S

ENGINEERING CHANGE NOTICE

Page 1 of 3

1. ECN 661141

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	4. USQ Required?	5. Date
Supplemental ☐ Direct Revision ☒ Change ECN ☐ Temporary ☐ Standby ☐ Supersedure ☐ Cancel/Void ☐	Dale M. Johnson, Site-Wide SNF Disposition R3-13 373-9614	☒ Yes ☐ No	11/15/00
	6. Project Title/No./Work Order No. W-518	7. Bldg./Sys./Fac. No. 200 Area ISA	8. Approval Designator ESQ
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) SNF-4894 Rev 0	10. Related ECN No(s). N/A	11. Related PO No. N/A

12a. Modification Work	12b. Work Package No.	12c. Modification Work Completed	12d. Restored to Original Condition (Temp. or Standby ECNs only)
☐ Yes (fill out Blk. 12b) ☒ No (NA Blks. 12b, 12c, 12d)	N/A	N/A Design Authority/Cog. Engineer Signature & Date	N/A Design Authority/Cog. Engineer Signature & Date

13a. Description of Change

13b. Design Baseline Document? ☒ Yes ☐ No

(1) Table of Contents
(2) Corrected typo in table 1.
(3) Reformatted sections 3.1 and 3.2: deletions and text changes. Added ISO container dose rate limit requirements.
(4) Added justification in 3.4 deleting loaded canister final weld pressure test requirement.
(6) Section 3.5 text change
(6) Section 3.6 text change.
(7) Section 4.0 Text Change
(8) Sections 5 and 6 Editorial
(9)7.0 Text Changes
(10)8.0 References added and deleted

GMJ 12/14/00
USQ # ISA-00-1022

14a. Justification (mark one)	14b. Justification Details
Criteria Change ☒ Design Improvement ☐ Environmental ☐ Facility Deactivation ☐ As-Found ☐ Facilitate Const. ☐ Const. Error/Omission ☐ Design Error/Omission ☐	(2) Point Beach fuel rods are 179 in each assembly, not 176 as listed. (3) The DOE-RW Standardized 18-inch Canister Standard canister has been removed from planning as the shipping overpack for the LWR storage canister. Planning is now based on transloading to shipping canisters (or casks) for future repository dispositioning (storage canisters will not be transported off-site). Deleting interface requirements with the DOE Standard Canister allows more flexibility of design parameters, with the limits now imposed by cask cavity and the Authorization Basis (SAR). (go to continuation page)

15. Distribution (include name, MSIN, and no. of copies)
See Distribution Sheet

RELEASE STAMP

DATE: DEC 20 2000
STA: 4
HANFORD RELEASE ID. 2

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1): 661141

16. Design Verification Required	17. Cost Impact		18. Schedule Impact (days)
	ENGINEERING	CONSTRUCTION	
☒ Yes	Additional ☐ $ N/A	Additional ☐ $ N/A	Improvement ☐ N/A
☐ No	Savings ☐ $	Savings ☐ $	Delay ☐

19. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 13. Enter the affected document number in Block 20.

SDD/DD	☐	Seismic/Stress Analysis	☐	Tank Calibration Manual	☐
Functional Design Criteria	☐	Stress/Design Report	☐	Health Physics Procedure	☐
Operating Specification	☐	Interface Control Drawing	☐	Spares Multiple Unit Listing	☐
Criticality Specification	☐	Calibration Procedure	☐	Test Procedures/Specification	☐
Conceptual Design Report	☐	Installation Procedure	☐	Component Index	☐
Equipment Spec.	☐	Maintenance Procedure	☐	ASME Coded Item	☐
Const. Spec.	☐	Engineering Procedure	☐	Human Factor Consideration	☐
Procurement Spec.	☐	Operating Instruction	☐	Computer Software	☐
Vendor Information	☐	Operating Procedure	☐	Electric Circuit Schedule	☐
OM Manual	☐	Operational Safety Requirement	☐	ICRS Procedure	☐
FSAR/SAR	☒	IEFD Drawing	☐	Process Control Manual/Plan	☐
Safety Equipment List	☐	Cell Arrangement Drawing	☐	Process Flow Chart	☐
Radiation Work Permit	☐	Essential Material Specification	☐	Purchase Requisition	☐
Environmental Impact Statement	☐	Fac. Proc. Samp. Schedule	☐	Tickler File	☐
Environmental Report	☐	Inspection Plan	☐	_____	☐
Environmental Permit	☐	Inventory Adjustment Request	☐	_____	☐

20. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number/Revision
HNF-3553 Annex D Revision 0		

21. Approvals

	Signature	Date		Signature	Date
Design Authority	DM Johnson	11/20/00	Design Agent		
Cog. Eng.			PE		
Cog. Mgr.	RL McCormack	12/20/00	QA		
QA	DW Smith	11/20/00	Safety		
Safety	LJ Garvin	12/19/00	Design		
Environ. for	DJ Watson	12/12/00	Environ.		
Other			Other		
Op'ns	OM Serrano	001204			
Op'ns Interface:	MT York	11/30/00			
SAR:	RD Carrell	11/21/00	DEPARTMENT OF ENERGY		
RCP/324 Bldg:	DS Takasumi	12/13/00	Signature or a Control Number that tracks the Approval Signature		
"	T.L. Erickson	12/14/00			
"	M.S. Wright	12/14/00	ADDITIONAL		
"	YB Katayama	12/13/00			

Justification, (3) continued

Changes in canister design requirements also are caused by changes in 324 Bldg planning which removes requirements for remote loading, closure, testing, and handling of canisters within the Hotcell and for the loaded bare canister lift and drop analyses.

Changes also incorporate or reference requirements from HNF-4832, 324 Building Fuel Storage Evaluation, and reference to the NAC-1 canister preliminary design have been removed.

(4)ASME B&PV Code Case N-595-1 ....."Final end closure welds, made after the canister is loaded with spent fuel are not required to be pressure tested."
(5)Canister is designated for storage at the 200 Area ISA only and will not go to the repository. OCRWM QARD does not apply to the canister. NRC equivilancy required at the ISA will be provided by 10 CFR 72 Part G or 10 CFR 71 Part H.
(6)Canister shield plug top surface is not large enough to accommodate the redundancies specified.
(7) Amplified on OCRWM QARD requirements and deleted pressure test (see (4) above)
(8) N/A
(9) Amplified on OCRWM QARD requirements for Spent Nuclear Fuel Documentation
(10)NAC and PNNL references to canister design no longer included per (3), above. Added new report on storage options which describes the changed planning base. Changed the reference for contamination limits from NRC to PHMC (per comment from RCP Rad Con.).

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	D.M.Johnson	Date 12/20/00
Project Title/Work Order		EDT No.
Spent Nuclear Fuel Project Acceptance Criteria for KWR Spent Fuel Storage W-518		ECN No. 661141

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
Carrell, R. D.	R3-13	x			
Erickson, T. L.	L1-02	x			
Garvin, L. J. III	S8-07	x			
Johnson, D. M.	R3-13	x			
Katayama, Y. B.	L1-02	x			
McCormack, R. L.	R3-13	x			
Serrano, O. M.	S2-44	x			
Smith, D. W.	S2-48	x			
Takasumi, D. S.	L1-02	x			
Turnbaugh, J. E.	X3-79	x			
Watson, D. J.	X3-79	x			
Wright, M. S.	L1-08	x			
York, M. T.	T3-06	x			
Baston, G. D. /RL	R3-82	x			
Reed, S. R. /Project Files	R3-11	x			

SNF-4894
Revision 1

Spent Nuclear Fuel Project Acceptance Criteria for LWR Spent Fuel Storage System

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

Fluor Hanford
P.O. Box 1000
Richland, Washington

SNF-4894
Revision 1

ECN 661141

Spent Nuclear Fuel Project Acceptance Criteria for LWR Spent Fuel Storage System

Project No: W-518 Document Type: TI Division: SNF

D. M. Johnson
Fluor Hanford

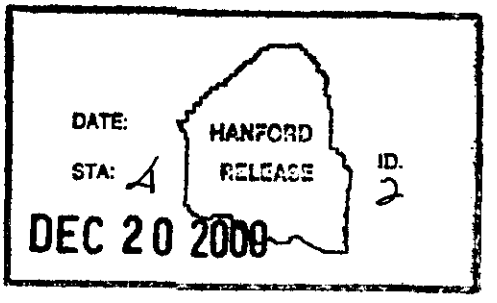
Date Published
December 2000

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

Fluor Hanford
P.O. Box 1000
Richland, Washington

Release Approval 12/20/00 Date



SNF-4894, rev1.

