (NWP, 2022c) because the HalfPACT application (NWP, 2022e) incorporates these instructions by reference.

b) A SER dated June 19, 2013 (NRC, 2013)

As documented in a June 19, 2013, SER, the staff found the approach proposed by the applicant acceptable.

For the current application, the staff confirmed that the 10% penalty is still in effect. Therefore, the staff found centering the radiation source within the shielded container acceptable for NCT evaluations.

The HAC drop tests demonstrated that the shielded containers did not move significantly from their pre-drop test location; therefore, staff found that translating both the source and the shielded containers closer to the detector is a conservative assumption. Because the HAC tests demonstrated that the shielded containers neither experienced significant damage nor significant deformation, staff determined that the HAC dose rate shielding model dimensions are conservative. In Section 5.4.5 of the TRUPACT-II application, the applicant evaluated the impact of axial gaps in the lead shielding. In addition, staff reviewed the material properties and compositions provided in Table 5.3-1 of the TRUPACT-II application and found them to be reasonable based on a review of open literature.

For these reasons, the staff finds that the applicant's shielding models reasonably depict the package under both NCT and HAC.

5.3.6 Conclusion

In Table 5.4-16 in TRUPACT-II application (NWP, 2022f), the applicant identified that the greatest two-meter dose rate increase was 0.8% for the SC-30G2 shielded container. However, the applicant decreased the content source term loaded into the SC-30G2, SC-30G3 and the SC-55G2 shielded containers by one percent. The staff finds this approach acceptable since the source term reduction exceeds the potential dose rate increase due to lead shielding gaps. In addition, the applicant revised the gamma scan testing procedure as discussed in Section 8 of this SER. Therefore, the staff finds acceptable for the applicant not to revise the dose rates reported in Tables 5.4-11 thru 5.4-15 of the TRUPACT-II application.

5.4 Shielding Evaluation

5.4.1 Methods of Evaluation

The applicant performed shielding calculations using the general-purpose, continuous-energy, generalized-geometry, time-dependent MCNP code. The applicant used MCNP5, version 1.60 to analyze the SC-30G1 shielded container, and MCNP6, version 6.2.0, to analyze the SC-30G2, SC-30G3, SC-55G1, and SC-55G2 shielded containers. To calculate dose rates, the applicant tallied either neutron or gamma fluxes over surfaces of interest using three-dimensional models that depicted all the relevant design parameters of both the HalfPACT package and the associated shielded containers. The applicant calculated dose rates with segmented surface detectors that were either axially aligned with the source centerline when a single source or tier of sources exist, or axially aligned with a plane that is midway between upper and lower tiers of sources. The applicant aligned the surface detectors in this way to minimize the aggregate distance from the source(s) to the detector and to generate the maximum dose rate.

The applicant ran the models in photon-only mode when evaluating gamma emitting radionuclides. The applicant ran the models in neutron only mode when evaluating neutron emitting radionuclides even though the code is able to analyze the dose from photons generated when neutrons (n) are captured by the packaging materials [i.e., (n,γ) reactions]. The applicant chose to do this because their MCNP evaluations showed that gamma dose rates generated by neutrons interacting with the shielding materials, as well as the gamma particles emitted by ^{252}Cf, increased the dose rate by less than 1% compared to the neutron dose rate alone.

The applicant performed supplemental calculations to justify excluding the photon dose rate due to (n,γ) reactions. In the supplemental calculations, the applicant modified the SC-30G2 and SC-55G1 shielding models described previously by adding polyethylene with a density of 0.94 g/cm^3 to the payload cavity. Pointing to the supplemental calculation results, the applicant stated that the photon dose rate generated by (n,γ) reactions is less than the decrease of the neutron dose rate from radiation attenuation by the proposed waste content material (i.e., self-shielding). Therefore, the applicant asserted that accounting for the photon dose rate from (n,γ) reactions leads to lower dose rates due to self-shielding from the proposed waste content.

5.4.2 Flux-to-Dose-Rate Conversion

The applicant used the American National Standards Institute (ANSI)/ANS-6.1.1-1977 flux-to-dose rate conversion factors in their analyses. The applicant multiplied the reference conversion factors by a factor of 1,000 within the code to generate dose rates in units of mrem/hr rather than rem/hr. The applicant provided the conversion factors in Tables 5.4-3 and 5.4-4 of the TRUPACT-II application (NWP, 2022f).

5.4.3 External Radiation Levels

The applicant summarized the dose rates calculated for NCT and HAC in Tables 5.4-11 to 5.4-15 of the TRUPACT-II application (NWP, 2022f). The staff found that these values meet the regulatory dose rate requirements for NCT in 10 CFR 71.47(b) and HAC in 10 CFR 71.51(a)(2).

5.4.4 Conclusion

Given the capabilities and the extensive application of the MCNP code within the nuclear industry, the staff found MCNP an acceptable code for this application. After reviewing the application, the staff determined that the shielding models used to calculate NCT and HAC dose rates reasonably depicted the package configurations under NCT and HAC situations. The staff found the applicant's approach of not calculating the photon dose rate from (n,γ) reactions acceptable because the applicant demonstrated that the ignoring self-shielding from the container contents is conservative because it compensates for excluding the photon dose rate from (n,γ) reactions. The staff confirmed that the tallies were located at the appropriate distances relative to the package to demonstrate regulatory compliance and that the applicant used NRC accepted flux-to-dose rate conversion factors.

Because the dose rate values presented in Tables 5.4-11 to 5.4-15 of the TRUPACT-II application (NWP, 2022f) were extremely close to the regulatory limit, the staff confirmed that the statistical error associated with the MCNP results had been included in the results. In Tables 5.4-11 to 5.4-15 of the TRUPACT-II application, the applicant provided the dose rates

that incorporated the statistical error associated with the MCNP results according to the following equation:

$D_a = D_c \times (1 + E)$

where,

D_a is the adjusted dose rate,
D_c is the dose rate calculated by the MCNP code, and
E corresponds to the tally error.

The staff determined that including the MCNP calculation error in the dose rates presented in the application is conservative.

Section 5.5.10 of the TRUPACT-II application requires that the sum of gamma sources plus the sum of neutron sources be less than or equal to 0.9. As discussed in Section 5.3.4 of the SER, the staff had previously accepted this approach for accounting for source strength and geometric uncertainties. Therefore, the staff finds it acceptable for this application.

In addition, the applicant stated that the code was run until the tally error, a statistical check used to evaluate the validity of an MCNP calculation result, was less than one percent. The staff noted that the applicant's error value goal is less than one tenth the value required by MCNP to pass this statistical check. The staff determined that running the code until an error of less than one tenth the value required to pass the MCNP statistical check provides greater confidence in the accuracy of the result.

The staff determined that the applicant incorporated several conservatisms into their shielding evaluation. Therefore, staff has reasonable assurance that package dose rates will not exceed the 10 CFR 71.47 regulatory limits, and the staff found that the applicant's shielding methods acceptable.

5.5 Evaluation Findings

The staff reviewed the application regarding the package shielding design. Based on its review of the statements and representations provided in the application, as well as staff's calculations as documented in Section 5.2.3 of this SER, the staff has reasonable assurance that the HalfPACT and TRUPACT-II packages with the proposed contents and design changes, will continue to satisfy the shielding requirements and radiation level limits in 10 CFR 71.47 and 71.51.

6. CRITICALITY SAFETY EVALUATION

The purpose of the criticality review is to confirm that the packages together with their contents meet the requirements in 10 CFR Part 71 for criticality safety. The applicant requested to revise the certificates and designs of the packages to incorporate various changes, as described in Section 1.0 of this SER and the sections below. The staff used the guidance in the standard review plan (NRC, 2020), to conduct this review.

As specified in Table 2.1-1 of the application, the four new shielded containers contain RH-TRU material for transportation in the HalfPACT packages. These containers are not authorized

contents in the TRUPACT-II packages. No special design features are required to maintain criticality of the HalfPACT packages due to the separation provided by the packages, and no neutron poisons are used. The methodology used in the applicant's analysis build on the previous NRC approved analyses and demonstrate that the materials requested to be transported in the TRUPACT-II and HalfPACT packages continue to meet the requirements of 10 CFR Part 71.

6.1 Fissile Material Contents

The quantities of the fissile isotopes present in the waste material were converted to FGE using the conversion factors that are outlined in the DOE report, "Contact-Handled Transuranic Waste Authorized Methods for Payload Control (CH-TRAMPAC)," Revision 6 (NWP, 2022c). For all of the models analyzed by the applicant, the package is assumed to contain ^{239}Pu at the FGE limit. Fissile composition of a typical payload is illustrated in the applicant's calculation SCA-CAL-0001 and is as follows:

Nuclide	Weight Percent
^{238}Pu	Trace
^{239}Pu	93.0
^{240}Pu	5.8
^{241}Pu	0.4
^{243}Pu	Trace
^{241}Am	Trace
All other fissile isotopes	0.7

No credit is taken for the parasitic neutron absorption in either the waste materials or dunnage. The contents of each package are modeled as an optimally moderated sphere of ^{239}Pu, which was determined by varying the H/Pu atom ratio. The overall size of each sphere is calculated based on the H/Pu ratio and the Pu mass.

