SEP 22 2000 (4) ENGINEERING DATA TRANSMITTAL

JT Att 4

Page 1 of 3

1. EDT 629819

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
Distribution	CSB Subproject	N/A
5. Proj./Prog./Dept./Div.:	6. Design Authority/ Design Agent/Cog. Engr.:	7. Purchase Order No.:
SNF/CSB	S. A. Krieg	N/A
8. Originator Remarks:		9. Equip./Component No.:
For approval and release.		N/A
		10. System/Bldg./Facility:
		W-379
11. Receiver Remarks: 11A. Design Baseline Document? [ ] Yes [x] No		12. Major Assm. Dwg. No.:
A USQ SCREENING IS NOT REQUIRED. NS-4-001 provides a categorical exclusion in Appendix C, B.1, "Provide vendor information for inclusion in the Hanford Document Control System" that applies to this document. R. B. Bendixsen 8/1/00		N/A
		13. Permit/Permit Application No.:
		N/A
		14. Required Response Date:
		N/A

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	SNF-6442	N/A	0	Design Verification Report Spent Nuclear Fuel Project Canister Storage Building	E, S, Q	1, 2	1	
2	Response to Aproval with comments, see Watson below.	N/A	N/A					

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)	1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION
(See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name (K) Signature (L) Date (M) MSIN	(G) Reason	(H) Disp.	(J) Name (K) Signature (L) Date (M) MSIN
1	1	CSB Design Authority S. A. Krieg S. A. Krieg 8/1/00	1	1	R. B. Bendixsen R. B. Bendixsen 8/1/00
1	1	MHM Design Authority C. E. Swenson [signature] 8/1/00	1	1	W. C. Miller W. C. Miller 8/3/00
1	1	~~Cog~~ Eng. W. W. Pickett W. W. Pickett 8/17/00			
1	1	Cog. Mgr. G. D. Bazinet G. D. Bazinet 9/22/00			
1	1	QA S. S. Moss Stephen Scott Moss 8-8-2000			
1	1	Safety L. J. Garvin 8/1/00			
1	2	Env. D. J. Watson 8-11-00			

18.	19.	20.	21. DOE APPROVAL (if required)
S. B. Harrington Signature of EDT Originator Date: 8-1-00	S. A. Krieg Authorized Representative for Receiving Organization Date: 8/1/00	G. D. Bazinet Cognizant Manager Date: 9/22/00	Ctrl. No. [ ] Approved [ ] Approved w/comments [ ] Disapproved w/comments N/A

BD-7400-172-2 (05/96) GEF097

BD-7400-172-1

-----Original Message-----
From: Biebesheimer, Eric
Sent: Thursday, September 21, 2000 7:58 AM
To: Watson, David J (Dave)
Cc: Biebesheimer, Eric; Davis, Patricia L (Pat); Bazinet, Gerald D (Jerry); Harrington, Sara B
Subject: RE: DESIGN VERIFICATION REPORT - CSB, SNF-6442, REV. 0

Dave,

You approved the subject report with comment on August 11, 2000. We have addressed your comments as follows below. A copy of this message is being included with the released design verification report EDT to document the resolution of your comments (approval disposition "2").

Eric 373-4497
CBS Engineering -- SNF

-----Original Message-----
From: Davis, Patricia L (Pat) **On Behalf Of** Watson, David J (Dave)
Sent: Friday, August 11, 2000 3:20 PM
To: Krieg, Stuart A
Cc: Turnbaugh, Jerry E; Bazinet, Gerald D (Jerry); Watson, David J (Dave)
Subject: DESIGN VERIFICATION REPORT - CSB, SNF-6442, REV. 0

The subject report was provided for approval. It has been "approved w/comment."

The report is well written and provides a well documented design history and lists of project design and design verification documents in Appendix A. the following are a few comments.

1. Third paragraph in Section 1.0 states, "This report outlines the methods, procedures, and outputs developed by Project W379 to verify that the provided Structures, Systems, and Components (SSCs): satisfy the design requirements and acceptance criteria; perform their intended function; ensure that failure modes and hazards have been addressed in the design; and ensure that the SSCs as installed will not adversely impact other SSCs."

   The actual material and construction specifications which were used in the actual construction could not be found in Appendix A. These conveyed the design requirements to the constructor. For example, Construction Specification 15840, "Ductwork and Accessories" is inconsistent with the CSB Performance Specification by specifying SMACNA standard in lieu of ASME N509 and N510.

   Therefore, unless the construction and equipment procurement specifications are included in Appendix A it doesn't seem that it can be demonstrated that the SSCs satisfy the "design requirements."

   It is recommended that all the construction specifications be added to Appendix A showing:

   Type of verification: Independent review.

In addition, Appendix A should be titled "List of Project Design, Construction, and Design Verification Documents."

Response: Accepted. Appendix A, Page A-6 reflects supporting documents. To the existing entry, were added the **SNF-6131 and SNF-6130** document numbers to aid in their identification (these are the construction and procurement specs addressed in Watson's observation). Also, the Appendix A title was amended as recommended "List of Project Design, **Construction,** and Design Verification Documents."

2. Section 3.1.4, Table 3, System 6, 7 - PAT W379-PAT-024-1 was listed as the verification of the HVAC system. That PAT has not yet been performed and was not included in Section 3.1.5. It is not certain if the above PAT will satisfy the requirement reference cited in item (h) of Section 3.1.5. Line No. 72 in Appendix B should reference PAT-024-1.

Response: Accepted. The scope of PAT 24-01 was rolled into PAT 006, so reference to 24-1 has been deleted from this document. Line 72 (in Appendix B, page B-23) has been amended to indicate that PAT 006 treats the negative pressure test.

3. Appendix A cites some of the documents are "NOT RELEASED." Should they be released before this report is finally approved and issued?

Response: The document was reviewed for unreleased documents. The "Not Released" documents were updated to reflect their actual "released" status where applicable. In some instances documents such as test specifications and pre-start acceptance tests are controlled within the start-up organization, approved by the joint test group and/or test review board, and when complete are turned over to operations for inclusion into the project files, but are not "released" into the Hanford document control system. In a couple of instances some of the test documents, e.g., PAT-006 remain to be completed and will be prior to this ORR phase but not before the release of this document.

4. Appendix B has several "TBDs" in it. Should these be filled in before this report is finally approved and issued.

Response: Those items designated as TBD were reviewed again and confirmed to represent CSB post-ORR and pre-fuel transportation activities. The Design Verification Report, Section 3.1.5 highlights **Design Verification/Validation activities remaining to be completed** and lists the requirement remaining to be fully verified/validated (many of the requirements are currently partially verified/validated). The facility readiness is being treated in a phased approach. It provides for both pre-ORR activities and allows for post-ORR [pre-fuel movement] punch list items. The TBDs included in this report are an acceptable approach and will be tracked and completed as pre-fuel movement punch list items.

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	CSB Subproject	Date 09/22/00
Project Title/Work Order		EDT No 629819
SNF-6442, Rev. 0 Design Verification Report Spent Nuclear Fuel Project Canister Storage Building		ECN No. N/A

	Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
H	G. D. Bazinet	S8-06	X			
H	R. B. Bendixsen	S8-07	X			
H	T. B. Bergman	X3-78	X			
H	E. Biebesheimer	S8-05	X			
H	L. J. Garvin	S8-07	X			
H	S. A. Krieg	S8-05	X			
H	S. S. Moss	S8-07	X			
H	W. W. Pickett	H4-01	X			
H	C. E. Swenson	S8-07	X			
H	D. J. Watson	X3-79	X			
H	CSB Project Files (2)	S8-05	X			
H	Central Files	B1-07	X			

SNF-6442
Revision 0
EDT 629819

Design Verification Report Spent Nuclear Fuel Project Canister Storage Building

Project No: W-379 Document Type: RPT Division: SNF

W. W. Pickett
Vista

Total Pages: 103

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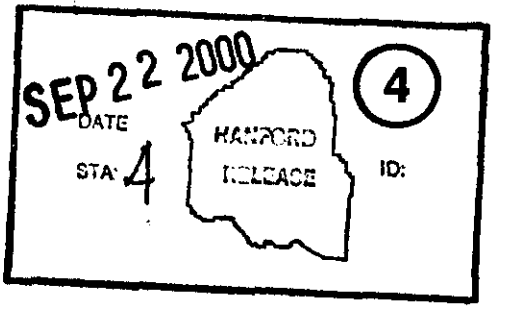
Date Published
September 2000

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

9-22-00
Release Approval Date



Approved for public release; further dissemination unlimited

SNF-6442
Revision 0

Design Verification Report Spent Nuclear Fuel Project Canister Storage Building

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

Printed in the United States of America

DESIGN VERIFICATION REPORT
SPENT NUCLEAR FUEL PROJECT-CANISTER STORAGE BUILDING SUB-PROJECT W379

Fluor Hanford, Inc. Contract 6704, Release 1
Vista Engineering Technologies, L.L.C. Project No. VET-1017

Prepared by:

Will Pickett

Reviewed by:

Jim Nelson

Prepared for:

U.S. Department of Energy
c/o Fluor Hanford, Inc.
P.O. Box 1000
Richland, Washington 99352

July 2000

DESIGN VERIFICATION REPORT
SPENT NUCLEAR FUEL PROJECT
CANISTER STORAGE BUILDING

SUB-PROJECT W379

July 28, 2000

Prepared by: _____ 7-28-00
W. W. Pickett, Vista Engineering Technologies, L.L.C. Date

Reviewed by: _____ 7/28/00
J. L. Nelson, Vista Engineering Technologies, L.L.C. Date

Approved by: _____ 7/28/00
P. C. Ohl, Vista Engineering Technologies, L.L.C. Date

Received by: _____ 7/28/00
G. D. Bazinet, Fluor Hanford, Inc. Date

TABLE OF CONTENTS

FIGURES

TABLES

TERMS

A/E	Architect/Engineer
ABU	Acceptance for Beneficial Use
ACD	Advanced Conceptual Design
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
CAT	Construction Acceptance Test
CN	Conference Notes
CSB	Canister Storage Building
DCPM	Design Control Procedures Manual
DESH	Duke Engineering Services Hanford
DOE	Department of Energy
DOE/RL	Department of Energy, Richland
ECN	Engineering Change Notice
EDT	Engineering Data Transmittal
FAT	Factory Acceptance Test
FDC	Functional Design Criteria
FDI	Fluor Daniel Incorporated
FDR	Formal Design Review
FMECA	Failure Mode Effect Critical Analysis
FRD	Functions and Requirements Documents
GEM	Gaseous Effluent Monitoring
HWVP	Hanford Waste Vitrification Plant
IDR	Independent Design Review
IR	Independent Review
JTG	Joint Test Group
MCO	Multi-Canister Overpack
MHM	MCO Handling Machine
MM	Meeting Minutes
NOG-1	Nuclear Overhead Gantry ASME crane requirements
OSHA	Occupational Safety and Health Administration
PAT	Pre-Operational Acceptance Test
RAM	Reliability, Availability, Maintainability analysis
SNF	Spent Nuclear Fuel
SSC	Structures, Systems and Components
SSF	Staging and Storage Facility
TDP	Technical Data Package
TRB	Test Review Board
VDT	Vendor Data Transmittal
WHC	Westinghouse Hanford Company

Design Verification Report
Spent Nuclear Fuel-Canister Storage Building

1.0 INTRODUCTION

The Sub-project W379, "Spent Nuclear Fuel Canister Storage Building (CSB)," was established as part of the Spent Nuclear Fuel (SNF) Project. The primary mission of the CSB is to safely store spent nuclear fuel removed from the K Basins in dry storage until such time that it can be transferred to the national geological repository at Yucca Mountain Nevada.

This sub-project was initiated in late 1994 by a series of studies and conceptual designs. These studies determined that the partially constructed storage building, originally built as part of the Hanford Waste Vitrification Plant (HWVP) Project, could be redesigned to safely store the spent nuclear fuel.

The scope of the CSB facility initially included a receiving station, a hot conditioning system, a storage vault, and a Multi-Canister Overpack (MCO) Handling Machine (MHM). Because of evolution of the project technical strategy, the hot conditioning system was deleted from the scope and MCO welding and sampling stations were added in its place. This report outlines the methods, procedures, and outputs developed by Project W379 to verify that the provided Structures, Systems, and Components (SSCs): satisfy the design requirements and acceptance criteria; perform their intended function; ensure that failure modes and hazards have been addressed in the design; and ensure that the SSCs as installed will not adversely impact other SSCs. Because this sub-project is still in the construction/start-up phase, all verification activities have not yet been performed (e.g., canister cover cap and welding fixture system verification, MCO Internal Gas Sampling equipment verification, and As-built verification.). The verification activities identified in this report that still are to be performed will be added to the start-up punchlist and tracked to closure.

2.0 DESIGN VERIFICATION REQUIREMENTS

2.1 EVOLUTION OF DESIGN VERIFICATION PROCEDURAL DOCUMENTS AND REQUIREMENTS

When Sub-project W379 was initiated, design verification was defined for the CSB sub-project by Westinghouse Hanford Company (WHC) procedure [WHC-CM-6.1], Standard Engineering Practices, EP 4.1, "Design Verification", and on the SNF Project by [HNF-1613], "Spent Nuclear Fuel Engineering Practices". Currently, design verification on the Hanford Site must be conducted in accordance with [HNF-PRO-1819], "Engineering Requirements". The SNF project

has developed Administrative Procedure [AP-EN-6-027-01], "Design Verification Process", for implementation of the [HNF-PRO-1819] verification requirements.

Even with the changes in the forms of the design verification implementing procedures, the design verification requirements themselves have not evolved extensively. The primary changes, which have been implemented in most recent design verification procedures, are mainly on the following aspects:

- More formalization of planning actions:
  - Ensure the graded approach on verification methods selection is based on a risk analysis (a methodology is provided as guidance)
  - Ensure that verification activities are defined during the planning phase, including:
    - Acceptance criteria
    - Verification responsibilities of the Architect/Engineer (A/E)
    - Verification documentation requirements
  - Ensure verification activities are integrated in activity/cost/schedule baselines
  - Implementation of a method to control verification status
- The addition of some detailed requirements (e.g. Design Verification Questionnaire).

The core verification requirements remain the same, and verification, regardless of originating procedures, can be categorized under the principle methods of design verification as defined in [AP-EN-6-027-01]. Verification methods include: Independent Review, Alternate Calculations, Qualification Testing, Formal Design Review, and Informal Review. The aspects of verification can be summarized as follows:

- Identify Design Requirements and associated verification methods.
- Plan and prepare verification activities and integrate them into project tasks.
- Perform verification activities according to selected method.
- Implement corrective actions resulting from verification, to ensure requirements are met and tracked to closure.
- Document verification activities and demonstrate design requirements are met.

The different design verification methods listed above are applied on a graded approach based on the importance to safety and the environment, complexity of the design, degree of standardization, state of the art, similarity with proven designs, and programmatic impacts. General application of the different design verification methods used by the CSB is described in

sections 2.2 through 2.6. Specific details and documentation of design verification is described in section 3.

2.2 INDEPENDENT REVIEW

Independent reviews were used extensively to verify the design packages and procurement packages produced by the design agent, Fluor Daniel Incorporated (FDI). The independent reviews performed on FDI Design met all the requirements of a formal review with the exception of the identification of a chairman and the issuance of a design review completion report. Independent reviews were conducted in accordance with FDI's Design Control Procedures Manual (DCPM) and documented in conference notes issued with PHMC concurrence. An independent review was also completed on the MCO design. FDI used independent design review on calculations applying to SSCs with enhanced quality assurance requirements, and the computer codes were independently validated and verified.

2.3 ALTERNATE CALCULATIONS

Design verification by means of alternate calculations involves the use of one or more different methods of analysis to check and ensure the correctness and applicability of pertinent design calculations, including both hand and computer calculations. Some of the alternate calculations include the following:

- An alternate calculation was performed by Q Metrics of the thermal analysis of the MCO loading during CSB Start-up.
- An alternate calculation of the CSB Design Capacity.
- An Independent Analysis of MCO Critical Failures by M&D Associates.
- Validation and Verification of computer codes used for Spent Nuclear Fuel CSB.

2.4 QUALIFICATION TESTING

Qualification testing was applied as a final verification for all testable systems and SSCs supplied by the project to verify they met the requirements and that the systems functioned as intended. Qualification testing includes a combination of:

- Factory acceptance testing to confirm that components meet procurement specification requirements,
- Construction acceptance tests, to confirm that components are installed in accordance with the construction specification requirements, and
- Pre-operational acceptance tests to assure that all SSC's function as intended as an integrated system.

2.5 FORMAL DESIGN REVIEW

Formal design reviews are typically conducted at key stages of the design process to provide a comprehensive verification that the design meets requirements. The bulk of CSB

design reviews that serve this function are classified as independent reviews as described in section 2.2. Formal Design reviews on Project W379 that were completed, include:

- The Conceptual Design Report
- The MHM System
- The Security System
- The Sample/Weld Station System

2.6 INFORMAL REVIEW

This method was used for review of non-final design documents, such as engineering studies, Functions and Requirements Documents (FRD), Performance Specifications, and for reviews of designs verified by others (e.g. design change notices). This method [AP-EN-6-027-01] was used extensively and is documented by signature on the releasing document such as the EDT or ECN. Design verification documentation included with the EDT or recorded on the EDT or ECN is transmitted to a Document Control Release Station for processing and retention.

3.0 DESIGN VERIFICATION ACTIVITIES

This section briefly describes the history of the W379 Sub-project and the design as well as design verification activities. The CSB requirements baseline at each project stage, the engineering products and the verification methods used are contained in Table 1. A schedule of events with the technical baseline development and associated verification methods are shown in Figure 1. The pre-conceptual and conceptual phases of the project were verified by both informal review and formal design review. The approval and release signatures of the reviews on the Engineering Data Transmittal (EDT) coversheets document the informal reviews. The conceptual design underwent a formal design review.

During the preliminary and detailed design stages, the Design Agent (Fluor Daniel Incorporated) developed the Design Control Procedures Manual (DCPM) that was used for directing design control and design verification activities. The DCPM has requirements for verification by checking, independent design review, squad checks, internal reviews, and client reviews. Additionally there was independent analysis performed and/or directed by the Project Management Hanford Contractor (PHMC).

Verification in the construction/start-up phase included: analysis, informal review, independent review, factory acceptance testing, construction acceptance testing, inspections, pre-operational testing, and As-builts. Changes to the approved design are controlled by Design Change Notice (DCN) process as outlined in the DCPM. SNF Procedure [AP-EN-6-027-01] states that all design changes are required to undergo a design verification. The design verification included an evaluation of the effects of those changes on the overall design and on any design analyses upon which the design change is based that are affected by the change. These reviews were included as assurance that the design analyses for the structure, system, or components are still

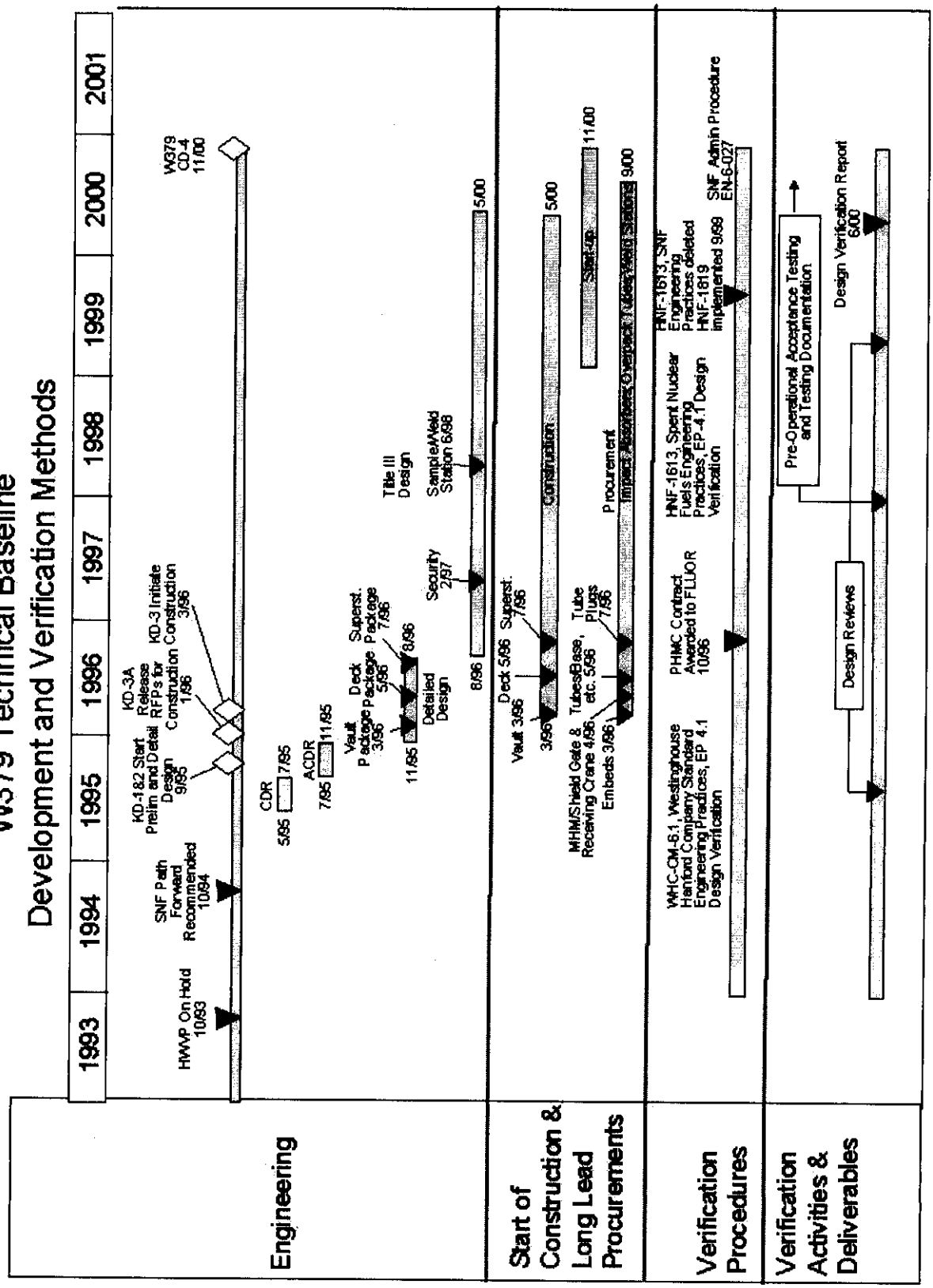
valid. For the CSB, verification of changes was implemented with independent reviews as documented by the signatures on the DCNs, including the Design Authority.

A list of the design documentation and design verification documents that were created during the different phases of the project has been developed and is included in Appendix A " List of Project Design and Design Verification Documents." A current list of drawings, and specifications is contained in the Acceptance for Beneficial Use (ABU) checklist [SNF-6253].

Table 1. CSB Baseline Design Stage Criteria, Design Output, and Verification

Pre-Conceptual Design & Conceptual Design	SNF Project /stage and Store K Basin SNF in CSB, Functions and Requirements WHC-SD-SNF-FRD-010	Staging and Storage Facility Feasibility Study Final Report WHC-SD-W379-ES-002	Informal Review documented by EDT signoff
		CSB Trade Study Final Report WHC-SD-W379-ES-003	Informal Review documented by EDT
		Spent Nuclear Fuel Canister Storage Building Conceptual Design Report WHC-SD-W379-CDR-001	Formal Review: SNF CSB Conceptual Design Report Review Committee Report WHC-SD-W379-DR-001
Preliminary & Definitive Design Stage	Performance Specification for the Spent Nuclear Fuel Canister Storage Building HNF-S-0425 Specification for the MCO Handling Machine HNF-S-0468	CSB Facility Drawings Procurement Specifications	Design Package Reviews: See Table 2
		Calculations	FDI Files containing Independent Design Reviews
		MHM Design Vender File VI-50100	Formal Review: MHM 100% Design Package in vendor file #VI-50100 and letters: MHM-BTR-092-R.1, DESH-9761988.1; MHM-BTR-101, DESH-9860199; and MHM-BTR-111, DESH-9851598.
Design & Construction Phases	Performance Specification for the Spent Nuclear Fuel Canister Storage Building HNF-S-0425 Specification for the MCO Handling Machine HNF-S-0468	Design Change Notices (DCN) and As-builts	Informal Review documented by DCN signoff
		Procurement Specifications Construction Specifications	Independent Review Specifications: See Table 2
		Safety Documentation	Independent Review (EDT)
	CSB System Test Specifications: SNF-W379-TS-001 – SNF-W379-TS-025-1	Testing Documentation	Independent Reviews of Test Specifications, Pre-operational Test Procedures, and Test Summary Reports: See Appendix A

Figure 1. CSB Technical Baseline Development and Associated Verification Methods



3.1 HISTORY OF DESIGN VERIFICATION ACTIVITIES

3.1.1 PRE-CONCEPTUAL PHASE

In October 1994, WHC published the Hanford Spent Nuclear Fuel Project Recommended Path Forward, WHC-EP-0830, outlining a recommended approach for expedited removal of spent fuel from the K Basins. An essential part of this recommended approach was the use of a new facility to safely store the spent nuclear fuel.

The entire pre-conceptual phase was conducted under the direct responsibility of the DOE prime contractor (WHC) with many of the feasibility studies subcontracted to an A/E (ICF Kaiser/FDI). In order to support an evaluation of adapting the HWVP storage facility for use with the SNF project, WHC initiated a Staging and Storage Facility (SSF) Feasibility Study, WHC-SD-W379-ES-002, with Fluor Daniel Incorporated (FDI) in January 1995, and a CSB Trade Study, WHC-SD-W379-ES-003, was performed in May 1995. WHC-SD-SNF-FRD-010, SNF Project Stage and Store K Basin SNF in CSB Functions and Requirements, documented the upper level functions and requirements in June 1995. Verification activities in this phase consisted of informal reviews of the documents produced during this design stage. The signatures of the reviewers, including Safety, Quality Assurance, the Design Authority, etc. on the Engineering Data Transmittals (EDTs) document the design verification.

The mission for Project W379 was accepted by DOE-RL in DOE-RL letter [95-NMD-081DOE-RL], K Basins Path Forward Approval of Mission Need.

3.1.2 CONCEPTUAL PHASE

The conceptual design was started in May 1995 concurrent with a CSB trade study, WHC-SD-W379-ES-003, that was intended to determine the most suitable site to store the K-Basin Spent Fuel. The CDR, "Spent Nuclear Fuel Canister Storage Building Conceptual Design Report," WHC-SD-W379-CDR-001, was issued July 24, 1995. This CDR provided the technical basis for the initial project cost baseline. The CDR underwent a formal design review and a design review report of the CDR, WHC-SD-W379-DR-001, was issued in September 1995.

The HWVP FDC and the Technical Data Package (TDP) were the source of design requirements during the conceptual design as a CSB Performance Specification was being developed. The CDR in conjunction with the "Hanford SNF Project Recommended Path Forward," WHC-EP-0830, provided the basis for proceeding with the Advanced Conceptual Design (ACD) in August 1995. A final version of the Performance Specification, WHC-S-0425, Rev. 0, was used during the ACD stage. The performance specification underwent an informal review as documented on EDT #613003. The information developed during the Advanced Conceptual Design was rolled directly into the detailed design when capital funding was received in late 1995. A revised estimate based on the ACD effort was documented in FDI correspondence FRF-2717 dated October 9, 1995.