19 Total pages.

RECORD OF REVISION

(1) Document Number: SNF-4894

Page ____

(2) Title: Spent Nuclear Fuel Project Acceptance Criteria for LWR Spent Fuel Storage System

Change Control Record

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Cog. Engr.	(6) Cog. Mgr. Date
0	(7) EDT 627771	DM Johnson	RLMcCormack
RSI.	Direct Revision, ECN-661141.	DM Johnson	RL McCormack 12/20/00

A-7320-005 (10/97)

SPENT NUCLEAR FUEL PROJECT ACCEPTANCE CRITERIA FOR LWR SPENT FUEL STORAGE SYSTEM

TABLE OF CONTENTS

1.0 INTRODUCTION

As part of the decommissioning of the 324 Building Radiochemical Engineering Cells there is a need to remove commercial Light Water Reactor (LWR) spent nuclear fuel (SNF) presently stored in these hot cells. To enable fuel removal from the hot cells, the commercial LWR SNF will be packaged and shipped to the 200 Area Interim Storage Area (ISA) in a manner that satisfies site requirements for SNF interim storage.

This document identifies the criteria that the 324 Building Radiochemical Engineering Cell Clean-out Project must satisfy for acceptance of the LWR SNF by the SNF Project at the 200 Area ISA. In addition to the acceptance criteria identified herein, acceptance is contingent on adherence to applicable Project Hanford Management Contract requirements and procedures in place at the time of work execution.

2.0 SYSTEM CONFIGURATION

The SNF inventory covered by this acceptance criteria is listed in Table 1. The inventory consists of five Pressurized Water Reactor (PWR) fuel assemblies plus intact PWR fuel rods which were removed from two of these assemblies, two Boiling Water Reactor (BWR) fuel assemblies plus intact BWR fuel rods which were removed from one of these assemblies, and six intact experimental BWR rod segments from General Electric's Segmented Rod Program (SRP). Each rod segment is one-fourth of a full-length fuel rod assembly that had been screwed together for irradiation in a standard fuel bundle.

Each of the PWR fuel assemblies will be individually loaded into a specially designed canister for shipping and dry storage within an existing NAC-1[1] cask. A sixth LWR SNF canister will contain the presently "loose" fuel rods (17 PWR, 9 BWR, and 6 SRP rods) along with 86 rods which will be removed from the two BWR assemblies. These 113.5 rods (counting the six SRP rods as ¼ rod each) will be tightly packed in a consolidated container approximating the configuration of a fuel assembly for placement in the canister.

Each NAC-1 cask will be placed horizontally in an International Standards Organization (ISO) container on a transporter for on-site shipment to the ISA. At the ISA the ISO containers, with a cask inside, will be lifted from the transporter onto a concrete storage pad provided by the SNF Project at the 200 Area ISA.

[1] NAC-1 generically refers to NAC-1 or NSF-4 casks which were fabricated to the same design at different times by different corporate owners.

TABLE 1

INTACT SPENT NUCLEAR FUEL INVENTORY	
Assembly or Rod Identification	***Description***
PWR ID# H-07 Point Beach Nuclear Plant	Manufacturer: Westinghouse Discharge date: October 1981 Initial Enrichment: 3.2 Wt% Array size: 14x14 No. of contained fuel rods: 179
PWR ID# H-12 Point Beach Nuclear Plant	Manufacturer: Westinghouse Discharge date: October 1981 Initial Enrichment: 3.2 Wt% Array size: 14x14 No. of contained fuel rods: 179
PWR ID# H-25 Point Beach Nuclear Plant	Manufacturer: Westinghouse Discharge date: October 1981 Initial Enrichment: 3.2 Wt% Array size: 14x14 No. of contained fuel rods: 179
PWR Combination Assembly ID# D047/BT03 Calvert Cliffs-1	Manufacturer: Combustion Engineering Discharge date: April 1982/October 1980 Initial Enrichment: 3.04/2.45 Wt% Array size: 14x14 No. of contained fuel rods: 126/13
PWR ID# D101 Calvert Cliffs-1	Manufacturer: Combustion Engineering Discharge date: October 1980 Initial Enrichment: 2.72 Wt% Array size: 14x14 No. of contained fuel rods: 168
BWR CZ346 Cooper Nuclear Power Plant	Manufacturer: General Electric Discharge date: May 1982 Initial Enrichment: 2.5 Wt% Array size: 7x7 No. of contained fuel rods: 37
BWR CZ348 Cooper Nuclear Power Plant	Manufacturer: General Electric Discharge date: May 1982 Initial Enrichment: 2.5 Wt% Array size: 7x7 No. of contained fuel rods: 49
Intact Rod Inventory 9 BWR fuel rods and 17 PWR fuel rods	4 fuel rods from fuel assembly ID# BT03 9 fuel rods from fuel assemble ID# CZ346 7 fuel rods from fuel assembly ID# D047 6 fuel rods from fuel assembly ID# D101
6 SRP Segmented BWR fuel rods	1 fuel rod from SRP-1 (ID# 1B03-4) 5 fuel rods from SRP-2 (ID# 0A03-2, ID# 0A08-1, ID# 5D17-3, ID# 5D18-2, ID#8D14-1)