6.2 Shielded Containers

6.2.1 Description of the Shielding Design of the Shielded Containers

Section 1 of this SER includes additional information about the design of the shielded containers.

6.2.1.1 SC-30G2

The SC-30G2 shielded container is a twin-shell vented carbon steel and lead cylindrical structure designed to ship TRU waste with high gamma energies within the HalfPACT package. The HalfPACT can contain up to two SC-30G2. Each SC-30G2 is designed to carry one 30-gallon drum, with the option to use a mesh "bag" to allow remote installation of the drum into the shielded container.

6.2.1.2 SC-30G3

The SC-30G3 shielded container is similar to the SC-30G2, since it also is a twin-shell vented carbon steel and lead cylindrical structure designed to ship TRU waste with high gamma energies within the HalfPACT. The SC-30G3 has additional shielding on the top, bottom, and periphery of the shielded container. The HalfPACT can contain one SC-30G3. Each SC-30G3

is designed to carry one 30-gallon drum, with the option to use a mesh “bag” to allow remote installation of the drum into the shielded container.

6.2.1.3 SC-55G1

The SC-55G1 shielded container is a vented carbon steel and lead cylindrical structure designed to ship TRU waste with high gamma energies within the HalfPACT. The HalfPACT can contain two SC-55G1 containers. Each SC-55G1 is designed to carry one 55-gallon drum, with the option to use a mesh “bag” to allow remote installation of the drum into the SC.

6.2.1.4 SC-55G2

The SC-55G2 shielded container is a vented carbon steel and lead cylindrical structure designed to ship transuranic waste with high gamma energies within the HalfPACT. The HalfPACT can contain one SC-55G2 container. Each SC-55G2 is designed to carry one 55-gallon drum, with the option to use a mesh “bag” to allow remote installation of the drum into the shielded container.

6.2.2 Shielded Containers Evaluation

Two different payloads are considered in the applicant’s analysis.

a) *Manually compacted waste* (i.e., not machine compacted), that has less *than 1.0 weight % (wt%) beryllium*, and is limited to *a maximum 325 FGE of ^{239}Pu*, which is identified as Case G throughout the applicant’s analysis.

b) *Machine compacted waste* that has *less than 1.0 wt% beryllium*, and is limited to *a maximum of 245 FGE*, which is identified as Case H throughout the applicant’s analysis.

For Case G, the waste stream is manually compacted, with an internal and external moderator composed of 25% polyethylene, 74% water, and 1% beryllium (by volume). For Case H, where the waste stream is mechanically compacted, the external moderator is composed of 100% polyethylene, and the internal moderator is composed of 99% polyethylene and 1% beryllium (by volume). The resulting dimensional composition of the modeled fissile sphere as a function of the hydrogen/plutonium (H/Pu) ratio is summarized in Table 2-2 for Case G, and Table 2-3 for Case H in the applicant’s calculation package SCA-CAL-0001 (NWP, 2021a).

The applicant states that polyethylene is the bounding hydrogenous moderating material present in both cases based on the SAIC-1322-001 study, “Reactivity Effects of Moderator and Reflector Materials on a Finite Plutonium System.” The applicant used a 25% packing fraction for polyethylene, which staff finds conservative based on the physical testing performed for TRU waste. Other materials that could provide better reflection than polyethylene are considered “special reflectors” and are limited to less than 1 wt.% for the HalfPACT package.

The applicant used KENO-V.a as part of the SCALE-PC v4.4a package of codes with the ENDF/B-VII continuous energy cross-section library to perform their analysis. In all models, the fissile material is assumed to form a single optimally moderated sphere. The staff found that conservative damage assumptions were used for both the NCT and HAC criticality safety analysis such as the following:

a) no credit for the head of the HalfPACT in order to reduce separation in the array configuration,

b) all foam and aluminum were replaced with reflectors,

c) in the array models, the internal and external reflector densities were varied to maximize neutron interaction between packages,

d) 1 wt.% of beryllium to account for any special reflector materials, and

e) maximize reactivity of the loaded HalfPACT by evaluating the shielded container materials in various configurations with fissile spheres.

Based on the analysis of the SC-30G2 and SC-30G3 shielded containers, the applicant concluded that the maximum reactivity of the single package and the arrays of packages were very similar, indicating that the neutron communication between packages is limited due to the isolation of each SC-30G2. The most reactive cases are listed in Table 4.7-2 in CH-TRU Payload Appendices, and both the NCT and HAC configurations result in k_{eff} values that are below the upper safety limit (USL) of 0.9375 (NWP, 2022d).

Based on the analysis of the SC-55G1 and SC-55G2 shielded containers, the applicant's analyses concluded that the maximum reactivity of the single package and the arrays of packages were very similar, indicating that the neutron communication between packages is limited due to the isolation of each SC-55G1. The most reactive cases are listed in Table 4.9-2 in CH-TRU Payload Appendices, and both the NCT and HAC configurations result in k_{eff} values that are below the USL of 0.9375.

6.3 Revised FGE limits for Cases A and C

The applicant revised the payload container FGE limits for Cases A and C. In previous approvals, the original 200 FGE limit that was placed on individual drums is not related to the Case A and Case C analysis assumptions. The applicant modified Table 6.1-1 of TRUPACT-II application to increase the FGE allowed in Case A from 200 to 325, and the FGE allowed in Case C up to 250 (NWP, 2022f). Since all drum payload configurations evaluated under Cases A and C assumed that all of the fissile material within a package consolidates into a single fissile region within the package such that no credit is taken for individual material absorption, is optimally moderated, used a very conservative spherical moderator with full density reflection, and using the supporting analyses provided in Section 6.4 of TRUPACT-II application and justified using the DOE report CH-TRAMPAC, "Contact-Handled Transuranic Waste Authorized Methods for Payload Control" (NWP, 2022c) staff finds this acceptable.

6.4 Evaluation Findings

The staff performed calculations using SCALE 6.2.3 and the continuous energy cross sections from ENDF/B-VII to confirm the conclusion of the applicant's calculations. In all cases the most reactive scenario for manually compacted waste bounded the reactivity of machine compacted waste for materials that had less than 1 wt% special reflectors. Based on a review of the information and representations provided in the application and the staff confirmatory analysis, the staff has reasonable assurance that the TRUPACT-II and HalfPACT packages with the proposed four new shielded containers identified above with the proposed contents, and the modified FGE limits for Cases A and C will continue to meet the criticality safety requirements in

10 CFR Part 71. Staff also finds that the Criticality Safety Index (CSI) of zero is appropriate for the SC-30G2, SC-30G3, SC-55G1, and SC-55G2 shielded containers in the HalfPACT package.

7. MATERIALS EVALUATION

The staff reviewed the application for the TRUPACT-II and HalfPACT shipping packages to verify that applicant has performed an acceptable evaluation with respect to materials to demonstrate that these packages meet the requirements of 10 CFR Part 71 under NCT and HAC.

The following discussions focus principally on the primary important-to-safety containment and structural components. Even though there were no changes for the material's evaluation, the staff performed a comprehensive review of the applicant's evaluation. The following sections include a brief discussion on some of the key areas of the application.

7.1 Evaluation of Materials of Package's Designs and Proposed Content

Section 1 of this SER includes a summary of the changes proposed by the applicant to the TRUPACT-II and HalfPACT packages. Along with the currently authorized SC-30G1 shielded container, the new shielded container designs for RH-TRU waste inventory will be in stackable configurations instead of in RH-TRU removable lid canisters, which are placed in excavated boreholes underground.

Section 1.2.1 of this SER includes a brief description of the TRUPACT-II and HalfPACT packagings. The applicant did not add any new materials or propose any changes to the materials used in the TRUPACT-II and HalfPACT packaging designs. The staff verified that the proposed revisions to the package do not expose the proposed packaging materials to thermal, structural, or corrosive service environments more severe than those that have been previously evaluated for the existing packaging. The staff found these materials acceptable in prior revisions to the CoCs.

The staff also confirmed that the all four shielded container models are nearly identical to the prior model SC-30G1. The staff concludes that the materials evaluation for these packages satisfy the requirements for 10 CFR Part 71 and are acceptable.

The following discussion focuses principally on the primary important-to-safety containment and structural components. Even though there were no changes for the material's evaluation a comprehensive review was conducted and following is a brief discussion on some of the key areas of the SAR.

7.1.1 Drawings

The staff reviewed the licensing drawings included in the TRUPACT-II and HalfPACT applications and verified that the drawings contain the following information:

a) bill of materials,

b) appropriate consensus code information such as the American Society of Mechanical Engineers (ASME), American Society for Testing and Materials (ASTM), American Welding Society (AWS), and

c) specification number(s) for the material(s) used in fabrication.

The licensing drawings well-characterize the weld requirements including standard welding symbols and notations are in accordance with AWS Standard A2.4, “Standard Symbols for Welding, Brazing, and Nondestructive Examination.” Therefore, based on the above discussion, the staff finds the description of materials, and fabrication in the drawing to be acceptable.

7.1.2 Codes and Standards

Section 2.1.1.1 of the application describes the design criteria and code and standards for the package. Specific subsections ASME B&PV Section III are used for the design of the package and remain unchanged from the previous amendment.

7.1.3 Material Properties

Major structural components are fabricated with austenitic stainless-steel Type 304 and mechanical properties are taken from ASME Section II, Parts A and D, and remain unchanged from the previous amendment.