3.1.3 PRELIMINARY AND DEFINITIVE DESIGN STAGE

Detailed design efforts for the SNF CSB were initiated after capital funding was received at the end on November 1995. It was determined that phased releases of design media would support the aggressive construction schedule while allowing for the required design reviews. The facility was divided into three main packages and several smaller packages for design reviews and releases for construction. The three primary packages making up the CSB are the Vault, the Deck, and the Superstructure. The Vault package was issued on March 21, 1996, the Deck package was issued on May 10, 1996, and the Superstructure package was issued on July 26, 1996. A Detailed Design report was issued in August 1996 (FRP-061) to document the detailed design phase of the CSB. It contained the project background; the facility and engineering descriptions from each design discipline; a cost estimate; a schedule; the Design Basis Document; the system design description; the list of calculations; the list of design documents; and equipment, piping, and valve lists.

As verification that the design met the requirements, the DCPM required FDI to complete a design requirement compliance matrix. The first matrix was completed in April 1996 for baseline verification of the vault design against Performance specification WHC-S-0425 (Interoffice Correspondence, File 106 dated 4/12/96). The Compliance matrix was revised in July 1996 for the entire Canister Storage Building (FRT-2694).

Design verification requirements were met during detailed design by following the process outlined in the DCPM. Verification included interim design reviews, group reviews, squad checks, and client reviews/independent design reviews. Figure 2. contains Exhibit 8.0-1 of the DCPM, which diagrams the design, and design verification process that includes independent reviews by the PHMC. These reviews are documented in the FDI Conference Notes (CNs) listed in Table 2. The checking and design verification outlined in the DCPM and followed during the project are as follows:

- Interim Design Review – evaluates design concepts to assure that the design criteria and operational, maintenance, safety, and constructability objectives are met. The interim review is performed with participants from DOE, DESH, Construction Management, and Fluor Daniel.

- Group Review – an internal process that supports records of working documents that are maintained by the originating discipline.

- Squad Check – process used to perform technical design reviews of drawings and specifications in order to assure the adequacy of design and that necessary design requirements for interfacing disciplines have been clearly specified. Design documents are squad checked prior to release as approved for construction.

- Independent Design Review (Client Review) – includes a graded quality assurance program that is used to ensure the quality and adequacy of design drawings, specifications, and other detailed design services to be furnished by Fluor Daniel. The reviewer may be from the same company/organization, but was not involved as a participant, supervisor, technical reviewer or advisor in the work being reviewed and

to the extent practical has freedom to do an impartial review. The independent reviews of the design packages are as outlined in Table 2. These independent reviews include a list of the PHMC reviewers. These reviews are documented in FDI Conference Notes (CNs).

Figure 2. Exhibit 8.0-1 Design Control Procedures Manual for CSB Engineering Control and Review Cycle

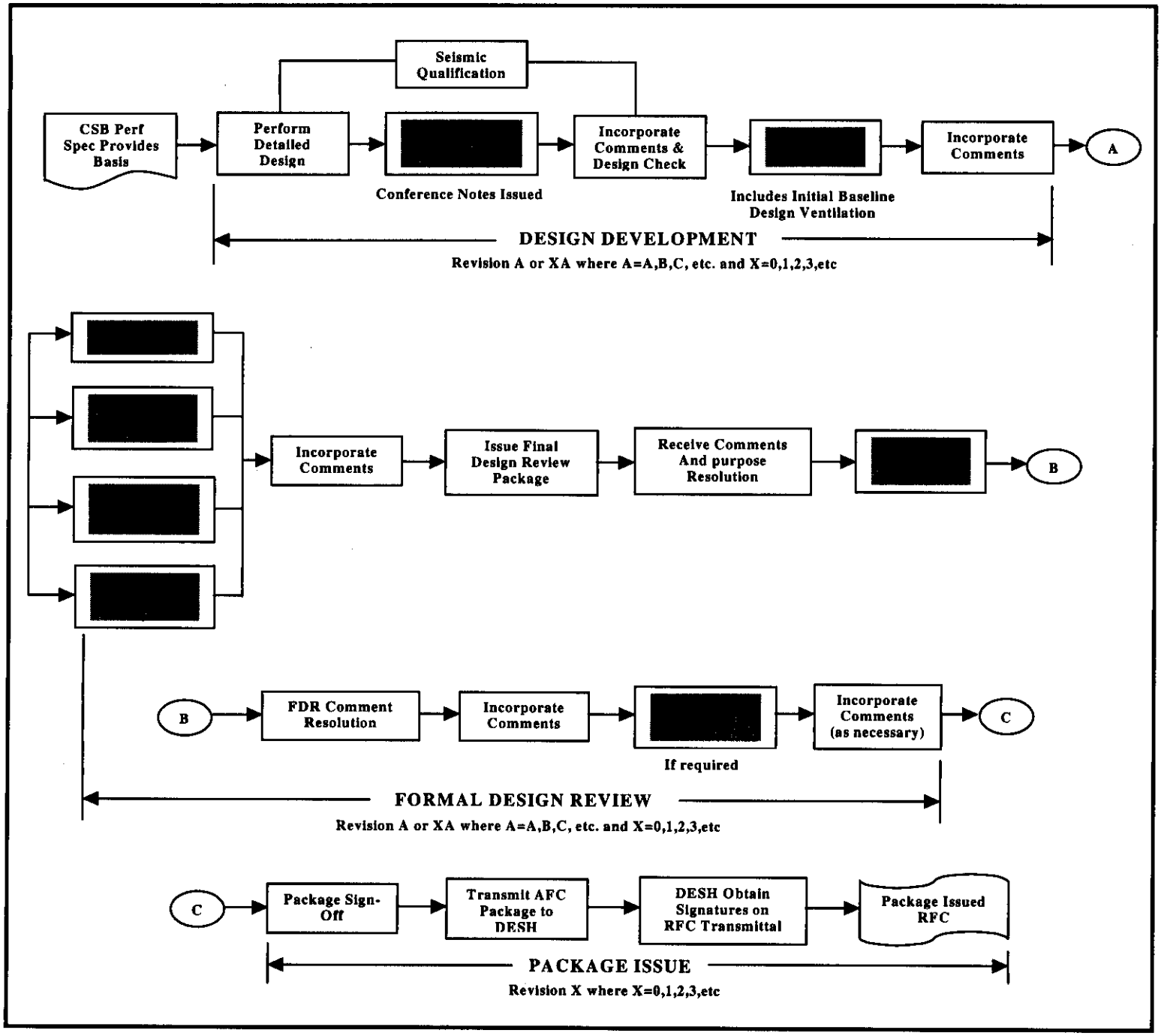


EXHIBIT 8.0-1 Rev 1
FDI Contract 80460200

Table 2. Design Package Independent Reviews

Design Procurement Packages	Systems in Package	Design Review Comments	Design Review Completion Record
Embed Package	Vault Embeds	FDI Log #CN-1069, File104.2, 2/28/96	FDI Log #CN-1071, File104.2, 3/1/96
CSB Vault Package	Vault Structure, Rebar, Concrete, etc.	FDI Log #CN-1078, File 104.2, 3/20/96	FDI Log #CN-1079, File104.2, 3/21/96 CN-1123 (Seismic)
MHM Shield Gate*	Portable shield gate between MHM and Deck	FDI Log #CN-1082, File104.2, 4/4/96	FDI Log #CN-1084, File104.2, 4/4/96
CSB Receiving Crane	Receiving Crane	FDI Log #CN-1083, File 104.2, 4/04/96	FDI Log #CN-1085, File 104.2, 4/04/96
CSB Deck Package	Deck, Rebar, Concrete, etc.	FDI Log #CN-1092, File104.2, 5/6/96	FDI Log #CN-1094, File104.2, 5/9/96 CN-1123 (Seismic)
CSB Tubes, Base, Covers, Absorbers, Cart Package	MCO storage tubes, tube bases, tube covers, Impact absorbers, etc.	FDI Log#CN-1096, File 104.2, 5/28/96	FDI Log # CN-1098, File 104.2, 5/31/96
CSB Superstructure Package	HVAC, instrument air and compressed air systems, HEPA room, distribution control room, change out room roofing, siding, fire protection systems, lighting, communication/PAX system, helium supply system, electrical distribution system, UPS system and battery room, control room.	FDI Log#CN-1109, File 104.2, 7/25/96	FDI Log #CN-1110, File 104.2, 7/26/96
Tube Plug Package	Storage Tube Plugs	FDI Log #CN-1111 and 1099, File 104.2, 7/29/96 and 6/10/96	FDI Log #CN-1112, File 104.2, 7/30/96
CSB/HCSA Design*	Hot Conditioning System	FDI Log #CN-1127, File104.2, 10/14/96	FDI Log #CN-1128, File104.2, 10/17/96
Security and Safeguards Package	Security Systems	FDI Log #CN-1134 File 104.2, 2/28/97	FDI Log #CN-1136 File 104.2, 2/28/97, and Formal Design Review documented in Letter FDH-9655540 R1
P&IDS	P&ID	FDI Log #CN-1150 File 104.2, 8/8/97	FDI Log #CN-1150 File 104.2, 8/8/97
Canister Impact Absorber	Impact Absorbers for Inside Tubes	FDI Log #CN-1196 File 104.2, 9/2/98	FDI Log #CN-1196 File 104.2, 9/2/98

Design/Procurement Packages	Systems in Package	Design Review Comments	Design Review Completion Record
MCO Sampling Station	MCO Sampling System	FDI Log #CN-1188 & 1189, File 104.2, 6/18/98 & 6/22/98	FDI Log #CN-1190 File 104.2, 6/29/98
HEPA Filter	Exhaust Fan and HEPAs for Sample Weld Station	FDI Log #CN-1199 File 104.2, 9/23/98	FDI Log #CN-1199 File 104.2, 9/23/98
Weld Station	MCO Cover Cap Welding System	FDI Log #CN-1212 File 104.2, 1/14/99	SNF MCO Design Review Completion Report, SNF-5222
Overpack Storage Tube and Plugs	Overpack Storage tubes and Plugs	FDI Log #CN-1225 File 104.2, 3/02/99	FDI Log #CN-1232 File 104.2, 4/29/99
Tube Plug Adapter	Tube Plug Adapter for MHM Grapple	FDI Log #CN-1233 File 104.2, 5/13/99	FDI Log #CN-1234 File 104.2, 5/20/99
Transfer System Impact absorber*	Impact Absorber for use During MCO Off-Load	FDI Log #CN-1335 File 104.2, 5/21/99	-N/A
High security gate	CSB Building Gate	FDI Log #CN-1236 File 104.2, 6/17/99	-
Rolling Gate	CSB Building Gate	FDI Log #CN-1243 File 104.2, 7/12/99	-
Guide Ring Funnel*	Alignment Funnel/Interface for Storage Tube	FDI Log #CN-1247 File 104.2, 7/19/99	-N/A
CSB Operations Building	Operations Personnel Trailers	FDI Log #CN-1238 File 104.2, 6/28/99	-
Frog Tooling Design package	Tool for Handling Rail Frogs	FDI Log #CN-1250 File 104.2, 9/7/99	-
Shield hatch	Shield Covers for Cask Receiving Pit and Sample/Weld Station Pit	FDI Log #CN-1252 File 104.2, 9/23/99	-
Containment Tent	Enclosure for Receipt of or High pressure Casks (Off Normal)	FDI Log #CN-1259 File 104.2, 11/8/99	-
Block Diagram	Process Block Flow Diagrams	In Process	H-2-123400, Sheets 1-12

***Note**: These features were subsequently removed from the scope of the SNF CSB Sub-project.

The vendor-supplied designs were reviewed by FDI/DESH and documented in FDI conference notes as listed in Table 2. Comments from all of the PHMC package reviews are located in the FDI conference notes. The largest procurement package (MHM) underwent a formal design review and is documented in the MHM 100% Design package, vendor file #VI-50100. After the formal design review, changes were made to the MHM Design Requirements. The modified design was independently reviewed and documented in the following letters: [MHM-BTR-092-R.1], [DESH-9761988.1]; [MHM-BTR-101], [DESH-9860199]; and [MHM-BTR-111], [DESH-

9851598]. Independent reviews of the seismic analysis for the MHM are documented in [FDP-591], [DESH-9853642], and [DESH-9760886].

Other documentation of design verification activities, e.g., independent reviews, informal/formal design reviews, and alternate calculations, performed on the CSB SSCs is contained in the following documents.

Independent reviews conducted on the CSB design documentation and CSB SSCs are documented in:

- 99-SNF/CES-001, Interoffice Correspondence, "MCO Machine - Shield Skirt/Concrete Deck Interface - Technical Evaluation," C. E. Swenson to A. S. Daughtridge, dated November 2, 1999, containing an unreleased copy of HNF-5297, "Radiation Exposure from the Gap Under the Multi-Canister Overpack (MCO) Handling Machine," S. R. Gedeon, FDNW, October 1999".

- CN-1123, "Design Review of SNF CSB Deck Structural Calculations and RCR's," Fluor Daniel, Inc., 1996.

- DESH-9760886, "Review of Soil and Building Structural Interaction on Seismic Response Spectra for CSB Receiving and Multi-Canister Overpack Handling," DE&S Hanford, Inc., 1997.

- DESH-9853642, "Review Comments to Seismic Analysis and Structural Calculations," DE&S Hanford, Inc., 1998.

- FDP-591, "Multi-Canister Overpack Handling Machine Seismic Analysis Review Report," Fluor Daniel, Inc., 1998.

Formal reviews have been completed and documented in the following:

- SNF-5222, "SNF MCO Design Review Completion Report," L. H. Goldmann, Fluor Daniel Hanford, 1999; containing SNF-RPT-011, Rev 1A, "SNF Project Design Basis Capacity Study," K. J. Cleveland, Fluor Daniel Northwest, 1999.

- SNF-5465, "SNF MCO Design Verification Summary," L. H. Goldmann, Fluor Daniel Hanford, 1999.

- FDH-9655540, "Security Concept and Design Criteria, 100% Design Review for the Canister Storage Building and Hot Conditioning System Annex," letter; E. S. McGinley, FDH, to F. G. Hudson, DESH, dated May 19, 1997.

Design compliance matrices have been completed and informally reviewed as documented on the EDTs as follows:

- HNF-4742, Rev. 0, "CSB Compliance Assessment, DOE Order 6430.1A, General Design Criteria," D. M. Black, Fluor Daniel Northwest, 1999.

- HNF-4776, Rev. 0, "CSB Compliance Assessment, SNF Project NRC Equivalency Criteria," D. M. Black, Fluor Daniel Northwest, 2000.

- SNF-5790, "Design Compliance Matrices to ANSI and OSHA," S. A. Krieg, FDH, 2000

- 00-SNF/CES-005, "Project Number W-379 - Multi-Canister Overpack Handling NOG-1 Compliance Matrix," SNF Project Internal Correspondence, C. E. Swensen to G. D. Bazinet, May 11, 2000.

Alternate calculations have been completed as follows:

- EDT 625800, "Preliminary Analysis of MCO Loading During CSB Startup." A. L. Pajunen, DESH, December 1, 1998 (Contains Independent analysis by Q Metrics on natural convective cooling). Alternate calculation of CSB-HV-0010, "CSB Vault Air Temperatures".

- SNF-5930, "Structural Analysis of MCO for Accidental Movement of MHM During MCO Lifting Operations," G. D. Bazinet, NHC, and G. Abatt, March 2, 2000 (Contains Independent Analysis of MCO Critical Failures by M&D Associates). Alternate calculation of CSB-S-0007 "Storage Tube Analysis & MCO Drop", CSB-S-0067 "MCO Drop Impacts on the Standard Storage Tubes", and CSB-S-0068 "MCO Drop Impacts on the Overpack Storage Tubes".

Computer code validation and verification:

- FDP-815, "Validation and Verification of Computer Codes Used For Spent Nuclear Fuel CSB," letter S. L. Petersen FDNW, to A. S. Daughtridge, DESH, dated March 11,1999.

Informal reviews have been completed and documented on EDTs on the following:

- HNF-6025, Rev. 0," Emergency Preparedness Hazards Assessment," L.R. Campbell, dated May 24, 2000.

- HNF-SD-SNF-FHA-002, Rev. 2., "Final Fire hazards Analysis for the Canister Storage Building," ARES report, 2000.

- HNF-SD-SNF-CSER-005, "Criticality Safety Evaluation Report for the MCO," S. F. Kessler, FFS, 2000.

- SNF-6449, "FMEA/RAM Analysis for the MHM," EDT 628719, 6/1/00

- HNF-3672, Rev0., "Canister Storage Building Safety Requirements." D.E. Krahn, 2000.

- HNF-3553, Vol. 1, Rev. 0a., Spent Nuclear Fuel Project Final Safety Analysis Report." L. J. Garvin, 2000.

- HNF-3553, Annex A, Rev. 0., Spent Nuclear Fuel Project SAR – Annex A Canister Storage Building." R.P. DiPiazza, 2000.

The following documents underwent an informal review with the FSAR as documented in the EDT:

- SNF-3907, "SNF Project CSB Human Factors Engineering (HFE) Analysis: Results and Findings," R. P. DiPiazza, 1999
- SNF-4831, "Human Factors Engineering and Ergonomics Analysis for the CSB: Results and Findings," R. P. DiPiazza, 1999
- SNF-3328, Rev. 2, "Canister Storage Building Design Basis Accident Analysis Documentation," R. D. Crowe, M. G. Piepho, et.al., FH, 2000.
- SNF-SD-SNF-HIE-000, "Canister Storage Building Hazard Analysis Report," L.J. Garvin, 1997.

3.1.4 CONSTRUCTION AND STARTUP PHASE

Verification of the CSB SSCs meeting their associated requirements during the construction and start-up phases of Sub-project W379 can be broken into five types of verification:

- Review of vendor supplied designs
- Factory Acceptance Tests (FATs)
- Construction Acceptance Tests (CATs)
- Pre-operational Acceptance Tests (PATs)
- As-Built Verification

Each of the 23 systems of the CSB is described in Table 3 along with their associated design verification. This testing verifies the design of the CSB SSCs by ensuring that the systems are within dimensional bounds; perform the required control or actuation; provide the required flow and/or pressure drop; or otherwise perform their required function. The systems and their required testing are outlined in the W379 Test Specifications. Below is a description of the testing process used on the CSB.

The Design Authority, Design Agent, construction contractor, or vendors, assist in the preparation and/or review of the detailed FAT test procedures and acceptance criteria. FATs typically occur at the vendor's site and verify that the SSC meets the requirements of the procurement specification. FATs can be dimensional in nature, test component actuation, simulate inputs and logic controls, provide load tests, hoist speeds, leak tests, etc. Factory

acceptance tests are approved by the Design Agent and the Design Authority and are controlled by the construction contractor.

During the construction phase, the Start-up organization, with input from the Design Agent and Design Authority, developed the Test Specifications. The Test Review Board (TRB), formerly the Joint Test Group (JTG), and the Design Authority performed an independent review of the Test Specifications (see JTG/TRB meeting minutes listed in Appendix A). The Test Specifications reviewed the adequacy of the FATs and developed the requirements for the CATs and PATs. The CATs are approved by the Design Agent and the Design Authority and are controlled by the construction contractor.

The Pre-operational Acceptance Test procedures that were developed contain the traditional Acceptance Testing Procedure (ATP) content with the physical and functional testing content of traditional Operational Testing Procedures (OTP). These PAT procedures also underwent independent reviews by the TRB and informal review by Design Authority as listed in Appendix A.

A compilation of the qualification testing of each of the CSB sub-systems is, or will be, documented in a Test Summary Report. The Test Summary Report is the culmination of a process to document the portions of the system needing testing, the procedure for executing the tests, and the test results. The Test Summary Reports also undergo an independent review by the TRB. A list of the Test Summary Reports and the references of the independent reviews is contained in Appendix A.

Not all of the systems identified have completed their qualification testing. Those systems are described in section 3.1.5.

The As-built verification process is currently underway for essential drawings for both the MHM and the balance of the CSB. These activities are being completed in accordance with the As-built verification plans (Verification Plan for As-Builting Cansister Storage Building, SNF Desk Instruction [CSB-DI-001]; and the MHM As-Built Verification Plan Rev. 0. C.E. Swenson, A. S. Daughtridge, [SNF-6448, Rev.0]).

Table 3. CSB Systems and Design Verification

1,18	**Electrical Distribution System** A safety support system comprised of normal electric power and uninterruptible power systems. The normal electric power distribution system conveys one-line connections between the Hanford Site Power and CSB. UPS function is to supply uninterrupted, reliable power to SNF CSB instrumentation distribution panels. *Safety Conditions:* Classified General Service.	Design Reviewed: Superstructure Package Tested: UPS W379-PAT-018
2	**Instrument/Service Air System** The CSB instrument and plant air system comprises two 2-stage, oil-free, air-cooled, rotary screw compressors operating in alternating lead-fashion to deliver compressed air at the compressor discharge. *Safety Conditions:* Classified General Service.	Design Reviewed: Superstructure Package Tested: W379-PAT-002
3	**Fire Protection System** The CSB structural system, roof, and exterior wall system are made of noncombustible materials. In any interior areas that have finishes, the finishes have a flame spread index less than 25 when tested in accordance with ASTM E84. *Safety Conditions:* Classified General Service.	Design Reviewed: Superstructure package

4	**Liquid Waste Collection System** The liquid waste collection system is designed to collect water condensate from HVAC air handling unit cooling coils and instrument air compressors, and provide for transfer of the condensate to approved containers for disposal. *Safety Conditions:* Classified General Service.	Design Reviewed: Superstructure package Tested: W379-PAT-004
5	**Communications System** The design of the plant communications system provides the cabling and/or raceway system equipment for the telephone, public address, intercom, and radio communications systems within the CSB to the communications equipment interface point. *Safety Conditions:* Classified General Service.	Design Reviewed: Independent review of U.S. West Telephone System and Public Address System Design (Not located in document release system). Tested: Construction Acceptance Testing summarized in Test Summary Report W379-TSR-005
6,7	**Heating, Ventilating and Air Conditioning System** The HVAC system is designed to provide, along with physical barriers, part of the CSB contamination confinement system and contamination control within the CSB. The HVAC system provides a controlled pressure gradient flow of air from outside the CSB inward through uncontaminated areas to potentially contaminated areas of the building and out through HEPA filters and a monitored exhaust. The HVAC system also provides climate control to ensure that environmental conditions in the CSB are maintained in the required ranges for personnel and equipment. *Safety Conditions:* Classified General Service.	Design Reviewed: Superstructure package Tested: Operating Area: W379-PAT-006 Support Area: W379-PAT-007 Stack Monitoring Phase 1: W379-PAT-010-1 Stack Monitoring Phase 2: W379-PAT-010-2
8	**Sanitary Water System** The sanitary water system is designed and limited to supplying clean water for possible future sanitary use (e.g., toilets, sinks, showers, and drinking fountains) if required. *Safety Conditions:* Classified General Service	Design Reviewed: Superstructure package
9	**Backup Power System** The backup power system designed for CSB will not be installed and connected at this time. *Safety Conditions:* No safety-class or safety-significant has been identified.	N/A
10,11	**Health Protection System** The health protection system is designed to monitor and warn plant personnel of hazardous radioactive conditions that may occur as a result of malfunctions or accidents, provide contamination control, and provide limited computer-activated database management and status reporting. An airborne emission monitoring system is designed to provide continuos stack monitoring for radionuclides and alpha/beta particulate. *Safety Conditions:* Classified General Service.	Design Reviewed: Superstructure package Tested: W379-PAT-011-1
12	**Transportation Cask Receiving System** The receiving crane is designed to offload an MCO transportation cask from a transport trailer and transfer the cask to the cask receiving pit. The receiving crane and appurtenances offload the MCO transportation cask from the transport trailer. After an MCO has been removed from the cask by the MHM, the receiving crane retrieves the cask, including an empty MCO, and places the cask back on the transport trailer. *Safety Conditions:* The major components have been classified in the following categories: A, B, safety-significant, and general service.	Design Reviewed: Superstructure package Tested: W379-PAT-012 W379-PAT-012-1
13	**Transportation Cask Servicing System** The transportation cask servicing system is designed for checking the pressure of the transportation cask and, if necessary for recovery operations, taking a sample of the gases inside the cask and purging the gases from the cask. The cask servicing system can be used by personnel to check the pressure of the received cask. Gases inside the cask are purged or vented with helium to ensure that potential hydrogen concentrations are diluted below flammable concentrations. *Safety Conditions:* The major components have been classified in the following categories: safety-significant, and general service.	Design Reviewed: Superstructure Package, Cask Receiving Crane Package Tested: W379-PAT-013
14	**Overpack Storage Tube Vent and Purge System** Overpack storage tube operations are designed to safely monitor a suspect leaking MCO or a damaged MCO. An MCO will be placed in an overpack storage tube for up to 1 year until monitoring activities determine the leak rate, if any, of gases escaping from the mechanically sealed MCO or from the damaged MCO. *Safety Conditions:* The major components have been classified in the following categories: A, safety-significant, and general service.	Design Reviewed: Superstructure Package, Purge Vent System Tested: W-379-PAT-014-1 W-379-PAT-014-2

15	**MCO Handling Machine System** The MHM is designed for safe handling of an MCO in the operations area of the CSB. The MHM removes an MCO from the cask in the cask receiving pit and carries the MCO to a standard storage tube for interim storage, to the sampling/weld station for sampling/weld operations, or to an overpack storage tube. *Safety Conditions:* The major components have been classified in the following categories: A, B, safety-significant, and general service.	Design Reviewed: MHM Package Tested: W-379-PAT-015-1 W-379-PAT-015-2 W-379-PAT-015-3 W-379-PAT-022-1 W-379-PAT-025-1
16	**Vault Cooling System** The CSB contains an array of storage tubes that are cooled using passive, naturally circulating air to remove the decay heat from the SNF contained in MCOs in the storage vault. *Safety Conditions:* The major components have been classified in the following categories: A and general service.	Design Reviewed: Superstructure and Vault Package Tested: W379-PAT-016
17	**Security System** The designed security system for the CSB includes: locking doors and an alarm system, closed-circuit television cameras, special access hardware; telescoping doors and heavy rolling shield gates, concrete curbs around the perimeter of the operations, intrusion barriers, special outside access hardware, crash bars for emergency exit, security seals. *Safety Conditions:* Classified General Service.	Design Reviewed: Security System Package Tested: W379-PAT-017-1
19	**Roll-up Doors System** The Roll-up Doors System is designed to provide a sealed (air-locked) entryway in to SNF CSB for the MCO from the Cold Vacuum Drying Facility and other spent nuclear fuel from various sources.	Design Reviewed: Superstructure Package Tested: W379-PAT-019
20	**Fire Water Pump House System** The Fire Water Pump House System is designed to supply backup Sanitary Water to the SNF CSB Fire Protection System (the Wet Pipe Sprinkler System and Fire Department Hose Connections) and surrounding facilities, for supplemental fire suppression.	Design Reviewed: HWVP Design Package (04Q3660 & 04R3660 Fire Protection Drawings) Tested: W379-PAT-020 W379-PAT-020-1
21	**Distributed Control System** The DCS is designed to serve as the central monitoring and control system for CSB facility conditions, systems (particularly the health physics monitoring system), and processes (specifically the inert gas dilution of vented cask gases). *Safety Conditions:* Classified General Service.	Design Reviewed: Superstructure Package Tested: W379-PAT-021
22,23	**MCO Sampling/Weld System** The MCO sampling system is used for withdrawing a sample of gases from the monitored MCOs according to a predetermined schedule. Weld equipment will provide additional sealing of the MCO by welding a cap on the MCO. *Safety Conditions:* The major components have been classified in the following categories: B, C, and safety-significant.	Design Reviewed: Formal Design Review Sampling/Weld Station Package Tested: W-379-PAT-023

3.1.5 DESIGN VERIFICATION ACTIVITIES TO BE COMPLETED

At the appropriate time, complete the following verification activities now listed as "TBD" in Appendix B:

HNF-S-0425, Performance Specification for the Spent Nuclear Fuel Canister Storage Building

a) Verify the capability to receive and handle MCO shipments by future operations test or Performance Acceptance Test. (Requirement 3.2.1.1.3)

b) Verify that clean, empty MCOs can be received at the required rate. (Requirement 3.2.1.2.1)

c) Verify the capability to receive and handle empty MCO shipments. (Requirement 3.2.1.2.3)

d) Verify the capability to receive and handle the MCO canister cover assembly shipments. (Requirement 3.2.1.2.4)

e) Complete Revision 10 of the CSB ALARA analysis. This supports verification of the Design Feed (Requirement 3.2.2.1.2.2), source terms for CSB shielding calculations (Requirement 3.2.2.1.6.1), implementation of 10CFR835 (Requirement 3.2.2.1.6.2), and occupational radiological exposure (Requirement 3.3.1.5), General ALARA considerations (requirement 3.1.4 and 1.33).

f) Verify functionality of canister cover cap assembly receipt and lag storage area. (Requirement 3.2.2.1.9.11)

g) Verify compliance to negative pressure requirement in ventilation zones. (Requirement 3.2.2.2.1)

h) Verify performance of CSB workstation enclosures. (Appendix A, Requirement 1.1.2)

i) Verify performance of MCO Internal Gas Sampling/Verification Equipment. (Appendix A, Requirement 1.1.3)

j) Verify performance of Canister Cover Cap Welding Machine. (Appendix A, Requirement 1.1.5)

k) Verify performance for Canister Cover Plate Welding. (Appendix A, Requirement 1.1.6)

l) Verify performance of Dye Penetrant Testing (PT) Equipment. (Appendix A, Requirement 1.1.7)

m) Verify performance of Leakage Rate Testing Equipment. (Appendix A, Requirement 1.1.8)

HNF-S-0468, Specification for the MCO Handling Machine

a) Provide verification of MHM bearing design life (Requirement 3.1.2.5.L).

b) Verify grapple recovery. (Requirement 3.2.5.9)

3.2 EVIDENCE THAT DESIGN REQUIREMENTS ARE MET

Current design requirements come from three sources: (1) the Canister Storage Building Performance Specification, [HNF-S-0425, Rev. 4]; (2) the Performance specification for the MHM, [HNF-S-0468, Rev 5]; and (3) the Spent Nuclear Fuel Project Stage and Store K Basin SNF in Canister Storage Building Functions and Requirements, [SD-SNF-FRD-010, Rev. 1].

