HNF-6807
Revision 1-E
EDC #: HNF-EDC-04-24275
Copy No. __

Safety Analysis Report for Packaging (Onsite) for the Pipe Overpack Container

Document Type: SARP Program/Project: WM

P. G. Johnson
Duratek Technical Services for Fluor Hanford, Inc.

Date Published
December 2004

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
U S. Department of Energy under Contract DE-AC06-96RL13200

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Nancy A. Fouad 1-3-05
Release Approval Date

JAN 0 3 2005
DATE: HANFORD RELEASE
STA: 15 ID: 65
Release Stamp

Approved for Public Release;
Further Dissemination Unlimited

Total Pages: 540

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Key Words: POC, SARP, TRUPACT-II, ash, drum, radioactive, Type B, HRCQ, fissile, transuranic, 55-gal, 85-gal, alloy, cryolite, oxide/mixed oxide, OX/MOX, transuranic-bearing.

Abstract: The pipe overpack container (POC) was designed for shipment in the TRUPACT-II. The TRUPACT-II provides the POC impact and thermal protection. Use of the TRUPACT-II for onsite shipments is not practical. A POC Overpack was designed for use during onsite shipments. The POC overpack provides protection to the POC equivalent to that provided by U.S. Department of Transportation requirements. This safety analysis report for packaging demonstrates that the POC Overpack provides the equivalent level of protection for Hanford Site conditions.

The POC Overpack system is used to transport plutonium-laden ash materials. Ash is a mixture of coarse, granular, fine, and very fine particulate materials from an incinerator.

An alternative risk-based configuration in which the POC is shipped without the 85-gal drum overpack is authorized only within the 200 West Area of the Hanford Site. Plutonium-laden ash, plutonium alloy, plutonium-bearing cryolite flux, and transuranic-bearing waste in an inert powder or pelletized form, such as oxide/mixed oxide (OX/MOX), are authorized payloads for this configuration. Alloy consists of variously shaped metal scraps. OX/MOX consists of powders and pellets containing up to 30% plutonium and uranium.

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Change Control Record (continued)

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) DA/TA	Date
1-E RS	Corrects decay heat limit for alloy payload in Shipper's Checklist. Replace RL approval letters/safety evaluaton report, contents, lists, and page A6-17. Per HNF-EDC-04-24275.	DL McCall DL McCall	12/23/04

List of Effective Pages

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B1-2	1-D				

Department of Energy
Richland Operations Office
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Richland, Washington 99352

0103273
CC RECD: 06/14/01

01-ABD-082

JUN 14 2001

Mr. E. K. Thomson, President
Fluor Hanford, Inc.
Richland, Washington 99352

Dear Mr. Thomson:

CONTRACT NO. DE-AC06-96RL13200 - REQUEST FOR APPROVAL OF SAFETY ANALYSIS REPORT FOR PACKAGING (SARP), HNF-6807, REV 1, PIPE OVERPACK CONTAINER, ENGINEERING CHANGE NOTICE #660212

This letter is in response to letter FH-0102861 from D. B. Van Leuven to me, "Safety Evaluation for Packaging, HNF-6807, Rev 1, Pipe Overpack Container, Engineering Change Notice #660212," dated May 30, 2001. RL has reviewed and approves the revision to the SARP as documented in the enclosed Safety Evaluation Report. If you have any questions, please contact me, or your staff may contact Richard Self, Authorization Basis Division, on (509) 372-2843.

Sincerely,

Keith A. Klein
Manager

ABD:RJS

Enclosure

cc w/encl:
M. T. Sautman, DNFSB
M. W. Frei, EM-40
E. S. Aromi, FHI
B. A. Austin, FHI
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Safety Evaluation Report
Safety Analysis Report for Packaging (Onsite)
Pipe Overpack Container (POC)
(HNF-6807 Rev. 1)

June 13, 2001

U.S. Department of Energy
Richland Operations Office

Approval

Shirley J. Olinger, Assistant Manager
for Safety and Engineering

for

C. J. Bosted,
Authorization Basis Division

Richard J. Self, Team Lead

2

Introduction

This Safety Evaluation Report (SER) documents the U.S. Department of Energy, Richland Operations Office (RL) review of the Safety Analysis Report for Packaging (SARP) (Onsite), Pipe Overpack Container (POC) Package, document HNF-6807, Rev. 1. The basis and any conditions of approval are identified.

The pipe overpack container (POC) was designed for shipment in the TRUPACT-II. Use of the TRUPACT-II onsite is not practical. Therefore, a POC Overpack packaging system was designed for onsite use utilizing an 85 Gallon Drum as an overpack. The U.S. Department of Energy (DOE) Order 460.1A (DOE 1996) requires that onsite transfers of Type B radioactive material packagings comply with the Hazardous Materials Regulations of the U.S. Department of Transportation (DOT) (49 CFR 171-180) or show that a degree of safety equivalent to the regulations is demonstrated. This Safety Analysis Report for Packaging (SARP) demonstrates that the POC Overpack packaging provides this equivalent degree of safety under Hanford Site conditions.