Mechanical properties for polyurethane foam and metallic materials (including brass, aluminum honeycomb, 300 series stainless steel screws, etc.) remain unchanged from the previous amendment.

7.1.3.1 Brittle Fracture

In Section 2.2.2.2.1 of the applications, the applicant specifically notes that brittle fracture concerns are precluded by avoiding ferritic steel in this packaging. In addition, the bolts used to secure the ICV, and OCV locking rings in the locked position are stainless steel. Other fasteners used in the packaging assembly provide redundancy and are mainly constructed from stainless steel further reducing brittle fracture concerns.

7.1.3.2 Fatigue Assessment

Section 2.1.2.2.2 of the application addresses fatigue assessment and remains unchanged from the previous amendment.

7.1.3.3 Chemical and Galvanic Reactions

Section 2.4.4 addresses chemical and galvanic reactions to satisfy the requirements of 10 CFR 71.43(d). Materials used in packaging are not expected to have significant chemical, galvanic, or other reactions in air, inert gas, or water environments. These materials have been previously approved without incident in radioactive material packages for transport of similar payload materials and no changes have been made in this revision that may impact the safe use of the packages.

7.1.4 Conclusion

Considering the new models are nearly identical in material construction, application, and none of the changes proposed in latest revisions impact the previous material's evaluation that have been performed, the staff continues to find the applicant's evaluations of to be acceptable.

7.2 Evaluations Findings

Based on a review of the statements and representations in the application, the staff concludes that the materials used by the applicant adequately described and evaluated the transportation package design. The staff finds that the package complies with the requirements in 10 CFR Part 71.

8. OPERATING PROCEDURES

The objective of the review of the operating procedures is to verify that the applicant has included clear and specific instructions for loading and unloading the packages.

The staff reviewed the operating procedures specified in Chapter 7 of the HalfPACT application (NWP, 2022e). The staff found that the applicant included specific instructions for loading and unloading the four new payload shielded containers (i.e., SC-30G2, SC-30G3, SC-55G1, and SC-55G2) for shipment of transuranic (TRU) wastes as qualified by the method specified in the CH-TRAMPAC, Revision 6 (NWP, 2022c). On this basis, the staff finds that the operating procedures, specified in Chapter 7 of the application for the HalfPACT package, are acceptable and meet the regulatory requirements of the 10 CFR 71.31(c), 71.35(c), 71.43(g), 71.47(b)(c)(d), 71.87, and 71.89.

9. ACCEPTANCE TESTS AND MAINTENANCE PROGRAM

The staff reviewed the changes to the acceptance tests and maintenance program discussed in the applications. The applicant added that the operating procedures continue to meet the requirements of 10 CFR Part 71 and that these procedures are adequate to assure the package will be operated in a manner consistent with its evaluation for approval.

9.1 Shielding Integrity Tests

9.1.1 Acceptance Criteria

The applicant revised the applications and added Section 8.1.5 to describe how the adequacy of the lead shielding of the proposed content is confirmed. The applicant stated that confirmation

of the presence of the minimum sidewall lead thickness for each shielded container, as described in the applicable application drawing (i.e., Drawing Nos. 163-008, 163-010, 163-011, 163-013, and drawings for the SC-30G1, SC-30G2, SC-30G3, and SC-55G2 containers), is the shielding integrity testing acceptance criteria. For those portions of the shielding aligned with the shielded container cavity, the applicant determined a rejection count rate (i.e., an acceptance criterion) using a flat-block calibration standard (NWP, 2022e). Section 5.1 of this SER includes the minimum thickness of the proposed payload for the HalfPACT package.

The applicant fabricated the calibration standard from two flat steel plates representing the inner and outer shells at their minimum thicknesses and a flat lead plate having the minimum thickness identified in the drawing associated with the shielded container being tested. The applicant sized the calibration standard to preclude indirect gamma radiation from affecting the measured rejection rate. In determining the rejection count rate, the applicant placed the radiation source at a distance from the flat-block calibration standard that mimicked the test configuration (NRC, 2021).

For those portions of the shielding above and below the shielded container cavity, the applicant performed the following additional steps:

1) Identified a source position above the bottom of the payload cavity that allowed the presence of axial gaps in the sidewall lead to be identified.

2) Created an MCNP model of the prototypic gamma scan test configuration for each shielded container design. Each MCNP model included a 0.5-in. axial gap at both ends of the sidewall lead column.

3) Ran each MCNP model using a unit source strength of ^{60}Co and ^{192}Ir, which are the two radionuclides commonly used for gamma scan testing.

4) Generated a straight-through-the-wall value as well as a “slant-shot” value for locations below and above the payload cavity.

By taking the ratio of the slant-shot unit dose rate with the straight-through unit dose rate, the applicant calculated reject count rate adjustment factors and applied these reject count rate adjustment factors to the dose rate values measured above and below the shielded container cavity during the shielded container gamma scans.

9.1.2 Staff Evaluation

The staff reviewed the description for confirming the lead shield adequacy. The staff found the applicant’s acceptance criterion acceptable because it conforms to the drawing requirements. The staff found the applicant’s approach for determining the rejection count rate for those portions of the shielding aligned with the shielded container cavity acceptable for the following reasons:

a) the applicant fabricated the calibration standard using the minimum material thicknesses allowed by the drawings.

b) the distance used to obtain the rejection count rate matched the distance associated with the shielding integrity test.

The staff found the applicant's approach for determining the rejection count rate for those portions of the lead shielding above and below the shielded container cavity acceptable for the following reasons:

a) The distance modeled to obtain the rejection count rate adjustment factors matched the distance associated with the shielding integrity test.

b) Applying adjustment factors to determine the rejection count rate is appropriate, since the lead shielding geometry above and below the shielded containers is not the same as the straight-through lead shielding geometry. As discussed earlier in Section 5.4.4 of this SER, staff found the use of MCNP acceptable.

c) The staff determined that the use of ^{60}Co and ^{192}Ir is acceptable because the following reasons:

   (1) ^{60}Co reasonably approximated the more energetic photons emitted by TRU elements, and

   (2) ^{192}Ir reasonably approximated the less energetic photons emitted by TRU elements.

The staff determined that similar requirements were not required for the lead shielding in the bases and lids for the shielded containers for the following reasons:

a) The lead shielding in the bases and lids are lead plates which are press fit into the lids and bases to eliminate gaps, and if gaps are present after installing the lead plates, lead wool is used to fill the gaps.

b) Prior to closure of the lid and base cavities, a visual examination is performed in accordance with Section 8.1.1 of the HalfPACT application to confirm the lead plates meet the drawing specifications and, after the lead plates are installed, to confirm no gaps are present.

For these reasons, staff finds the modifications to the shielding integrity tests acceptable.

9.2 Evaluation Findings

The staff review the changes to the acceptance tests and maintenance program including the description of the requirements for the lead shield for the shielded canisters. The staff finds acceptable the changes to the acceptance tests, the maintenance program assures adequate packaging performance during its service life, and that the packages are in compliance with the requirements of 10 CFR Part 71.

10. QUALITY ASSURANCE

The staff reviewed the description of the quality assurance program provided in the applications and found only administrative changes, which included reference updates to the most recent revisions to 10 CFR Part 71, DOE Order 460.1(D) (DOE, 2016), and Regulatory Guide 7.10. This section continues DOE's commitment to enacting a quality assurance program that meets

the requirements and guidelines set forth in these documents. Except as exempted by law, DOE Order 460.1D specifically requires the following:

> "Each (DOE) Departmental element that participates in the use, design, purchase, fabrication, handling, shipping, storing, cleaning, assembly, inspection, testing, operation, maintenance, repair, and modification of Type B or fissile materials packaging must have and maintain a quality assurance (QA) program in accordance with 10 CFR Part 71, Subpart H that is approved by the NRC or approved by the DOE CO (Certifying Official) for DOE elements or by the NNSA CO for NNSA elements, prior to the performance of those operations."

The staff finds the DOE's commitment and obligation to meet the requirements of 10 CFR 71, Subpart H in executing the above-mentioned activities relating to the HalfPACT package to be acceptable.

11. CONDITIONS

The staff made some editorial changes as well as changes to the conditions of approval to the CoCs for the Model Nos. TRUPACT-II and HalfPACT packages. The following items summarize the changes to both certificates:

11.1 Model Nos. TRUPACT-II and HalfPACT CoCs

11.1.1 General changes

The following general changes apply to the Model Nos. TRUPACT-II and HalfPACT CoCs:

a) Increased the CoCs Revision No. (Condition 1.a.) by one.

b) Changed references to CH-TRU Payload Appendices from Revision 4 (Rev. 4) to Rev. 5.

c) Changed references to CH-TRAMPAC from Rev. 5 to Rev. 6.

d) Condition No. 3.b., "Title and Identification of Report or Application," includes the date of the application.

e) Editorial changes throughout the CoCs.

11.1.2 Condition No. 5.(a)(3), "Drawings"

The Model Nos. TRUPACT-II and HalfPACT CoCs include the latest revisions for the following drawings:

a) Drawing No. 163-001, "Standard Pipe Overpack SAR Drawing," sheets 1-3, Rev. 9;

b) Drawing No. 163-009, "Criticality Control Overpack SAR Drawing," sheets 1 and 2, Rev. 2.