Evidence that the design requirements in the Performance Specifications listed above are met is contained in Appendix B. Appendix B reviewed Project W379 for compliance to the latest requirements [HNF-S-0425, Rev. 4] and [HNF-S-0468, Rev 5]. Earlier evidence of the design requirements being met includes two Baseline Design Verification Compliance Matrices performed by Fluor Daniel Incorporated [FDI File 106] and FDI, [FRT #2694].

Compliance of the design with DOE Order 6430.1A and NRC equivalency are documented in compliance documents [HNF-4742] and [HNF-4776]. Design compliance matrices to applicable American National Standards Institute (ANSI) requirements and Occupational Safety and Health

Association (OSHA) requirements are contained in [SNF-5790]. Additionally, an ASME Nuclear Overhead Gantry crane requirements (NOG-1) compliance matrix was completed on the MHM SNF Interoffice Correspondence [00-SNF/CES-005].

3.3 EVIDENCE THAT DESIGN VERIFICATION REQUIREMENTS ARE MET

Requirements verification methods are defined in the FDI DCPM. Methods of verification for the requirements are proposed in two sources: (1) The Baseline Design Verification for the CSB, FDI Transmittal to WHC, [FRT-2694], July 1996; and (2) the Test Review Board Meeting minutes. These sources were used to create the Design Requirements Compliance matrix (Appendix B) that listed the verification method used for each of the requirements in the CSB and MHM specifications. Those verification methods included:

- Independent Review
- Alternate Calculations
- Qualification Testing
- Formal Design Review
- Informal Review

Evidence that Sub-project W379 performed the required design verification is contained in the Design Verification Status Questionnaire contained in Appendix C and supported by the List of Project Design and Design Verification Documents in Appendix A and Design Requirement Compliance Matrix in Appendix B.

4.0 CONCLUSION

The Canister Storage Building (CSB) subproject has performed thorough and appropriate design verification activities throughout the project life cycle. Proper planning was performed and a graded approach was used based on safety and other project risks. Design verification was performed in accordance with the design agent's Design Control Procedures Manual, as approved by CSB engineering, and included independent, informal, and formal reviews as well as alternate calculations and qualification testing. At all phases of the design, verification activities were conducted in a graded manner appropriate to the complexity and importance to safety of the design being verified. Verification of the design is continuing with the performance of pre-operational acceptance tests in preparation for operational readiness review and start of fuel movement.

5.0 REFERENCES

00-SNF/CES-005, "Project Number W-379 - Multi-Canister Overpack Handling NOG-1 Compliance Matrix," SNF Project Internal Correspondence, C. E. Swensen to G. D. Bazinet, May 11, 2000.

95-NMD-081DOE-RL, Letter J.D. Wagoner, DOE-RL, to Dr. A.L. Trego, Westinghouse Hanford Company, K Basins Path Forward Approval Of Mission Need, dated June 13, 1995.

97-SNF-117, "RAM Analysis for the MHM," Letter S. A. Daughtridge, DESH, to N. H. Williams, FDH, DESH-97606888, dated November 26, 1997

99-SNF/CES-001, Interoffice Correspondence, "MCO Machine - Shield Skirt/Concrete Deck Interface - Technical Evaluation," C. E. Swenson to A. S. Daughtridge, dated November 2, 1999, containing an unreleased copy of HNF-5297, "Radiation Exposure from the Gap Under the Multi-Canister Overpack (MCO) Handling Machine," S. R. Gedeon, FDNW, October 1999"

AP-EN-6-027-01, "Design Verification Process," Fluor Daniel Hanford, 1999.

CN-1123, "Design Review of SNF CSB Deck Structural Calculations and RCR's," Fluor Daniel, Inc., 1996.

CSB-DI-001, "Verification Plan for As-Builting Canister Storage Building," desk instruction dated November 15, 1997.

DESH-9760886, "Review of Soil and Building Structural Interaction on Seismic Response Spectra for CSB Receiving and Multi-Canister Overpack Handling," DE&S Hanford, Inc., 1997.

DESH-9853642, "Review Comments to Seismic Analysis and Structural Calculations," DE&S Hanford, Inc., 1998.

EDT 625800, "Preliminary Analysis of MCO Loading during CSB Startup." A. L. Pajunen, DESH, December 1, 1998 (Contains Independent analysis by Q Metrics on natural convective cooling).

EDT 627041, Independent Analysis of MCO Critical Failures by M&D Associates.

EDT-612984, "H-2-825867 and H-2-825868, SNF Project Process Flow Diagram Summary," A.L. Pajunen, Westinghouse Hanford Company, 1995.

FDH-9655540 R1 "100% Design review for the Canister Storage Building and Hot Conditioning System Annex." Letter, E. S. McGinley, FDH, to F. G. Hudson, DESH, dated May 19, 1997.

FDH-9655540, "Security Concept and Design Criteria, 100% Design Review for the Canister Storage Building and Hot Conditioning System Annex," letter; E. S. McGinley, FDH, to F. G. Hudson, DESH, dated May 19, 1997.

FDI DCPM Document; Spent Nuclear Fuel Canister Storage Building Design Control Procedures Manual.

FDP-591, "Multi-Canister Overpack Handling Machine Seismic Analysis Review Report," Fluor Daniel, Inc., 1998.

FDP-815, "Validation and Verification of Computer Codes Used For Spent Nuclear Fuel CSB," letter S. L. Petersen FDNW, to A. S. Daughtridge, DESH, dated March 11,1999.

File 106, Fluor Daniel Internal Log, "Vault Baseline Design Verification;" Interoffice Correspondence, dated April 12, 1996.

FRF-2717, "Technical Baseline and Design to Cost CS & SR Cost Data," Letter, R. S. Poultier, FDI, to M. K. Mahaffey, WHC, dated October 9, 1995.

FRF-2717, "Technical Baseline and Design to Cost CS & SR Cost Data," Letter, R. S. Poulter, FDH, to M. K. Mahaffey, dated October 9, 1995.

FRP-061, "Spent Nuclear Fuel Canister Storage Building Detailed Design Report," Transmittal letter, E. R. Jacobs, FDI, to M. K. Mahaffey, WHC, dated August 23, 1996.

FRT-2661, "CSB Interim Design Report," FDI, dated February, 1996.

FRT-2694, "Baseline Design Verification for the SNF CSB," FDI, dated June 24, 1996.

HNF-1613, "Spent Nuclear Fuels Engineering Practices," W. C. Miller, Numatec Hanford Corporation, 1999. [This document deleted and superseded by the SNF Project Administrative Procedures]

HNF-4742, Rev. 0, "CSB Compliance Assessment, DOE Order 6430.1A, General Design Criteria," D. M. Black, Fluor Daniel Northwest, 1999.

HNF-4776, Rev. 0, "CSB Compliance Assessment, SNF Project NRC Equivalency Criteria," D. M. Black, Fluor Daniel Northwest, 2000.

HNF-6025, Rev. 0," Emergency Preparedness Hazards Assessment," L.R. Campbell, dated May 24, 2000.

HNF-PRO-1819, "Engineering Requirements," Fluor Daniel Hanford.

HNF-S-0425, "Performance Specification for the Spent Nuclear Fuel Canister Storage Building," G. D. Bazinet, Numatec Hanford Company, 1998.

HNF-S-0468, Rev 5, "Specification for the MCO Handling Machine," C. E. Swenson, Duke Engineering & Services Hanford, 1999.

HNF-SD-FHA-002, "Final Fire hazards Analysis for the Canister Storage Building," ARES report, 2000.

HNF-SD-SNF-CSER-005, "Criticality Safety Evaluation Report for the MCO," S. F. Kessler, FFS, 2000.

HNF-SD-SNF-OCD-001, "SNF Project Product Specification," A. L. Pajunen, Fluor Hanford, 2000.

HNF-SD-SNF-RPT-011, "SNF Project Design Basis Capacity Study," K. J. Cleveland, Fluor Daniel Northwest, 1999.

HNF-SD-SNF-TI-015, "SNF Project Technical Databook," M. A. Reilly, Duke Engineering & services Hanford, 1998.

SNF-3328, Rev. 2, "Canister Storage Building Design Basis Accident Analysis Documentation," R. D. Crowe, M. G. Piepho, et.al., FH, 2000.

SNF-3907, "SNF Project CSB Human Factors Engineering (HFE) Analysis: Results and Findings," R. P. DiPiazza, 1999

SNF-4831, "Human Factors Engineering and Ergonomics Analysis for the CSB: Results and Findings," R. P. DiPiazza, 1999

SNF-5222, "SNF MCO Design Review Completion Report," L. H. Goldmann, Fluor Daniel Hanford, 1999.

SNF-5465, "SNF MCO Design Verification Summary," L. H. Goldmann, Fluor Daniel Hanford, 1999.

SNF-6253, "Acceptance for Beneficial Use Checklist," Fluor Hanford, 2000.

SNF-6448, Rev. 0, "MHM As-Built Verification Plan," C. E. Swenson, A. S. Daughtridge, (In release process).

SNF-CO-9911443, "CSB As-Built Verification Program Review," letter S. L. Petersen, FDNW, to A. S. Daughtridge, DESH, dated March 29, 1999.

SNF-RPT-011, Rev 1A, "SNF Project Design Basis Capacity Study," K. J. Cleveland, Fluor Daniel Northwest, 1999.

SNF-SD-SNF-HIE-000, "Canister Storage Building Hazard Analysis Report," L.J. Garvin, 1997.

VI-50100,Vender File with MHM 100% Design package.

WHC-CM-6.1, Standard Engineering Practices, EP 4.1, "Design Verification," Westinghouse Hanford Company.

WHC-EP-0830, "Hanford Spent Nuclear Fuel Project Recommended Path Forward.

WHC-SD-SNF-FRD-010, Rev. 1, "SNF Project Stage and Store K Basin SNF in CSB, Functions and Requirements," J. C. Womack, Westinghouse Hanford Company, 1995.

WHC-SD-W379-CDR-001, "Spent Nuclear Fuel Canister Storage Building Conceptual Design Report," C. E. Swenson, Westinghouse Hanford Company, 1996.

WHC-SD-W379-DR-001, "SNF CSB Conceptual Design Report Review Committee Report," W. P. Dana, Westinghouse Hanford Company, 1995.

WHC-SD-W379-ES-002, "Staging and Storage Facility Feasibility Study Final Report," M. D. Conner, Westinghouse Hanford Company, 1996.

WHC-SD-W379-ES-003, "CSB Trade Study Final Report," M. D. Conner, Westinghouse Hanford Company, 1995.

APPENDIX A

LIST OF PROJECT DESIGN, CONSTUCTION, AND DESIGN VERIFICATION DOCUMENTS

Supporting Documents (to be developed and listed in subsequent design verification)	Document Name and Number	Type of Verification	Verification Required
Procedural Document			
Specific procedures developed by the Project related to verification work	EN-6-027-01 "Design Verification Process" Spent Nuclear Fuel Project Administrative Procedure, Fluor Daniel Hanford	N/A	
	EN-6-012-01 "As-Built Verification Plan Development Process" Spent Nuclear Fuel Project Administrative Procedure, Fluor Daniel Hanford	N/A	
	EN-6-012-00 "Spent Nuclear Fuel As-Built Verification Plan Development Process" Spent Nuclear Fuel Project Administrative Procedure, Fluor Daniel Hanford	N/A	
AE procedures related to their internal personnel qualification process	"Spent Nuclear Fuel Canister Storage Building Design Control Procedures Manual (DCPM)," Fluor Daniel Incorporated (FDI propritary document)	N/A	
Engineering Practices	WHC-CM-6.1 EP 4.1 "Design Verification" WHC Engineering Procedure	N/A	
	HNF-1613 "Spent Nuclear Fuels Engineering Practices" W. C. Miller, NHC, September 30, 1999. DOCUMENT DELETED AND SUPERSEDED BY SNF PROJECT ADMINISTRATIVE PROCEDURES	N/A	
	HNF-PRO-1819 "PHMC Engineering Requirements" Project Hanford Management Systems Procedure	N/A	
Project Management Documents			
Project Execution Plan or equivalent	HNF-3552, Rev. 0a "Spent Nuclear Fuels Project Execution Plan" N. H. Williams, March 17, 1999	Informal Review	EDT-625983 ECN-652709
	"K Basins Path Forward Approval of Mission Need" Letter, J. D. Wagoner, DOE-RL, to A. L. Trego, WHC, 95-NMD-081, dated June 13, 1995	N/A	
Path Forward	WHC-EP-0830, Volumes 1-3 "Hanford Spent Nuclear Fuel Project Recommended Path Forward" J. C. Fulton, WHC, 1994	N/A	Public Release
Cost Baseline document	FRF-2717 "Technical Baseline and Design to Cost CS & SR Cost Data" Letter, R. S. Poulter, FDH, to M. K. Mahaffey, dated October 9, 1995	N/A	
Schedule baseline document	BCR-SNF-98058, -1999006; SNF TPA Baseline. December 1998.	N/A	
Open Issue List	SNF Project Corrective Action Report (SNF Engineering); SNF Data Tracking System (T. Collins); Construction Punch List (FDI - J. Koeberg); Operations Punch List (PHMC - K. Freeman).	N/A	
Verification Planning Documents			
Verification Plans	CSB-DI-001 "Verification Plan for As-Builting Canister Storage Building" SNF CSB Sub-Project Desk Instruction, Mahaffey, November 15, 1997	N/A	

			[illegible]	[illegible]	[illegible]
			SNF-6448, "As-Built Verification Plan Spent Nuclear Fuel Canister Storage Building MCO Handling Machine," Rev. 0, June 1, 2000	N/A	
			"As-Built Verification Plan Spent Nuclear Fuel Canister Storage Building MCO Handling Machine - Electrical," Rev. 0A, dated April 5, 2000., is included in SNF-6448, Rev. 0	N/A	
Test Planning Documents					
		Test Planning form	SNF Start-up Preoperational Acceptance Test Status Matrix (not a released document, but a tool used by start-up organization)	N/A	N/A
		Test Plans	SNF-W379-PAT-002 Instrument/Service Air System Test	Independent Review TRB/JTG	TRB MM 12/16/97 & 3/17/98
			SNF-W379-PAT-004 Liquid Waste Collection System Test	Independent Review TRB/JTG	TRB MM 2/17/98
			SNF-W379-PAT-006 Operating Area HVAC System Test		In Process
			SNF-W379-PAT-006-1 Operating Area HVAC System Test Deficiencies (Retest)		In Process
			SNF-W379-PAT-007 Support Area HVAC System Test	Independent Review TRB/JTG	TRB MM 9/1/98
			SNF-W379-PAT-010-1 HVAC Stack Monitoring Equipment Test	Independent Review TRB/JTG	TRB MM 8/14/98 & 9/10/98
			SNF-W379-PAT-010-2 HVAC Stack Monitoring Equipment Test	Independent Review TRB/JTG	TRB MM 11/6/99
			SNF-W379-PAT-011-1 Health Protection System Test	Independent Review TRB/JTG	TRB MM 7/21/98
			SNF-W379-PAT-011-2 Health Protection System Test	Independent Review TRB/JTG	
			SNF-W379-PAT-012 Cask Receiving Crane Test	Independent Review TRB/JTG	TRB MM 4/19/99
			SNF-W379-PAT-013 MCO Servicing & Floor Crane Test	Independent Review TRB/JTG	TRB MM 4/19/99
			SNF-W379-PAT-014-1 MCO Tube Purge Cart Test	Independent Review TRB/JTG	
			SNF-W379-PAT-014-2 MCO Overpack Plugs/Tubes Test	Independent Review TRB/JTG	
			SNF-W379-PAT-015-1 MHM Logic Test	Independent Review TRB/JTG	TRB MM 4/19/99
			SNF-W379-PAT-015-2 MHM Load Test	Independent Review TRB/JTG	TRB MM 4/27/99
			SNF-W379-PAT-015-3 MHM Operational Demonstration Test	Independent Review TRB/JTG	TRB MM 4/27/99
			SNF-W379-PAT-017 Security System Test	Independent Review TRB/JTG	TRB MM 3/24/98
			SNF-W379-PAT-018 Uninterruptible Power Supply System Test	Independent Review TRB/JTG	TRB MM 3/10/98
			SNF-W379-PAT-019 Rollup Doors Test	Independent Review TRB/JTG	TRB MM 6/2/98
			SNF-W379-PAT-020 Fire Water Pumphouse System Test	Independent Review TRB/JTG	TRB MM 5/5/98
			SNF-W379-PAT-021 Distributed Control System Test	Independent Review TRB/JTG	TRB 3/17/98
			SNF-W379-PAT-023 MCO Sample Station Test	Independent Review TRB/JTG	TRB MM 9/15/99
			SNF-W443-PAT-001 Cask Transportation System Trailer CSB Test	Independent Review TRB/JTG	TRB MM 5/11/99
		Test Specifications	SNF-W379-TS-001 Electrical Distribution System Test Specification	Independent Review TRB/JTG	TRB MM 1/20/98 (Rev. 0), 3/9/99 (Rev. 1)

			SNF-W379-TS-002 Instrument/Service Air System Test Specification	Independent Review TRB/JTG	TRB MM 10/27/98
			SNF-W379-TS-003 Fire Protection & Detection System Test Specification	Independent Review TRB/JTG	TRB MM 10/6/98
			SNF-W379-TS-004 Liquid Waste Collection System Test Specification	Independent Review TRB/JTG	TRB MM 1/27/98
			SNF-W379-TS-005 Communication System Test Specification	Independent Review TRB/JTG	TRB MM 4/28/98
			SNF-W379-TS-006 Operating Area HVAC System Test Specification	Independent Review TRB/JTG	TRB MM
			SNF-W379-TS-007 Support Area HVAC System Test Specification	Independent Review TRB/JTG	TRB MM 1/27/98
			SNF-W379-TS-010 HVAC Stack Monitoring Equipment Test Specification	Independent Review TRB/JTG	TRB MM 3/17/98, 6/23/98 (Rev.0), 3/16/99 (Rev. 1)
			SNF-W379-TS-011 Health Protection System Test Specification	Independent Review TRB/JTG	TRB MM 4/14/98
			SNF-W379-TS-012 Cask Receiving Crane Test Specification	Independent Review TRB/JTG	TRB MM 3/17/98
			SNF-W379-TS-013 MCO Servicing & Floor Crane Test Specification	Independent Review TRB/JTG	TRB MM
			SNF-W379-TS-014-1 MCO Tube Purge Cart Test Specification	Independent Review TRB/JTG	TRB MM 4/27/99
			SNF-W379-TS-014-2 MCO Overpack Plugs/Tubes Test Specification	Independent Review TRB/JTG	TRB MM
			SNF-W379-TS-015 MCO Handling Machine System Test Specification	Independent Review TRB/JTG	TRB MM 11/17/98 (Rev. 0), 4/27/99 (Rev.1)
			SNF-W379-TS-016 Vault Cooling System Test Specification	Independent Review TRB/JTG	TRB MM
			SNF-W379-TS-017 Security System Test Specification	Independent Review TRB/JTG	TRB MM 2/17/98
			SNF-W379-TS-018 Uninterruptible Power Supply System Test Specification	Independent Review TRB/JTG	TRB MM 1/20/98
			SNF-W379-TS-019 Rollup Doors Test Specification	Independent Review TRB/JTG	TRB MM 4/14/98
			SNF-W379-TS-020 Fire Water Pumphouse System Test Specification	Independent Review TRB/JTG	TRB MM 12/16/97
			SNF-W379-TS-021 Distributed Control System Test Specification	Independent Review TRB/JTG	TRB MM 1/20/98
			SNF-W379-TS-023 MCO Sample Station Test Specification	Independent Review TRB/JTG	TRB MM 9/2/99
			Building/Balance of Equipment (TBD)		In process

SUGGESTED DOCUMENTS to be produced by Project to demonstrate design verification			Document Name and number	Type of verification	Verification Reference
			SNF-W443-001 Cask Transportation System Trailer CSB Test Specification	Independent Review TRB/JTG	TRB MM 5/11/1999

Document Type	Document Name and Number	Type of Review	Verification Reference
Design Documents			
Feasibility Studies	WHC-SD-W379-ES-002 "Staging and Storage Facility Feasibility Study Final Report" M. D. Conner, WHC, January 4, 1996	Informal Review	EDT-614752
Trade Studies	WHC-SD-W379-ES-003 "Canister Storage Building Trade Study Final Report" M. D. Conner, WHC May, 1995	Informal Review	EDT- 614752
Design Document List	WHC-SD-W379-CDR-001, Rev. 0 Spent Nuclear Fuel Canister Storage Building Conceptual Design Report (EDT-614752)	Formal Review	WHC-SD-W379-DR-001, Rev. 0. SNF CSB CDR Review Committee Report. W. P. Dana, WHC, December 15, 1995 (EDT-614726)
	SNF-6154, Rev. 0 Spent Nuclear Fuel Canister Storage Building Detailed Design - Design Basis Document, July 20, 2000	Informal Review	EDT-629815
	FRT-2661, Rev. 1 CSB Interim Design Report E. R. Jacobs, FDI, April 1, 1996	N/A	
	FRP-061 Spent Nuclear Fuel Canister Storage Building Detailed Design Report. Transmittal letter, E. R. Jacobs, FDI, to M. K. Mahaffey, WHC, dated August 23, 1996	N/A	
	Detailed Design Package for the CSB Vault	Independent Review	See Design Review Completion Report section below
	Detailed Design Package for the CSB Deck	Independent Review	See Design Review Completion Report section below
	Detailed Design Package for the CSB Superstructure	Independent Review	See Design Review Completion Report section below
	FDH-9655540 Canister Storage Building and Hot Conditioning System Annex Security Concept and Design Criteria. B&W Protec, Inc., 1997	Formal Review	Security Concept and Design Criteria, 100% Design review for the Canister Storage Building and Hot Conditioning System Annex. Letter, E. S. McGinley, FDH, to F. G. Hudson, DESH, FDH-9655540 R1, dated May 19, 1997.
	VI-50100 MHM 100% Design Package	Formal Review	Vender File VI-50100 and letters DESH-9761988.1, MHM-BTR-092 DESH-9800197, BTR-101 DESH-9851598, BTR-111
	WHC, SD-HWV-FDC-001, Rev. 5I HWVP Project Functional Design Criteria J. Kalia, WHC, 1993	Informal Review	ECN-400304 ECN-400239
	WHC-SD-HWV-DP-001, Rev. 6U HWVP Project Technical Data Package. J. Kalia, WHC, 1994	Informal Review	ECN-400249
Requirements Documents	WHC-SD-SNF-FRD-010, Rev. 1 SNF Project Stage And Store K Basin SNF in CSB, Functions and Requirements J. C. Womack, October 24, 1995	Informal Review	EDT-160164 ECN-191380

			HNF-S-0425, Rev. 4 Performance Specification for the Spent Nuclear Fuel Canister Storage Building, June 20, 2000	Informal Review	Original EDT 613003, ECNs 191382, 6266377, 191397, 1911408, 191418, 648619, 654452. (Replaces SD-SNF-FRD-014)
			HNF-S-0468, Rev. 5 Specification for the MCO Handling Machine. C. E. Swenson, DESH, April 23, 1999	Informal Review	ECN-652275 ECN-651423 ECN-645103
		Calculation Verification	See FDI Calculation list	Independent Review on Calculations Requiring Independent review	See Calculation list with Independent Design Reviews
		Supporting Documents	SNF-6130, CSB Procurement Specifications SNF-6131, CSB Construction Specifications	Independent Review	See Design/Procurement Package Reviews as listed in Design Review Completion Report section below
		Drawings	See H-2-116004, sheets 1-5 for Drawing List	Independent Review	See Design Package Reviews as listed in Design Review Completion Report section below
			H-2-825867 & H-2-825868 Spent Nuclear Fuel Project Level 0 Process Flow Diagram	Informal Review	EDT-612984, A.L. Pajunen, Westinghouse Hanford Company, 1995.
			H-2-123400, sheets 1-12, Rev. 0, Process Block Flow Diagram	Informal Review	EDT-627196
		As-built Program	Canister Storage Building As-Built Verification Program Review. Letter, S. L. Petersen, FDNW, to A. S. Daughtridge, DESH, SNF-CO-9911443, dated March 29, 1999 (File 102.1.1R)	N/A	
			Canister Storage Building Field Verification Program to Validate Accuracy of Field Information for Development of As-Built Drawings. Letter, A. S. Daughtridge, DESH, to S. L. Petersen, FDNW, DESH-9951340, dated March 1, 1999	N/A	
			Canister Storage Building Verification Program. Letter, S. L. Petersen, FDNW, to A. S. Daughtridge, DESH, SNF-CO-9911426, dated March 15, 1999	N/A	
			Facility Walkdowns	Independent Review	Verification Walkdowns: DVPC-99-001, As-Built Verification walkdown of CSB Sampling/Weld Station Summary; 98-001, Electrical Distribution Components; 98-002, Cask Receiving Crane; 98-004, Fire Protection System; 98-005, HVAC System; 98-006, Security Systems; 98-007, Overall Facility Packages 1-3; 97-001, 13.8kV Conduit/Duct Bank; 97-002, Firewater and Sanitary Water Lines.
		As-Built Drawings	See Essential drawing on ABU Checklist	Informal Review	DA signature as released into Hanford System
Verification Documents					
		List of reviewers	Calculations	Independent Review	See FDI Calculation files with IDR required
			PHMC Design Reviews		See Design Review Completion Reports below