3.0 CANISTER REQUIREMENTS

The canister will maintain the conditions of criticality safety and provides leak-tight containment of the SNF in an inert atmosphere during on-site transport and long term interim storage. The canister and internal supports are classified as Safety Class.

It must be able to be shown that the canister was designed, fabricated, inspected, loaded and tested to requirements acceptable for on-site transfer and interim storage at the 200 Area ISA, as discussed in HNF-6433, *324 Building Fuel Storage Evaluation* (FH 2000a) and as identified within these Acceptance Criteria.

No action shall be taken during packaging of the fuel to compromise the integrity of the fuel rods or bundles.

3.1 General Requirements

The LWR Spent Fuel Canister shall be designed to interface with the following systems, as described in this section:

Spent BWR Fuel Rods: The minimum canister cavity length must be sufficient to handle the BWR fuel rods' length plus any additional length required for containing the rods in a geometry that meets requirements for criticality prevention. Sampling measurements of the BWR fuel rod lengths stored in the 324 Building hot cell show rod lengths as long as 163.9 $\pm$ 0.1 inches, except for the sixteen corner tie-rods for the two assemblies, which have end pieces two-inches longer than the others.

The criticality safety evaluation for packaging the disassembled BWR rods and the PWR loose rod inventory (FDNW 1999) determined that the maximum pitch allowable without attaining 0.95 k_{eff} (flooded) is 2.3 cm. This corresponds to a cylinder not exceeding 27.7 cm. (10.9 in.) diameter. The LWR Spent Fuel Canister is more than an inch larger in diameter and will require a Safety Class means of limiting maximum fuel rod pitch to 2.3 cm. (0.905 in.).

The loose rods shall be placed in an inner container with an inside diameter no greater than 10.9 in., or designed as a single-element-size canister as discussed in draft OCRWM *Waste Acceptance Systems Document*. The package requirements for the loose rods include a design that allows for the fuel rods to be out-gassed and backfilled with helium within the LWR Spent Fuel Canister. Procedures are required during fabrication of the inner container or single-element-size canister that prevent the introduction of RCRA-regulated materials.

If a single-element-size canister is designed for packaging the loose rods, the design shall include a lifting fixture compatible with national repository handling capability.

Spent PWR Fuel Assemblies: Two of the canisters will each contain a PWR fuel assembly 157.25 in. long and 8.125 in. square over the active portion of the fuel and three canisters will each contain a fuel assembly 159.8 in long and 7.76 in. square. Criticality control requires Safety Class internal support to assure the fuel assembly geometry is maintained within the canister under conditions of the worst case accident..

Canister Loading and Closure Systems: Each canister shall be provided with a test port and valve in the shield plug closure for vacuum drying and helium backfill. The final test port and shield plug closure welds shall be leak tested. The equipment must be capable of providing the required testing to the required standards as specified in Section 3.4

The welding and weld inspection equipment for seal welding the canister shield plug and test port closure shall have the capability to meet the required quality standards of ASME Section III NB.

NAC-1 Cask: The maximum diameter of the LWR Spent Fuel Canister will be limited by the dimensions of the NAC-1 cask cavity, which will enable a maximum canister outside diameter of 13.5 inches, less tolerances. The NAC-1 cavity length is 178 inches.

ISO Container

The maximum allowable radiation dose on the surface of the ISO Container shall not exceed 200 mrem/hr contact and the maximum dose shall not exceed 10 mrem/hr at 2 meters away from any surface.