11.1.3 Conditions No. 14

Condition No. 14 was removed from both CoC since the due dates in the conditions have passed.

11.1.4 Condition No. 15

Condition No. 15 was renumbered as 14 due to the deletion of Condition No. 14.

11.1.5 References

The "REFERENCES" section of the Model Nos. TRUPACT-II and HalfPACT CoCs were revised to include the most recent consolidated application dated February 24, 2022.

11.2 Model No. TRUPACT-II CoC (Additional Changes)

11.2.1 Condition No. 5.(a)(3), "Drawings"

In addition to the changes depicted in Section 11.1 2 of this SER, Condition No. 5.(a)(3), "Drawings," the staff updated the revision No. of Drawing No. 2077-500SNP, "TRUPACT-II Packaging SAR Drawing," sheets 1-11, Rev. AA.

11.2.2 Condition No. 5.(b)(2)

a) Added Table 2 (see the table below) with the same No. of payload containers as in Rev. 25 of the CoC. This change was editorial.

Table 2. Maximum number of payload containers per package and authorized packaging configurations

Type of Payload Container	Maximum Number of Payload Containers per Package
standard pipe overpack	14
S100 pipe overpack	14
S200 pipe overpack	14
S300 pipe overpack	14
100-gallon drum	6
55-gallon drum	14
85-gallon drum	8
SWB	2
TDOP	1
CCO	14

b) Renumbered Table 2 to Table 3 because of the addition of Table 2 to the CoC.

c) Rearranged the rows and columns for the FGE values to be consistent with Table 3 of the CoC for the HalfPACT package. The values for the "Maximum FGE of ^{239}Pu" and "Additional limits…" for CCOs and pipe overpacks remain the same as in Rev. 25 of the CoC for the Model No. TRUPACT-II.

11.3 Model No. HalfPACT CoC (Additional Changes)

11.3.1 Condition No. 5.(a)(3), "Drawings"

In addition to the changes depicted in Section 11.1 2 of this SER, Condition No. 5.(a)(3), "Drawings," the Model No. HalfPACT CoC includes a revision to Drawing No. 163-008 and drawings for new payload consisting of the shielded containers.

a) Drawing No. 163-008, "SC-30G1 Shielded Container SAR Drawing," sheets 1-6, Rev. 4;

b) Drawing No. 163-010, "SC-30G2 Shielded Container SAR Drawing," sheets 1-7, Rev. 1;

c) Drawing No. 163-011, "SC-30G3 Shielded Container SAR Drawing," sheets 1-8, Rev. 1;

d) Drawing No. 163-012, "SC-55G1 Shielded Container SAR Drawing," sheets 1-5, Rev. 0; and

e) Drawing No. 163-013, "SC-55G2 Shielded Container SAR Drawing," sheets 1-4, Rev. 1.

11.3.2 Condition No. 5.(b)(1)

Added the shielded containers and reorganized the list as follows:

(i) 55-gallon drum,
(ii) standard waste box (SWB),
(iii) 85-gallon drum,
(iv) standard pipe overpack,
(v) S100 pipe overpack,
(vi) S200 pipe overpack,
(vii) S300 pipe overpack,
(viii) 100-gallon drum,
(ix) criticality control overpack (CCO),
(x) SC-30G1 shielded container,
(xi) SC-30G2 shielded container
(xii) SC-30G3 shielded container
(xiii) SC-55G1 shielded container
(xiv) SC-55G2 shielded container

11.3.3 Condition No. 5.(b)(2)

a) Revised Table1 to include the shielded containers identification and corresponding "Maximum Gross Rate" for the new payload and some editorial changes.

Table 1. Maximum gross weight for a payload container

Type of Payload Container	Maximum Gross Weight
6-inch standard pipe overpack	328 pounds
12-inch standard pipe overpack	547 pounds
S100 pipe overpack	550 pounds
S200 pipe overpack	547 pounds
S300 pipe overpack	547 pounds
100-gallon drum	1,000 pounds
55-gallon drum	1,000 pounds
85-gallon drum	1,000 pounds
SWB	4,000 pounds
CCO	350 pounds
Shielded container SC-30G1	2,260 pounds
Shielded container SC-30G2	3,160 pounds
Shielded container SC-30G3	6,300 pounds
Shielded container SC-55G1	3,410 pounds
Shielded container SC-55G2	6,500 pounds

b) Added Table 2 (see the table below) which includes the same No. of payload containers as in Rev. 9 of the CoC and the addition of the maximum shielded containers per type and per package.

Table2. Maximum number of payload containers per package and authorized packaging

Type of Payload Container	Maximum Number of Payload Containers per Package
standard pipe overpack	7
S100 pipe overpack	7
S200 pipe overpack	7
S300 pipe overpack	7
100-gallon drum	3
55-gallon drum	7
85-gallon drum	4
SWB	1
CCO	7
Shielded container SC-30G1	3
Shielded container SC-30G2	2
Shielded container SC-30G3	1
Shielded container SC-55G1	2
Shielded container SC-55G2	1

c) Renumbered Table 2 to Table 3 because of the addition of Table 2 to the CoC.

d) For Table 3, rearranged the rows and columns for the FGE values to accommodate the values for the “Maximum FGE of ^{239}Pu” and “Additional limits…” for the new shielded containers.

Table 3. Maximum Fissile Gram Equivalent (FGE) in CCOs and pipe overpacks and associated additional controls/limits.

	Parameters			
	Non-machine compacted material		Machine compacted material	
Payload Containers	**Maximum FGE of ^{239}Pu**	**Additional limits/controls**	**Maximum FGE of ^{239}Pu**	**Additional limits/controls**
CCO	380	≤ 1% by weight Be/BeO*	380	≤ 1% by weight Be/BeO and ≤ 2,000 grams plastic
Pipe Overpack	200	for Be/BeO > 1 wt%, Be/BeO must be chemically or mechanically bound to the fissile material	200	≤ 1% by weight Be/BeO
Shielded containers	325	≤ 1% by weight Be/BeO	245	≤ 1% by weight Be/BeO

* Be means beryllium and BeO means beryllium oxide.

11.3.4 References

The "REFERENCES" Section, besides adding the reference to the consolidated application dated February 24, includes a reference to a response to a follow up question.

CONCLUSIONS

Based on the statements and representations contained in the application, as supplemented, and the conditions listed above, the staff concludes that the designs have been adequately described and evaluated, and the Model Nos. TRUPACT-II and HalfPACT packages meet the requirements of 10 CFR Part 71.

Issued with Certificates of Compliance No. TRUPACT-II and HalfPACT packages, Revisions 26 and 10, respectively, on April 28, 2022.

REFERENCES

(DOE, 1981) U.S. Department of Energy, Oak Ridge National Laboratory, DOE/TIC-11026 (DE81002999), "Radioactive Decay Data Tables, A Handbook of Decay Data for Application to Radiation Dosimetry and Radiological Assessments," 1981.

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(NRC, 2009) Benner, Eric J. U.S. Nuclear Regulatory Commission (NRC) letter to Sellmer, T. E. Nuclear Waste Partnership, LLC (NWP), May 15, 2009, Agencywide Documents Access and Managing System (ADAMS) Accession No. ML091380026.

(NRC, 2013) Sampson, Michele (NRC) letter to Sellmer, T. E. (NWP), June 19, 2013, ADAMS Accession No. ML13170A464.

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(NRC, 2021) Garcia Santos, Norma (NRC) letter to Sellmer, T. E., August 11, 2021, ADAMS Accession No. ML21214A145.

(NWP, 2013) Sellmer, T. E. Sellmer (NWP) letter to Document Control Desk (NRC), March 27, 2013, ADAMS Accession No. ML13112A104.

(NWP, 2021a) Sellmer, T. E. Sellmer (NWP) letter to Document Control Desk U.S. Nuclear Regulatory Commission (NRC), February 23, 2021, ADAMS Accession No. ML21054A050.

(NWP, 2021b) Sellmer, T. E. (NWP) letter to Document Control Desk (NRC), June 24, 2021, ADAMS Accession No. ML21175A366.

(NWP, 2021c) Sellmer, T. E. (NWP) letter to Document Control Desk (NRC), October 6, 2021, ADAMS Accession No. ML21279A181.

(NWP, 2021d) Sellmer, T. E. Sellmer (NWP) letter to Document Control Desk (NRC), November18, 2021, ADAMS Accession No. ML21322A121.

(NRC, 2021e) Conference call from NRC to NWP. December 1, 2021. ADAMS Package Accession No. ML22006A350.

(NWP, 2022a) Scott Burns (NWP) e-mail to Norma Garcia Santos (NRC). January 28, 2022. ADAMS Package Accession No. ML22103A064.

(NWP, 2022b) Sellmer, T. E. Sellmer (NWP) letter to Document Control Desk (NRC), February 24, 2022, ADAMS Accession No. ML22055A629.

(NWP, 2022c) Nuclear Waste Partners LLC, “CH-TRAMPAC Appendices,” Revision 6, February 24, 2022, ADAMS Accession No. ML22055A632.

(NWP, 2022d) Nuclear Waste Partners LLC, “CH-TRU Appendices,” Revision 5, February 24, 2022, ADAMS Accession No. ML22055A633.