Supporting Documents to be produced by Project to demonstrate design verification	Document Name and Number	Type of Verification	Verification Reference
Computer software verification	FDP-815 Validation and Verification of Computer Codes Used For Spent Nuclear Fuel Canister Storage Building. Letter, S. L. Petersen, FDNW, to A. S. Daughtridge, DESH, dated March 11, 1999, FDI Log #FDP-815, File 102.5E.	N/A	
Requirement Compliance matrices			
	SNF-5790 "Design Compliance Matrices to ANSI and OSHA" S. A. Krieg, FDNW, 2000	N/A	EDT-627197
	HNF-4742, Rev. 0 Canister Storage Building Compliance Assessment, DOE Order 6430.1A, General Design Criteria. D. M. Black, FDNW, June 29, 1999.	N/A	EDT-626885
	HNF-4776, Rev. 0 Canister Storage Building Compliance Assessment, Spent Nuclear Fuel Project NRC Equivalency Criteria - HNF-SD-SNF-DB-003. D. M. Black, FDNW, May 9, 2000. (EDT-616886)	N/A	ECN-656340
	00-SNF/CES-005, "Project Number W-379 - Multi-Canister Overpack Handling NOG-1 Compliance Matrix," SNF Project Internal Correspondence, C. E. Swensen to G. D. Bazinet, May 11, 2000, (Not released)	N/A	
	Baseline Design Verification for the SNF CSB. FDI Log #FRT-2694, 7/24/96	N/A	
	Vault Baseline Design Verification. FDI Log File 106, Interoffice Correspondence, 4/12/96	N/A	
Design Review Comments (RCR) issued by reviewers			
	SNF-5222 Formal Design Review of Sample Weld Station SNF MCO Design Review Completion Report. Goldmann, L. H., FDH, November 30, 1999.	Formal Review	EDT-628351
	SNF-5465 SNF MCO Design Verification Summary (with Appendix B Verification Report Checklist). Goldmann, L. H., FDH, November 30, 1999.	Formal Review	EDT-628352 ECN-658759
	Formal Design Review of Monitoring Equipment, May 5, 2000	Formal Review	EDT-629021
	Embed Package FDI Log #CN-1069, File104.2, 2/28/96	Independent Review	
	CSB Vault Package FDI Log #CN-1078, File 104.2, 3/20/96	Independent Review	
	MHM Shield Gate FDI Log #CN-1082, File104.2, 4/4/96		Deleted from scope
	CSB Receiving Crane FDI Log #CN-1083, File 104.2, 4/04/96	Independent Review	
	CSB Deck Package FDI Log #CN-1092, File104.2, 5/6/96	Independent Review	
	CSB Tubes, Case, Covers, Absorbers, Cart Design FDI Log#CN-1096, File 104.2, 5/28/96	Independent Review	
	CSB Superstructure Package FDI Log#CN-1109, File 104.2, 7/25/96	Independent Review	
	Tube Plug Package FDI Log #CN-1111 and 1099, File 104.2, 7/29/96 and 6/10/96	Independent Review	
	CSB/HCSA Design Package FDI Log #CN-1127, File104.2, 10/14/96		Deleted from scope

			Security and Safeguards Package FDI Log #CN-1134 File 104.2, 2/28/97	Independent Review	
			P & IDS FDI Log #CN-1150 File 104.2, 8/8/97	Independent Review	
			Canister Impact Absorber FDI Log #CN-1196 File 104.2, 9/2/98	Independent Review	
			MCO Sampling Station FDI Log #CN-1188 & 1189, File 104.2, 6/18/98 & 6/22/98	Independent Review	
			HEPA Filter FDI Log #CN-1199 File 104.2, 9/23/98	Independent Review	
			Weld Station FDI Log #CN-1212 File 104.2, 1/14/99	Independent Review	
			Overpack Storage Tube and Plugs FDI Log #CN-1225 File 104.2, 3/02/99	Independent Review	
			Tube Plug Adapter FDI Log #CN-1233 File 104.2, 5/13/99	Independent Review	
			Transfer System Impact Absorber FDI Log #CN-1335 File 104.2, 5/21/99	Independent Review	
			High security gate FDI Log #CN-1236 File 104.2, 6/17/99	Independent Review	
			Rolling Gate FDI Log #CN-1243 File 104.2, 7/12/99	Independent Review	
			Guide Ring Funnel FDI Log #CN-1247 File 104.2, 7/19/99		Deleted from scope
			CSB Operations Building FDI Log #CN-1238 File 104.2, 6/28/99	Independent Review	
			Frog Tooling Design package FDI Log #CN-1250 File 104.2, 9/7/99	Independent Review	
			Shield hatch FDI Log #CN-1252 File 104.2, 9/23/99	Independent Review	
			Containment Tent FDI Log #CN-1259 File 104.2, 11/8/99	Independent Review	
			Block Diagram	In Process	
		Design Review Completion Documentation	U.S. West Telephone System and Public Address System Review	Independent Review	Reference not located.
			SNF-5222 Formal Design Review of Sample Weld Station SNF MCO Design Review Completion Report. Goldmann, L. H., FDH, November 30, 1999.	Formal Review	EDT-628351
			SNF-5465 SNF MCO Design Verification Summary (with Appendix B Verification Report Checklist). Goldmann, L. H., FDH, November 30, 1999.	Formal Review	EDT-628352 ECN-658759
			Formal Design Review of Monitoring Equipment, May 5, 2000	Formal Review	EDT-629021
			Embed Package FDI Log #CN-1071, File104.2, 3/1/96	Independent Review	
			CSB Vault Package FDI Log #CN-1079, File104.2, 3/21/96	Independent Review	
			MHM Shield Gate FDI Log #CN-1084, File104.2, 4/4/96	Independent Review	Deleted from scope
			CSB Receiving Crane FDI Log #CN-1085, File 104.2, 4/04/96	Independent Review	
			CSB Deck Package FDI Log #CN-1094, File104.2, 5/9/96	Independent Review	
			CSB Tubes, Case, Covers, Absorbers, Cart Design FDI Log # CN-1098, File 104.2, 5/31/96	Independent Review	
			CSB Superstructure Package FDI Log #CN-1110, File 104.2, 7/26/96	Independent Review	
			Tube Plug Package FDI Log #CN-1112, File 104.2, 7/30/96	Independent Review	
			CSB/HCSA Design Package FDI Log #CN-1128, File104.2, 10/17/96	Independent Review	Deleted from scope
			Security and Safeguards Package FDI Log #CN-1136 File 104.2, 2/28/97	Independent Review	

			P & IDS FDI Log #CN-1150 File 104.2, 8/8/97	Independent Review	
			Canister Impact Absorber FDI Log #CN-1196 File 104.2, 9/2/98	Independent Review	
			MCO Sampling Station FDI Log #CN-1190 File 104.2, 6/29/98	Independent Review	
			HEPA Filter FDI Log #CN-1199 File 104.2, 9/23/98	Independent Review	
			Overpack Storage Tube and Plugs FDI Log #CN-1232 File 104.2, 4/29/99	Independent Review	-
			Tube Plug Adapter FDI Log #CN-1234 File 104.2, 5/20/99	Independent Review	
			Transfer System Impact Absorber	Independent Review	-
			High security gate	Independent Review	-
			Rolling Gate	Independent Review	-
			Guide Ring Funnel		Deleted from scope
			CSB Operations Building	Independent Review	-
			Frog Tooling Design package	Independent Review	-
			Shield hatch	Independent Review	-
			Containment Tent	Independent Review	-
			Block Diagram	Informal Review	EDT-627196
		Completed Design Review Checklists Checklist			
			CSB Vault Package Design Review Checklist. Project File 1.2, DSI from J. D. Phillips, to M.K. Mahaffey, dated 3/20/96.		
			MHM Shield Gate		Deleted from scope
			CSB Deck Package Design Review Checklist. No reference, dated 5/14/96		
			CSB Tubes, Case, Covers, Absorbers, Cart Package Design Review Checklist. No reference, dated 6/10/96		
			CSB Superstructure Package. No reference, dated 7/26/96		
			CSB/HCSA Design Package Design Review Checklist. No reference, dated 10/18/96		Deleted from scope
			Guide Ring Funnel		Deleted from scope
		Alternate calculation notes	See FDI Files and Calculation list with Independent Design Reviews		
		Alternate Calculations			
			SD-SNF-FHA-002 Final Fire Hazards Analysis for the Canister Storage Building R. L. Fritz, ARES, to D. Mertz, FDH, January 6, 2000.	Informal Review	EDT-627186
			HNF-SD-SNF-HIE-001, Rev. 0 Canister Storage Building Hazard Analysis Report L. J. Garvin, FDNW,1997	Informal Review	ECN-607691
			HNF-SD-SNF-HIE-001, Rev. 1 Canister Storage Building Hazard Analysis Report T. B. Powers, FH, 2000	Informal Review	ECN-656344
			SNF-3328, Rev. 2 Canister Storage Building Design Basis Accident Analysis Documentation R. D. Crowe, M. G. Plepho, and others.	Informal Review	EDT-624295 ECN-647516 ECN-656349
			HNF-SD-SNF-CSER-005 Criticality Safety Evaluation Report for the MCO S. F. Kessler, FFS, March 16, 2000.	Informal Review	ECN-646342
			SNF-3951 Hydrogen Combustion in an MCO During Interim Storage M. G. Plys, DESH, February 16, 1999	Informal Review	EDT-625804

			SNF-3907 SNF Project CSB Human Factors Engineering (HFE) Analysis: Results and Findings R. P. DiPiazza, 1999	Informal Review	EDT-626890
			SNF-4831 Human Factors Engineering and Ergonomics Analysis for the CSB: Results and Findings R. P. DiPiazza, 1999	Informal Review	EDT-626889
			HNF-6025, Rev. 0 CSB Hazards Assessment, May 24, 2000	Informal Review	EDT-623872
			CSB ALARA Analysis, Rev 10 (release TBD)	Informal Review TBD	EDT-629817 for Rev. 9 (SNF-6132 calculation [CSB-AL-0009])
			99-SNF/CES-001, Interoffice Correspondence, "MCO Machine - Shield Skirt/Concrete Deck Interface - Technical Evaluation," C. E. Swenson to A. S. Daughtridge, dated November 2, 1999, containing an unreleased copy of HNF-5297 Radiation Exposure from the Gap Under the Multi-Canister Overpack (MCO) Handling Machine S. R. Gedeon, FDNW, October 1999	Informal Review	Sign off coversheet and attached interoffice correspondence regarding review.
			SNF-RPT-011, Rev. 1a SNF Project Design Basis Capacity Study K. J. Cleveland, FDNW, and A. L. Pajnunen, FH, January 29, 1999 (Witness Model)	Alternate Calculation	ECN-651420
			WHC-SD-SNF-RPT-005, Rev. C SNF CSB Construction Restart Recommendation Report Released by J. D. Phillips, WHC, March 28, 1996. Report Prepared by ARES Corporation. Transmitted by letter, R. L. Fritz, ARES, to M. K. Mahaffey, WHC, 96RL0336, dated March 22, 1996	Informal Review	EDT-607666
			WHC-SD-SNF-RPT-006, Rev. 0 SNF CSB Recommendation on Selected Initiation of Construction Activities Released by J. D. Phillips, WHC, March 28, 1996. Report Prepared by ARES Corporation. Transmitted by letter, R. L. Fritz, ARES, to M. K. Mahaffey, WHC, 96RL0309, dated March 8, 1996	Informal Review	EDT-607666
			Canister Storage Building Phase II Construction Continuation Recommendation Report ARES Report transmitted by letter, R. L. Fritz, ARES, to M. K. Mahaffey, DESH, 96RL1205, dated December 9, 1996	Independent Review by ARES	
			SD-WM-ANAL-0205 Hanford Site Stored SNF Vulnerability Assessments R. A. Cox, WHC, December 6, 1993.	Informal Review	EDT-155563
			HNF-SD-TI-015 Spent Nuclear Fuel Project Technical Databook M. A. Reilly, DESH, October 23, 1998	Informal Review	ECN-648624
			HNF-SD-SNF-OCD-001 Spent Nuclear Fuel Project Product Specification A. L. Pajunen, FH, April 21, 2000	Informal Review	ECN-659418

	Structural Analyses	SNF-5930 Structural Analysis of MCO for Accidental Movement of MHM During MCO Lifting Operations G. D. Bazinet, NHC, and G. Abatt, March 2, 2000.	Informal Review	EDT-627041
		Preliminary Analysis of MCO Loading During CSB Startup A. L. Pajunen, DESH, December 1, 1998 (No document number in RMIS). Independent analysis by Q Metrix on natural convective cooling	Alternate calculation underwent Informal Review.	EDT-625800
	Failure Modes and Effects Analyses	SNF-6449, Rev. 0 Transmittal of FMEA and RAM Analysis for the MCO MHM Document, June 1, 2000	Informal Review	EDT-628719
		ESL/R-97-036 Failure Modes and Effects and Hazard Analysis of MCO Hoist and Grapple C. E. Swenson, DESH, December 1, 1997 (Report provided by FWEC)	Informal Review	Reviewed in "Hoisting System Design Review" DESH letter, C. E. Swenson to R. J. Roberts, MHM-BTR-101, DESH-9850197, dated January 9, 1998. (Vendor File VI 50100)
		ESL/R-97-043 Failure Modes and Effects and Hazard Analysis of MCO Hoist and Grapple Control System C. E. Swenson, DESH, December 1, 1997 (Report provided by FWEC)	Informal Review	Reviewed in "Hoisting System Design Review" DESH letter, C. E. Swenson to R. J. Roberts, MHM-BTR-101, DESH-9850197, dated January 9, 1998. (Vendor File VI 50100)
		CSB Deck FMEA Letter, P. J. Bedell, FDI, to M. K. Mahaffay, DESH, FDT-059, September 24, 1997.	Informal Review	Letter, P. J. Bedell, FDI, to M. K. Mahaffay, DESH, FDT-059, September 24, 1997.
	Verification Documents Related to Qualification Testing			
		Test Report for W379-TSR-001		In Process
		Test Report for W379-TSR-002	Independent Review TRB/JTG	TRB MM 9/22/98
		Test Report for W379-TSR-003		In Process
		Test Report for W379-TSR-004	Independent Review TRB/JTG	TRB MM 6/8/98
		Test Report for W379-TSR-005		In Process
		Test Report for W379-TSR-006		In Process
		Test Report for W379-TSR-007		In Process
		Test Report for W379-TSR-010-1	Independent Review TRB/JTG	TRB MM 3/16/99
		Test Report for W379-TSR-010-2	Independent Review TRB/JTG	TRB MM 5/21/99
		Test Report for W379-TSR-011		In Process
		Test Report for W379-TSR-012	Independent Review TRB/JTG	TRB MM 9/8/98
		Test Report for W379-TSR-013		In Process
		Test Report for W379-TSR-014-1		In Process
		Test Report for W379-TSR-015-1		In Process
		Test Report for W379-TSR-015-2		In Process
		Test Report for W379-TSR-015-3		In Process
		Test Report for W379-TSR-015-4		In Process
		Test Report for W379-TSR-016		In Process
		Test Report for W379-TSR-017-1		In Process
		Test Report for W379-TSR-017-2		In Process
		Test Report for W379-TSR-018	Independent Review TRB/JTG	TRB MM 5/28/98
		Test Report for W379-TSR-019	Independent Review TRB/JTG	TRB MM 7/31/98
		Test Report for W379-TSR-020		In Process
		Test Report for W379-TSR-020-1		In Process
		Test Report for W379-TSR-021		In Process
		Test Report for W379-TSR-022-1		In Process
		Test Report for W379-TSR-023		In Process
		Test Report for W379-TSR-024-1		In Process

			Test Report for W379-TSR-025-1		In Process
			Test Report for W433-TSR-001-1		In Process

APPENDIX B

DESIGN REQUIREMENT COMPLIANCE MATRIX

Canister Storage Building Verification and Validation Matrix

Line #	Spec. Section HNF-S-4025		Function / Requirement	Verification/Validation Method						Reference Document
				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
1	1.0	Scope	General Information						X	
2	2.0	Applicable documents	General Information						X	
3	3.1.1	Functional definition	General Information						X	
4	3.1.2.1	Location	Site Location		X					Independent Design Review (IDR) of vicinity and project area maps H-2-117071 in CSB/HCS design review
5	3.1.2.2	Facility Description	General Facility Description		X					Independent Design Review of Building Sections H-2-117798 in CSB/HCS design review
6	3.1.3	Interface Definitions	The CSB must interface with other SNF Project elements							Interfaces verified in the following ICDs: IC-004, IC-005, IC-006, IC-083, IC085, IC-086, IC-087, IC-129, IC-131, IC-132, IC-133, IC-135, IC-139, IC-233
		3.1.3.1.1 Interfaces with the SNF packaging and transportation systems								
		3.1.3.1.2 Interface with SNF transporter					X			W-443-PAT-001 and associated Test Summary Report (TSR)
		3.1.3.1.3 Interface with SNF transportation cask					X			-PAT-001 and TSR
		3.1.3.1.4 Interface with SNF MCO					X			PAT-012 and TSR
		3.1.3.1.5 Interface with SNF MCO Overpack Storage Tubes					X			PAT-015-3 and TSR
		3.1.3.1.6 Interface with Fast Flux Test Facility SNF Transloading Systems			X		X			IDR of Overpack Tube Package and **Qualification test under development**.
		3.1.3.2 Interfaces with Hanford Site infrastructure and utilities						X		Informal review of MOU with Site Utilities. Dyncorp MOU-002
		3.1.3.3 Other Programs						X		Informal review of FFTF drawings (ref: Roger McCormack)

Line #	Spec. Section HNF-S-4025		Function / Requirement	Verification/Validation Method						Reference Document
				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
7	3.1.4	Operational philosophy	Transition from construction to operation and facility operation shall be in accordance with DOE Order 5480.19, Conduct of Operations Requirements for DOE Facilities. No lost time accidents shall be a primary goal. Exposures to radiation and toxic materials shall be held as low as reasonably achievable (ALARA) consistent with good industry practice and DOE Regulations and Orders Operations will be conducted with direct visual access and with personnel wearing the appropriate clothing and using appropriate protection devices. Permanent or temporary shielding, the appropriate distance and staytime are utilized to reduce personnel exposure to ALARA. The operating staff will be housed adjacent to the main facility in temporary structures. There are no fulltime occupied areas within the building during the 40-year interim storage period. However, fulltime occupation will be required during the approximate 3 years of MCO receipt/shipping and MCO welding operations. Other than monitoring, the only operations would be responses to off-normal events.	X	X			X		Formal Design Review (FDR) of Sample Weld Station package that included a revision of the ALARA report, and Informal Review of ALARA Analysis Rev. 10 on EDT. (release TBD). Independent review of HNF-5297, "Radiation Exposure from the Gap Under the MCO Handling Machine," S. R. Gedeon, FDNW, 1999 by FDH as documented in Internal Letter Report, "MCO Machine – Shield Skirt/Concrete Deck Interface – Technical Evaluation," C. E. Swenson to A. S. Daughtridge, dated November 2, 1999
8	3.1.5	Loadout and shipment to repository.	Not to preclude loadout at a later date						X	
9	3.2.1.1.1	Receive MCO shipment rate.	The SNF CSB shall receive shipments of MCOs from CVD Facility at the established rate of 1 shipment every 24 hours. The average shipping time between CVD Facility and CSB is 14 hours. The MCO shipping window between CVD Facility and CSB is limited to 234 hours to avoid accumulation of 2.5% hydrogen in the cavity of the transport cask as defined in HNF-SD-TP-SARP-017, Rev. 1, Safety Analysis Report for Packaging (on site) Multi-Canister Overpack Cask (1999).		X	X				Independent review of H-2-123400 of Block diagram package and alternate calculation by process analysis. See HNF-SNF-RPT-011 Rev. 1a, SNF Project Design Basis Capacity Study, K. J. Cleveland, 1999.
10	3.2.1.1.2	Receive and handle MCO shipment timeline.	The SNF CSB handles one MCO shipment in approximately 24 hours. Receiving and handling of the MCO shipment starts with the transporter entering the SNF CSB and ends when the transporter is dispatched from the SNF CSB (H-2-123400, Sheet 4 and 7). It includes all the functions listed in Section 3.2.1.1.3 below. The term transporter, as used in this specification, refers to a truck-based transporter.		X	X				Independent review of H-2-123400 of Block diagram package and alternate calculation by process analysis. See HNF-SNF-RPT-011 Rev. 1a, SNF Project Design Basis Capacity Study, K. J. Cleveland, 1999.

Line #	Spec. Section HNF-S-4025		Function / Requirement	Verification/Validation Method						Reference Document
				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
11	3.2.1.1.3	Capability to receive and handle MCO shipments.	The capability to receive and handle the MCO shipment shall implement the following functions: a. Transporter access to the CSB site by means of a new road connected to the Hanford Site roadway system.		X					a) IDR of site map H-2-117071 in CSB/HCS package.
			b. Deliver the transporter/cask at all facilities involved in the receiving and handling of K Basin SNF shipments.						X	
			c. Move the transporter/cask within the CSB site to the receiving area.		X					c) IDR of Superstructure package
			d. Isolate the transporter/cask to protect the environment.		X					d) IDR of airlock superstructure package
			e. Unload the MCO and the cask off the transporter and position for further handling.				X			e) W379-PAT-012-1
			f. Check the pressure of the gas in the cask annulus and sample the gas if high pressure is detected. (Note: Cask pressure may be checked before unloading off transporter.)				X			f) W379-PAT-**TBD or future operations test**
			g. Open the cask lid and remove the MCO using the MHM.	X			X			g) FDR of MHM package and PAT-015-3
			h. Perform radiological surveys of the transporter and cask to assess contamination levels.						X	h), i) Operations Functions
			i. Perform visual inspections of the transporter, cask, and cask lifting attachments to assess their condition and determine maintenance needs. Note: A leakage rate test of the cask in accordance with ANSI N 14.5 (ANSI 1987) is required annually or after replacement of O-ring seals based on requirements of HNF-SD-TP-SARP-017, Rev. 1.						X	
			j. Retrieve and move a clean, empty MCO to the loading area, and perform visual inspection of MCO for cracks or damage. Load accepted MCO into the cask/transporter and install cask lid on the transporter.				X			j) W379-PAT-015-3 and associated TSR
			k. Dispatch the transporter/cask from the SNF CSB facilities.						X	
12	3.2.1.2.1	Receive clean, empty MCOs at the shipment rate.	The SNF CSB shall receive clean, empty MCO shipments at the rate of 3 units per shipment based on preliminary shipping and handling efficiency studies (1 or 2 MCOs/container and 2 or more containers per shipment)				X			Operations test **TBD** when MCO completed and delivered
13	3.2.1.2.2	Receive and handle empty MCO shipment timeline.	The SNF CSB shall handle one empty MCO shipment in 4 hours. Handling of the empty MCO shipment starts once the truck-trailer accesses the SNF CSB site and ends when the truck-trailer is dispatched from the SNF CSB site. It includes all the functions listed in Section 3.2.1.2.3 below.		X					IDR of H-2-123400 in Block Diagram Package
13a	3.2.1.2.3	Capability to receive and handle empty MCO shipments	The capability to receive and handle the empty MCO shipment shall implement the following functions: a. Conventional truck-trailer access to the CSB site by means of a new road connected to the Hanford Site roadway system.		X					Independent review of receipt of empty MCOs is **TBD**
			b. Move the truck-trailer within the CSB site to the receiving area.							
			c. Receive and handle empty MCO shipments from the truck-trailer at the CSB .							
			d. Unload the empty MCOs off the truck-trailer, place on storage cart(s), and position cart(s) in the receiving area.							
			e. Move cart(s) with the new, empty MCOs and place in lag-storage.							
			f. Lag-store empty MCOs.							
			g. Dispatch the truck-trailer from the SNF CSB.							