3.2 Canister Design Requirements

3.2.1 Configuration:

- The LWR Spent Fuel Canister top closure shall be designed as a stainless steel shield plug extending into the canister shell and shall be seal welded at the top of the shell. The total length of the canister shall utilize the entire cask cavity to provide maximum shield plug length from the top of the spent fuel to the top surface of the canister.

- The canister shield plug closure shall have a process port, including port valve, allowing the canister to be evacuated and backfilled with

helium to one atmosphere. The port valve shall be provided with a metallic seal and the port shall be designed for a welded closure, flush with the top of the shield plug, to be welded following backfill.

- The shield plug penetration for the process port shall be designed to prevent direct radiation streaming from the spent fuel assembly components.

3.2.2 The canister shall be designed, fabricated and tested to the requirements of ASME Boiler and Pressure Vessel Code Section III, Division 1, Subsection NB (latest revision) and canister internals required for criticality control shall be designed, fabricated, and tested to the requirements of Subsection NG. No code stamp will be required.

3.2.3 The bottom base cap shall be machined and shop welded to the 12-inch, schedule-40 stainless steel pipe or equivalent stainless steel tubing constituting the canister body.

3.2.4 Acceptable requirements for weld design appear in ASME Code Section III, Subsection NB-3352 *Permissible Types of Welded Joints* and NB-4240 *Requirements for Weld Joints in Components*. An alternative confinement boundary weld design (such as NB-5200) which has previously been accepted by the NRC, (NUREG-1536, *Standard Review Plan for Dry Cask Storage Systems*) typically for Category C welded joints, shall be considered, if required, for a remotely welded canister lid. Equivalent structural integrity is achieved but all the provisions of NB-3352 for full penetration and the NDE requirements for full volumetric nondestructive examination are not met. The use of an alternative weld design requires redundant welds to provide redundant sealing of the confinement system. The Nuclear Regulatory Commission (NRC) has accepted multiple surface examination of welds (PT), combined with helium leak tests, for inspecting the final redundant seal welded closures.

3.2.5 The canister shall provide for ease of decontamination. External surfaces shall be smooth with no surface burrs or sharp edges. Machined surfaces shall be 63-RMS finish or better per ANSI B46.1, *Surface Texture.*

3.2.6 The weight of the canisters, unconnected end shield plugs, and payload shall be calculated to determine the weight in the NAC-1 Cask cavity. The NAC-1 Certificate of Compliance (24 Sept. 1999) weight limit for the cask cavity is 3700 lbs. The authorization basis established by the safety analyses is a maximum loaded canister weight of 3,300 lbs. (1,500 kg.).

3.2.7 The canister design pressure shall be 75 psig, the shell and bottom cap weld testable to 100 psig. See 3.4 for the final field closure after fuel is loaded into the canisters. The design pressure bounds normal, off-normal, and accident conditions including rupture of 100 % of the maximum volume fuel rods releasing 100% of the fill gas and fission gas release per fuel characterization experiments performed at PNNL.

3.2.8 The design temperature is 540 ^{0}F (282 ^{0}C), which bounds the design basis accidents.

3.2.9 For transport and handling at the ISA the canister will be within the cask inside the ISO container. The design decelerations based on worst case orientation G loads for the NAC-1 Cask 30 foot drop are 76.6 G axial and 96 G longitudinal, taking no credit for impact absorption of the ISO container.

3.3 Materials of Fabrication

The canister shall be stainless steel and the design shall specify materials of fabrication meeting ASME Code. At a minimum all structural materials shall have Code specified minimum yield and tensile strength values. Materials of fabrication shall provide a canister design life of 75 years.

3.4 Testing Requirements

The fabrication specification shall provide details on the required testing for acceptance of the canisters. For the canister closure field welds ASME Boiler and Pressure Vessel Code Case N-595-1 may apply: "Final end closure welds, made after the canister is loaded with spent fuel are not required to be pressure tested."

Following the final confinement seal weld the canister and contents shall be dried by evacuating, filling with helium and re-evacuating to 3 Torr (the canister shall maintain the vacuum for 30 minutes with the vacuum pump turned off). The canister shall then be refilled with helium, the process port seal welded, and the closure weldments leak tested in accordance with ANSI N14.5, Containment System Fabrication Verification (latest revision). The acceptance criterion shall be leakage equal to or less than 1.0 x 10^{-7} std cm^3/sec air.

3.5 Quality Assurance Requirements

The suppliers QA program for design and fabrication shall implement the requirements of 10 CFR 72 Subpart G (or 10 CFR 71 Subpart H) and shall be approved by the NRC. Evidence of approval will be a current NRC issued Certificate of Authorization.