An alternative configuration, in which the POC is shipped without a drum overpack, is also authorized for use in the 200 West Area of the Hanford Site only. Even though this configuration does not meet 10CFR71 site equivalent standards, by applying a risk-based approach consistent with DOE Order 5480.23, the limited configuration is considered safe for shipment.

The POC Overpack packaging consists of two primary components.. These are the 210 L (55-gal) pipe overpack container, or POC, and the 322 L (85-gal) drum overpack. The POC includes a 47.4 L (12.5-gal) to 48.6 L (12.8-gal) vented inner containment vessel (pipe component) surrounded by Celotex™/plywood (cane fiberboard) spacers placed in a vented 210 L (55-gal) drum. It is also authorized for use limited to the 200 West Area of the Hanford Site without the 322 L (85-gal) Overpack drum.

The drum overpack is a vented 322 L (85-gal) drum. The overpack includes a fire-resistant spacer placed on top of the POC and a plywood spacer under the POC. The drum overpack has four vent holes to protect the POC from impact and fire conditions during transport on the Hanford Site.

Detailed system descriptions are provided in Part A, Section 2.0.

The Pipe Overpack Container (POC) Package is used to transport Plutonium-and Americium laden ash, other incinerated materials Plutonium Alloy residues, and Plutonium bearing Cryolite flux and other radioactive materials subject to the following content restrictions:

- 200 ^{239}Pu Fissile Gram Equivalent (FGE)
- 0.932 Watts decay heat (Ash payloads and incinerated materials)
  2.8 Watts decay heat (Plutonium Alloys and Plutonium bearing Cryolite flux)

- 10% by weight total combined moisture and organic content (Ash payloads and incinerated materials).
  1% by weight total combined moisture and organic content (Plutonium Alloys and Plutonium bearing Cryolite flux).

- Isotope and activity limited as defined in HNF-6807, Rev 1 POC SARP Table A3-1 (Ash payloads) or Table 3-2 (Alloy payloads), *Bounding Radiological Inventory of the POC*, plus their decay products at activities not to exceed 6E-3 Ci or 0.1 A_2s.

- Activity and mass limits, provided in Tables A3-1 and A3-2 as applicable, are for each individual isotope. The cumulative mass of all isotopes cannot exceed 200 ^{239}Pu FGE as stated above.

- Flammable organics are limited to 500 parts per million (ppm) in the headspace of any POC.

The POC, as documented in the SARP, meets the requirements of DOE Order 460.1A *Packaging and Transportation Safety*, for onsite shipments. Onsite shipments are required to demonstrate equivalent level of safety to 10CFR71 requirements. The SARP analysis shows that the POC maintains leak tight containment of the waste for all Normal Conditions of Transport (NCT) and for Hypothetical Accident Conditions (HAC) as required by 10CFR71. This packaging system therefore meets the requirement for demonstrating an Equivalent Level of Safety to 10CFR71 safety criteria for onsite transportation safety as established by DOE Order 460.1A, and as further specified in HNF-PRO-157, Radioactive Waste Shipments, Rev 1A and HNF-PRO-154, Responsibilities and Procedures, for all Hazardous Materials, Rev 1.

Specific discussion of risk is contained in the POC SARP, Part B, Chapter 3.0 provide additional assurance of the ability to safely use the cask onsite. Based on this review, it is the judgement of the review team that shipments, as described in the analyses and conditions identified in POC, SARP document HNF-6807, Rev. 1, present acceptable levels of risk and are approved.

Scope of Review

The POC was designed for shipment in the TRUPACT-II. DOE Order 460.1A (DOE 1996) requires that onsite transfers of Type B radioactive material comply with the Hazardous Materials Regulations of the U. S. Department of Transportation (DOT) 49CFR171-180) or show that a degree of safety equivalent to the regulations is demonstrated.

The review resulted in approval for onsite use based on the given inventory and design. As part of the review supporting documentation, calculation methods, and design criteria were verified.

Technical Review

The review team assessed the SARP sections for understandability of the information as presented, and internal consistency of the document. In addition, there were specific areas of consideration unique to each topic as discussed below. Most observations or comments generated by the review team related to internal consistency of the document, clarity in the presentation of information, and general editorial changes. Changes incorporated due to the review rectified any inconsistencies or errors found.

Material and Fabrication Specifications Review

Part A of the SARP presents the design and specifications for the POC and its approved payload. The design drawings and descriptions provided appear to meet regulatory requirements and are consistently applied in the analyses in Part B of the SARP.

Radiological Risk Review

The Radiological Risk Review for the POC SARP is configuration dependant. The two authorized package configurations are:

1. The POC is packaged within an 85 Gallon Drum Overpack for shipment, and
2. For selected, authorized shipments within the 200 West Area, an alternative configuration, in which the POC is shipped without an 85 Gallon drum overpack.