Line #	Spec. Section HNF-S-4025		Function / Requirement	Verification/Validation Method						Reference Document
				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
13b	3.2.1.2.4	The capability to receive and handle the MCO canister cover assembly shipments	The capability to receive and handle the new MCO canister cover assembly shipment shall implement the following functions: a. Conventional truck-trailer access to the CSB site by means of a new road connected to the Hanford Site roadway system. b. Move the truck-trailer within the CSB site to the sampling/weld station receiving area. c. Receive and handle canister cover assembly shipments from the truck-trailer at the CSB . d. Unload the canister cover assemblies off the truck-trailer and position in the receiving area. e. Lag-store canister cover cap assemblies. g. Dispatch the truck-trailer from the SNF CSB.		X		X			Independent Review **TBD**. Qualification testing **TBD** when weld stations complete and canister cover assemblies delivered.
14	3.2.1.3.1	Handle MCO for interim storage timeline.	The SNF CSB shall provide facilities and equipment to allow operators to place a MCO in interim storage in the established time period. Handling the MCO for interim storage starts after end cap welding and weld seal leakage testing and ends when the MCO is positioned and configured for interim storage. It includes all the functions listed in Section 3.2.1.3.4 below, with the exception of Paragraph f.		X					IDR of H-2-123400 in Block Diagram Package
15	3.2.1.3.2	Interim store MCO capacity.	The SNF CSB shall provide interim storage for up to 440 MCOs in standard tubes and 6 damaged or failed MCOs in overpack tubes for up to 40 years (See Section 3.2.2.1.1).		X					IDR of H-2-119276 in Deck package
16	3.2.1.3.3	Handle MCO for final disposition timeline.	Handling the MCO for final disposition starts with retrieving the MCO from its interim storage location and ends when the MCO has been prepared for loading into a shipping cask for transfer to final disposition. It includes all the functions listed in Section 3.2.1.3.4 below. Packaging for repository shipment is not included.		X					IDR of H-2-123400 in Block Diagram Package

Line #	Spec. Section HNF-S-4025		Function / Requirement	Verification/Validation Method						Reference Document
				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
17	3.2.1.3.4	Capability to handle, interim store, and prepare MCO.	The capability to handle, interim store, and prepare the MCO for transfer to final disposition shall implement the following functions: a. Maintain the MCO radiation dose to ALARA throughout the receiving, handling, interim storage, and preparation for final disposition operations. b. Move, position, and retrieve the MCO within the SNF CSB facilities. c. Prepare the MCO for interim storage, maintain the integrity of the MCO throughout the interim storage period, and prepare the MCO for transfer into a shipping cask for final disposition. The Maintain MCO Integrity function is described in Section 3.2.1.6. d. Configure the MCO for interim storage. Configuring the MCO consists of welding a cover cap onto the MCO collar prior to MCO insertion into the storage tube (See Appendix A). Note: The gas inside approximately six preselected MCOs will be monitored before sealing of the MCO. The monitored MCOs will be moved to the sample station and checked for internal gas pressure and sampled (as necessary) a total of 8 times during the first 24 months of storage. After each sampling event, the monitored MCOs will be returned to their storage tubes. After an engineering evaluation of the monitoring results, the monitored MCOs will then be welded and reinserted into the storage tubes. e. Interim store the MCO for up to 40 years (extendable to 75 years). f. Prepare the MCO for transfer to final disposition.	X X X	X		X X		X	a) FDR of ALARA Report in Sample Weld Station Package b) PAT-015-3 and associated TSR c) FDR of Weld Station Package d) FDR of Weld Station Package and Alternate Calculation by Witness Model. (SNF-RPT-011, Rev. 1a, SNF Project Design Basis Capacity Study) e)IDR of superstructure, vault, and deck, f) Weld Station qualification testing TBD when system installed.
18	3.2.1.4	Control MCO surrounding environment.	The SNF CSB shall include all the necessary ventilation, cooling system(s), and enclosures to control the MCO surrounding environment during MCO transfer in the MHM, storage in overpack and standard tubes, short term monitoring, and welding operations. The MCO surrounding environment shall maintain the MCO wall temperature of <132□C (270□F), which corresponds to the SNF centerline temperature of <157□C (315□F).		X					Independent review of Heat Transfer Analysis, Calculation # CSB-HV-0001 and check on Welding-Glycol Cooling System, -HV-0012.
19	3.2.1.5	Monitor MCO surrounding environment.	The SNF CSB shall include all the necessary provisions to monitor the MCO surrounding environment during the storage operation. The capability to monitor the MCO surrounding environment shall implement the following functions: a. Monitor the temperature and flow rate of the MCO cooling media; b. Monitor contamination of the MCO surrounding environment; and c. Monitor personnel radiation exposure.		X					c) IDR on Superstructure Package

Line #	Spec. Section HNF-S-4025		Function / Requirement	Verification/Validation Method						Reference Document
				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
20	3.2.1.6	Maintain MCO integrity.	The SNF CSB shall include all the necessary provisions to maintain the integrity of the MCO during the short-term monitoring, welding and interim storage, including receipt, staging for transfer, and transfer. The capability to maintain the integrity of the MCO shall implement the following functions:							
			a. deleted						X	
			b. Provide a structurally welded cover cap as an outer confinement barrier.	X						b) FDR of Sample Weld Station Package and MCO Design Review. SNF-5222 and SNF-5465
			c. Perform radiological surveys of the MCO top surface.						X	
			d. Decontaminate the top surface of the MCO (portable equipment).						X	c), d), e) Operations Function
			e. Perform physical inspections of the MCO top surface (ports and weld areas).						X	
			f. Store failed MCOs (inside overpack storage tubes).			X				f) Failed MCO Calculation. HNF-2155, Rev. 1
			g. Provide fail-safe methods that prevent inadvertent dropping of an MCO during transfer and extraction/addition to a storage tube, sample/weld station, or service station pit.	X	X	X				g) FDR MHM, IDR Receiving crane, Independent drop analysis by Waste Mgmt Hanford. SNF-5677
			h. The MCO shall be kept dry and free of moisture on the outside so the risk of corrosion of any of the MCO welds is kept to the absolute minimum.		X					h) IDR of Specification Environmental Conditions and 6430.1a waiver for sprinklers
			i. The MCO shall be kept free of halogens, sulfur, and liquid metal compound, low melting point metals, and other deleterious materials so the MCO maintains its structural proportions, and remains sound and suitable for service.		X					i) IDR of Vault, Deck, and Superstructure packages

Line #	Spec. Section HNF-S-4025		Function / Requirement	Verification/Validation Method: Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	Reference Document
21	3.2.1.7	Accommodate operations personnel and activities.	The SNF CSB or surrounding temporary or existing facilities shall include all the necessary accommodations to facilitate SNF CSB operations and maintenance activities during the short term monitoring, welding, and storage operations. These include:							
			a. Receive and store materials, and supplies necessary for its operation and maintenance.		X					a) b) c) IDR of Support Building and Superstructure packages
			b. Provide for the maintenance of both radioactive and non-radioactive equipment to support operations and to minimize downtime. The radioactive equipment maintenance area shall include appropriate minimal portable decontamination capability of small items with portable equipment.		X					
			c. Provide operational support facilities and equipment, such as truck loading and unloading areas, cranes, and MCO handling equipment.		X					
			d. Provide operational support services such as electrical power, site-generated power, uninterruptable power, communications, and compressed gases.		X					d) e) f) IDR Superstructure Package
			e. Provide change rooms for contamination control including lockers and health physics areas.		X					
			f. Provide offices and work space in temporary facilities in noncontaminated areas.		X					
			g. Provide facility hardware and process equipment to perform the MCO cover cap welding in the CSB Annex. Hardware includes addition of cranes and hoists, modifications to CSB Annex and pits, utility services, heating, ventilation, and air conditioning (HVAC) and distributed control system (DCS), and the addition of shielding. Process equipment will be provided by others and includes MCO internal gas sampling/verification apparatus, MCO cover cap welding machines, non destructive examination/testing (NDE/T) equipment, and enclosures with ventilation and local shielding (see Appendix A).	X						g) FDR Sample Weld Station package
			h. Provide an HVAC system to ensure the safe operation of the facilities. The HVAC system shall be designed to maintain airflow from non-contaminated to progressively contaminated areas. Separate HVAC supply systems for contaminated and non-contaminated areas will be provided. The HVAC system(s) shall meet applicable requirements in DOE Order 6430.1A, General Design Criteria (DOE 1989); ASME N509-1989, Nuclear Power Plant Air-Cleaning Units and Components (ASME 1989); ASME N510-1989, Testing of Nuclear Air Treatment Systems (ASME 1989); and HNF-5173, PHMC Site Radiological Control Manual.		X					h) IDR Superstructure Package, HVAC P&ID, and HVAC Block Diagram. Independent review of 6430.1a compliance in HNF-4742
			i. Provide a health protection system (HPS) to monitor and protect personnel and the environment from radioactive and hazardous materials. The HPS shall include instrumentation for sampling, and monitoring; an alarm of radiation, contamination, and hazardous conditions; and an alarm for environmental releases.		X					i). IDR Superstructure Package

Line #	Spec. Section HNF-S-4025		Function / Requirement	Verification/Validation Method						Reference Document
				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
22	3.2.1.8	Manage the disposal of incidental waste.	The generation of solid waste as a result of the SNF CSB operations shall be minimized. SNF CSB operations include sampling of transport cask and MCO atmospheres, monitored MCO gas pressure sensor replacement, weld cleaning and inspection, grinding of failed MCO cover cap welds, limited decontamination with portable equipment, loaded HEPA filters, routine maintenance, and equipment services. The management of these waste will comply with HNF-SD-SNF-RD-001, Rev 2A, SNF Project Standards/Requirements Identification Document and be performed in the following manner: a. Collect and control the waste during operations to prevent the spread of contamination and limit personnel and environmental exposure to as low as reasonable achievable. b. Characterize waste to determine its radioactive and hazardous constituent quantities to allow for the proper sorting, classification, handling, packaging, and accountability prior to transport for disposal. c. Package and accumulate waste for treatment, storage, and/or disposal by others. Packaging, accumulation and shipping of waste will be in accordance with all applicable federal, state, and local regulations.		X					Independent Design Review of P&ID Liquid Waste Collection, H-2-123395; Piping drawing for condensate collection, H-2-125160; HVAC Support Area (humidifier), H-2-129417; Mechanical CSB MCO Service Station, H-2-129417; Mechanical CSB MCO Service Station, H-2-120902
23	3.2.2.1.1	Design life.	The SNF CSB structure safety class (SC) concrete, storage tubes needed to accomplish interim storage for 40 years shall have a potential for service life extension projected to 75 years. The design life for systems, structures, and components needed to accomplish interim storage mode operations shall be 40 years based on safety, operability, maintainability, reliability, sourcing, and life cycle cost.		X					Independent Design Review of Calculation. CSB-S-0008.
24	3.2.2.1.2	Design basis.	SNF CSB structures, systems, and components shall be designed based on safety classification as determined in Section 3.2.2.1.2.3. The safety classification determines physical design criteria, based on Design Basis Accidents and hazards, including natural hazards phenomena.		X					IDR of design packages with licensing involvement.
25	3.2.2.1.2.1	Minimum capacity.	The SNF CSB shall provide storage for up to 440 MCOs. In addition, it shall be capable of storing 6 damaged/failed MCOs.		X					IDR of H-2-119276 in Deck package
26	3.2.2.1.2.2	Design feed.	The SNF CSB shall provide storage for MCOs that contain uranium metal-form nuclear fuel materials as described in this section and in Tables 3.2.2.1.2.2-1 and 3.2.2.1.2.2-2 below. With the exception of ALARA calculations, design calculations that address localized effects shall be based on the attributes shown under "Maximum." Design calculations to address localized effects would typically include those that establish the load capacity of a crane that handles MCOs or that establish the extent of a radiation area or radiological buffer area where radiation levels are controlled by individual MCOs, as opposed to general building backgrounds. For ALARA calculations, which are typically performed with project-average source terms (see below), the design basis shall be calculated as 80% of the attributes shown under "Average" and 20% of those shown under "Maximum." This additional conservatism is intended to accommodate any increases to source terms, time durations, etc., that may accrue as the project evolves.					X		Informal review of CSB ALARA Analysis, Rev. 10 (release TBD). An engineering and technical review has shown that the results of Rev. 9 of the ALARA Report are sufficiently conservative and valid. However, the report will be revised to make the ALARA analysis consistent with the new source terms.

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				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
27	3.2.2.1.2.3	Classification of structures, systems, and components.	The SNF CSB shall use a deterministic value of 5 rem in safety analysis for the onsite worker at the boundary of the controlled area (defined as 100 meters from the facility release point) for design basis accidents to assist in determining Safety Significant structures, systems, and components (SSCs). All other safety analysis shall comply with safety classification requirements as stated below and in accordance with HNF-PRO-704, Hazards and Accident Analysis Process (Rev. 1) 1999. SNF CSB SSCs shall be assigned a safety classification according to the following criteria and methodology, which are based on the potential consequence of failure. Items that fall into more than one class shall be assigned to the higher requirement. In addition, SSCs shall be identified "important to safety" in accordance with Section 3, Definitions, of 10 CFR 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste (CFR 1994). Once SSCs important to safety have been identified, the graded approach to an SSC shall be applied using the guidance provided in NUREG/CR-6407, Classification of Transportation Packaging and Dry Spent Fuel Storage Systems (NRC 1996).					X		Informal review of Safety classification forms (FDI Letter FDP-1158) in EDT 627200
28	3.2.2.1.2.3.1	Criteria for Safety Classification	Criteria for safety classification (safety class (SC)), safety significant (SS), and general service (GS) are given in HNF-PRO-704 and WHC-SD-SNF-DB-003. Items important to safety (ITS) use the graded approach described in NUREG/CR-6407.		X					Verified by independent review of FSAR, HNF-3553
29	3.2.2.1.2.3.2	Risk Guidance	Risk evaluation guidance in accordance with HNF-PRO-704, Hazard and Accident Analysis Process (1999), should be used to identify and establish SC and safety significant SSCs. The following Radiological Risk Guidelines (Table 3.2.2.1.2.3.5-1) define offsite and onsite risk guidelines for all credible frequencies. The radiological risk guidelines apply to only doses that result from direct exposure to the passing plume (i.e., inhalation and submersion). The Toxic Chemical Risk Guidelines (Table 3.2.2.1.2.3.5-2) apply to the airborne pathway only for the determination of risk for toxic chemical releases.		X					Informal reviews of HNF-SD-SNF-HIE-001, Revs. 0 and 1; CSB Hazard Analysis Report; and SNF-3328, Rev. 2, Canister Storage Building Design Basis Accident Analysis Documentation
30	3.2.2.1.2.3.3	Correlation of safety classification to performance categories.	Safety classification of SSCs shall be correlated to the Performance Categories defined in DOE Order 5480.28, Natural Phenomena Hazards Mitigation (DOE 1993) in accordance with WHC-SD-GN-RD-30011, Correlation of NPH Performance Categories with SSC Safety Classifications (WHC 1994).					X		Informal review of Safety classification forms (FDI Letter FDP-1158) in EDT 627200
31	3.2.2.1.2.4	Design basis security	Design parameters for the security system were based on physical security and protective force requirements, material control and accountability requirements, operational security procedures and administrative controls traceable to DOE directives. All security system components are classified as general service (GS) and are designed and qualified as performance Category 1 per HNF-PRO-097, Engineering Design and Evaluation.		X			X		Informal Review by vulnerability assessment (classified) and FDR of Security System package.
32	3.2.2.1.2.5	Design criteria.	The SNF CSB shall be designed in accordance with DOE Order 6430.1A, General Design Criteria (DOE 1989); WHC-SD-SNF-DB-009, Rev. 4, Canister Storage Building Natural Phenomena Design Loads (WHC-1996); Uniform Building Code (ICBO1994), SDC-4.1, Standard Architectural-Civil Design Criteria, Design Loads for Facilities (RL 1993); ANSI/ANS 57.1-1992, Design Requirements for Light Water Reactor Fuel Handling Systems (ANSI/ANS 1992); ANSI/ANS 57.9-1992, Design Criteria for an Independent Spent Fuel Storage Installation (Dry Type) (ANSI/ANS 1992); and, Spent Nuclear Fuel Canister Storage Building Design Basis Document, Rev. 1. The SSCs needed to accomplish the SNF CSB mission during the interim storage mode of operations shall be designed for permanent installation. The SSCs needed to accomplish the short term MCO monitoring and welding mission shall be designed for temporary installation and eventual removal.		X			X		Informal Review of the design in the 6430.1a Compliance evaluation, HNF-4742, and IDR of the design packages

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33	3.2.2.1.2.6	Design flexibility.	The SNF CSB shall be designed to facilitate modifications to allow the SNF CSB to support other Hanford SNF programs. The following flexibility features shall be provided: a. Capability to extend storage to other nuclear materials by similar use of remaining vaults. b. Capability so that future additional features will allow storage of vitrified high level radioactive waste canisters. c. Capability to receive an ISC, SWC, and T-3 transportation casks on transporters at the CSB and accommodate transloading of the FFTF SNF assemblies from an ISC to a T-3 transportation cask.		X			X		a) Informal Review of Shippingport fuel at T-Plant in SAR. SNF-5133 b) c) IDR of Superstructure Package
34	3.2.2.1.3	Design basis accidents.	The SNF CSB shall be designed to withstand the effects of design basis accidents (DBAs), as delineated in DOE Order 6430.1A, General Design Criteria (DOE 1989); DOE Order 5480.23, Nuclear Safety Analysis Reports (DOE 1992), and DOE-STD-3009-94, Preparation Guide for U.S. Department of Energy Non-reactor Nuclear Facilities Safety Analysis Report (DOE 1994), with confinement of radioactive and toxic materials within allowable limits. All Safety SSCs items, and non-Safety SSCs items required to prevent failure of Safety SSCs items, shall withstand the following DBAs in a manner that preserves the safety function. 3.2.2.1.3.1 Design basis fire. 3.2.2.1.3.2 Design basis power failure. 3.2.2.1.3.3 Design basis earthquake. 3.2.2.1.3.4 Design basis wind and tornado. 3.2.2.1.3.5 Design basis flood. 3.2.2.1.3.6 Volcanic eruption considerations.		X X X X	X			X	3.2.2.1.3.1) Alternate Calculation in FHA by Hueges Ass. Inc. HNF-SD-HNF-FHA-002, Rev. 2 3.3), 3.4), 3.6) IDR on structural Calculations. CSB-S-0001 through –0012. 3.5) CSB-C-0001 for the design basis flood has been checked. Independent Review in SNF-3328, Rev. 2, Canister Storage Building Design Basis Accident Analysis Documentation
35	3.2.2.1.4	Abnormal operations detection.	The SNF CSB design shall include provisions to monitor and alarm on detection of abnormal conditions such as radioactive particulate release, liquid and gaseous release, abnormal radiation levels, fires, and overheating or pressurization. The facility design shall incorporate the requirements of ANSI/ANS-8.3-1986, Criticality Accident Alarm System (ANSI/ANS 1986) if required by the safety analysis. Process and facility systems shall be designed to ensure safe channeling of energy and material flows (e.g., seal pots, fault-to-ground electrical circuitry, siphon breaks, etc.).		X		X			The GEMS system, Fire Detection System, and HVAC systems went through a IDR and are further verified by PAT-010-1 and 010-2 on the GEMS system, PAT-003 on the Fire Detection System, and –006 on the HVAC system. Informal review of Human Factors review in SNF 3907 and SNF 4831.
36	3.2.2.1.5	Nuclear criticality safety.	The SNF CSB design shall incorporate a criticality safety value of 0.95 for Keff and shall comply with DOE Order 5480.24, Nuclear Criticality Safety (DOE 1992) as implemented by WHC-CM-4-29, Nuclear Criticality Safety (WHC 1988).		X					Independent Review in Criticality Analysis. HNF-SD-SNF-CSER-005, Rev 5B

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37	3.2.2.1.6	Radiological Design and Radiation Exposure Analysis.	In addition to meeting the general design criteria provided in DOE Order 6430.1A (DOE 1989), the radiological design of the CSB shall meet the ALARA requirements of 10 CFR 835, Occupational Radiation Protection (CFR 1999), and HNF-5173, Rev. 0, PHMS Radiological Control Manual. See section 3.2.2.1.7, below, for contamination control criteria. The radiological design (including shielding, confinement, any provision for remote operations, etc.) for different facility areas and/or operations shall be evaluated against the requirements of HNF-5173, Article 128 (Facility Modifications and Radiological Design Considerations) and the ALARA design objectives of 10 CFR 835, Subpart K. All facility design and control actions taken to maintain occupational exposures ALARA shall be documented in accordance with Paragraph 835.704(b) of 10 CFR 835. The design shall consider the guidance provided by WHC-SD-GN-DGS-30011, Radiological Design Guide. Guidelines for achieving exposure levels that are ALARA are contained in PNL 6577, Health physics Manual of Good Practices for Reducing Exposure to Levels that are as Low as Reasonably Achievable (ALARA) (Munson 1988). WHC-IP-1043, WHC Occupational ALARA Program (WHC 1995) describes FDH/DESH implementation of the ALARA program. Section 3.2.2.1.6.2, below, provides additional guidance for implementation of 10 CFR 835 requirements.					X		Informal Review of CSB ALARA Analysis, Rev. 10 (release TBD)
38	3.2.2.1.6.1	Source Terms for CSB Shielding Calculations	Table 3.2.2.1.2.2-1 of this document provides MCO radionuclide inventory listings for various SNF Project design feeds. Section 3.2.2.1.2.2 describes each feed and (depending on the purpose of a given calculation) specifies which feed, or combinations of feeds, must (as a minimum condition) be input to CSB shielding calculations. Note that all the isotopic activity listings in Table 3.2.2.1.2.2-1 are on a "per-MCO" basis whereas it may sometimes be necessary to base a shielding calculation on the isotopic content of a single fuel basket. While the table does not specifically include listings for Ci content per unit mass of fuel, it does provide listings for the total fuel mass. It also provides detailed references to the original source documents. Therefore the necessary information may either be obtained from Table 3.2.2.1.2.2-1 (by dividing the total mass of uranium per MCO into the total Ci of 137Cs per MCO, etc.) or it may be obtained directly from the original source listings that are referenced in the table notes. Reconciliation of Existing Shielding Calculations with Revised Source Terms As a result of changes to some of the assumptions and methodology that drove the source term listings in earlier versions of the reference document (HNF-SD-SNF-TI-015) used for Table 3.2.2.1.2.2-1, some of the values in this revision (Rev. 4) are different (when normalized to the same decay dates) than those that were listed in previous revisions of this document. Consequently, most of the existing CSB shielding calculations were performed using source terms that are no longer supported by this document. Therefore it will be necessary to reconcile existing calculations results with the current source term listings. Note that this does NOT necessarily mean that the existing calculations must be revised, although that would be an acceptable option. In most cases it should be possible to reconcile dose rates from existing calculations with those that would result from the current source term listings by simply adjusting the existing dose rates upward, based on the ratio of 137Cs contents (normalized to the same decay date), and downward, based on additional decay to the latest official project start-up date.					X		Informal Review of CSB ALARA Analysis, Rev. 10 (release TBD)
39	3.2.2.1.6.2	Guidance for Implementation of 10	Section 835.2 of 10 CFR 835, Occupational Radiation Protection (1999), provides the following definition of ALARA:					X		Informal Review of CSB ALARA Analysis, Rev. 10 (release TBD)

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		CFR 835.	ALARA means "As Low As is Reasonably Achievable," which is the approach to radiation protection to manage and control exposures (both individual and collective) to the work force and to the general public to as low as is reasonable, taking into account social, technical, economic, practical and public policy considerations. As used in this part, ALARA is not a dose limit but a process which has the objective of attaining doses as far below the applicable limits of this part as is reasonably achievable. Appendix A of SNF Project Administrative Procedure RP-12-009-01 (Radiological Review Process) provides an overview of ALARA design requirements, and Appendix B provides guidance for implementation of 10 CFR 835. Section 1.0 of Appendix A states that "...the highest level requirements specifically related to ALARA considerations in design are in 10 CFR 835." Section 1.1 of Appendix A provides the following quotes from 10 CFR 835.1001: (a) Measures shall be taken to maintain radiation exposure in controlled areas ALARA through physical design features and administrative control. The primary methods used shall be physical design features (e.g., confinement, ventilation, remote handling, and shielding). Administrative controls and procedural requirements shall be employed only as supplemental methods to control radiation exposure. (b) For specific activities where use of physical design features are [sic] demonstrated to be impractical, administrative controls and procedural requirements shall be used to maintain radiation exposures ALARA. Section 1.2 of Appendix A provides the following quotes from 10 CFR 835.1002: (a) Optimization methods shall be used to assure that occupational exposure is maintained ALARA in developing and justifying facility design and physical controls. (b) The design objective for controlling personnel exposure from external sources of radiation in areas of continuous occupational occupancy (2000 hours per year) shall be to maintain exposure levels below an average of 0.5 mrem (5 microsieverts) per hour and as far below this average as is reasonably achievable. The design objectives for exposure rates for potential exposure to a radiological worker where occupancy differs from the above shall be ALARA and shall not exceed 20 percent of the applicable standards in Section 835.202. Under the heading "835.1002, Facility Design and Modification," Appendix B provides the following explanation of the term "objective" as it relates to evaluation of shielding designs against 10 CFR 835: The term "objective" is not defined in the regulations and needs some explanation. An objective is a goal; something which one is trying to meet. It is not a design requirement that must be met. However, the objective must still be accounted for in the design process by making a conscious attempt to meet it. In this case, it is necessary to attempt to meet the objectives in the Subpart K and to document why the objective is or is not met. It is necessary to document the attempt to meet the objective, because 10 CFR 835.704(b) requires that facility design actions required by 10 CFR 835.1002 be documented. It is clear that it is not defensible to interpret the objectives as fixed limits that must be met, since this would defeat the overall requirement (above) for radiation exposure to be kept as low as reasonably achievable. It is clearly possible, in principle, for it to be impractical (not ALARA) to meet the objectives in a given case. On the next page, under the subheading "Design Objective for External Radiation Control," Appendix B provides the following discussion:							

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			The design objective (not limit) for the control of external radiation exposure in areas continuously occupied is to maintain exposure levels below 0.5 mrem/hr and ALARA. Therefore, it is not enough to have an objective of not greater than 0.5 mrem/hr, but it must also be ALARA. The use of this design objective and the rational for the final decisions will be documented as required by Paragraph 835.104(b) (see below). The design objective (not limit) for the control of external radiation exposure is areas not continuously occupied is to be no greater than 20% of the basic exposure limits and ALARA. These limits are for annual does to individuals; therefore, the objective discussed here is for the maximally exposed individual working full-time in the facility on a task or set of tasks. [Again]..., it is not enough to have an objective of not greater than 20% of the limit, but it must also be ALARA. The use of this design objective and the rationale for the final decisions will be documented as required by Paragraph 835.704(b) (see below). Note that it is not required that either of these objectives be met when the design is done. It is required, however, that a conscious effort be made to meet them and to document why it is ALARA if they are not met.							
40	3.2.2.1.6.3	Radioactive material packaged for transportation.	Dose rate limits for radioactive material packaged for onsite transportation is identified in HNF-PRO-157 and HNF-5173. These documents shall be used for all material shipped and stored at the Hanford Site.						X	N/A for the CSB. Shipping cask underwent design review in other SNF Sub-Project.
41	3.2.2.1.7	Contamination control.	The SNF CSB design shall confine contamination to the vicinity of the source and minimize contamination spread. Confinement shall be achieved by ventilation control (differential pressure), by directing air from uncontaminated areas toward areas of higher contamination, by high-efficiency particulate air (HEPA) or equivalent filtration or equivalent back flow isolation, and by the use of controlled personnel traffic patterns. The cross-contamination of work areas by airflow shall be minimized.		X		X			IDR on Superstructure Package, Tent Enclosure Package. Qualification test on HVAC system, PAT-006.

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42	3.2.2.1.8	Component failure.	The SNF CSB design shall be such that no single credible component failure or loss of normal power will result in unacceptable safety consequences. Safety classification is performed per HNF-PRO-704, Hazard and Accident Analysis Process, Rev. 1 (1999). Unacceptable safety consequences include the following: a. Exposure of personnel to ionizing radiation in excess of 10 CFR 835, Occupational Radiation Protection (CFR 1999). b. Exposure of personnel to toxic chemical agents in excess of ceiling threshold limit (CTL) value of the American Conference of Governmental Industrial Hygienists. c. Instantaneous release of radioactivity from the facility in excess of 5,000 times the derived concentration guide (DCG) values specified in WHC-CM-7-5, Environmental Compliance, (WHC 1988), Appendix C, at point of discharge. d. Fire (other than localized minor fire such as caused by shorting of electrical equipment). e. Criticality. f. Explosion. The effects of component failure, including control and monitoring, and utilities failure (such as power sources, air and vacuum supplies) shall be evaluated for unacceptable consequences.					X X X X X X		a) Informal Review of SNF-3328, Rev. 2, Canister Storage Building Design Basis Accident Analysis Documentation b) Informal Review of CSB Hazard Analysis Report HNF-SD-SNF-HIE-001 c) Independent Review in Notice of Construction (NOC) d) Informal Review of Fire Hazards Analysis. e) Independent Review in Criticality Analysis. HNF-SD-SNF-CSER-005, Rev 5B f) Informal Review in SNF-3328, Rev. 2, Canister Storage Building Design Basis Accident Analysis Documentation Informal Review of RAM Analysis (In Release Process). Ref DESH-9760688 Reliability, Availability, Maintainability Analysis for the MHM. Letter, A. S. Daughtridge, DESH, to N. H. Williams, FDH, date November 26, 1997.