3.6 Canister Identification

Each canister shield plug shall have a unique identifier which is engraved in the top. The canister shell and bolted lifting fixture shall be stamped with the same identifier. The characters of the identifier shall be one inch high and shall contrast the base metal. The identifier shall be readable by television camera.

The identifiers are:

D101
D047
H-07
H-12
H-25
CONSOLIDATED

4.0 FUEL PREPARATION AND LOADING REQUIREMENTS

4.1 Fuel Inspection

Verification shall be provided that fuel is intact prior to loading into the LWR Spent Fuel Canister. A visual inspection will be performed of each PWR fuel assembly, the intact rod inventory (including those from the disassembled BWR assemblies), and SRP segmented BWR fuel rods. The PWR fuel assemblies will not be disassembled. An inspection plan for verification that the fuel rods are intact shall be documented and submitted for review and approval by the SNF Project. The inspection plan shall meet the requirements of the OCRWM QARD (DOE 1999).

4.2 Evacuation and Backfill

Following canister loading and welded closure of the canister shield plug, the canister shall be evacuated and backfilled with helium. During evacuation, canister dryness shall be verified by vacuum hold test. This test shall be equivalent to testing described in NUREG 1997. The helium backfill shall have a purity of at least 99.95 % as certified by a supplier approved in accordance with DOE 1999.

4.3 Quality Assurance

The following operations and controls for fuel preparation and loading shall comply with requirements of DOE 1999.

- Fuel cleaning,
- Fuel loading,
- Canister closure weld process
- Evacuation and Inerting,

- Leak testing, and
- Safeguards (material inventory and transfer documentation)

4.4 Exclusions

Operational controls shall be provided to ensure materials other than the specified SNF inventories and inert gas are not introduced into the LWR Spent Fuel Canisters. Written verification shall be provided by the facility Regulatory Compliance Officer that no materials that designate as hazardous/dangerous waste have been introduced into the canister.

5.0 NAC-1 CASK REQUIREMENTS

The casks provide confinement, radiation shielding, and protection of the canister and it's payload from damage or fire during on-site transport from the 324 Building to the 200 Area ISA. During storage at the ISA, the cask provides continued radiation shielding and fire protection of the canister as well as protection against accidents and severe natural phenomena. Credit is not taken for the cask confinement boundary during long term storage at the ISA. The cask is classified as Safety Significant.

5.1 NAC-1 Cask Design Description

The NAC-1 cask was designed and fabricated to the requirements of the ASME Code, Section III, Subsection NB. The external shape of the NAC-1 spent fuel shipping cask approximates a smooth-surface, right circular cylinder that is modified, in that impact limiters protrude radially at both ends. The internal cross-section of the cask cavity is circular. The overall dimensions of the cask include a length of 214 in. (including lid impact limiter) and a maximum cross-sectional envelope diameter of 50 in. The internal cavity of the cask is 178 in. long and 13.5 in. diameter. The maximum loaded gross weight of the cask, including the maximum fuel and inner canister weight is approximately 47,150 lbs. The principle design features of the cask are the confinement boundary, shielding and heat dissipation systems, and the lifting and tie-down systems.

The primary confinement boundary of the NAC-1 cask is the inner shell, lower end casting, upper end casting, bolted closure lid with double neoprene O-ring seals and seal test port, lower casting drain valves, rupture disks, and a vent/helium fill valve.

Neutron shielding tanks are provided in the 4.5-in. thick annular space formed between the outer shell of the lead gamma shield and a thin stainless steel shell that constitutes the outer cask surface. The neutron shield tanks are not required or used for on-site transport or for the storage configuration at the 200 Area ISA and will contain air.

5.2 NAC-1 Cask Modifications

The NAC-1 cask will be modified to minimize worker exposure and eliminate unnecessary maintenance during surveillance and maintenance activities during storage at the 200 Area ISA. The modified cask will maintain its confinement boundary during on-site transport to the 200 Area ISA. The modifications consist of:

- The cask drain penetrations, relief valve penetration (rupture disk port), and vent/helium fill penetration shall have all existing valve components and rupture disks removed; pipe plugs installed in the threaded holes (Helicoil™ inserts); and the existing port cover plates reinstalled (NAC 1996a). Cover plates over cask confinement penetrations will remain or be replaced, if required, to serve as heat shields during the postulated Design Basis Fire accident. The neutron shield tank relief penetrations (burst disk assembly port) shall have existing assembly nut, rupture disk and muffler removed with a threaded solid plug installed in place of assembly nut.