As discussed in POC SARP, Part B, Section 3, no radiological risk assessment was performed for the package configuration utilizing an 85 Gallon Drum Overpack as the package meets 10CFR71 performance requirements for both NCT and HAC. By meeting the 10CFR71 performance requirements, the package can be assumed to survive all credible accident scenarios without release of its radioactive contents. Risk is a function of Accident Frequency and Dose Consequence. By meeting the 10CFR71 performance requirements, the Accident Frequency is zero, thus making the risk zero.

For the limited case where there is no 85 Gallon Drum Overpack as part of the packaging configuration, the package does not meet the onsite equivalent level of safety to 10CFR71. However, the configuration proposed in the ECN, which applied a risk-based approach consistent with DOE Order 5480.23, is deemed acceptable. A Radiological Risk Evaluation was conducted in POC SARP, Part B, Section 3.3 *Appendix: Analysis of POC Configuration without 322 L (85-GAL) Overpack.* This analysis evaluates a risk based analysis in place of the usual 10CFR71 deterministic based approach. The analysis adequately analyzes the potential risk based upon accident frequency and dose consequence considerations.

Structural Review

Review of Part B, Chapter 7, Structural Evaluation, focused on material properties and stresses, structural performance of the package design under normal and accident conditions, and the appropriateness of input parameters to ABAQUS, the computer code used. The review team performed limited manual confirmatory analyses.

The POC meets the minimum transport requirements for both NCT and HAC within the Hanford Site. The structural evaluation of the POC demonstrated that it will sustain the loads of site wide performance tests for both normal and accident conditions and maintain containment. The Structural Evaluation was based upon material properties and allowable stress. Package performance during the puncture test was demonstrated by determining the minimum thickness required to prevent puncture. The resulting positive margins of safety show that there is sufficient material thickness to prevent puncture and maintain containment. Incorporation of thermal and pressure stresses from Chapters 8 and 9, and environmental heat loading were also verified.

Due to the potential for the bolts used on the 210 liter (55-gal) and 322 liter (85-gal) drums to fail in the brittle fracture mode at temperatures below -33 °C (-27 ° F), a restriction is placed on the use of the package. Transport of the POC Overpack package is restricted to ambient air temperatures at or above -29 °C (-20 ° F) irrespective of wind chill. The packaging system when operated with this operating restriction, will meet onsite equivalent level of safety to 10CFR 71 requirements.

Thermal Review

Review of Part B, Chapter 8, Thermal Evaluation, was conducted using the SINDA/FLUENT general purpose thermal analysis package and ABAQUS / Standard general purpose finite element analysis computer programs.

Results of the thermal evaluation demonstrate that under Hanford Site NCT extremes, temperatures of the materials remain within materials rated capabilities. Under NCT, temperature of the containment vessel's seals are within the manufacturer's recommended maximum continuous use limits. Also, the maximum reported temperatures under NCT are well below the temperatures at which the Celotex will off-gas. Consequently, there will be no pressure build up or combustible gas generation from the Celotex under NCT.

Based upon the results of the HAC thermal and structural evaluations, Sandia National Laboratory (SNL) test data, and the Towell report (1988), the containment vessel's seals maintain containment under fire accident conditions. The conservative evaluation used in the SARP shows that as long as the overpack drum lid remains secured and the containment vessel is not exposed to direct flame and heat, that the temperature at the seals remain below the maximum temperature for short term high temperature capability of the seal material. This is also supported by SNL POC fire test data (SNL 1997) and the conclusion of the Towell report.

Containment Review

The structural analyses contained in Part B, Section 7.0, and the thermal analyses in Part B, Section 8.0. of the POC SARP taken in combination with testing at SNL documented in SNL (1997a) and SNL (1997b) of the POC SARP demonstrate that the leak tightness of the POC Overpack packaging system containment is maintained per ANSI N14.5 (1997) for both NCT and HAC.

Shielding Review

Review of the SARP's shielding evaluation supports the transport of Plutonium, Uranium and Americium–laden ash, alloys and residues. The maximum payload activity evaluated in the SARP shielding evaluation was 200 FGEs consisting of the isotopes: ^{235}U, ^{238}U, ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{241}Pu, ^{241}Pu, and ^{241}Am. Photon dose rates were calculated in both the axial and radial directions using the ISO-PC (Ver 2.1) computer code. Neutron dose rates were estimated using procedures described in Nelson (1996). Neutron Sources were evaluated using the ORIGEN2 computer code. Beta Sources were also evaluated.

During NCT, the photon dose rates at the surface of the overpack were found to be less than 0.05 mSv/h (5 mrem/h), while the neutron dose rates were conservatively estimated to be on the order of 0.01 mSv/h (1 mrem/h). These values are significantly less than the DOT surface limit of 2 mSv/h (200 mrem/h). At 1 meter from the package surface, the dose rate is bounded by 0.003 mSv/h (0.3 mrem/h), which is well within the 0.10 mSv/h (10 mrem/h) DOT limit. For accident conditions, the package was assumed to consist only of the pipe component. The dose rate at one meter from the damaged package was calculated to be 0.01 mSv/h (1 mrem/h), which is well below the 10 mSv/h (1000 mrem/h) DOT requirement.