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43	3.2.2.1.9	General configuration.	The building configuration shall be considered under twelve major areas: the storage vault area, the operation deck area, the load-in/load-out area, the systems controls area, the equipment decontamination area, the health physics support and personnel decontamination area, the MCO/cask service area, radioactive maintenance area, the non-radioactive maintenance area, new MCO lag receipt area, the HVAC equipment area, and the waste (solid and liquid) handling area. Additionally, an annex to the CSB will house the MCO sampling and welding facilities (See Appendix A). A temporary support structure located near the CSB will be used for administrative support and welfare of personnel.						X	General Information
			The structure and layouts of the facility shall conform to DOE Order 6430.1A, General Design Criteria (DOE 1989), NFPA 70, National Electrical Code (NFPA 1993), NFPA 101, Life Safety Code (NFPA 1994), and the Uniform Building Code (ICBO 1994). Control devices for access to High Radiation Areas shall conform to the requirements of Section 1601 of 10 CFR 20, Standards for Protection Against Radiation (CFR 1994).					X		Informal Review HNF-4742, Rev. 0 Canister Storage Building Compliance Assessment, DOE Order 6430.1A, General Design Criteria.
			Utilization of the existing design and construction of the HWVP Canister Storage Building will be maximized as much as possible. Expedited and optional building modularization construction methods will be done in the re-design of the facility for spent nuclear fuels.		X					Independent Constructability review inWHC-SD-SNF-RPT-005, Rev. C SNF CSB Construction Restart Recommendation Report
44	3.2.2.1.9.1	Storage vault area.	The storage vault will be designed to contain up to 440 MCOs stacked two levels high with an impact absorber below each MCO. An intermediate impact absorber between the stacked MCOs is required to prevent damage to the top surface and critical components of the MCO. Six overpack tubes shall be provided for damaged/failed MCOs. The damaged/failed MCO shall be a "maximum" case from Table 3.2.2.1.2.2-2. The impact absorbers will be designed to decelerate a dropped MCO from the full-up position in the MHM to the bottom of the storage tube. The HWVP CSB design contains three vaults, each with a maximum of 220 steel storage tubes. All three-vault operating deck areas will have storage tube openings in the deck. One storage vault for SNF CSB will have a storage tube for every normal opening in the operation deck. Each storage tube will be designed to support and maintain storage configuration in any abnormal or naturally occurring event. Confinement is required for overpack storage tubes only according to DOE Order 6430.1A, General Design Criteria (DOE 1989). The storage vault will have natural convective cooling, to ensure the MCOs and structural materials are within the allowances of the design codes and the MCO Description as contained in Table 3.2.2.1.2.2-1, MCO Material and Radionuclide Inventory (05/31/98).		X			X		Independent Review of vendor submittal for impact absorber and qualification test and test report on prototype impact absorbers. Informal Review of Q Metrix independent analysis of natural convective cooling. EDT 625800, and IDR on calculation CSB-HV-001.
45	3.2.2.1.9.2	Operation deck area.	The operation deck area within the existing footprint will contain plug openings for placement and removal of MCOs in the vault storage tubes. The deck will provide adequate personnel shielding for workers on the deck and structural support for normal, abnormal loads, and upset (impact) loads based on design basis accidents in accordance with HNF-S-0426, Rev. 6. The operation deck area will be serviced by an integral MHM and crane of sufficient capacity to safely lift the fully loaded MCO weight, and that includes safety features designed to prevent an MCO drop onto the operation deck. The operating deck area will have conditioned air and illumination for workspace requirements. Confinement will be maintained consistent with design basis accidents and safety analysis results.	X	X		X			Independent review of the shielding analysis, structural analysis, and drop analysis. There was an IDR of the Deck package, HVAC, and FDR of the MHM. There was qualification testing of the HVAC system (PAT-006), and a lighting test.

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46	3.2.2.1.9.3	Load-in/load-out area.	The Load-In/Load-Out Area will include the flexibility to receive SNF loaded and empty/clean MCOs and impact absorbers by conventional truck-trailer. An overhead gantry-receiving crane will be included with a capacity of 60 tons to handle the fully loaded MCO and transport cask. A 10-ton capacity auxiliary hoist is required to handle the cask lid. The receiving crane is used to move empty MCOs and impact absorbers from the truck trailer. Proximity to a non-radioactive maintenance area will be provided. The Load-In/Load-Out area shall include the flexibility to receive ISCs, the SWC, and T-3 transportation cask by conventional truck. The overhead handling crane (Receiving Crane) within the Load-In/Load-Out area shall have the lifting capacity and lifting height capability to accommodate a fully loaded ISC on its transporter, a SWC on its transporter, T-3 transportation cask, and a fully loaded T-3 transportation cask. The Load-In/Load-Out Area shall include provisions for future addition of a caisson (nominally 12 feet in diameter and 20 feet deep) adjacent to the MCO/Cask Service Area		X		X			IDR of the receiving crane as well as qualification testing (PAT-012). The load-in/load-out had an IDR as part of the Superstructure package and qualification testing in W443-PAT-001.
47	3.2.2.1.9.4	Systems controls area.	There will be an area for control panels for active electrical and mechanical systems as well as monitoring functions. This need not be a separate independent building, but a zone or protected room with such functions.		X					IDR was performed on the Support Building package, See Control Area Layout, H-2-121110; P&ID HVAC Support Equipment, H-2-129587
48	3.2.2.1.9.5	Equipment decontamination area.	Space for limited decontamination area within the radioactively controlled area will be included. Equipment components that may need decontamination includes HVAC components, smaller crane components, smaller MCO/cask handling components, and miscellaneous MCO/Cask service components. This will be located within close proximity to the MCO/Cask service area. Equipment and systems for decontamination of large components and casks are not intended at the SNF CSB.		X					IDR on the FFTF pit and the Maintenance pit as part of the Superstructure package.
49	3.2.2.1.9.6	Health physics support and personnel decontamination area.	An area for health physics work controls (not office administration) will be provided including personnel decontamination functions and change rooms for contaminated work areas. The area will be located in close proximity to the radioactive activities surrounding the MCO/Cask services and limited Decontamination areas.		X					IDR of the Superstructure package, see Step off pad, HP Service Area.
50	3.2.2.1.9.7	MCO/cask service area.	The MCO/cask service area is a shielded area that will enable MCO handling, transportation cask pressure check, gas sampling and cask lid removal, MCO shield plug visual inspection, and MCO transfer from a transport cask to a facility storage tube by the MHM. The MCO service area will have capability for airspace separation from other areas during MCO cask depressurization and gas sampling. The service area may be a smaller area within the operations area. The receiving crane will be utilized to handle the transport cask within the Load-In/Load-Out area. The receiving crane and gantry hoist will be used to move empty MCOs from the trailer to a lag storage area, move empty MCOs from the lag storage area into the empty transport cask, reinstall the cask lid, and move impact absorbers from the trailer for pickup and transfer to storage tubes by the MHM. Negative air pressure relative to adjacent areas and exhaust air function with HEPA filters will be provided. The MCO/cask Service Area shall have provisions to accommodate a SWC, SWC adapter, T-3 transportation cask, and T-3 cask adapter for FFTF SNF assembly. The SWC and T-3 cask adapters will be in a vertical orientation below floor elevation of the Load-In/Load-Out Area		X		X			IDR was performed on the Superstructure, Weld Sample Station, and Receiving Crane. Qualification testing was performed on the MHM by PAT-015-3, the receiving crane by PAT-012, and the HVAC system by PAT- 006. Provisions to accommodate the SWC and the T-3 transportation cask was verified in the Superstructure IDR.
51	3.2.2.1.9.8	Radioactive maintenance area.	Space for a radioactive maintenance area for limited MHM maintenance will be provided adjacent to the operations deck area.		X					Verified in the IDR of the MHM maintenance pit in the Superstructure package.

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52	3.2.2.1.9.9	Non-radioactive maintenance area.	The non-radioactive maintenance area contains normal facility maintenance activities of a non-radioactive condition. Typical services will be HVAC equipment maintenance services, electrical equipment services, and testing equipment maintenance. Metal fabrication, welding, solvent handling, instrument calibration, and electrical testing will be some of the functions in the area. This will be provided in the support building separate from the operating area.		X					Verified in the IDR of the Superstructure.
53	3.2.2.1.9.10	New MCO receipt and lag storage area.	An area within the non-radioactive truck shipment receipt area for interim holding of up to 5 new MCOs will be provided. An area for new MCO receipt and lag storage will be provided for all MCOs prior to use or shipment to the 100K area. A separate structure for storage of new MCOs will be provided or use of existing storage at the Hanford area will be used.		X					Verified in the IDR of the Superstructure.
53a	3.2.2.1.9.11	Canister cover cap assembly receipt and lag storage area	An area within the sampling/weld loading/storage are will be provided for receipt and interim holding of a few cover cap assemblies.		X					Independent Review TBD.
54	3.2.2.1.9.12	HVAC and storage vault cooling area.	An area will be provided for equipment to condition and duct air throughout the facility, short-term (6 years or less) skid-mounted equipment will be considered where possible. The vault is a separate area with natural draft features to cool air sufficient to maintain the MCOs at the required temperature.		X		X			Verified by IDR of calculation HV-001 for vault cooling; the IDR of the Vault package and Superstructure package, and qualification testing completed in PAT-006 and –007 for the HVAC system.
55	3.2.2.1.9.13	Waste handling area.	An area for the purposes of handling wastes will be provided. The capability to collect liquid and solid wastes for shipment to approved disposal facilities will be included in the waste handling area.		X		X			Verified by IDR of the Superstructure package, and qualification tested in W379-PAT-004.
56	3.2.2.1.9.14	Emergency generator area.	An area for emergency/backup generators will be provided. There is no safety requirement for an emergency generator system.						X	Requirement for back-up power deleted, see CSB Change Request #CR-006.
57	3.2.2.1.9.15	Exterior area.	The surrounding exterior area will have 2-lane service roads with an HS-20 load capacity that will serve vehicle traffic to the Load-In/Load-Out area, the HVAC area, the new MCO receipt and lag storage area, canister cover assembly receipt and lag storage area, and gas cylinder areas. All utilities will be supplied by the existing underground site utilities constructed during HWVP site work. Access for future rail routing will be preserved from the 200E rail system.		X					Verified by IDR of Superstructure Package, see vicinity and project area maps H-2-117071 – 074.
58	3.2.2.1.10	Service provisions.	Utilities and services such as, but not limited to, water, compressed air, light, closed-circuit television, and electrical outlets shall be provided for major operational areas as required. The design shall provide corrosion protection for outdoor/buried metallic equipment.		X					Verified by IDR of Superstructure

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59	3.2.2.1.11.1	Cranes and hoists.	Cranes and hoists shall conform to applicable sections of DOE/RL-92-36, Hoisting and Rigging Manual (RL 1993); ASME B30 Series, Miscellaneous Specifications for Cranes, Hoists, and Hooks (ASME 1989, 1990, 1991, 1992, 1993, 1994) and CMAA Specification #70, Specifications for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes (CMAA 1994). Cranes and hoists required for handling of nuclear or radioactive materials shall meet, in addition to the above, the applicable requirements to ASME NOG-1-1995, Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder) (ASME 1995). The MHM crane shall be maintained in a designated area at the MHM service trench in the load-in/load-out area or at another suitable location commensurate with operation and safety concerns. Maintenance platforms for repair of the crane shall be provided by the vendor and must fit within the space envelope of the facility. Allowance shall be provided for future adjustments of crane rail alignment and elevation, and for repair or replacement of the crane. Consideration shall be given in design and procurement to disassembly features such as plug-in units for drives and electrical connectors. Remote CCTV shall be provided in conjunction with the MHM crane.	X			X	X		Verified by FDR of MHM and Receiving Crane; Informal Review of compliance by DA in MHM NOG-1 compliance matrix (SNF Internal Correspondence 00-SNF/CES-005); and qualification tested in PAT-012 and PAT-015., and FMEA of MCO Hoist and Grapple (ESL/R-97-036 and ESL/R-97-043)
60	3.2.2.1.11.2	Finishes for decontamination.	Finishes for decontamination shall be in accordance with DOE Order 6430.1A, General Design Criteria (DOE 1989) where necessary.		X					Verified by IDR of Superstructure Package
61	3.2.2.1.11.3	Special coatings.	Special wall coatings that can be easily decontaminated shall be used on the walls, floors, and ceilings in the MCO cask service area and in other areas where infrequent decontamination is possible. The colors shall be gray undercoat and a white topcoat (or two-color equivalent) to identify chipped paint.		X					Verified by IDR of Superstructure Package
62	3.2.2.1.11.4	Security	The CSB security system is a dedicated stand-alone system, therefore, maintenance is performed by Project Hanford Security Engineering and Maintenance organization.						X	Maintenance Function

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63	3.2.2.1.12	Fire protection.	The fire protection system shall meet the requirements of DOE Order 6430.1A, General Design Criteria (DOE 1989); DOE Order 5480.7A, Fire Protection (DOE 1993); and the NFPA Codes and Standards. The design features of the CSB are to be in compliance with NFPA 69, Explosion Prevention Systems - Tentative Interim Amendment (NFPA 1995) to provide for the protection from hydrogen deflagration events. 3.2.2.1.12.1 Sprinklers. The main water fire protection for the Support Area Building shall be by sprinkler system33 installed in accordance with NFPA 13, Installation of Sprinkler Systems (NFPA 1994) and DOE Order 6430.1A, General Design Criteria (DOE 1989). No uncontrolled combustibles will be allowed in the operational deck area. Backflow prevention devices shall be installed in accordance with AWWA Standards and shall be on the Washington State Department of Health approved list. 3.2.2.1.12.2 Halon. Halon shall not be used. 3.2.2.1.12.3 Central alarms. A Fire Alarm Control Panel shall be conveniently located in the building and shall be compatible with the site Radio Fire Alarm Report (RFAR) Box which interfaces with the 200 Area Fire Department Emergency Dispatch System. The alarm system shall be installed in accordance with NFPA 70, National Electrical Code (NFPA 1993) and NFPA 72, National Fire Alarm Code (NFPA 1993).		X		X			Verified by IDR Superstructure Package; and qualification tested by PAT-003.
64	3.2.2.1.13	Drains.	Contaminated and non-contaminated drains shall not be interconnected. Back flow prevention shall be provided. Curbs shall be provided around equipment to contain potential oil leakage or spills. The specifics for storm and chemical drains are as follows: 3.2.2.1.13.1 Storm drains. Storm drains shall be installed in accordance with DOE Order 6430.1A, General Design Criteria (DOE 1989) standard callouts. 3.2.2.1.13.2 Chemical drains. There are no chemical drains in the CSB.		X					Verified by IDR Superstructure.
65	3.2.2.1.14.1	Service vents.	Service vents shall be installed as required and shall not be cross-tied with process vents.		X					Verified by IDR Superstructure

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66	3.2.2.1.15	Communications.	A communications system shall be provided in accordance with DOE Order 6430.1A, General Design Criteria (DOE 1989), and DOE Order 5300.1C, Telecommunications (DOE 1988). All normally occupied parts of the facility shall have telephone conduits installed to accommodate communications. 3.2.2.1.15.1 Telephone system. Telephones shall be provided for internal and external communications in accordance with DOE Order 6430.1A, General Design Criteria (DOE 1989). Unit locations shall be chosen to provide operations support, and personnel and equipment safety. Redundant emergency telephone units shall be located in the main operation areas. 3.2.2.1.15.2 Plant and security. Exterior communications and alarm systems shall be designed in accordance with DOE Order 6430.1A, General Design Criteria (DOE 1989). Fire, security, and telephone systems shall be included. The CSB security system design conforms to the following codes, standards, and source documents: W-A-450C/GEN, Federal Specification Components for Interior Alarm Systems (1990), DOE M 5632.1C-1, Manual for Protection and Control of Safeguards and Security Interests (DPE 1994), DOE 5633.3B, Control and Accountability of Nuclear Materials (DOE 1994), and DOE 6430.1A, General Design Criteria (DPE 1989). 3.2.2.1.15.3 Intercommunication system. An intercommunication system shall be included to provide communication between areas within the facility. Unit locations shall be determined to provide communications between areas within the building. Call privacy and call annunciator capabilities shall be provided. The intercommunication system shall be an integral part of the telephone system. 3.2.2.1.15.4 Public address system. A public address system shall be included. Speakers shall be installed throughout the building interior and around the building perimeter. The public address system control panel will be located in the communications room. A microphone for the control of the public address system shall be located in each main operation area.	X	X X X		X X X X	X X		Informal review of HNF-4742, "CSB Compliance Assessment, DOE Order 6430.1A, General Design Criteria," 3.2.2.1.15.1, .15.3, &.15.4 Independent review of US West telephone system design and the Public Address System (Reference not located in document release system), and testing of the systems summarized in W379-TSR-005. 3.2.2.1.15.2 FDR of Security System and Qualification testing of the systems in PAT-017.
67	3.2.2.1.16.1	Lighting.	High-pressure sodium vapor lighting and fluorescent lighting shall be used whenever possible. The interior lighting shall be installed in accordance with the IES Standard and DOE Order 6430.1A, General Design Criteria (DOE 1989), except in the remote areas where the minimum requirements shall be determined by the light intensity requirements for remote viewing. Emergency lighting shall be in accordance with NFPA 101, Life Safety Code (NFPA 1994). The operating deck shall be illuminated at all times with lighting of a minimum 2.2 lux (0.2 foot candles) at all floor level locations per DOE M 5632.1C-1, Manual for Protection and Control of Safeguards and Security Interests (DOE 1994).		X					Verified by IDR of the Superstructure Package

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68	3.2.2.1.16.2	Insulation.	The exterior wall insulation requirements shall be in accordance with DOE Order 6430.1A, General Design Criteria (DOE 1989). Identification of outside design temperatures shall be in accordance with SDC-5.1, Heating, Ventilation, and Air Conditioning (RL 1979). Identification of inside design temperatures shall be in accordance with DOE Order 6430.1A. Performance standards for all facilities shall be in accordance with 10 CFR 435, Energy Conservation Voluntary Performance Standards for New Buildings; Mandatory for Federal Buildings (CFR 1994).		X					Verified by IDR of the Superstructure Package.
69	3.2.2.1.16.3	Equipment.	Economics and alternatives shall be considered in accordance with DOE Order 6430.1A where applicable. Electrical equipment shall conform to DOE Order 6430.1A, NEMA standards, NEC requirements, and ANSI/ASHRAE/IES 90A-1980.		X			X		Informal review of 6430.1a compliance in HNF-4742 and electrical equipment reviewed in IDR of Superstructure and independent review at receipt inspection.
70	3.2.2.1.16.4	Metering.	Energy metering shall be provided in accordance with DOE Order 6430.1A, General Design Criteria (DOE 1989).		X					Verified by IDR of Superstructure package.
71	3.2.2.2	Heating, ventilating, and air-conditioning.	The SNF CSB design shall include a ventilation system to provide contamination confinement, to ensure contamination control, and to provide for dilution and removal of potential hydrogen and krypton from the work area in order to maintain acceptable concentrations within the SNF CSB. The ventilation system shall be in accordance with DOE Order 6430.1A, General Design Criteria (DOE 1989), DOE Order 5400.5, Radiation Protection of the Public and the Environment (DOE 1990), ASME N509-1989, Nuclear Power Plant Air-Cleaning Units and Components (ASME 1989), ASME N510-1989, Testing of Nuclear Air Treatment Systems (ASME 1989), and WAC-246-247, Radiation Protection-Air Emissions (1994). The total volume of air handled shall be that required for workspace conditioning, and contamination control, and shall include the infiltration air from the outside. The infiltration of outside air shall be limited by providing tight-fitting doors or airlocks, as appropriate, at the entrances to the building. Sufficient redundancy and/or spare capacity shall be provided as necessary to ensure adequate ventilation during normal operations and DBA conditions. Operation of the facility shall be in accordance with RL-98-30, Radioactive Air Emissions Notice of Construction Canister Storage Building (Revised Sealing Configuration for Spent Nuclear Fuel) Project W-379 (1998).		X		X	X		Prevention of accumulation of Kr and H_2 is verified by IDR building HVAC system and informal review of ALARA analysis 96-02 for KR 85 and Fire Hazards Analysis WHC-SD-FHA-002, Rev. 1, for hydrogen. Qualification testing performed in PAT-006 PAT-007, PAT-010-1, and PAT-010-2. Airlocks and doors verified by IDR of Superstructure Package. HVAC design verified for redundancy and spare capacity in IDR of HVAC systems.

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72	3.2.2.2.1	Ventilation zones.	The definition of the ventilation zones shall be as specified in Table 3.2.2.2.1. The differential pressures specified shall be with respect to atmosphere and shall be considered minimum. Airlocks and other barriers shall be provided as required to separate zones to ensure ventilation balance and contamination control and to maintain pressure differentials. The operating area will be maintained at a negative pressure with respect to atmosphere. Electrical embeds providing access to Zone I may exit in Zone III by means of an inner barrier that provides two seals between the zones. The inner barrier shall require testing to qualify the integrity of the seals. Building airflow shall be from nonradioactive zones to zones with low potential for contamination to zones with greater potential for contamination. Within a zone, air shall flow from less contaminated to more contaminated areas. If air is cascaded from one zone to another of higher potential for contamination, back flow protection between the zones shall be provided. Back flow protection between zones shall consist of HEPA filters or an equivalent back flow isolation device. Back flow protection in supply air systems shall be sufficient to prevent airborne releases to the environment. Dampers shall be provided as required to control and balance airflow's. Dampers must be accessible for operation and repair.		X		X			Airlocks, barriers, backflow devices, and dampers verified by IDR of the Superstructure package HVAC system was qualification tested in PAT-006 and –007. The negative pressure requirement is verified in PAT-006.
73	3.2.2.2.2.1	Supply air	Supply air shall be conditioned in accordance with DOE Order 6430.1A, General Design Criteria (DOE 1989). Supply air inlets shall be located off the ground to minimize dust loading to the filters, and the effects of high winds, windblown trash, windblown vegetation, ash, snow, and ice. Supply air inlet locations shall minimize the possibility of recirculating facility exhaust air. Supply air systems shall be protected from birds and hoarfrost. Supply air filters shall be rated at a minimum of 85 percent efficiency (atmospheric dust spot) in accordance with ASHRAE 52.1-1992, Gravimetric and Dust-Spot Procedures for Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter (ASHRAE 1992). The air temperature in man-accessible work areas shall be maintained for normal operating conditions. Consideration shall be given to the utilization of sensible heat from the exhaust stream to preheat incoming air in accordance with DOE Order 6430.1A, General Design Criteria (DOE 1989).		X		X			Verified by the IDR of the Superstructure package. Air temperature maintenance verified by qualification tested in PAT - 006 and – 007.

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74	3.2.2.2.2.2	Exhaust air.	Releases postulated to occur as a result of DBAs shall be limited according to Section 0200-1, Facility Siting, of DOE Order 6430.1A, General Design Criteria (DOE 1989). Air emissions shall be in accordance with 40 CFR 61, National Emissions Standards for Hazardous Air Pollution (CFR 1994). The design, construction, and installation of equipment to control and monitor emissions shall utilize best available radionuclide control technology to meet the requirements of WAC-246-247, Radiation Protection - Air Emissions (WAC 1994), ANSI N13.1, Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities, 40 CFR 60, Appendix A, Test Methods, and 40 CFR 52, Appendix E, Performance Specifications and Specification Test Procedures for Monitoring Systems for Effluent Stream Gas Volumetric Flowrate. The effluent monitoring requirements of 10 CFR 20, Standards for Protection Against Radiation (CFR 1994), 10 CFR 70.59, Effluent Monitoring Reporting Requirements (CFR 1994), and 10 CFR 835, Occupational Radiation Protection (CFR 1993) shall be reviewed to provide the necessary monitoring instrumentation. All release points of airborne emissions that have the potential for containing particulate radioactive contaminants shall be filtered using Best Available Radionuclide Control Technology (BARCT), as cited in WHC-CM-7-5, Environmental Compliance (WHC 1988), shall use a HEPA or equivalent filter. An installed HEPA or HEPA-equivalent filter shall have an efficiency of at least 99.95 percent of 0.3-micron particles and be testable. The adequacy of the filtration system (the number of filtration stages required) shall be determined by analysis to ensure the contamination in the effluents are ALARA and do not exceed the above emission limits. The HEPA filter assemblies shall comply with DOE Order 6430.1A and ASME N509-1989, Nuclear Power Plant Air-Cleaning Units and Components (ASME 1989). In place testing design requirements shall meet all the recommendations cited in DOE Order 6430.1A and ASME N510-1989, Testing of Nuclear Air Treatment Systems (ASME 1989). Design shall preclude excessive personnel exposure and the release of contaminants to the environment during testing. Design shall provide for measurement of supply and exhaust airflows. Final HEPA filter systems shall include the necessary fire protection provisions to comply with DOE Order 6430.1A and DOE Order 5480.7A, Fire Protection (DOE 1993). The local exhaust fans for confinement control shall be fabricated to facilitate decontamination. Multiple fans shall be provided downstream of the filters. Standby fans may be provided and their operation initiated by abnormal pressure(s) within the ventilation system. To ensure isolation, there shall be no common walls between supply and exhaust air tunnels or ducts. Leak proof dampers shall be provided for each section of HEPA filters such that each section can be isolated for filter replacement during normal operations. Provisions shall be made for representative sampling (shrouded probe) and continuous monitoring of particulate gaseous effluents in accordance with DOE Order 5480.4, Environmental Protection, Safety, and Health Protection Standards (DOE 1984), and DOE Order 5484.1, Environmental Protection, Safety, and health Protection Information Reporting Requirements (DOE 1981). Capability shall be provided for local and remote indication of gaseous effluent contamination levels and monitoring equipment alarm conditions. Stack height shall be sufficient to meet dispersion requirements for normal as well as DBA releases for process gaseous effluents. Process stacks mounted on the process building shall discharge air above the building wake per recommended practices to prevent recirculation of exhaust air to supply air intakes.		X		X			Verified by the IDR of the Superstructure packages and qualification tested by PAT-101-1 and –010-2.

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75	3.2.2.2.3	Uncontrolled access zones.	The uncontrolled access zone ventilation system shall filter, condition, and control the zone environment in accordance with DOE Order 6430.1A, General Design Criteria (DOE 1989). Design consideration shall be given to using recycle air or economy cycles in accordance with DOE Order 6430.1A. Exhaust air shall not be used to dilute process, control, and operating zone exhaust to meet emission standards.		X			X		Verified by Informal review of 6430.1a compliance, HNF-4742, and IDR of Superstructure package.
76	3.2.2.2.3.1	Computer rooms.	Computer room ventilation shall be designed to accommodate the requirements of the specific computer manufacturer's recommendation for temperature, humidity, and filtration.		X		X			Verified by IDR of Superstructure package and qualification tested by PAT-007.
77	3.2.2.3	Piping and vessels.	Regulatory Guide 1.26, Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Conditioning Components of Nuclear Power Plants (NRC 1976) shall be used to assist in assigning the appropriate code class to ASME Section III piping and vessels. The NRC positions in Regulatory Guide 1.84, Design and Fabrication Code Case Acceptability ASME Section III Division 1 (NRC 1993) and Regulatory Guide 1.85, Materials Code Case Acceptability ASME Section III Division 1 (NRC 1993) shall be reviewed on ASME Section III and ANSI/AISC N690-94, Specification for the Design, Fabrication, and Erection of Safety Related Structures for Nuclear Facilities, code cases before using such code cases for Safety Class applications. Where no NRC position is stated in regards to acceptance of a code case, that code case may be used as approved by the Code Committee.		X					Verified by IDR of the Tube and Tube plug package.
78	3.2.2.3.1	Embedded and contaminated piping.	The SNF CSB embedded and contaminated lines, rack and piping shall be designed and installed in accordance with ASME B31.3-1990, Chemical Plant and Petroleum Refinery Piping (ASME 1990). Piping shall be designed for removal, or be permanently installed and provide a service life equal to that of the facility. Embedded piping installations shall meet Category 1 seismic requirements in accordance with Section 3.2.2.1.3.3 and hydraulic shock pressures. Piping and piping components shall be made of materials compatible with the operating conditions (i.e., chemical, and abrasives). Embedded lines must have adequate spares or be replaceable. SC piping must meet requirements of ASME Boiler and Pressure Vessel Code Section III, Rules for Construction of Nuclear Power Plant Components (ASME 1995).						X	No embedded or contaminated lines.
79	3.2.2.3.2	Other piping.	This piping shall be seismically designed in accordance with Section 3.2.2.1.3.3 as classified. Piping for sprinkler systems shall be in accordance with NFPA 13, Installation of Sprinkler Systems (NFPA 1994). Other piping such as cold chemical or instrument air shall be designed and installed in accordance with ASME B31.1-1992, Power Piping (ASME 1992), ASME B31.3-1990, Chemical Plant and Petroleum Refinery Piping (ASME 1990), or ASME/ANSI B31.9-1988, Building Services Piping Code (ASME/ANSI 1988) as defined in the scope of these codes and DOE Order 6430.1A, General Design Criteria (DOE 1989). Cylinder gas piping shall be designed and installed in accordance with Compressed Gas Association guidelines, CGA P-1-1991, Safe Handling of Compressed Gases in Containers (CGA 1991). Identification of piping shall be in accordance with the HPS and shall meet Occupational Safety and Health Administration (OSHA) standards. The separation of potable water supplies from other water supplies and the use of back flow preventers shall be in the temporary administrative support structure in accordance with the Uniform Plumbing Code (ICBO 1991) and DOE Order 6430.1A. Any Safety Class piping must meet requirements of ASME Boiler and Pressure Vessel Code Section III, Rules for Construction of Nuclear Power Plant Components (ASME 1995).		X		X			Verified by IDR of Superstructure package. He system qualification tested in PAT-002.