- Plug materials shall be 304 stainless steel ASME (SA479).

- The anti-rotational lugs within the interior cavity shall be removed.

The O-ring test port and the impact limiter test port will remain as they are. The scope of this modification is separate from any modifications that may be required by the SARP or other on-site transportation requirements.

The authorized payload is a highway route control quantity (HRCQ), so the SARP will require U.S. Department of Energy, Richland Operations Office (RL) approval.

Following removal of the anti-rotational lug within the cask cavity (by cutting and/or grinding) the surface finish in the area shall be 125 RMS or better with no surface burrs.

The maximum weight of the loaded canister portion of the payload will remain 3,300 pounds. The NRC Certificate of Compliance dated 24 Sept. 1999 states that the "cavity content must not exceed a thermal decay heat load of 750 watts and a weight of 3700 lbs, including weight of component spacers (or fuel basket) used in the cask cavity to limit movements of contents during shipment." (The maximum payload heat load is less than 400 watts.)

Prior to loading the canister into the casks, the casks will have been decontaminated externally, as required, to meet the requirements of HNF-5173, section 2, table 2.2 (FDH 2000). Internal decontamination will be

performed as practically achievable to enable internal modifications and loading of canisters. Measures shall be taken to minimize introduction of smearable contamination into the cask cavity during loading of the fuel.

5.3 Cask Identification

Each cask shall be identified by engraved nameplates on the lid and shell. Each nameplate shall bear the unique identifying information for the contained canister. These may be in addition to and substantially different from any existing identifiers. The casks as currently designated below shall be identified as shown.

Cask NAC-1A.... changes to.... NAC-1/ISA-A D101
Cask NFS-4B..... changes to.... NFS-4/ISA-B D047
Cask NAC-1C..... changes to..... NAC-1/ISA-C H-07
Cask NAC-1D..... changes to..... NAC-1/ISA-D H-12
Cask NAC-1E..... changes to..... NAC-1/ISA-E H-25
Cask NFS-4A..... changes to..... NFS-4/ISA-F CONSOLIDATED

The nameplate on the cask shell shall be located on the neutron shield tank near the top of the cask and oriented for readability with the casks in their normal horizontal storage position. The nameplate characters shall be one inch high and shall contrast with the base metal. In addition the casks shall be stenciled with the identifier of the contained canister on each side of the casks, with the characters large enough to be visible from the ISO container door.

6.0 ISO CONTAINER REQUIREMENTS

The ISO container provides environmental protection and is classified as General Service.

6.1 ISO Container Refurbishment

Each ISO container shall be cleaned, inspected, repaired as required by inspection; have door gaskets replaced; and be provided with a smooth flat white surface coating. The ISO container lids shall be modified for structural adequacy of roof loads to include 24 lb/ft^2 ash and 20 lb/ft^2 snow.

6.2 ISO Container Identification

The ISO containers shall be provided with nameplates near the access doors. The nameplates shall bear the alpha identifier A through F for the corresponding canister/cask contained within. The ISO containers shall be additionally identified on sides and ends with stenciled characters large enough to be visible from the nearest ISA fence line.

7.0 DOCUMENTATION

Acceptance of the LWR spent fuel dry cask storage system and payload requires documentation be provided to the Site Wide Spent Nuclear Fuel Project as follows. The documents shall be original in so far as is possible. Document reviews and turnovers shall be scheduled by River Corridor Project (RCP) for review and approval by the SNF Project.

Canister and payload documentation shall be packaged as a supporting document for peer review and release prior to turning over to the SNF Project at the time of transfer of the cask to the 200 Area ISA. Documentation requiring SNF Project approval shall be submitted for review and approval as produced, prior to final submittal of the technical packages.

7.1 Canister

Canister documentation shall be prepared and controlled by procedures that meet the applicable requirements of DOE 1999. Documentation shall include inspections and certifications of the field welding and testing of the canister closure; pressure rebound testing certifications and pressure gauge calibrations; backfill purity certification; and certification that the loading operations and the leak-testing were provided in accordance with the requirements established in the Acceptance Criteria.

7.2 Payload

The following documentation shall be provided for the LWR SNF. Canister documentation shall be prepared and controlled by procedures that meet the applicable requirements of DOE 1999.