(NWP, 2022e) Nuclear Waste Partners LLC, “HalfPACT Safety Analysis Report,” Revision 8, February 24, 2022, ADAMS Accession No. ML22055A631.

(NWP, 2022f) Nuclear Waste Partners LLC, “TRUPACT-II Safety Analysis Report,” Revision 25, February 24, 2022, ADAMS Accession No. ML22055A630.

(NWP, 2022g) Scott Burns (NWP) e-mail to Norma Garcia Santos (NRC). March 14, 2022. ADAMS Package Accession No. ML22091A163.

Item 2

Class 2 Permit Modification Request

Revise Site Recertification Audit Scheduling from Annual to Graded Approach

Waste Isolation Pilot Plant
Carlsbad, New Mexico

Hazardous Waste Facility Permit

EPA ID Number NM4890139088-TSDF

April 2024

Table of Contents

Acronyms and Abbreviations

ANL	Argonne National Laboratory
CCP	Central Characterization Program
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
LLNL	Lawrence Livermore National Laboratory
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
Permit	WIPP Hazardous Waste Facility Permit
PMR	Permit Modification Request
QA	quality assurance
QC	quality control
SNL	Sandia National Laboratory
TRU	transuranic
TSDF	treatment, storage, and disposal facility
VE	visual examination
WAP	Waste Analysis Plan
WIPP	Waste Isolation Pilot Plant

Overview of the Permit Modification Request

This document contains a Class 2 Permit Modification Request (**PMR**) for the Waste Isolation Pilot Plant (**WIPP**) Hazardous Waste Facility Permit (**Permit**), NM4890139088-TSDF. This PMR is being submitted by the U.S. Department of Energy (**DOE**) and Salado Isolation Mining Contractors, LLC, collectively referred to as the Permittees, in accordance with the Permit Part 1, Section 1.3.1. (20.4.1.900 New Mexico Administrative Code [**NMAC**] incorporating Title 40 of the Code of Federal Regulations [**CFR**] §270.42[b]).

- This modification revises the Permit to allow a graded approach for scheduling small quantity site recertification audits.

These changes do not reduce the ability of the Permittees to determine that the waste generator/storage sites have effectively implemented and comply with applicable requirements of the Waste Analysis Plan (**WAP**), and thereby provide continued protection to human health and the environment.

The requested modification to the Permit and related supporting documents are provided in this PMR. The modifications to the text of the Permit have been identified using red font and double underline and a ~~strikeout~~ font for deleted information. Direct quotations are indicated by italicized text. The following information specifically addresses how compliance has been achieved with Permit Part 1, Section 1.3.1, for submission of this Class 2 PMR.

1. 20.4.1.900 NMAC (incorporating 40 CFR §270.42(b)(1)(i)) requires the applicant to describe the exact change to be made to the permit conditions and supporting documents referenced by the Permit.

The exact changes to Permit text, figures, and tables are described in Appendix A and Appendix B to this PMR. The changes are summarized below and include a brief explanation of why the change is needed:

- Revised Permit Part 2 Table of Contents to change the Section 2.3.2.2 title, “Observation of Audits and Generator Site Technical Reviews,” to “Observation of Certification/Recertification Audits and Generator Site Technical Reviews.”

- Revised Permit Part 2, Section 2.3.2.2, *Observation of Audits and Generator Site Technical Reviews,* to reflect the new title, and consolidate audit scheduling information into Permit Attachment C6, Section C6-1.

- Revised Permit Attachment C, Section C-5a, *Phase 1 Waste Stream Screening and Verification,* to remove redundancy and consolidate audit scheduling information into Permit Attachment C6, Section C6-1.

- Revised Permit Attachment C, Section C-5a(3), *Audit and Surveillance Program,* to clarify subsequent audits and remove redundancy.

- Revised Permit Attachment C4, Section C4-3g, *Audits of Acceptable Knowledge,* to consolidate audit scheduling information into Permit Attachment C6, Section C6-1, and clarify subsequent audits.

- Revised Permit Attachment C6, Section C6-1, *Introduction*, to add a graded approach to scheduling audits.

- Revised Permit Attachment C6, Section C6-2, *Audit Procedures*, to consolidate audit scheduling information into Permit Attachment C6, Section C6-1.

- Revised Permit Attachment C6, Section C6-3, *Audit Position Functions*, to remove redundancy and consolidate audit scheduling information into Permit Attachment C6, Section C6-1, and clarify waste generator/storage site certification frequency.

2. 20.4.1.900 NMAC (incorporating 40 CFR §270.42(b)(1)(ii)) requires the applicant to identify that the modification is a Class 2 modification.

This PMR is classified as a Class 2 modification for the reason indicated below:

> 20.4.1.900 NMAC, incorporating 40 CFR §270.42, *Appendix I, B. General Facility Standards, 1. Changes to waste sampling or analysis methods, d. Other changes…2*

Updates to Permit conditions in this PMR do not reduce the capacity of the Permittees to protect human health or the environment for the following reasons:

- Small quantity generator/storage site audits will be scheduled and performed based on criteria that assure waste characterization programs have implemented and comply with applicable requirements of the WAP while reducing the frequency of audits that are not necessary when minimal changes to the program have occurred, or when minimal conditions adverse to quality have been identified in the small quantity generator/storage site waste characterization program.

- Implementing the graded approach to auditing is consistent with standard Quality Assurance/Quality Control (**QA/QC**) practice and enhances protection of human health and the environment by timely placing of audit focus on areas of greatest importance based on criteria that assure waste characterization programs have been implemented and comply with applicable requirements of the WAP while eliminating audits that are not necessary. This may also serve as an incentive for small quantity generator/storage sites to perform continuously at a high level with regard to compliance.

- This change ensures DOE and small quantity generator/storage site resources are used where most needed.

- Each site will be audited at least once within a 2-year period.

3. 20.4.1.900 NMAC (incorporating 40 CFR §270.42(b)(1)(iii)) requires the applicant to explain why the modification is needed.

This modification is needed to add graded approach-based criteria (consistent with DOE documents) for scheduling small quantity generator/storage site recertification audits. According to the U.S. DOE, Carlsbad Field Office, *Quality Assurance Program Document*, DOE/CBFO-94-1012, graded approach is:

The process by which the level of analysis, documentation, verification, and other controls necessary to comply with QA program requirements are developed commensurate with specified factors.

The specified factors for scheduling small quantity generator/storage site audits are the criteria being added to Permit Attachment C6, Section C6-1, *Introduction*.

The DOE will perform an audit at least once every 2 years at each small quantity generator/storage site shipping transuranic (**TRU**) mixed waste to the WIPP facility. This change applies to the following small quantity generator/storage sites; Argonne National Laboratory (**ANL**), Sandia National Laboratory (**SNL**), and Lawrence Livermore National Laboratory (**LLNL**). This schedule is appropriate for the following reasons:

- The DOE reviews and approves data quality-affecting changes to generator/storage site plans and procedures prior to them being implemented.

- The Central Characterization Program (**CCP**) procedures are common to each of their certified sites, as well as similar Advanced Mixed Waste Treatment Project procedures.

- Few data quality-affecting changes have been made to the WAP since 2013.

- The New Mexico Environment Department (**NMED**) will provide input and approve the annual audit schedule. The NMED observes generator/storage site audits and is familiar with their programs.

- The DOE will perform surveillances as indicated in the Permit, on an as-needed basis.

Permit Part 2, Section 2.3.2.2; Permit Attachment C, Sections C-5a and C-5a(3); Permit Attachment C4, Section C4-3g; and Permit Attachment C6, Section C6-3, require initial certification of a generator/storage site prior to shipment of waste to the WIPP facility. Please note that the requirement for performing initial audits prior to shipment of waste to the WIPP facility is not being changed. The DOE will continue to conduct an initial audit of each site prior to certifying the site for shipment of TRU mixed waste to the WIPP facility. The graded approach to scheduling audits will not apply to initial certification audits.

This PMR to utilize the graded approach to scheduling audits is needed for the following reasons:

- to reduce redundant procedure reviews,
- to ensure resources are efficiently applied, and
- to place audit focus on areas of greatest importance and provide incentive for generator/storage sites to perform continuously at a high level.

Reduce redundant procedure reviews

Permit Attachment C, Section C-2, *Waste Characterization Program Requirements and Waste Characterization Parameters*, requires each generator/storage site to develop waste characterization procedure(s). Permit Attachment C, Sections C-2 and C-5a, require the DOE to review these procedures during initial and annual audits.

The CCP uses the same program plans and procedures at each certified generator/storage site. Note that a generator/storage site is considered “certified” once an initial audit is performed and the final audit report is issued by the DOE and subsequently approved by the NMED. Although the same procedures are used at each generator/storage site, they are reviewed at each annual audit. Currently, the CCP program is certified at Argonne National Laboratory, Idaho National Laboratory, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, and Savannah River Site. Allowing a graded approach to scheduling audits will reduce the redundant review of these same procedures at each annual audit at each small quantity generator/storage site.

Furthermore, Permit Attachment C3, Section C3-9, requires generator/storage sites to notify the DOE of changes to data quality-affecting procedures. The DOE is required by Permit Attachment C, Section C-2, to review these changes before they are implemented. These procedures are then subject to redundant review at each annual audit.