The review team verified accuracy of source term and input parameters to both the ORIGEN2 and ISO-PC computer codes The SARP evaluated the following types Direct Radiation Sources:

Gamma Source

Beta Source

Neutron Source

The SARP shielding calculations demonstrated that POC meets both NCT and HAC 10CFR71 shielding.

Criticality Review

The criticality evaluation in the SARP (as supported by the TRUPACT-II SARP and Sandia National Laboratory test data) supports shipment of pipe components that are placed in the POC and subsequently loaded into an 322 liter (85-gal) drum overpack. The POC packaging system has a maximum payload of 200 FGEs of fissile material, and the SARP evaluation supports transport of up to 15 POC Overpack packaging system units in an enclosed van.

As shown in Part B, Section 6 of the SARP, a single POC Overpack loaded with 200 grams of ^{239}Pu, or an array of 15 POC overpacks loaded with 200 grams of ^{239}Pu each and transported together in a van, will remain safely subcritical during accident conditions.

Operating Procedures Review

Operating procedures as documented in the SARP, in Fluor Project Hanford and PFP and CWC Facility Procedures are considered adequate to ensure safe operation of the POC.

Maintenance Program Review

Maintenance procedures as documented in the SARP, in Fluor Project Hanford, PFP and CWC Facility Procedures are considered adequate to ensure safe operation of the POC.

Pressure and Gas Generation Evaluation

The review team reviewed and evaluated the Pressure and Gas Generation portion of the POC SARP (Part B, Section 9). The POC is a fully vented container during all NCT. Any Hydrogen gas that is generated inside the Pipe Component can escape by diffusion. The POC SARP evaluated possible HAC scenarios where the HEPA vent filter might plug causing pressure buildup with in the POC. (Part B, Section 8.6.3). Based upon both the analyses and Sandia National Laboratory test data presented in the POC SARP, a worst case Hydrogen gas explosion scenario within the POC is not considered likely.

Package Tiedown System Evaluation

The review team reviewed and evaluated the Package Tiedown System portion of the POC SARP (Part B, Section 10). The Tiedown System design, analysis and operating requirements presented in the POC SARP support regulatory requirements and safe operation of the package.

Quality Assurance Requirements Review

The procurement, fabrication and maintenance Quality Assurance requirements as defined in the POC SARP, Fluor Project Hanford, PFP and CWC Facility Quality Assurance Programs are required to be adequate to ensure proper procurement, fabrication and operation of the POC.

Conditions of Approval

The Review Team has identified the following conditions that are to be implemented by the contractor:

1. The Pipe Overpack Container (POC) Package may be used to transport Plutonium-and Americium laden ash, incinerated materials, Plutonium Alloy residues, and Plutonium bearing Cryolite flux subject to the following content restrictions:

   - 200 ^{239}Pu Fissile Gram Equivalent (FGE)
   - 0.932 Watts decay heat (Ash payloads and incinerated materials)
     2.8 Watts decay heat (Plutonium Alloys and Plutonium bearing Cryolite flux)
   - 10% by weight total combined moisture and organic content (Ash payloads and incinerated materials).

1% by weight total combined moisture and organic content (Plutonium Alloys and Plutonium bearing Cryolite flux).

- Isotope and activity limited as defined in HNF-6807, Rev 1 POC SARP Table A3-1 (Ash payloads) or Table 3-2 (Alloy payloads), *Bounding Radiological Inventory of the POC*, plus their decay products at activities not to exceed 6E-3 Ci or 0.1 A_2s.

- Activity and mass limits, provided in Tables A3-1 and A3-2 as applicable, are for each individual isotope. The cumulative mass of all isotopes cannot exceed 200 ^{239}Pu FGE as stated above.

- Flammable organics are limited to 500 parts per million (ppm) in the headspace of any POC.

2. A satisfactory fabrication leak rate verification test of the Pipe Component containment boundary will be performed by the manufacturer prior to acceptance. The leak test will demonstrate that the POC meets the 10^{-7} atm cm^3/s leak rate defined as leak tight under ANSI N14.5 per Annex A, Section 6.5 (ANSI 1997).

3. Loading and Transport of the POC Overpack package is restricted to ambient air temperatures at or above -29 °C (-20 ° F) irrespective of wind chill.

4. All operating and maintenance procedures involved in the use of this SARP, as well as specification and procurement of spare and replacement parts, will be verified to comply with the requirements of this SARP prior to their use.

5. Up to fifteen POC Overpack packages may be transported in a single van.

6. Under NCT the Dose rate is limited to 2 mSv/h (200 mrem/h) at any point on the external surface of the POC Overpack and 0.1 mSv/h (10 mrem/h) at 1 meter (40 inches) from the external surface of the POC Overpack (49 CFR 173.441(a)). For Accident Conditions the dose rate is limited to 10 mSv/h (1000 mrem/h) at 1 meter (40 inches) from the external surface of the package (49CFR173.413, 10CFR71.51).