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80	3.2.2.3.3	Contaminated vessels.	Contaminated vessels that contain fluids at pressures of 15 lb/in2 (gauge) and greater shall be designed and constructed in accordance with ASME Boiler and Pressure Vessel Code Section VIII, Rules for Construction of Pressure Vessels (ASME 1995), Division 1. This code also shall be used for design and fabrication of other vessels that contain fluids at pressures lower than 15 lb/in2 (gauge), except seal pots and agitator oil catch vessels. All vessels, designed and fabricated in accordance with ASME Section VIII, Division 1 requirements, shall be designed and fabricated with the intent to be code stamped, however code stamping is not required. This is to ensure quality of design and fabrication of the vessels. Any Safety Class vessels must meet the requirements of ASME Boiler and Pressure Vessel Code Section III, Rules for Construction of Nuclear Power Plant Components (ASME 1995).						X	There are no contaminated vessles.
81	3.2.2.3.4	Non-contaminated vessels.	Non-contaminated pressure vessels that contain fluids at pressures of 15 lb/in2 (gauge) and greater shall be designed and constructed in accordance with ASME Boiler and Pressure Vessel Code Section VIII, Rules for Construction of Pressure Vessels (ASME 1995), Division 1, however, code stamping will not be required. Atmospheric vessels shall be constructed in accordance with ASME Section VIII, Division 1; API Standard 650, Welded Steel Tanks for Oil Storage (API 1993); or other industry standard appropriate to the intended service. Code stamping of atmospheric vessels is not required. A means shall be provided to remove vessels from service and allow them to be accessed for inspection.						X	There are non-contaminated vessels containing fluids.
82	3.2.2.3.5	Vessel and piping insulation.	Insulation for vessels and piping shall meet the requirements of DOE Order 6430.1A, General Design Criteria (DOE 1989), ANSI/ASHRAE/IES 90A-1980, Energy Conservation in New Building Design (ANSI/ASHRAE/IES 1980), or as applicable. Vessels and piping used for contaminated service shall be left uninsulated or utilize specially designed insulation to ensure that the outer surface can be decontaminated. All surfaces with elevated temperatures that could cause thermal currents and spread contamination must be insulated to 122□F (50□C) maximum temperature or cooled to 122□F (50□C).						X	There is no piping or vessel insulation.
83	3.2.2.3.6	Motor-operated valves.	The applicable design requirements of Generic Letter 89-10, Safety-Related Motor-Operated Valve Testing and Surveillance 10 CFR 50.54(f) (NRC 1989) shall be incorporated into Safety Class motor operated valves.						X	There are no motor-operated valves
84	3.2.2.4	Utilities.	Any sharing of common utilities and services and physical interaction between the modes of operation shall not impair the capability of the facility to perform its safety function.		X					Verified by IDR Superatructure.
85	3.2.2.4.1	Steam.	There is no steam utility to be supplied to the CSB.						X	
86	3.2.2.4.2.1	High pressure air.	This system shall have a sufficiently low dew point to prevent condensation from forming in the distribution piping. The air-stream shall be free of particulate dirt and oil.		X					Verified by IDR of Superstructure package.
87	3.2.2.4.2.2	Instrument air.	This system shall have a dew point of -40C, and shall be free of moisture, oil (<1 ppm), and particulate. Safety Class instrument air systems shall incorporate applicable design requirements of Generic Letter 88.14, Instrument Air Supply System Problems Affecting Safety-Related Equipment (NRC 1988).		X					Verified by IDR of Superstructure package.
88	3.2.2.4.3	Water.	Safety Class open-cycle cooling water systems shall incorporate applicable design requirements of Generic Letter 89-13, Service Water System Problems Affecting Safety-Related Equipment (NRC 1989).						X	There is no open cycle cooling water.

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89	3.2.2.4.3.1	Raw and sanitary water.	Raw and sanitary water shall be provided in accordance with WAC-246-290, Public Water Supplies (WAC 1995), and the AWWA and NFPA standards. Sanitary (potable) water shall be separated from raw (non-potable) water by the design criteria as stated in DOE Order 6430.1A, General Design Criteria (DOE 1989), and WHC-CM-4-3, Industrial Safety Manual (WHC 1995) (for cross-contamination control). Sanitary water shall be used to supply the plant facilities water needs (e.g., water for domestic purposes) in the temporary administrative support structure. Water shall be provided for equipment needs. Raw water shall be supplied for fire protection purposes. The water required for fire suppression measures shall normally be supplied by the raw water system.		X					Verified by IDR of Superstructure package
90	3.2.2.4.4	Bottled gases.	Bottled gases shall be supplied as required for facility operation. Recommendations of CGA P-1-1991, Safe Handling of Compressed Gas in Containers (CGA 1991) shall be used as applicable.	X	X					Verified by IDR of Superstructure package and FDR of the Sample Weld Station package.

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91	3.2.2.4.5	Electrical.	All electrical design shall conform to NFPA 70, National Electrical Code (NFPA 1993), C2-1993, National Electrical Safety Code (IEEE 1993), and DOE Order 6430.1A, General Design Criteria (DOE 1989). However, the use of aluminum conductors requires prior approval. a. The SNF CSB shall be supplied with electrical power to meet all facility and operations requirements. b. The process and facility power shall be supplied via medium-voltage switchgear, load centers (low-voltage switchgear), motor control centers, and distribution panels. c. The uninterrupted power supply (UPS) system shall provide uninterruptable power to alarms, critical equipment, instrumentation, and other circuits. All security sensors, cameras, and video transmission equipment shall be provided a UPS with minimum of 8 hours run time at full load. Deck lighting must be on separate UPS, which will not be a part of the Security System. d. Lightning protection/grounding shall be provided for this facility in accordance with requirements in DOE Order 6430.1A and NFPA 70. e. All electrical equipment and connections (e.g., lighting, conduit, etc.) for the operational areas shall be designed and installed to meet the requirements of NFPA 70. f. Sensors and display devices shall be provided for the electrical distribution system (excluding the Security System). These sensors and devices shall be an integral part of the switchgear, switch panels, and motor control centers, and will have the capacity to interface with standard programmable controllers and desktop-type personal computers. g. Emergency power is governed by the current safety basis. Standby power to support design features may be employed. h. Section (e)(5) of 10 CFR 50.49, Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants (CFR 1994) and Regulatory Guide 1.89, Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants (NRC 1984) shall be used to determine the aging requirements for SC electrical equipment, non-SC equipment that could, upon failure, adversely impact SC equipment in performance of its safety function, and certain post-accident monitoring equipment as described in Regulatory Guide 1.97, Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident (NRC 1983). i. The electrical equipment qualification program shall include the testing requirements provided in Sections (f)(1-4) of 10 CFR 50.49, Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants (CFR 1994). j. The requirements of IEEE Std. 484-1987, IEEE Recommended Practices for Installation Design and Installation of Large Lead Storage Batteries for Generation Stations and Substations (IEEE 1987) shall be incorporated into the design and installation of Safety Class batteries. The requirements of IEEE Std. 535-1986, IEEE Standard for Qualification of Class IE Lead Storage Batteries for Nuclear Power Generating Stations (IEEE 1986) shall be incorporated into the qualification of Safety Class lead storage batteries. k. The requirements of IEEE Std. 603-1991, IEEE Standard Criteria for Safety Systems for Nuclear Power Generating Stations (IEEE 1991) shall be incorporated into the design of Safety Class instrumentation and control systems.		X		X			a), b), c), d), e), f), g), h), j), and k) Verified by IDR of Superstructure package i), d) Varifiied by qualification testing in PAT-001 and PAT-018.

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92	3.2.2.4.6	Liquid waste.	Liquid process waste is not produced in the CSB.						X	
93	3.2.2.4.7	Liquid effluents.	The effluent monitoring requirements of 10 CFR 20, Standards for Protection Against Radiation (CFR 1994), and 10 CFR 835, Occupational Radiation Protection (CFR 1999) shall be reviewed to provide the necessary monitoring instrumentation.		X		X			Verified by IDR Superstructure and qualification tested by PAT-004
			3.2.2.4.7.1 Cooling water.							
			Cooling water is not required for building HVAC and no cooling water sources which could leak into vault and flood it are allowed. A closed loop cooling system is required at the weld station to cool the MCO after welding (see Appendix A). The sampling/weld station cooling unit shall be designed to meet the requirements of ANSI/ARI 590, Positive Displacement Compression Water Chilling package (ANSI 1992).				X	X		Verified by FDR of Weld Station and qualification tested in PAT-003
			3.2.2.4.7.2 Condensate.							
			Steam condensate is not required; however, condensate collection is required for HVAC system and compressed air equipment.		X					Verified by IDR of Superstructure
			3.2.2.4.7.3 Sanitary sewer.							
			Sanitary sewer is not required for the SNF CSB. Sanitary Sewer is required for the temporary administrative support structure. The sanitary effluent sewer shall be designed for a seven-day, twenty-four-hour, three work-shift basis, and shall be sized for the maximum daily occupancy.		X					Verified by IDR of operations support facilities.
94	3.2.3.1	Reliability and availability.	To meet the plant capacity requirements established in Section 3.2.2.1.2.1, the following concepts shall be utilized: a. Maximize equipment interchangeability. b. Locate complex components including electronic devices or those having a high probability of failure in non-radiation areas. c. Operate power transmission devices below 75% of manufacturer's rating. d. Select pumps to operate in the middle of their flow and head range. e. Provide adequate equipment materials for the operating environment. f. Utilize commercially available equipment. g. Identify equipment repair methods and egress routes. h. Provide lag storage for process flow interruptions affected by maintenance. i. Project Hanford Security Engineering is responsible for monitoring reliability and availability of the CSB security components.		X		X	X		Verified by informal of facility: CGI testing of relief valves and rupture disks and IDR of Sample Weld Station Effluent (Superstructure package).

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95	3.2.3.2	Operability.	The SNF CSB shall be designed to be satisfactory for humans to operate and maintain. Design considerations shall be given to the guidelines in DOE Order 6430.1a, General Design Criteria (DOE 1989), DOE draft standard, Human Factors Engineering Design Criteria, Volume 1 General Criteria (DOE 1992), and MIL-STD-1472E, Human Engineering Design Criteria for Military Systems, Equipment, and Facilities (DOD 1996). The NRC guidance of NUREG-0700, Guidelines for Control Room Design Reviews (NRC 1981) and SRP 18.1, Control Room, of NUREG-0800, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants (NRC 1987) shall be reviewed against DOE Order 6430.1A to identify appropriate additional NRC guidance for the design of the CSB. The reviews shall give consideration to the differences in complexity between power reactor control rooms and that of the CSB. In addition, the following concepts shall be utilized where practicable. a. Instrument readout shall be located at average eye elevation for ease of reading and controls. Such instruments shall be located to permit visual monitoring without drastic shifts of body position. Alarms and annunciators shall be located near the operational personnel and convey the proper action required. b. Equipment shall be accessible for ease of operation and maintenance. c. Valve handles shall be sized properly and located for ease of operation. d. Labels, legends, placards, signs, or markings shall be provided whenever it is necessary to identify, interpret, follow procedures, or avoid hazards, except where it is obvious to the observer. e. Facilities shall be designed for both men and women operators. f. Lighting levels shall be verified to be at or above that recommended for the type of location and work to be performed, including remote operations, in accordance with IES standards. g. Similar types of equipment which require operator monitoring shall be located in close proximity. h. Complex operator interactive equipment requiring operators to make interpretive judgments beyond their training levels shall be avoided.					X		Verified by informal review in Human Factors Engineering reports SNF-3907 and SNF-4831

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96	3.2.3.3	Maintainability.	Maintainability features and guidelines for the different maintenance conditions shall be utilized as appropriate. The design for such equipment shall include the following requirements. a. Locate higher failure rate assemblies so as to minimize replacement impact on other equipment. b. Be operable and/or serviceable by fixed or mobile crane. c. Be positioned for visibility by plan view from remote viewing equipment. d. Be portable where feasible. e. Consider temporary installations and services. f. Minimize the number and standardize, to the extent practicable, handling fixtures such as yokes, hooks, grapples, etc. g. Have legible identification according to the facility numbering scheme. For that equipment used in radioactive areas, but of such high value as to warrant decontamination and repair (i.e., cranes), the design shall, include the following requirements. h. Have protective coatings resistant to decontamination solutions. i. Minimize contamination traps such as ledges and crevices. J. Be portable where feasible. k. Utilize standard fastening devices l. Utilize fastening devices of dissimilar metal to prevent galling. m. Be capable of post-repair qualification. For all equipment used in the facility, the design shall, include the following requirements as much as possible. n. Utilize standardized equipment and components. o. Position consumables for ease of access. p. Provide lay down and work space. q. Provide adequate lighting. r. Provide for safe isolation by mechanical separation, valving, or electrical disconnection.		X					Verified by IDR of Superstructure package.
97	3.2.3.4	Repair facilities.	Adequate space and environmental quality for equipment maintenance and repair and materials storage shall be provided in three areas: contaminated maintenance areas, electrical/instrument and mechanical rooms, and the MCO/Cask service area. The size of the area reserved for decontamination should be reviewed to ensure small appropriate equipment can be decontaminated, inspected, or repaired.		X					Verified by IDR of Superstructure package.
98	3.2.4	Environmental conditions.	The SNF CSB shall be designed for the prevailing environmental conditions shown in Table 3.2.4. [Reference: WHC-SD-TP-RPT-004, Environmental Conditions for On-Site Hazardous Materials Packages (WHC 1992)] as required by their designated safety function and the natural phenomena hazards design basis accidents specified in 3.2.2.1.3.		X					Verified by IDR of Superstructure package, Tube and Plug package, and receiving crane package.

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99	3.3	Design and construction.	The design and construction of the SNF CSB shall be in accordance with the regulations, orders, directives, codes, and standards listed in Section 2.0, "Applicable Documents".		X					General Information verified in all IDRs
100	3.3.1	General requirements.	The design and construction of the SNF CSB shall comply with the programmatic requirements established in SNF-RD-PM-001, Spent Nuclear Fuel Program Requirements Document (DOE 1994).		X					General Information verified in all IDRs
101	3.3.1.1	General safety requirement.	The safety of the public and the worker, and the protection of the environment shall be the primary considerations in the design, construction, startup, and operation of the SNF CSB.		X					General Information verified in all IDRs
102	3.3.1.2	Regulatory compliance.	The SNF CSB shall be designed, constructed, and operated in full compliance with applicable Federal, State, and local laws and regulations for the protection of the public and worker health and safety, and environment.		X					General Information verified in all IDRs
103	3.3.1.3	Facilities authorization basis.	The SNF CSB shall be designed, constructed, and operated to modern industry standards promulgated for new facilities having equivalent functions within the commercial nuclear industry. The SNF CSB shall achieve nuclear safety equivalence to comparable NRC-licensed facilities as described in section 1.0.					X		Verified by Informal review in NRC equivalency assessment, HNF-4476.
104	3.3.1.4	Accident radioactive releases.	The SNF CSB shall be designed, constructed, and operated such that after a design basis accident, potential exposure to radiation shall be within regulatory requirements, as specified in applicable sections of 10 CFR 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste (CFR 1994), Subparts E, F, G, and H.		X					Verified by licensing review on IDRs
105	3.3.1.5	Occupational radiological exposure.	The SNF CSB shall be designed, constructed, and operated such that worker radiation exposures during normal operation and anticipated operational occurrences are within regulatory requirements, as specified in applicable sections of 10 CFR 20, Standards for Protection Against Radiation (CFR 1994), and 10 CFR 835, Occupational Radiation Protection (CFR 1999). Actions shall be taken to achieve the fundamental goal of reducing worker exposures to ALARA in accordance with HNF-5173, PHMC Site Radiological Control Manual (DOE 2000) and Regulatory Guide 8.8, Information Relative to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will be as Low as Reasonably Achievable (NRC 1978).					X		Informal Review of CSB ALARA Analysis, Rev. 10 (release TBD)
106	3.3.1.6	Worker safety and industrial hygiene.	The SNF CSB shall be designed, constructed, and operated such that worker exposures to occupational safety hazards are within the requirements of 10 CFR 835, Occupational Radiation Protection (CFR 1993), 29 CFR 1910, Occupational Safety and Health Standards (CFR 1994), and DOE Order 5480.10, Contractor Industrial Hygiene Program (DOE 1985).		X					General Information verified by industrial safety representative on IDRs
107	3.3.1.7	Safety documentation.	Safety Analysis Reports (SARs) and Technical Safety Requirements (TSRs), or Technical Specifications (per NRC regulations) as appropriate, shall be developed to establish facility bases and to control SNF facility operations.		X					Verified by independent review of FSAR. HNF-3553
108	3.3.1.8	NEPA compliance.	The SNF CSB shall be designed, constructed, and operated in full compliance with the National Environmental Policy Act (NEPA), as specified by implementing regulations 40 CFR 1500-1508, Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (CFR 1986) (on a governmental basis) 10 CFR 1021, National Environmental Policy Act Implementation Procedures (CFR 1994) (for DOE), 61FR10736, Record of Decision: Management of Spent Nuclear Fuel from the K Basins at the Hanford site and DOE/EIS-0245F, Management of Spent Nuclear Fuel from the K Basin at the Hanford Site (DOE 1996). The transloading of FFTF SNF shall be operated in compliance with DOE/EA-1185, Management of Hanford Site Non Defense Production Reactor Spent Nuclear Fuel (DOE 1997).		X					Verified by Independent review of SNF Record Of Decision (6450-01-P dated 3/4/96)

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109	3.3.1.9	Pollution prevention and waste minimization.	The SNF CSB shall be designed, constructed, and operated to integrate the fundamental goals of: 1) reducing through source reduction and recycling the total release of hazardous materials to the environment, 2) establishing site-specific goals for the reduction of the generation of all types of wastes and pollutants from site operations, and establishing operational restrictions to meet ALARA objectives for radioactive materials in effluents in accordance with DOE/S-118, Pollution Prevention Program Plan 1996 (DOE 1996).		X					Verified in IDRs of design packages
110	3.3.1.10	Use of recyclable materials.	Recyclable materials shall be incorporated into the design of the SNF CSB to the extent practical in accordance with 40 CFR 247, Comprehensive Procurement Guideline for Products Containing Recovered Materials (CFR 1996).		X					Verified in IDRs of design packages
111	3.3.1.11	Inherent and passive features.	The SNF CSB design shall incorporate inherent and passive features to preclude the need for active, manpower intensive operations to the extent feasible and with client approval.		X					Verified by IDR of Vault.
112	3.3.1.12	Defense-in-depth design approach.	The SNF CSB design shall utilize the fundamental principles of defense-in-depth (i.e., redundancy and diversity) to assure that critical safety functions are achieved and that multiple barriers to the release of radioactivity are provided.		X					Verified by IDRs
113	3.3.1.13	Site related hazard.	The SNF CSB shall be designed to industry standards for resistance to seismic events, floods, and other natural phenomena in accordance with 3.2.2.1.3.							See 3.2.2.1.3
114	3.3.1.14	Safeguards and security.	The CSBs security system's primary purpose is to provide reasonable assurance that breaches of security boundaries are detected and that assessment information is provided to protective force personnel. In addition, the system is utilized by Operations to support reduced personnel radiation goals and to provide reasonable assurance that only authorized personnel are allowed to enter and exit the designated security areas per DOE M 5632.1C-1, Manual for Protection and Control of Safeguards and Security Interests (DOE 1994).	X			X			Verified by FDR Security System and PAT-017. (See also 3.2.2.1.11.4)
115	3.3.1.15	Emergency planning.	The SNF CSB shall be designed with the goal to eliminate the need for off-site evacuation and sheltering.					X		Verified by Informal Review of Emergency Preparedness Hazards Assessment, HNF-6025, Rev. 0.
116	3.4	Documentation management.	Formal documentation controls shall be used to assure that requirements are clearly defined and controlled and that the SNF CSB satisfies the technical, safety and operational needs.					X		Informal Review of SNF Configuration Management Plan, WHC-SD-SNF-CM-001.
117	3.5.1	Maintenance planning.	Preventative maintenance shall receive primary focus when undertaking facility maintenance planning. The project Hanford Security Engineering and Maintenance organization will perform servicing and maintenance to the CSB security system.						X	No a design requirement
118	3.5.2	Mockups for training.	The SNF CSB may provide mockups for training aimed at reducing radiological exposure and easy repair or replacement of components during workflow situations, as necessary.						X	Not a design requirement
119	3.5.3	Support equipment.	The SNF CSB shall provide limited space and some routine maintenance equipment located and sized to facilitate work.		X					Verified by IDR of Superstructure Package. (See also 3.2.3.3)
120	3.6.1	Personnel.	The CSB operational workspaces will be designed for adequate number of personnel to meet the process operational flow of materials and related support requirements.		X			X		Verified by IDR of Superstructure package and Informal review of Witness Model. HNF-SD-SNF-RPT-011

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121	3.6.2	Training.	There will be an operational training program in accordance with DOE Order 5480.20A, Personnel Selection, Qualification, Training, and Staffing Requirements at DOE Reactor and Non-Reactor Facilities (DOE 1994). Retraining and recertification shall be part of the operator-training plan.						X	Not a design requirement
122	3.7	Pre-operational and startup testing.	Pre-operation and startup testing of the SNF CSB shall be planned and conducted to assure proper performance of components and subsystems individually, and as part of overall facility performance according to DOE Order 425.1a, Startup and Restart of Nuclear Facilities (DOE 1998).						X	Not a design requirement
123	3.8.1	Decontamination and decommissioning.	The design of the SNF CSB shall include provisions to facilitate decontamination of structures and equipment, minimize the quantity of radioactive wastes and contaminated equipment, and facilitate the removal of radioactive wastes and contaminated materials at the time the SNF CSB is decommissioned.		X					Verified by IDRs of design packages.
124	3.8.2	Criteria for decommissioning.	Design guidance that facilitates eventual decommissioning shall be obtained from ANSI N300-1975, Design Criteria for Decommissioning of Nuclear Fuel Reprocessing Plants (ANSI 1975) and DOE Order 5820.2A, Radioactive Waste Management (DOE 1988). The principles listed below shall be employed to the extent practicable. a. Filters shall be placed as near as practical to the source of contamination to minimize contamination of ductwork. b. Areas subject to contamination shall be designed to facilitate decontamination. Liners and coatings shall be selected to withstand decontaminating agents and radiation degradation throughout the life of the plant. c. Storage vault penetrations shall be designed to minimize technical and construction problems in the structural closing and sealing of these penetrations during decommissioning. d. Penetrations shall be waterproofed for protection during decontamination. e. Fixtures and outlets shall be sealed. f. Floors shall be monolithic, nonporous, and sloped to provide drainage. g. Drains and similar piping shall have physical provisions for cleaning. h. Piping systems shall be sloped and free of traps except as required for process isolation. i. Adequate overhead clearance shall be provided for remote transfer of equipment over installed piping. j. Aisles shall be wide enough to facilitate movement of equipment.		X					Verified by IDR Superstructure package.

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125	4.1	Quality assurance (General).	All contractors involved in the development, design, construction, and testing of the SNF CSB shall formulate and execute quality assurance program to provide the following assurances: a. performance requirements and design criteria are established and clearly understood, b. studies, analyses, and design decisions are fully documented, c. design meets performance requirements and design criteria, is complete and adequate, and is properly documented in the contractor specifications, drawings, and plans, d. construction is performed in accordance with the design, e. testing verifies compliance with performance requirements and design criteria, the adequacy of the design, the quality of construction and manufactured components, and the facility operability, maintainability, and reliability, f. traceability to the requirements of this specification is maintained throughout the development, design, construction, and testing of the SNF CSB.					X		Verified by informal review of QAPP (WHC-SD- 379-QAPP-001).
126	4.1.1	Responsibility for quality assurance.	The SNF CSB contractors shall be responsible to plan, perform, and document quality conformance inspections, including those under the direct responsibility of subcontractors. The procuring activity reserves the right to access and to inspect work performed by the contractor and its subcontractors, as well as to separately perform additional inspections.					X		Verified by informal review of QAPP (WHC-SD- 379-QAPP-001).
127	4.1.2	Quality assurance requirements.	All quality assurance activities shall be in accordance with HNF-MP-599 Hanford Quality Assurance Description (1999) [10 CFR 830.120, Quality Assurance Requirements (CFR 1994)]and 10 CFR 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High Level Radioactive Waste (CFR 1994), Subpart G, as applicable to satisfy U.S. NRC equivalency. Applicable Quality Assurance program requirements may be imposed through the use of Nationally recognized standards such as ASME NQA-1-1994, Quality Assurance Program Requirements for Nuclear Facility Applications (ASME 1994). A graded approach will be used for items important to safety in accordance with NUREG/CR-6407.					X		Verified by informal review of QAPP (WHC-SD- 379-QAPP-001).
128	4.1.3	Quality assurance of critical items.	Upgraded quality assurance requirements shall be applied to items identified as having high technical risk and to critical items. Critical items and the actions to prevent or mitigate their failure shall be identified by a comprehensive, systematic, documented evaluation of the design. Critical items include: a. SC and SS items as defined in Section 3.2.2.1.2.3.1 and 3.2.2.1.2.3.2 of this specification, b. items whose failure could cause failure of a SC or SS item, c. items whose failure could result in extended downtime, significant program delay, or high recovery cost, d. high development, high-risk equipment.					X		Verified by informal review of QAPP (WHC-SD- 379-QAPP-001).
129	5.0	NOTES	General Information						X	
130	**Appendix A**									

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131	1.1	Multi-Canister Overpack Welding Facilities/Equipment	The Multi-Canister Overpack (MCO) containing Reactor fuel from K Basins will be weld sealed following processing in the Cold Vacuum Drying Facility. This appendix describes the facilities, equipment, and process envisioned to conduct the welding of a canister cover cap assembly (cover cap, test plug, and cover plate) over the mechanical compression seal of MCOs. The MCOs will be welded at the Canister Storage Building (CSB) in the CSB annex. Upon arrival at the CSB, most MCOs will be transported to the welding stations by the Multi-Canister Overpack Handling Machine (MHM) where they will undergo an optional leak test of mechanical seals, and when verified as acceptable to proceed, the canister cover cap assembly will be welded to the MCO collar. Equipment shall be provided to cool the MCO welded surface before manual examination and testing of the closure welds. The successfully welded and examined MCO will then be transported by the MHM into a CSB standard storage tube for interim storage. Approximately six preselected, mechanically sealed MCOs will be stored with the canister cover cap off for short term monitoring.						X	General Information
132	1.1.1	CSB Work Stations	The required sampling/weld stations are planned for location at the old Hot Conditioning System (HCS) process pits and will interface with the MHM. These stations receive the MCO and position the MCO for manned access around the MCO, manned preparation for welding, manned setup of the welding machine on the canister cover cap, manned examination of the MCO top surface and the weld passes, manned installation of the test plug, manned welding of the cover plate, and manned testing of the MCOs and welds-all after the MHM has departed. The welding stations will provide radiation shielding immediately around the MCO for personnel exposure control. Steel and concrete shielding are incorporated into the facility design to minimize exposure directly from the pit. Two workstations are equipped with all the equipment and utilities required within the process pits for MCO welding, examination, monitored MCO sampling operations and monitored MCO pressure sensor replacement, and monitored MCO reinerting with helium. The reinerting returns the MCO gas pressure to the pressure before sampling or before pressure sensor replacement. Two sets of the portable welding and weld testing components (provided by others - not CSB), one set of MCO gas sampling components, and the equipment for handling and controlling the processes that are to be located above the deck will be provided at startup. The stations are to be designed in concert with the work station enclosure to adequately control off gas, any incidental loose contamination from the MCO, and to ensure appropriate cooling of a 776 watt MCO as necessary, while performing MCO gas sampling, gas pressure sensor replacement, helium reinerting, welding, and inspections. These stations include labyrinth shielding to reduce radiation streaming. The system will be equipped with a lower impact absorber to break the inadvertent drop of a MCO.		X			X		Verified by FDR of Sample Weld Station and informal review of Witness Model (HNF-SD-SNF-RPT-011, Rev 1a).