Few changes are made to generator/storage site data quality-affecting procedures. The DOE is essentially repeatedly reviewing the same procedures every year. Utilizing the graded approach will reduce this redundancy.

Ensure resources are efficiently applied

Annual site audits are currently performed in accordance with the Permit without considering whether they are necessary to evaluate changes that have occurred at generator/storage sites, past performance, or quantities of waste being characterized, and whether a certified site is shipping TRU mixed waste. Audits are resource intensive, requiring CBFO management, audit team, and generator/storage site resources, and also NMED resources as observers. Similarly, annual recertification audits impact waste characterization personnel and resources at generator/storage sites. The changes in this PMR will allow small quantity generator/storage site resources to be focused on compliant waste characterization operations.

Significant resources are required in order to develop the audit scope, update checklists, prepare for and perform the audit, develop the required reports, and track and address any issues identified. Utilizing a graded approach for scheduling small quantity generator/storage site recertification audits will allow the DOE to perform these audits at sites actively shipping and/or characterizing waste based on need. This change would potentially reduce the number of audits performed within a 2-year period because audits will be scheduled utilizing need-based criteria that assure waste characterization programs have been implemented and comply with applicable requirements of the WAP while eliminating audits deemed unnecessary when minimal changes to the program have occurred or when few conditions adverse to quality have been identified in the generator/storage site waste characterization program. This will allow the DOE to focus audit team resources where needed, resulting in overall resource/cost savings.

Some generator/storage sites may be characterizing and shipping only small volumes of waste (i.e., few containers). Small quantity sites such as Lawrence Livermore National Laboratory and Argonne National Laboratory are examples of sites shipping only small volumes of waste. The CCP is certified at these sites and is characterizing waste on an as-needed basis.

Some sites build up an inventory of characterized waste containers prior to shipping the waste to the WIPP facility. These containers might not be shipped within the annual auditing cycle. The DOE will consider the quantity of waste being characterized and the shipping rate at generator/storage sites in developing the annual audit schedule.

Place audit focus on areas of greatest importance and provide incentive for generator/storage sites to perform continuously at a high level

Implementing the graded approach to scheduling will enhance protection of human health and the environment by placing audit focus on areas of greatest importance (e.g., potential weakness identified in a generator/storage site waste characterization program). The DOE will consider the results of previous audits and surveillances in developing the annual schedule. Small quantity generator/storage sites with good performance may only be required to be audited once within a 2-year period, while those with poor performance (e.g., many conditions adverse to quality are identified) may have to be audited at least annually. Because audits significantly impact resources at generator/storage sites, this criterion will serve as an incentive for maintaining good performance.

Please note that the DOE plans to continue performing surveillances, as needed at generator/storage sites. Surveillances verify whether an item, activity, system, or process conform to specified requirements. For example, a surveillance can be done when a new waste characterization process is started.

Scheduling criteria

The following is a discussion of the graded approach scheduling criteria for subsequent audits:

- replacement of the contracting organization performing the TRU waste management,
    - Audits may be required to assess the performance of new contracting organizations. This will depend on the level of change. For example, changes to a management and operating contractor may have no impact on waste characterization activities; however, changes to subcontractors performing Permit-required waste characterization testing activities may require evaluation. The DOE will consider these changes in scheduling audits.
- new Permit-related waste characterization activities (e.g., new radiography or visual examination [**VE**] processes),
    - Sometimes new equipment or new waste characterization test methods are deployed at sites. This may require audit or surveillance, depending on the significance of the change. The DOE will consider these changes in scheduling audits.
- changes in waste types or forms (e.g., additional Summary Category Groups not previously approved by the NMED),
    - Characterization of waste per each Summary Category Group (Homogeneous Solids [Summary Category S3000], Soil/Gravel [Summary Category S4000], and Debris Waste [Summary Category S5000]) is evaluated in audits. For example, the initial audit may have only included one Summary Category Group, and another is added later. The DOE will consider changes In Summary Category Groups in developing the annual audit schedule.
- quantity of waste being characterized,

- Some small quantity generator/storage sites may be characterizing and shipping only small volumes of waste (i.e., few containers). The CCP is certified at these sites and is characterizing waste on an as-needed basis. The DOE will consider the quantity of waste being characterized and the shipping rates at small quantity generator/storage sites in developing the annual audit schedule.

- unexpected issues and events, and
    - The DOE will consider reportable occurrences in developing the audit schedule.

- input received from the NMED.
    - The NMED observes generator/storage site audits and is very familiar with their waste characterization programs. The DOE will consider input from the NMED in developing the annual audit schedule.

Consolidation of audit scheduling information into Permit Attachment C6, Section C6-1

The changes described in the overview of this PMR pertaining to consolidating audit scheduling information are required to reduce redundancy, avoid inconsistency to facilitate implementation of the WAP, and to minimize administrative burden in updating and maintaining the Permit.

The changes in this PMR do not reduce the ability of the Permittees to determine generator/storage sites' TRU mixed waste characterization program implementation and compliance with the WAP and thereby provide continued protection to human health and the environment for the following reasons:

- Small quantity generator/storage site recertification audits will be scheduled and performed where needed based on criteria that assure waste characterization programs are adequate while eliminating audits that are not necessary when minimal changes to the program have occurred, or when minimal conditions adverse to quality have been identified in the generator/storage site waste characterization program.

- Implementing the graded approach to audit scheduling will enhance protection of human health and the environment by placing audit focus on areas of greatest importance (e.g., potential weakness identified in a generator/storage site waste characterization program). This will also serve as an incentive for generator/storage sites to perform continuously at a high level with regard to compliance.

- This change will ensure DOE and generator/storage site resources are used where most needed.

- Each site will be audited at least once within a 2-year period.

4. 20.4.1.900 NMAC (incorporating 40 CFR §270.42 (b)(1)(iv)) requires the applicant to provide the applicable information required by 40 CFR §§270.13 through 270.21, 270.62, and 270.63.

The Regulatory Crosswalk describes those portions of the Permit that are affected by this PMR. Where applicable, regulatory citations in this modification request reference Title 20, Chapter 4,

Part 1, NMAC, revised December 1, 2018, incorporating the CFR (40 CFR Parts 264 and 270). Title 40 CFR §§270.16 through 270.21, 270.62, and 270.63 are not applicable at the WIPP facility. Consequently, they are not listed in the Regulatory Crosswalk table.

5. 20.4.1.900 NMAC (incorporating 40 CFR §270.11(d)(1) and 40 CFR §270.30(k)) requires that any person signing under paragraphs a and b must certify the document in accordance with 20.4.1.900 NMAC.

The transmittal letter for this PMR contains the signed certification statement in accordance with Permit Part 1, Section 1.9.