7. All Transport System Requirements listed in the POC SARP, Part A, Sections 4.1 through 4.3 and Part B, Sections 10.1 through 10.4 shall be complied with.

8. All Operating Requirements listed in the POC SARP, Part A, Sections 6.1

through 6.5 shall be complied with.

9. All Quality Assurance Program Requirements listed in the POC SARP, Part A, Sections 7.1 through 7.14 shall be complied with.

10. All Maintenance Requirements listed in the POC SARP, Part A, Sections 8.1 through 8.2 and facility maintenance requirements shall be complied with. In addition, PFP and CWC Facility maintenance documents covering the POC shall be provided to ABD for review prior to package use.

11. The 3-82B Cask will be handled in accordance with the Hanford Site Hoisting and Rigging manual.

Conclusions

This SARP (Onsite) POC, HNF-6807, Rev. 0, presents an adequate analysis of the safety and risks associated with onsite shipments of Plutonium-and Americium laden ash, other incinerated materials and other radioactive materials. Based on compliance with the requirements and conditions presented therein, shipments as described are authorized.

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Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

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CC RECD. 09/20/2001

01-ABD-106

SEP 19 2001

Mr. E. K. Thomson, President
Fluor Hanford, Inc.
Richland, Washington 99352

Dear Mr. Thomson:

CONTRACT NO. DE-AC06-96RL13200 - REQUEST FOR APPROVAL OF ENGINEERING CHANGE NOTICE (ECN) #629650 TO SAFETY ANALYSIS REPORT FOR PACKAGING (SARP), HNF-6807, Rev 1, PIPE OVERPACK CONTAINER

This is in response to FHI letter FH-0104562, from D. B. Van Leuven, to K. A. Klein, RL, "Safety Analysis Report for Packaging, HNF-6807, Rev 1 Pipe Overpack Container, Engineering Change Notice #629650" dated September 4, 2001. The revision contained the technical justification to support the approval of an increase package payload for Plutonium 242 within the Pipe Overpack Container based upon risk. RL has reviewed and approves the ECN. If you have any questions, please contact me, or your staff may contact Richard Self, Authorization Basis Division, on (509) 372-2843.

Sincerely,

acting
Keith A. Klein
Manager

ABD:RJS

cc: B. A. Austin, FHI
R. R. Bloom, FHI
M. W. Frei, EM-40
D. W. Fritz, FHI
M. T. Sautman, DNFSB
T. A. Tomaszewski, FHI
D. B. Van Leuven, FHI

Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

0404019
CC Recd: 12/27/2004

05-SED-0037

DEC 23 2004

Mr. R. G. Gallagher, President
and Chief Executive Officer
Fluor Hanford, Inc.
Richland, Washington 99352

Dear Mr. Gallagher:

CONTRACT NO. DE-AC06-96RL13200 – REQUEST FOR APPROVAL HNF-6807, REVISION 1-D, SARP (ONSITE) FOR THE PIPE OVERPACK CONTAINER (PAYLOAD MODIFICATION) AND PAGE CHANGE TO HNF-SD-TP-SARP-010, REVISION 1-A, SARP (ONSITE) INTERIM STORAGE CASK (CASK COVER PLATE MODIFICATION)

This is in response to FH-0403328, dated October 26, 2004, which requested approval of changes to HNF-6807, Safety Analysis Report For Packaging (Onsite) For The Pipe Overpack Container, and HNF-SD-TP-SARP-010, Safety Analysis Report For Packaging (Onsite) Interim Storage Cask.

RL approves the submitted change to HNF-6807 subject to incorporation of the attached page change to HNF-6807. However, it is noted that this approval is limited to the submitted material only, as reviews of the full Package Specific Safety Documents (PSSDs) were not conducted. The proposed change to HNF-SD-TP-010 is not approved as the submittal did not provide an adequate basis for approval. The basis for the conclusions reached regarding the requested approvals is provided in the attached Safety Evaluation Report.

If you have any questions, please contact me, or your staff may contact Doug S. Shoop, Assistant Manager for Safety and Engineering, on (509) 376-0108.

Sincerely,

for Keith A. Klein
Manager

SED:RJS

Attachments:
1. Safety Evaluation Report
2. Page Change to HNF-6807

cc w/attachs:
R. R. Connolly, FHI
M. A. Hahn, FHI
H. Hermanas, FHI

Safety and Engineering Division
U.S. Department of Energy, Richland Operations Office

Safety Evaluation Report

Date Published: December 2004

REQUEST FOR APPROVAL HNF-6807, REVISION 1-D, SARP (ONSITE) FOR THE PIPE OVERPACK CONTAINER (PAYLOAD MODIFICATION) AND HNF-SD-TP-SARP-010, REVISION 1-A, SARP (ONSITE) INTERIM STORAGE CASK (CASK COVER PLATE MODIFICATION)

U.S. DEPARTMENT OF ENERGY, RICHLAND OPERATIONS OFFICE
SAFETY EVALUATION REPORT
REQUEST FOR APPROVAL HNF-6807, REVISION 1-D, SARP (ONSITE) FOR THE PIPE OVERPACK CONTAINER (PAYLOAD MODIFICATION) AND HNF-SD-TP-SARP-010, REVISION 1-A, (ONSITE) INTERIM STORAGE CASK (CASK COVER PLATE MODIFICATION)