- DOE-RW Data Packages and all fuel characterization data for each cask, original to the extent available, shall be turned over to the SNF Project prior to transfer of the SNF to the 200 Area ISA. Existing operational and transportation records (Form 741) from the commercial power plants involved and Approved Testing Material (ATM) reports on tests performed by PNL will provide compliance with the OCRWM QARD (DOE 1999) requirements, without updating, as described in FH 2000b.

- Technical data packages covering fuel receiving and on-site movements of the intact fuel to be stored at the ISA, disassembly of the BWR fuel assembly and fuel rod identification and inventory and total payload source term.

- New data packages for each cask shall include inventory of radionuclide content, inventory of fissile content, and certification of no RCRA regulated materials.

- Copies of incident reports that involved or impacted the LWR spent fuel targeted for storage in the 200 Area ISA shall be provided prior to the acceptance of the dry cask storage system design.

Safeguards data and transfer forms to accompany each cask transfer shall be a separate submittal .

7.3 NAC-1 (and NFS-4) Casks

The following documentation shall be provided for the casks. Documentation prepared by RCP shall meet the requirements of 10CFR830.120, Quality Assurance Requirements.

- The modification requirements for each cask including sketches, calculations, drawings, specifications, and QA requirements; controlling the modifications to each of the NAC-1 and NFS-4 Casks. These shall be submitted for review and approval by SNF project prior to performance of the work.

- Receipt and inspection reports shall describe the process noting any abnormalities encountered, materials used, and condition of the casks, including surveys for internal, prior to loading, and external smearable contamination. These shall be submitted for review and approval by SNF project prior to acceptance of the work.

- Available documentation provided by NAC with the purchase of the casks as verified in the 10/00 inventory against SNF 1999 shall also be provided.

- All documentation shall be turned over in a timely manner following acceptance of the modified casks. The document package for the cask to be used in the trial run shall be available at that time. Documents pertaining to individual casks shall be provided in packages identified to the cask. SAR and SARP related documentation shall be packaged separately.

- The modified NAC-1 On-Site SARP shall be submitted to the SNF Project for review and approval before submittal to the DOE for approval.

- Document reviews and turnovers shall be scheduled by RCP for review and approval by the SNF Project.

7.4 ISO Containers

The following documentation shall be provided for the ISO containers. Documentation prepared by RCP shall comply with the requirements of 10CFR830.120, Quality Assurance Requirements (latest revision).

- A design report including calculations, sketches or new drawings for any reinforcements for each ISO container and as-built drawings including any modifications.

- An inspection report and the painting specification for each ISO container.

- All drawings, design notes, calculations, specifications and procurement documents associated with the acquisition of the six containers.

- A documentation package for the ISO container to be used in the trial runs must be complete at that time.

- Document reviews and turnovers shall be scheduled by RCP for review and approval by the SNF Project.

8.0 REFERENCES

DOE 1999, *U.S. DOE Office of Civilian Radioactive Waste Management Quality Assurance Requirements and Description for the Civilian Radioactive Waste Program,* DOE/RW-0333P, DOE, Washington D.C.

FDNW 1999, *CSER 99-004: NFS-4/NAC-1 Spent Fuel Shipping Cask Criticality Safety Evaluation for Loose LWR Pins,* HNF-4832 Rev 0, Fluor Daniel Northwest, Richland, Washington.

FH 2000a, *324 Building Fuel Storage Evaluation,* HNF-6433 Rev 0, Fluor Hanford, Richland, Washington.

FDH 2000, *PHMC Radiological Control Manual,* HNF-5173 Rev 0, Fluor Daniel Hanford, Richland, Washington.

NAC 1996a, *Modifications, Cavity Ports, NAC-1 Cask,* NAC Dwg 485-20 (sheets 1 & 2), Nuclear Assurance Corporation, Norcross, Georgia.

NAC 1996b, *Fabrication Specification, NAC-1 Cask Modification.* NAC, Document No. 485-S-04, Nuclear Assurance Corporation, Norcross, Georgia.

NUREG 1997, *Standard Review Plan for Dry Cask Storage Systems,* NUREG-1536, Nuclear Regulatory Commission, Washington D.C.

SNF 1999, *NFS-4/NAC-1 Cask Document Inventory,* SNF 4962 Rev 0, Fluor Daniel Hanford, Richland, Washington.