Regulatory Crosswalk

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the Permit or Permit	Yes	No
§270.13		Contents of Part A permit application	Attachment B, Part A		✓
§270.14(b)(1)		General facility description	Attachment A		✓
§270.14(b)(2)	§264.13(a)	Chemical and physical analyses	Attachment C		✓
§270.14(b)(3)	§264.13(b)	Development and implementation of waste analysis plan	Attachment C	✓	
	§264.13(c)	Off-site waste analysis requirements	Attachment C		✓
§270.14(b)(4)	§264.14(a-c)	Security procedures and equipment	Part 2.6		✓
§270.14(b)(5)	§264.15(a-d)	General inspection requirements	Attachment E		✓
	§264.174	Container inspections	Attachment E		✓
§270.23(a)(2)	§264.602	Miscellaneous units inspections	Attachment E		✓
§270.14(b)(6)		Request for waiver from preparedness and prevention requirements of Part 264 Subpart C	NA		✓
§270.14(b)(7)	264 Subpart D	Contingency plan requirements	Attachment D		✓
	§264.51	Contingency plan design and implementation	Attachment D		✓
	§264.52 (a) & (c-f)	Contingency plan content	Attachment D		✓
	§264.53	Contingency plan copies	Attachment D		✓
	§264.54	Contingency plan amendment	Attachment D		✓
	§264.55	Emergency coordinator	Attachment D		✓
	§264.56	Emergency procedures	Attachment D		✓
§270.14(b)(8)		Description of procedures, structures or equipment for:	Part 2.10		✓
§270.14(b)(8)(i)		Prevention of hazards in unloading operations (e.g., ramps and special forklifts)	Part 2.10		✓
§270.14(b)(8)(ii)		Runoff or flood prevention (e.g., berms, trenches, and dikes)	Part 2.10		✓
§270.14(b)(8)(iii)		Prevention of contamination of water supplies	Part 2.10		✓
§270.14(b)(8)(iv)		Mitigation of effects of equipment failure and power outages	Part 2.10		✓
§270.14(b)(8)(v)		Prevention of undue exposure of personnel (e.g., personal protective equipment)	Part 2.10		✓
§270.14(b)(8)(vi) §270.23(a)(2)	§264.601	Prevention of releases to the atmosphere	Part 4 Attachment A2 Attachment N		✓
	264 Subpart C	Preparedness and Prevention	Part 2.10		✓
	§264.31	Design and operation of facility	Part 2.10		✓
	§264.32	Required equipment	Part 2.10 Attachment D		✓
	§264.33	Testing and maintenance of equipment	Attachment E		✓
	§264.34	Access to communication/alarm system	Part 2.10		✓
	§264.35	Required aisle space	Part 2.10		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the Permit or Permit	Yes	No
	§264.37	Arrangements with local authorities	Attachment D		✓
§270.14(b)(9)	§264.17(a-c)	Prevention of accidental ignition or reaction of ignitable, reactive, or incompatible wastes	Part 2.10		✓
§270.14(b) (10)		Traffic pattern, volume, and controls, for example: Identification of turn lanes Identification of traffic/stacking lanes, if appropriate Description of access road surface Description of access road load-bearing capacity Identification of traffic controls	Attachment A3		✓
§270.14(b) (11)(i) and (ii)	§264.18(a)	Seismic standard applicability and requirements	Part B, Rev. 6 Chapter B		✓
§270.14(b) (11)(iii-v)	§264.18(b)	100-year floodplain standard	Part B, Rev. 6 Chapter B		✓
	§264.18(c)	Other location standards	Part B, Rev. 6 Chapter B		✓
§270.14(b) (12)	§264.16(a-e)	Personnel training program	Part 2 Attachment F		✓
§270.14(b) (13)	264 Subpart G	Closure and post-closure plans	Attachment G & H		✓
§270.14(b)(13)	§264.111	Closure performance standard	Attachment G		✓
§270.14(b)(13)	§264.112(a), (b)	Written content of closure plan	Attachment G		✓
§270.14(b)(13)	§264.112(c)	Amendment of closure plan	Attachment G		✓
§270.14(b)(13)	§264.112(d)	Notification of partial and final closure	Attachment G		✓
§270.14(b)(13)	§264.112(e)	Removal of wastes and decontamination/dismantling of equipment	Attachment G		✓
§270.14(b)(13)	§264.113	Time allowed for closure	Attachment G		✓
§270.14(b)(13)	§264.114	Disposal/decontamination	Attachment G		✓
§270.14(b)(13)	§264.115	Certification of closure	Attachment G		✓
§270.14(b)(13)	§264.116	Survey plat	Attachment G		✓
§270.14(b)(13)	§264.117	Post-closure care and use of property	Attachment H		✓
§270.14(b)(13)	§264.118	Post-closure plan; amendment of plan	Attachment H		✓
§270.14(b)(13)	§264.178	Closure/ containers	Attachment G		✓
§270.14(b)(13)	§264.601	Environmental performance standards-Miscellaneous units	Attachment G		✓
§270.14(b)(13)	§264.603	Post-closure care	Attachment G		✓
§270.14(b)(14)	§264.119	Post-closure notices	Attachment H		✓
§270.14(b)(15)	§264.142	Closure cost estimate	NA		✓
	§264.143	Financial assurance	NA		✓
§270.14(b)(16)	§264.144	Post-closure cost estimate	NA		✓
	§264.145	Post-closure care financial assurance	NA		✓
§270.14(b)(17)	§264.147	Liability insurance	NA		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the Permit or Permit	Yes	No
§270.14(b)(18)	§264.149-150	Proof of financial coverage	NA		✓
§270.14(b)(19)(i), (vi), (vii), and (x)		Topographic map requirements Map scale and date Map orientation Legal boundaries Buildings Treatment, storage, and disposal operations Run-on/run-off control systems Fire control facilities	Attachment B Part A		✓
§270.14(b)(19)(ii)	§264.18(b)	100-year floodplain	Attachment B Part A		✓
§270.14(b)(19)(iii)		Surface waters	Attachment B Part A		✓
§270.14(b)(19)(iv)		Surrounding Land use	Attachment B Part A		✓
§270.14(b)(19)(v)		Wind rose	Attachment B Part A		✓
§270.14(b)(19)(viii)	§264.14(b)	Access controls	Attachment B Part A		✓
§270.14(b)(19)(ix)		Injection and withdrawal wells	Attachment B Part A		✓
§270.14(b)(19)(xi)		Drainage on flood control barriers	Attachment B Part A		✓
§270.14(b)(19)(xii)		Location of operational units	Attachment B Part A		✓
§270.14(b)(20)		Other federal laws Wild and Scenic Rivers Act National Historic Preservation Act Endangered Species Act Coastal Zone Management Act Fish and Wildlife Coordination Act Executive Orders	Attachment B Part A		✓
§270.15	264 Subpart I	Containers	Attachment A1		✓
	§264.171	Condition of containers	Attachment A1		✓
	§264.172	Compatibility of waste with containers	Attachment A1		✓
	§264.173	Management of containers	Attachment A1		✓
	§264.174	Inspections	Attachment E Attachment A1		✓
§270.15(a)	§264.175	Containment systems	Attachment A1		✓
§270.15(c)	§264.176	Special requirements for ignitable or reactive waste	Part 2		✓
§270..15(d)	§264.177	Special requirements for incompatible wastes	Part 2		✓
	§264.178	Closure	Attachment G		✓
§270.15(e)	§264.179	Air emission standards	Part 4 Attachment N		✓
§270.23	264 Subpart X	Miscellaneous units	Attachment A2		✓
§270.23(a)	§264.601	Detailed unit description	Attachment A2		✓

Regulatory Citation(s) 20.4.1.900 NMAC (incorporating 40 CFR Part 270)	Regulatory Citation(s) 20.4.1.500 NMAC (incorporating 40 CFR Part 264)	Description of Requirement	Added or Clarified Information		
			Section of the Permit or Permit	Yes	No
§270.23(b)	§264.601	Hydrologic, geologic, and meteorologic assessments	Part 5 Attachment L		✓
§270.23(c)	§264.601	Potential exposure pathways	Part 4 Attachment A2 Attachment N		✓
§270.23(d)		Demonstration of treatment effectiveness	NA		✓
	§264.602	Monitoring, analysis, inspection, response, reporting, and corrective action	Part 2 Part 4 Part 5 Attachment A2 Attachment N		✓
	§264.603	Post-closure care	Attachment H Attachment H1		✓
	264 Subpart E	Manifest system, record keeping, and reporting	Part 2 Attachment C		✓

Appendix A
Table of Changes

Table of Changes

Affected Permit Section	Explanation of Change
Part 2, *Table of Contents*	Modified the Permit language for 2.3.2.2 from: “Observation of Audits and Generator Site Technical Reviews” to: “Observation of Certification/Recertification Audits and Generator Site Technical Reviews.”
Part 2, Section 2.3.2.2, *Observation of Audits*	Modified the Permit language for the title of Part 2, Section 2.3.2.2 from: “Observation of Audits and Generator Site Technical Reviews” to: “Observation of Certification/Recertification Audits and Generator Site Technical Reviews.”
	Modified the Permit language from: “DOE shall provide the Secretary with a current audit schedule on a monthly basis and notify the Secretary no later than 30 calendar days prior to each audit.” to “The DOE shall provide the Secretary with an audit schedule, as specified in Permit Attachment C6, Section C6-1. The DOE shall notify the Secretary no later than 30 calendar days prior to each audit.”
Attachment C-5, Section C-5a, *Phase 1 Waste Stream Screening and Verification*	Removed the following Permit language: “Before the Permittees begin the process of accepting TRU mixed waste from a generator/storage site, an initial audit of that generator/storage site will be conducted as part of the Audit and Surveillance Program (Permit Attachment C6).”
	Modified the following Permit language from: “Subsequent audits, focusing on the results of waste characterization, will be performed at least annually.” to: “Subsequent audits, focusing on the results of waste characterization, will be performed as specified in Permit Attachment C6, Section C6-1.”
	Modified the following Permit language from: “Audits will be performed at least annually thereafter, including the possibility of unannounced audits (i.e., not a regularly scheduled audit).” to: “Subsequent audits will be performed thereafter, including the possibility of unannounced audits (i.e., not a regularly scheduled audit).”
Attachment C4-3g, *Audits of Acceptable Knowledge*	Modified the following Permit language from: “This initial audit will establish an approved baseline that will be reassessed annually by the DOE.” to: “This initial audit will establish an approved baseline that will be reassessed by the DOE.”
	Modified the Permit language from: “The DOE is provided the required waste characterization information prior to management, storage, or disposal of that waste at WIPP and also will conduct audits at least annually.” to: “The DOE is provided the required waste characterization information prior to management, storage, or disposal of that waste at WIPP and also will conduct subsequent audits.”

Affected Permit Section	Explanation of Change
Attachment C6, Section C6-1, *Introduction*	Added the following Permit language: "The Permittees will provide a proposed annual generator/storage site audit schedule for the upcoming calendar year to the NMED, by October 1, for approval by NMED within 90 days of receipt. Any subsequent changes to the annual schedule proposed by the Permittees will be promptly submitted to the NMED for approval. The Permittees will consider the following for developing the annual audit schedule: • initial audits if any required, • replacement of the contracting organization performing the TRU waste management, • new Permit-related waste characterization activities (e.g., new radiography or VE processes), • changes in waste types or forms (e.g., additional Summary Category Groups not previously approved by the NMED), • quantity of waste being characterized, • unexpected issues and events, and • input received from the NMED. Before the Permittees begin the process of accepting TRU mixed waste from a generator/storage site, an initial audit of that generator/storage site will be conducted as part of the Audit and Surveillance Program. Each generator/storage site shipping TRU mixed waste to the WIPP facility must be audited at least annually with the exception of ANL, SNL, and LLNL, due to the small quantity of waste being generated currently at these generator/storage sites, which may be audited every two years if approved by NMED in the annual audit schedule."
Attachment C6, Section C6-2, *Audit Procedures*	Modified the following Permit language from: "Assign auditors and lead auditors to perform annual certification audits" to: "Assign auditors and lead auditors to perform certification audits"
Attachment C6, Section C6-3, *Audit Position Functions*	Modified the following Permit language from: "Audits will be conducted at least annually for each site involved in the waste characterization program." to: "Audits will be conducted at each site involved in the waste characterization program."
	Modified the Permit language from: "Annual certification audits shall address contact-handled (CH) and remote-handled (RH) waste characterization activities if the site has approval or is seeking approval for such wastes." to: "Certification and recertification audits shall address contact-handled (CH) and remote-handled (RH) waste characterization activities if the site has approval or is seeking approval for such wastes."