SIGNATURE PAGE

Prepared By:

12/20/2004
Richard J. Self, Review Team Leader
Safety and Engineering Division
Date

Reviewed By:

Pete J. Garcia Jr.
12/20/04
Pete J. Garcia Jr., Director
Safety and Engineering Division
Date

Approved By:

12/20/04
Doug S. Shoop, Assistant Manager
for Safety and Engineering
Date

U.S. DEPARTMENT OF ENERGY, RICHLAND OPERATIONS OFFICE
SAFETY EVALUATION REPORT
REQUEST FOR APPROVAL HNF-6807, REVISION 1-D, SARP (ONSITE) FOR THE PIPE OVERPACK CONTAINER (PAYLOAD MODIFICATION) AND HNF-SD-TP-SARP-010, REVISION 1-A, (ONSITE) INTERIM STORAGE CASK (CASK COVER PLATE MODIFICATION)

Introduction

This Safety Evaluation Report (SER) documents the approval basis for the Fluor Hanford, Inc. (FHI) request for approval of changes to HNF-6807, Safety Analysis Report For Packaging (Onsite) For The Pipe Overpack Container (POC) provided in response to concerns over the USQ_T evaluation previously submitted and the basis for non-approval of the proposed changes to HNF-SD-TP-SARP-010, Safety Analysis Report For Packaging (Onsite) Interim Storage Cask (ISC).

The ISC Package Specific Safety Document (PSSD) is a "grandfathered" PSSD which does not meet current Transportation Safety Document (TSD, DOE/RL-2001-36) methodology. It was DOE's expectation that FHI would revise this PSSD to meet TSD standards. Until recently, the package was only being used on a limited basis. Based upon the limited onsite use, RL agreed to postpone requiring FHI to update the PSSD to TSD standards. FHI is now looking to expand the onsite use of this package for new and increased payloads which may impact the safe use of the ISC as currently evaluated.

Scope of Review

The FHI submittal, letter, R. G. Gallagher, FHI, to K.A. Klein, RL, "Request for Approval HNF-6807, Revision 1-D, Safety Analysis Report for Packaging (Onsite) for the Pipe Overpack Container (Payload Modification), and HNF-SD-TP-SARP-010, Revision 1-A, Safety Analysis Report For Packaging (Onsite) Interim Storage Cask (Cask Cover Plate Modification)" FH-0403328, dated October 26, 2004, submitted proposed changes to the two SARPs for RL review and approval. RL's Safety and Engineering Division (SED) reviewed the submitted changes in accordance with the applicable RIMS process and Hanford Site TSD. Review of the submitted changes to HNF-6807 revealed several minor items that required clarification or revision prior to approval. The review team resolved these comments with contractor personnel. The substantial issues are incorporated in the attached page change to the document, and include correction of an erroneous heat limit and editorial clarifications. However, the submittal did not provide an adequate basis for approval of the proposed changes to HNF-SD-TP-SARP-010 as described below.

Review of the changes to HNF-SD-TP-SARP-010, Safety Analysis Report For Packaging (Onsite) Interim Storage Cask revealed that the submitted analysis of the change was not complete.

Review Summary

The POC SARP, HNF-6807, was modified to add a payload-specific evaluation to Part B, Section 11.0 for the addition of two new payloads designated as Payloads 1 and 2. These payloads will allow the shipment of Transuranic (TRU) bearing waste that is in an inert powder or pelletized

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SAFETY EVALUATION REPORT
REQUEST FOR APPROVAL HNF-6807, REVISION 1-D, SARP (ONSITE) FOR THE PIPE OVERPACK CONTAINER (PAYLOAD MODIFICATION) AND HNF-SD-TP-SARP-010, REVISION 1-A, (ONSITE) INTERIM STORAGE CASK (CASK COVER PLATE MODIFICATION)

form. The shipment of ash payloads, as described in Section B-2, is specifically excluded from being shipped under these new payload designations. Revised package specific analyses were evaluated for the new payloads in the following areas: Thermal, Dose Consequences, and Shielding (then revised analyses are included in Section B-II of the FH submittal). Additionally, the gas generation section was updated to use the methodology defined for the TRUPACT – II SARP. This methodology is consistent with the gas generation methodology presented in the TSD.

The changes to HNF-SD-TP-SARP-010 involved enlarging the bolt holes on the environmental cover plate of the ISC to facilitate placement after the casks were filled. The supporting analysis submitted for approval was found to be incomplete. The ISC Structural Analysis addressed the free drop test, but failed to analyze the required puncture test. Therefore, there is no basis provided for concluding that the required series of accident condition tests specified in the TSD can be successfully met. The environmental cover is required to allow the package to survive the specified fire accident, which is postulated to occur after a collision. Therefore, the effects of the specified puncture event need to be evaluated to determine whether the environmental cover can be credited in the subsequent fire situation. Until a complete Structural Analysis is submitted for review, the safety impact of the proposed change cannot be determined.