Appendix B
Revised Permit Text

PART 2 – GENERAL FACILITY CONDITIONS

TABLE OF CONTENTS

2.3 GENERAL WASTE ANALYSIS

2.3.2 Audit and Surveillance Program

2.3.2.2 Observation of Certification/Recertification Audits and Generator Site Technical Reviews

The Secretary may observe such audits as necessary to validate the implementation of and compliance with applicable WAP requirements at each generator/storage site. The NMED will be invited to the daily audit team caucus as observers. The DOE shall provide the Secretary with ~~a~~an ~~current~~ audit schedule, as specified in Permit Attachment C6, Section C6-1. ~~on a monthly basis and~~ The DOE shall notify the Secretary no later than 30 calendar days prior to each audit.

ATTACHMENT C

WASTE ANALYSIS PLAN

C-5a Phase 1 Waste Stream Screening and Verification

The first phase of the waste screening and verification process will occur before TRU mixed waste is shipped to the WIPP facility. ~~Before the Permittees begin the process of accepting TRU mixed waste from a generator/storage site, an initial audit of that generator/storage site will be conducted as part of the Audit and Surveillance Program (Permit Attachment C6).~~ The RCRA portion of the generator/storage site audit program will provide on-site verification of characterization procedures; BDR preparation; and recordkeeping to ensure that applicable provisions of the WAP requirements are met. Another portion of the Phase I verification is the WSPF approval process. At the WIPP facility, this process includes verification that the required elements of the WSPF and the CIS are present (Permit Attachment C3, Section C3-6b(1)) and that the waste characterization information meets acceptance criteria required for compliance with the WAP .

A generator/storage site must first prepare a QAPjP, which includes applicable WAP requirements, and submit it to DOE for review and approval (Permit Attachment C5). Once approved, a copy of the QAPjP is provided to NMED for examination. The generator/storage site will implement the specific parameters of the QAPjP after it is approved. An initial audit will be performed after QAPjP implementation and prior to the generator/storage site being certified for shipment of waste to the WIPP facility. Subsequent audits, focusing on the results of waste characterization, will be performed ~~at least annually~~ as specified in Permit Attachment C6, Section C6-1. The DOE has the right to conduct unannounced audits and to examine any records that are related to the scope of the audit. See Section C-5a(3) and Permit Attachment C6 for further information regarding audits.

C-5a(3) Audit and Surveillance Program

The DOE will perform an initial audit at each generator/storage site performing waste characterization activities prior to the formal acceptance of the WSPFs and/or any waste characterization data supplied by the generator/storage sites. Subsequent ~~A~~audits will be performed ~~at least annually~~ thereafter, including the possibility of unannounced audits (i.e., not a regularly scheduled audit). These audits will allow NMED to verify that the Permittees have implemented the WAP and that generator/storage sites have implemented a QA program for the characterization of waste and meet applicable WAP requirements. The accuracy of physical waste description and waste stream assignment provided by the generator/storage site will be verified by review of the radiography results, and visual examination of data records and radiography images (as necessary) during audits conducted by DOE. More detail on this audit process is provided in Permit Attachment C6.

C4-3g Audits of Acceptable Knowledge

The DOE will conduct an initial audit of each site prior to certifying the site for shipment of TRU mixed waste to the WIPP facility. This initial audit will establish an approved baseline that will be reassessed ~~annually~~ by the DOE. These audits will verify compliance with the requirements specified in the WAP (Permit Attachment C). The audits will be used to verify compliance with the compilation, application, and interpretation requirements of AK information specified in this Permit at the sites, and to evaluate the completeness and defensibility of site-specific AK documentation related to hazardous waste characterization. Permit Attachment C6 gives a description of the overall audit program and a required checklist. Figure C4-2 includes the primary steps associated with the audit process of AK.

The DOE disseminates information regarding TRU mixed waste characterization requirements and program status through the WIPP Home Page. The Permittees will use this web page to disseminate information regarding TRU mixed waste streams, RCRA compliance, and operational and programmatic issues, methods development, and waste characterization information, including the application of AK. The DOE is provided the required waste characterization information prior to management, storage, or disposal of that waste at WIPP and also will conduct subsequent audits ~~at least annually~~. The Permittees will maintain an Operating Record for review during regulatory agency audits. The NMED may also review any information relevant to the scope of the audit during site audits. The DOE will notify the NMED regarding any site's failure to implement corrective actions associated with hazardous waste characterization as specified in Permit Parts 1 and 2 and Permit Attachment C3.

ATTACHMENT C6

AUDIT AND SURVEILLANCE PROGRAM

C6-1 Introduction

The Waste Isolation Pilot Plant (**WIPP**) Audit and Surveillance Program shall ensure that: 1) the operators of each generator/storage site (**site**) that plan to transport transuranic (**TRU**) mixed waste to the WIPP facility conduct testing of wastes in accordance with the current WIPP Waste Analysis Plan (**WAP**) (Permit Attachment C), and 2) the information supplied by each site to satisfy the waste screening and acceptability requirements of Permit Attachment C, Section C-4 of the WAP is being managed properly. The U.S. Department of Energy (**DOE**) will conduct these audits and surveillances at each site performing these activities in accordance with a standard operating procedure (**SOP**). The New Mexico Environment Department (**NMED**) personnel may observe these audits and surveillances to validate the implementation of WAP requirements at each site. As specified in Permit Part 2, Section 2.3.2.2, the NMED will be invited to the daily audit team caucus as observers. Only personnel with appropriate DOE clearances will have access to classified information during audits. Classified information will not be included in audit reports and records. The audit SOP will contain steps for selecting audit personnel, reviewing applicable background information, preparing an audit plan, preparing audit checklists, conducting the audit, developing an audit report, and following up audit deficiencies. A deficiency is any failure to comply with an applicable provision of the WAP. The checklists for each site shall include, at a minimum, the appropriate checklists found in Tables C6-1 through C6-4 for the summary category groups undergoing audit.

The Permittees will provide a proposed annual generator/storage site audit schedule for the upcoming calendar year to the NMED, by October 1, for approval by NMED within 90 days of receipt. Any subsequent changes to the annual schedule proposed by the Permittees will be promptly submitted to the NMED for approval. The Permittees will consider the following for developing the annual audit schedule:

- initial audits if any required,
- replacement of the contracting organization performing the TRU waste management,
- new Permit-related waste characterization activities (e.g., new radiography or VE processes),
- changes in waste types or forms (e.g., additional Summary Category Groups not previously approved by the NMED),
- quantity of waste being characterized,
- unexpected issues and events, and
- input received from the NMED.

Before the Permittees begin the process of accepting TRU mixed waste from a generator/storage site, an initial audit of that generator/storage site will be conducted as part of the Audit and Surveillance Program. Each generator/storage site shipping TRU mixed waste to the WIPP facility must be audited at least annually with the exception of ANL, SNL, and LLNL, due to the small quantity of waste being generated currently at these generator/storage sites, which may be audited every two years if approved by NMED in the annual audit schedule.

C6-2 Audit Procedures

Audit procedures shall establish the responsibilities and methodology for planning, scheduling, performing, reporting, verifying, and closing announced and unannounced audits of sites. Records of audit activities shall be part of the WIPP Operating Record and maintained at the WIPP facility until closure. The NMED shall be provided unlimited access to these records.

Approved SOPs shall be used to describe audit activities and requirements. These SOPs define the responsibilities of specific positions necessary to manage this audit program. The DOE manager who oversees the audit program shall ensure that the following tasks are performed:

- Schedule audits
- Designate lead auditor(s)
- Appoint auditor and lead auditor trainees
- Maintain auditor training and qualification records
- Assure that auditors have been given appropriate training, including training on the WAP
- Assign auditors and lead auditors to perform ~~annual~~ certification audits
- Review and approve final audit reports
- Oversee tracking and closure of deficiencies and any observations requiring action
- Assure records are entered into the WIPP Operating Record and are properly maintained until facility closure

C6-3 Audit Position Functions

Audits will be conducted ~~at least annually for~~ at each site involved in the waste characterization program. Both announced and unannounced audits will address the following:

- Results of previous audits
- Changes in programs or operations
- New programs or activities being implemented
- Changes in key personnel

~~Annual c~~Certification and recertification audits shall address contact-handled (**CH**) and remote-handled (**RH**) waste characterization activities if the site has approval or is seeking approval for such wastes. At a minimum, the audit shall evaluate AK documentation for CH and RH waste separately by Summary Category Group, as applicable.