Condition of Approval

RL approves the submitted changes to HNF-6807 subject to incorporation of the attached page change to HNF-6807. However, it is noted that this approval is limited to the submitted material only, as reviews of the full Package Specific Safety Document (PSSD) was not conducted.

Restrictions

Pending receipt and approval of a revised Structural Analysis reflecting Hypothetical Accident Conditions (HAC) penetration test followed by fire, use of modified ISCs is not permitted. Furthermore, until the ISC PSSD, HNF-SD-TP-SARP-010 has been updated to fully meet TSD requirements, no additional changes to this PSSD based on USQ_T evaluations are authorized.

Conclusions

Based on criteria in the TSD, the Review Team recommends that RL Manager approve the submitted changes to HNF-6807. This approval of the submitted changes also resolves the specific concerns for the HNF-6807 POC related to the USQ_T evaluation identified in Observation 4 of the DOE-RL TSD Assessment Report. It is also noted that this approval is limited to the submitted material only, as reviews of the full PSSDs were not conducted.

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SAFETY EVALUATION REPORT
REQUEST FOR APPROVAL HNF-6807, REVISION 1-D, SARP (ONSITE) FOR THE PIPE OVERPACK CONTAINER (PAYLOAD MODIFICATION) AND HNF-SD-TP-SARP-010, REVISION 1-A, (ONSITE) INTERIM STORAGE CASK (CASK COVER PLATE MODIFICATION)

The contractor submittal did not provide an adequate basis for approval of changes to HNF-SD-TP-SARP-010 as discussed above. Until the ISC PSSD, HNF-SD-TP-SARP-010, has been updated to fully meet TSD requirements, no additional changes to this PSSD based on an USQ_T evaluation are authorized.

ATTACHMENT 2

HNF-6807, DRAFT, Rev. 1-E, December 21, 2004

Date: ____________ Shipper: ____________

General: Shipper shall read the SARP and understand the basis and all controls.

CHECKLIST FOR ONSITE SHIPMENT OF PU ASH OR ALLOY IN POC	
ROUTE & ACCESS CONTROLS	(X)
1. Verify that the transport route will not pass outside the 200 West Area. (Part A, Section 4.3.1)	
2. Verify that appropriate emergency response notifications have been made. (Part A, Section 4.3.4)	
ENVIRONMENTAL CONTROLS	(X)
3. Verify the ambient air temperature will be above -29 °C (-20 °F) during shipment. (Part A, Section 4.3.3)	
PACKAGING ACCEPTANCE	(X)
4. Verify POC acceptance criteria for acceptance, pre-use inspection, and verification prior to use have been met. (Part A, Sections 5.1.2, 6.1.2.1)	
CONTENT CONTROLS	(X)
5. Verify waste content is Pu-contaminated ash or Pu alloy. (Part A, Section 3.2)	
6. Verify each POC does not contain more than 200 FGEs. (Part A, Section 3.2)	
7. Verify each POC *does not contain isotopes other than those in* Table A3-1 *for ash or* A3-2 for alloy or their decay products. (Part A, Section 3.2)	
8. Verify each POC does <u>not</u> contain any listed isotope that exceeds its specific activity limit in Table A3-1 for ash or A3-2 for alloy. (Part A, Section 3.2)	
9. Verify that for each POC the total decay heat of the payload does not exceed 0.932 watts for ash or 2.8 watts for alloy. (Part A, Section 3.2)	
10. Verify that for each POC the total hydrogenous material content does not exceed 10% by weight in the waste matrix for ash or 1% by weight in the waste matrix for alloy. (Part A, Section 3.2)	
11. Verify each POC does not contain any sources of flammable organic gases in the waste matrix. (Part A, Section 3.2)	
12. Verify the gross weight of each POC does not exceed 248 kg (547 lb). (Part A, Sections 2.5, 3.2)	

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PART A – DESCRIPTION AND OPERATIONS

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LIST OF TERMS

AC	accident condition
ANSI	American National Standards Institute
ARF	airborne release fraction
ASTM	American Society of Testing and Materials
CoC	certificate of compliance
CWC	Central Waste Complex
DE	dose equivalent
DE-Ci	dose-equivalent curies
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DR	damage ratio
DRM	Documentation and Records Management
ECN	engineering change notice
EDE	effective dose equivalent
ENDF	evaluated nuclear data file
EPDM	Ethylene Propylene Diene Monomer
Federal Services	Duratek Federal Services, Inc., Northwest Operations
FGE	fissile gram equivalent
HAC	hypothetical accident condition
HD	height-to-diameter ratio
HDPE	high-density polyethylene
HEPA	high-efficiency particulate air
HI	Hazard Impact
HRCQ	Highway Route Controlled Quantity
ISO	International Standards Organization
LANL	Los Alamos National Laboratory
LOI	loss on ignition
LPF	leakpath factor
MAR	material at risk
MCNP	Monte Carlo N-Particle (computer code)
NEA	Nuclear Energy Agency
NCR	nonconformance report
NCT	normal conditions of transport
NRC	Nuclear Regulatory Commission
NTC	normal transport conditions
OD	outside diameter
OX/MOX	oxide/mixed oxide
PFP	Plutonium Finishing Plant
PNNL	Pacific Northwest National Laboratory
POC	pipe overpack container
QA	quality assurance
QC	quality control

LIST OF TERMS, cont.

QL	quality level
RF	respirable fraction
RFETS	Rocky Flats Environmental Technology Site
SAR	safety analysis report
SARP	safety analysis report for packaging
SNL	Sandia National Laboratory
SSD	safety significance designator
THI	Transportation Hazard Indicator
TI	Transport Index
TRAMPAC	TRUPACT-II Authorized Methods of Payload Control
TRU	transuranic
TRUCON	TRUPACT-II Content Codes
TRUPACT-II	Transuranic Packaging Transporter
UNC	unified national course thread
WEPD	Westinghouse Engineered Products Department
WIPP	Waste Isolation Pilot Project
WLL	working load limit
WMFS	Waste Management Federal Services
WRAP	Waste Receiving and Packaging

Date: ____________ Shipper: ____________

General: Shipper shall read the SARP and understand the basis and all controls.

CHECKLIST FOR ONSITE SHIPMENT OF PU ASH OR ALLOY IN POC	
ROUTE & ACCESS CONTROLS	**(X)**
1. Verify that the transport route will not pass outside the 200 West Area. (Part A, Section 4.3.1)	
2. Verify that appropriate emergency response notifications have been made. (Part A, Section 4.3.4)	
ENVIRONMENTAL CONTROLS	**(X)**
3. Verify the ambient air temperature will be above -29 °C (-20 °F) during shipment. (Part A, Section 4.3.3)	
PACKAGING ACCEPTANCE	**(X)**
4. Verify POC acceptance criteria for acceptance, pre-use inspection, and verification prior to use have been met. (Part A, Sections 5.1.2, 6.1.2.1)	
CONTENT CONTROLS	**(X)**
5. Verify waste content is Pu-contaminated ash or Pu alloy. (Part A, Section 3.2)	
6. Verify each POC does not contain more than 200 FGEs. (Part A, Section 3.2)	
7. Verify each POC does not contain isotopes other than those in Table A3-1 for ash or A3-2 for alloy or their decay products. (Part A, Section 3.2)	
8. Verify each POC does <u>not</u> contain any listed isotope that exceeds its specific activity limit in Table A3-1 for ash or A3-2 for alloy. (Part A, Section 3.2)	
9. Verify that for each POC the total decay heat of the payload does not exceed 0.932 watts for ash or 2.8 watts for alloy. (Part A, Section 3.2)	
10. Verify that for each POC the total hydrogenous material content does not exceed 10% by weight in the waste matrix for ash or 1% by weight in the waste matrix for alloy. (Part A, Section 3.2)	
11. Verify each POC does not contain any sources of flammable organic gases in the waste matrix. (Part A, Section 3.2)	
12. Verify the gross weight of each POC does not exceed 248 kg (547 lb). (Part A, Sections 2.5, 3.2)	

Date: ____________ Shipper: ____________

General: Shipper shall read the SARP and understand the basis and all controls.

CHECKLIST FOR ONSITE SHIPMENT OF PU ASH OR ALLOY IN POC	
LOADING PIPE COMPONENT AND POC	(X)
13. Verify that the payload was packaged and placed in the pipe component and POC following operating procedures approved by package engineering. (Part A, Section 6.0)	
14. Verify that each POC is packaged according to an approved TRUCON code. Enter TRUCON code(s): ____________________. (Part A, Section 6.3.1)	
15. Verify that each pipe component leak test was completed less than 12 months before it was loaded. (Part A, Section 6.3)	
16. Verify that each POC is surveyed for contamination and dose rate levels, and the measured levels are within DOT limits. (Part A, Section 7.6.2)	
TRANSPORTATION	(X)
17. Verify that the transport vehicle is van HO-68B-2500 or HO-68B-2501 or an enclosed van with equivalent tiedown hardware that is approved by Transportation Safety Operations. (Part A, Section 4.2.2.2)	
18. Verify that the interior floor of the transport vehicle is free of visible surface oil, liquid, and large debris. (Part A, Section 4.2.2.2)	
19. Verify that the transport vehicle has current certifications. (Part A, Section 8.1.3)	
20. Verify that no more than 15 payload-bearing POCs having a maximum total weight of 3,730 kg (8,205 lb) are placed into van. The POCs may consist of more than one payload type. (Part A, Section 4.2.1)	
21. Verify that no POCS are loaded into 322 L (85-gal) overpacks. (Part A, Section 4.2.2.2)	
22. Verify the load is secured properly. (Part A, Section 4.2.2.2)	
23. Verify that a tamper-indicating device is used on each of the POCs or on the van door. (Part A, Section 6.0)	