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133	1.1.2	CSB Work Station Enclosures	These enclosures will be portable sampling and welding hoods which will be moved in after the MHM has deposited the MCO and departed. Provisions for hookup to ventilation equipment and to allow the ingress and egress of equipment to the MCOs is necessary. Adequate lighting and room for equipment installation are necessary inside the enclosure. The enclosure will be big enough to allow for the work described in this appendix to be properly accomplished. The enclosure ventilation system will be integrated with the design of the workstation to assure that any possible contamination is adequately controlled. Provisions for MCO gas pressure and skin temperature measurement, MCO gas sampling, handling the canister cover cap, welding machine head, leakage rate testing equipment, cooling of MCO top enclosure, and other tools must be considered in the work station design.	X			X			Verified by FDR Weld Station and tested in PAT-TBD.
	1.1.3	MCO Internal Gas Sampling/Verification Equipment	This equipment will be used to connect to the preselected MCOs and any other safety basis challenged MCOs used for gas pressure and gas composition testing at the CSB sampling/weld stations. The equipment shall be able to safely vent and reinert the MCO interior gas with fresh helium to the pressure before sampling or before pressure sensor replacement while inside the work station enclosure. This MCO Sampling/Verification equipment and sample results will be used to confirm nominal process operations are consistent with analytical predictions (models, testing, sampling). Key elements of the MCO monitoring are described in HNF-3312, Rev. 1, MCO Monitoring Activity Description (1998) and SNF-5536, Rev. 0, MCO Monitoring Plan (2000).	X			X			Verified by FDR Monitoring Equipment (EDT-629021), and Qualification Test TBD.
	1.1.4	Canister Cover Cap Handling Fixture	A fixture will be provided to allow for pick up of the canister cover cap and placement of it on the prepared MCO at any of the two work stations.		X		X			Verified by IDR Handling Fixture, and Qualification Test TBD.
	1.1.5	Canister Cover Cap Welding Machine	In support of the previous baseline that assumed post-HCS welding of the canister cover cap, a gas tungsten arc automatic welder has been specified, procured, and some testing has been conducted. Follow on work is planned with the cover cap weld process development and qualification. The gas tungsten arc welder produces very high quality welds, with no smoke, spatter, or slag. Post weld cleaning is unnecessary. Closed-Circuit Television monitors weld operation. Current planning considers that a subcontracted supplier will provide the welding equipment and perform the production canister cover cap welds.		X		X			Verified by future IDR and PAT-TBD
	1.1.6	Canister Cover Plate Welding	The canister cover plate is welded to the canister cover cap using a manually operated gas tungsten arc welder. No smoke, spatter or slag is produced and post weld cleaning shall be limited to light brushing. Current planning considers that a subcontracted supplier will provide the welding equipment and perform the production cover plate welds.		X		X			Verified by future IDR and PAT-TBD
	1.1.7	Dye Penetrant Testing (PT) Equipment	Dye penetrant testing (PT) is planned for the several passes of the canister cover cap to collar weld joint and the cover plate to canister cover cap weld joint. The application of reagents, development, and reading of indications for the test will be done by manual, hands on, means with personnel beside the MCO. MCO temperatures will be regulated to < 50□C for the PT activity.		X		X			Verified by future IDR and PAT-TBD

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	1.1.8	Leakage Rate Testing Equipment	PT and Leak Testing (LT) will be adequate for long term storage of the MCOs. After the weld is complete, the leakage rate of the weld joint will be determined. Leakage rate testing of the weld joint involves filling the cavity under the welded canister cover cap with helium, then trying to pull the helium through the weld joint into the outer test ring. This approach involves a penetration in the cover cap to introduce the helium to the cavity. The access penetration in the cover cap will be later sealed mechanically and seal welded.		X		X			Verified by future IDR and PAT-TBD
	1.1.9	Ultrasonic Testing Equipment	The canister cover cap to collar welded joint is designed for an ultrasonic (UT) inspection. However the UT inspection of the joint is not a requirement and is not planned.						X	Not a design requirement
	1.1.10	Equipment Utilities	The following equipment utilities are required to be available to service each of the two workstations for the monitored MCO sampling, monitored MCO pressure sensor replacement, welding, leakage rate testing. penetrant testing, possible ultrasonic testing activities, and other examination and/or testing. Helium gas supply (canister cover cap and cover plate back gas, leak testing, monitored MCO gas venting, and monitored MCO reinerting) Welding gas supply (Argon) Electric Power- (2ea.) 120 VAC, 1 phase, 20 amp circuit (1ea.) 480 VAC. 3 phase, 50 amp. Circuit Compressed air - 100 psig. Supply Cooling system to maintain MCO top surface temperatures < 50□C during gas sampling helium reinerting, post-weld testing, inspection and cleaning activities, and for worker safety.	X						Verified by FDR Sample Weld Station
	1.2	Applicable Documents	General Information						X	
	1.3	Technical Requirements	General Information						X	
	1.3.1	Definition	General Information						X	
	1.3.2	Interface Definition	The monitored MCO gas sampling and weld sealing operation is an internal function within the CSB and interfaces are included as part of the CSB operation.		X					IC-233
	1.3.3	Operational Philosophy	The safety of the public, the safety of the worker and protection of the environment shall be the primary considerations in the redesign, construction, startup and operation of the CSB Annex. The redesign shall include As Low As Reasonably Achievable (ALARA) provisions to protect the public, worker, and environment from hazards associated with startup and operation of the monitored MCO gas sampling, monitored MCO gas pressure sensor replacement, helium reinerting, and canister cover cap assembly welding operations in the CSB Annex. Startup and operations shall maintain the CSB Annex within the CSB safety authorization and shall be conducted in full compliance with applicable Federal, State and Local laws and regulations. The MCO transfer, sampling, gas pressure sensor replacement, helium reinerting, and weld sealing operations shall be conducted efficiently. No lost time accidents shall be a primary goal. Exposures to radiation and toxic materials shall be held as low as reasonably achievable consistent with good industry practice and U.S. Department of Energy regulations and Orders.					X		Verified by informal review of CSB ALARA Analysis Rev 10 (release TBD).

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				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
	1.3.4.1	House MCO Gas Sampling and Weld Sealing Operations	The CSB Annex shall house the MCO gas sampling, gas pressure sensor replacement, helium reinerting, and welding operations including the equipment and personnel (provided by others) required to perform these operations at 2 stations. Adequate space shall be provided for the sampling, welding and testing equipment, personnel and adequate clearance and access to equipment to enable the CSB Annex personnel to perform their duties in a safe and effective way.	X						Verified By FDR Sample Weld Station
	1.3.4.2	Accommodate MCO Gas Sampling and Welding Equipment	The CSB Annex shall provide accommodations for MCO gas sampling, gas pressure sensor replacement, and welding operations at 2 stations, local process control systems, process off gas system, process ventilation system and continuous air effluent monitoring equipment. Two sets of the welding, testing components (provided by others), MCO cooling, and one set of MCO gas sampling/sensor replacements components will be provided at start up. The equipment used for monitored MCO gas sampling will be used for venting, purging, and reinerting of the MCO during pressure sensor replacement.	X						Verified By FDR Sample Weld Station
	1.3.4.3	Enable MCO Transfer	The CSB Annex shall enable the transfer of MCOs from the CSB service station and vault areas to any of the 2 sampling/weld stations in the CSB Annex, from one station to another, and from any of the 2 stations back to the CSB vault. The CSB Annex shall also enable the handling of supplemental shielding panels. This plan shall support the Spent Nuclear Fuel (SNF) removal campaign schedule for the K Basins.	X			X			Verified by FDR of the MHM and PAT-015-3
	1.3.4.4	Provide Support Facilities	The CSB Annex shall provide support facilities to enable functions to receive shipments of sampling, gas pressure sensor replacement, and welding equipment and supplies, and to ship solid wastes, independently of CSB receiving and shipping operations. In addition the CSB Annex shall provide adequate space to allow: a. the staging of solid waste, and b. storage of supplies		X					Verified by IDR Superstructure package.
	1.3.5.1	Design Life	The CSB Annex structure shall have a projected design life of 75 years. Systems or components needed to house and enable gas sampling, cooling of MCO top, gas pressure sensor replacement, helium reinerting, welding, and post welding of MCOs shall have minimum design life of 10 years. Criteria for the selection of systems and components shall include safety, operability, reliability, maintainability and life cycle cost.	X						Verified by FDR Sample Weld Station
	1.3.5.2	Design Flexibility	The workstations shall be designed to facilitate integration with the CSB design and installation of the gas sampling, MCO cooling, gas pressure sensor replacement, helium reinerting, welding, and testing equipment as well as to enable the safe and efficient conduct of sample/weld/test operations. The CSB Annex redesign shall maintain the area south of the CSB Annex clear and free of encumbrances to allow future expansion and interface of the CSB with other users.	X						Verified by FDR Sample Weld Station
	1.3.5.3	CSB Annex Reconfiguration	The redesign of the CSB Annex shall be based on the characteristics defined in this appendix and the criteria established in other sections of this document. Redesign of the CSB Annex for MCO gas sampling, MCO cooling, gas pressure sensor replacement, helium reinerting, and welding shall be consistent with design features and constraints of the CSB. The redesign and equipment layout of the CSB Annex shall provide adequate space for a maximum shift crew size of 4, adequate clearance between equipment, and adequate access to equipment to enable the crew to perform their duties in a safe and effective way. The redesign of the CSB Annex and design of new equipment shall be in accordance with applicable documents of Section 2.0.	X						Verified by FDR Sample Weld Station

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				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
	1.3.5.3.1	CSB Annex Access Road	Access to the CSB Annex shall be provided by extending the new CSB paved road to the CSB Annex in the southwest corner of the CSB. This road shall be designed as a 2-lane service road with an HS-20 load capacity to extend road access to the CSB Annex receiving and shipping area. The balance of the exterior area shall have gravel surface stabilization.		X					Verified by IDR Superstructure package
	1.3.5.3.2	CSB Annex Substructure	The redesign of the CSB Annex and design/installation/operation of new equipment for MCO sampling, MCO cooling, gas pressure sensor replacement, helium reinerting, and welding shall comply to the design loads and design criteria of the previous Hot Conditioning System Annex and shall maintain the seismic integrity of the CSB. In establishing CBS Annex loads and design criteria, consideration shall be given to the loads and design features required to accommodate the above operation at 2 stations and extension of the MHM rails the full width (north-south) of the CSB Annex.	X	X					Verified by FDR Sample Weld Station and Independent review of Weld Station Pit Seismic Analysis
	1.3.5.3.3	CSB Annex Operations Deck	The redesign of the CSB Annex and design/installation/operation of new equipment for MCO gas sampling, MCO cooling, pressure sensor replacement, helium reinerting, and welding shall comply to the design loads and design criteria of the previous Hot Conditioning System Annex and shall maintain the seismic integrity of the CSB. In establishing CBS Annex deck loads and design criteria, consideration shall be given to the loads and design features required to accommodate the above operations at 2 stations and extension of the MHM rails the full width (north-south) of the CSB Annex.	X	X					Verified by FDR Sample Weld Station and Seismic Analysis with IDR
	1.3.5.3.4	CSB Annex Structure	The redesign of the CSB Annex and design/installation/operation of new equipment for MCO gas sampling, cooling of MCO top, gas pressure sensor replacement, helium reinerting, and welding shall comply to the design loads and design criteria of the previous Hot Conditioning System Annex and shall maintain the seismic integrity of the CSB. In establishing CSB Annex superstructure loads and design criteria, consideration shall be given to the loads and design features required to accommodate the above operations at 2 stations and extension of the MHM rails the full width (north-south) of the CSB Annex.	X	X					Verified by FDR Sample Weld Station and IDR of Seismic Analysis
	1.3.5.3.5	CSB Annex Grounding Grid	The CSB Annex grounding grid has been designed to the criteria established for the CSB grounding grid and has been integrated with the CSB grounding grid. The 2-sampling/weld stations shall be tied to the available grounding grid.	X						Verified by FDR Sample Weld Station
	1.3.5.3.6	CSB Annex Operation Deck Area HVAC	The CSB Annex operations deck has been designed to receive ventilation from the CSB operations deck area HVAC system. The necessary cooling, ventilation and High-Efficiency Particulate Air (HEPA) filtration capabilities for MCO gas sampling, cooling of MCO top, gas pressure sensor replacement, helium reinerting, and welding will be provided by the MCO sampling and welding equipment.					X		Verified by FDR Sample Weld Station
	1.3.5.3.7	CSB Annex MHM Crane Rails	The MHM crane rails shall be extended to the CSB Annex so that the MHM can access each of the seven pits. The MHM shall be capable of transferring an MCO from the CSB service pit or vault to any of the 2 sampling/weld stations, from one station into another and from any of the 2 sampling/weld stations back to the CSB vault. The redesign of the CSB Annex shall provide adequate space and clearance for safe operation of the MHM.	X			X			Verified by FDR MHM and qualification tested in PAT-015-3
	1.3.5.3.8.1	CSB Annex I&C	Conduit and wire from the CSB control room shall be routed to a junction box located on the south wall of the CSB. The I&C equipment from the 2 sampling/weld stations of the CSB Annex shall be tied into the junction box and routed to the CSB I&C system. A CSB distributed control system shall provide monitoring, alarming, data logging and personnel interface of equipment.	X						Verified by FDR Sample Weld Station

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	1.3.5.3.8.2	CSB Annex Communication	The CSB Annex shall be tied into the CSB communication system. Equipment shall be provided for integrated communication to the CSB Annex and between the control room and locations near the 2-sampling/weld stations. The CSB Annex communication system shall be designed to the needs of the CSB Annex maximum crew shift and design criteria established for the CSB and be consistent with the CSB design.	X						Verified by FDR Sample Weld Station
	1.3.5.3.8.3	CSB Annex Safeguards and Security	The CSB Annex shall meet the design criteria established for the CSB and will be integrated into the CSB safeguards and security system.	X						Verified by FDR of Security Concept and Design Criteria, "100% Design review for the Canister Storage Building and Hot Conditioning System Annex." Letter, E. S. McGinley, FDH, to F. G. Hudson, DESH, FDH-9655540 R1, dated May 19, 1997.
	1.3.5.3.8.4	CSB Annex Lighting	The CSB Annex lighting system shall be designed to the illumination levels and criteria established for the CSB and shall be consistent with the CSB design. Supplemental lightening of the sample/weld station equipment will be provided as needed.	X						Verified by FDR Sample Weld Station
	1.3.5.3.8.5	CSB Annex Instrument Air	The CSB Annex shall provide any instrument air if necessary.	X						Verified by FDR Sample Weld Station
	1.3.5.3.8.6	CSB Annex Electrical Power	The CSB Annex shall provide accommodations to facilitate integration of the CSB Annex electrical power (normal loads) with the CSB electrical power systems. A single point of connection shall be provided at the CSB main switchgear. Standby or uninterruptible power shall be provided as needed for monitoring of equipment.	X						Verified by FDR Sample Weld Station
	1.3.5.3.8.7	CSB Annex Water and Sewage	No water or sewage systems are required for the CSB Annex.						X	
	1.3.5.3.8.8	CSB Annex Helium	The CSB Annex shall provide piping and tie into the CSB helium supply line to provide a source of helium to each of the 2-sampling/weld stations.	X						Verified by FDR Sample Weld Station
	1.3.5.3.8.9	CSB Annex Argon	The CSB Annex shall provide piping and tie into an argon bottle supply to provide a source of argon to each of the 2-sampling/weld stations.	X						Verified by FDR Sample Weld Station
	1.3.5.3.10	Sampling/Weld Station Accommodations	The design of accommodations for the 2-sampling/weld stations shall be based on layouts, dimensions, utility services and loads. The design and layout of the accommodations for the 2-sampling/weld stations shall provide adequate space, clearance, and access to equipment to enable the crew to perform their duties in a safe and effective way. The accommodations shall permit concurrent operation at the 2 stations using any combination of equipment systems for welding/weld testing, MCO gas sampling, cooling of MCO top, pressure sensor replacement, and helium reinerting, depending on operational requirements.	X	X					Verified by FDR Sample Weld Station, and Independent Review of Human Factors Report Chapter 13 FSAR (HNF3553)
	1.3.5.3.11	CSB Annex Support Facilities	The CSB Annex shall provide support facilities within the CSB to support sampling/weld operations at 2 stations. Support facilities include, but are not limited to shipping and receiving area, staging area, solid waste staging area, liquid waste staging area, and supplies storage area.	X	X					Verified by IDR Superstructure and FDR Sample Weld Station
	1.4	Quality Assurance	The quality assurance criteria established in Section 4.0 are applicable to the CSB Annex.							See Section 4 of the Specification
	2.1	MCO Welding	Process information						X	

Canister Storage Building Verification and Validation Matrix

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				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
1	1.0	Scope	General Information						X	
2	2.0	Applicable documents	General Information						X	
3	3.0.	Design Criteria	General Information						X	
4	3.1.	Environmental Conditions	3.1.1 The Spent Nuclear Fuels Canister Storage Building will house the MHM and all support systems. Air temperature within man-accessible work areas will be maintained for normal operating conditions for personnel access, as required in DOE Order 6430.1A. 3.1.2 The contact operated MHM will be exposed to climatic, design, and operating environment as follows. 3.1.2.1 Climatic and Geographic Site Conditions a. Site Elevation: 708 feet above sea level. b. Barometric Pressure: 14.3 psia. c. Minimum Temperature: -27 °F. d. Maximum Temperature: 115 °F. e. Relative Humidity: 6 to 100%. 3.1.2.2 Operating Environment a. Normal Operating Temperature Range: 60 to 85 °F. b. Minimum External Design Temperature: 5 °F. c. Maximum External Temperature: 115 °F. d. Maximum Internal Cask Design Temperature: 220 °F. e. Design Relative Humidity: 5 to 95%	X X						See CSB Design Verification Verified in Formal Design Review (FDR) of the Material Handling Machine (MHM). Verified in Formal Design Review (FDR) of the MHM.
5	3.2	Detailed Design Criteria								
6	3.2.1.1		The crane system shall be designed, fabricated, manufactured, inspected and factory tested primarily in accordance with ASME NOG-1 Type I, except as noted in section 3.2.2.1(d). The site MCO hoist load test shall also be the governing load test for crane and trolley structures. In addition however, the requirements of applicable sections of Specification CMAA 70 shall also apply in case these are not already covered in ASME NOG-1 or are applicable only to the Owner/User of the crane. In case of conflict between this Specification and ASME NOG-1, including specifications referenced herein, the requirements of this Specification shall take precedence. ASME NOG-1 includes stipulations for the Buyer to specify additional ordering information, clarifications or exclusions. The paragraphs that follow are in reference thereto and must be read in conjunction with the matching sections in ASME NOG-1.	X				X		Verified by Informal Review of NOG-1 Compliance Matrix (SNF Internal Correspondence 00-SNF/CES-005) and FDR of the MHM.

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7	3.2.1.2	Section NOG-1000, Introduction:	The shipping cask has less shielding ability than the MHM cask; therefore, the TID calculated for the Receiving Crane should be applicable for the MHM crane as well. Based on an analysis of the side exposure of the Receiving Crane a maximum rate of approximately 11 mR/h is obtained or about 4 X 103 Rad is the 40 year lifetime TID. This should be conservative since it is unlikely that the Receiving and MHM Cranes will experience a 40 year continuous work schedule.						X	
8	3.2.1.3	Section NOG-3000, Coatings and Finishes:	The MHM Crane shall be coated to Category C, "Standard Industrial Practice," in accordance with Paragraphs NOG-3230 and NOG-3240. The final paint color for the structural crane components and bridge drive enclosures shall be Safety Yellow #13655 in accordance with FED-STD595. The colors of all other crane components shall be the Seller's standard colors.	X				X		Verified by Informal Review of NOG Compliance Matrix (SNF Internal Correspondence 00-SNF/CES-0005) and FDR of the MHM, see also NCR 97-PQA-021 R.1. Paint on girders (T.Z. Anderson).
9	3.2.1.4	Section NOG-4000, Structural Components	a. Paragraph NOG-4132 Live Loads TROLLEY (see note below) Rated Load, Plr (See note) Cask/turret, MCO, trolley plus miscellaneous. Critical Load, Plc (See note) The MHM does not have a critical load per the definitions of NOG-1. Construction Load, Pcn As applicable by Erector/Seller Credible Critical Load, Pco Not a requirement Credible Critical Load, Pcs Not a requirement							
			NOTE: There is no main hoist. The bridge and trolley are continuously loaded by the dead weight of the cask/turret system and accessories. The cask handles the additional load, which is the 10.5-ton MCO, handled by its own grapple drive system. The MHM arrangement of dead weights does not match the definitions for Plr and Plc in NOG-4132.	X			X			a) Verified by FDR of the MHM and Qualification tested by W379-PAT-015-2
			b. Paragraph NOG-4134, Wind Load: See Section 3.4.						X	b) See Section 3.4
			c. Paragraph NOG-4152, Seismic Input Data: The in-structure response spectra for a Design Basis Earthquake (DBE), which is equivalent to a Safe Shutdown Earthquake (SSE) in NOG-1, as shown in Appendix B, Figures 1 and 2, and shall be used in the analysis for the crane.	X	X					c) Verified by FDR of MHM and Independent Review (IR) of seismic analysis by FDI
			d. Paragraph NOG-4153.5, Decoupling Criteria: The MHM Crane and Cask system is different from the usual gantry system in that the crane can be restrained at the MHM Cask as well.						X	
			A seismic analysis shall be performed using the seismic response spectra in Appendix B. The horizontal displacement of the nose of the cask relative to the operating deck shall be limited to prevent damage or shear of a MCO when partially inserted in a storage tube during a seismic event.		X					d) Verified by Independent Review (IR) of seismic analysis by FDI, and FDR MHM
			The vertical relative displacement of the nose with respect to the operating deck shall be accommodated by design to prevent the cask from hammering onto the operating deck during a DBE.		X					
			e. Paragraph NOG-4153.8, Damping Values: A damping value of 5% of critical damping shall be used for the initial crane analysis. The seismic analysis at 7% of critical damping shall be the governing criteria in accordance with NOG-4153.8.	X	X					e) Verified by FDR MHM and IR of seismic analysis

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			f. Paragraph NOG-4457, Gantry Stability: The MHM Crane system shall be stable against overturning during a seismic occurrence in accordance with the requirements as stated.	X	X					f) Verified by FDR MHM and IR seismic analysis
			g. Paragraph NOG-4470, Foot walks, Handrails, Platforms, etc: The Seller shall provide operations and maintenance platforms for in-situ servicing of trolley based drives, including drives associated with the cask/turret system.	X						
			Access to the trolley platform from the operating floor shall be by a ladder preferably attached to the south-west gantry leg. Alternate ladder location will be submitted to Buyer for approval.							g) Verified by FDR MHM
10	3.2.1.5	Section NOG-5000, Mechanical	a. Paragraph NOG-5111(a), Load Spectrum: The load spectrum shall be in accordance with Specification CMAA 70, Class D.	X						a) Verified in FDR MHM
			b. (deleted)							
			c. Paragraph NOG-5332.1, Trolley Speeds: The rated load trolley speed shall be 40 FPM with a tolerance of ±10%. A variable speed control shall be provided with a creep speed capability of 1.0 FPM for 1 hour.	X			X			c) Verified in FDR of MHM and W370-PAT-015-3
			d. Paragraph NOG-5333.1, Bridge Speeds: The rated load bridge speed shall be 40 FPM with a tolerance of ±10%. A variable speed control shall be provided with a creep speed capability of 1.0 FPM for 1hour.							
			e. (deleted)	X			X			d) Verified in FDR of MHM and W370-PAT-015-3
			f. (deleted)							
			g. (deleted)							
			h. (deleted)							
			I. Paragraph NOG-5430(a), Trolley Drives: Single failure-proof features for the trolley drive will not be required.							i), j) N/A
			j. Paragraph NOG-5440(a), Bridge Drive: Single failure-proof features for the bridge drive will not be required.						X	
			k. Paragraph NOG-5452, Wheels: The bridge wheels shall be designed to run on 175# UNTREATED crane rails which will be furnished and installed by others in accordance with ParagraphNOG-4160.						X	k), l) Verified in FDR of MHM, and Informal Review of NOG-1 Compliance Matrix (SNF Internal Correspondence 00-SNF/CES-005)
			l. Paragraph NOG-5455.1(b)(3), Bearings: Anti-friction bearings shall have an AFBMA L-10 life of minimum 20,000 hours.	X				X		
			m. Paragraph NOG-5458.1(a), Bridge Stops: The bridge stops that will be contacted by the bumpers will be furnished and installed as shown on Drawing H-2-120913. The track-type limit switches, see ParagraphNOG-5459.1(e), shall be positioned and bridge bumpers sized so as to limit impact loading on the stops to a maximum of 6000 lbs.	X						m) Verified in FDR of MHM, H-2-120916, see also 3.2.1.7.c

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11	3.2.1.6	Section NOG-6000, Electrical Components	a. General: All electrical requirements shall be in accordance with Section NOG-6000, with exceptions and clarifications described below, and in accordance with Specification Section16610 "Electrical Requirements for Packaged Equipment."	X	X					a) Verified by Independent Review (NCR-99-DESH-021) and FDR of MHM
			b. Paragraph NOG-6310 Performance, General: In addition to the requirements of Paragraph NOG-6320, NOG-6330, and NOG-6340, the hoist, bridge and trolley drives will require stepless variable speed control for the speed ranges. Control of creep speeds shall be possible for a duration of at least 1 hour.	X			X			b) Verified by FDR of MHM and qualification tested by W379-PAT-015-3
			c. Paragraph NOG-6416, Adjustable voltage ac: The preferred speed control system for hoist and travel is the Flux Vector Control or equal.	X			X			c) Verified by FDR of MHM and qualification tested by W379-PAT-015-3
			d. Paragraph NOG-6447, Overtravel Limit Switches: In addition to bridge and trolley overtravel limit switches the MHM Crane shall be hard contact wired for collision prevention.	X						d), e) Verified by FDR of MHM
			e. Paragraph NOG-6450, Crane Controls: The MHM (Crane and Cask/Turret system) shall be provided with an all-encompassing control console.	X						
			f. Paragraph NOG-6462, Light Fixtures: The MHM Crane trolley operator area shall be provided with emergency light fixtures for operator evacuation. Normal visual access for operators for cask/turret operations shall be provided by the CSB facility lighting.		X					f) Independent Review by Design Authority, see field RCR 7,13, & 14.
			g. Paragraph NOG-6465, Convenience Outlets: Convenience outlets to support maintenance and repair work on the MHM are required.		X					g) Independent Review by Design Authority
			h. Paragraph NOG-6482.1, Runway Conductor System: The Seller shall supply a cable festooning system, including the festoon track beam and tow arm to the crane, in accordance with ASMENOG-1 and Seller furnished wiring diagrams. The festoon system shall support 480 V power, control conductors and pneumatic hoses. Structural support brackets for attachment of the Seller supplied track beam will be furnished and installed by others as shown on DrawingH-2-120903. The support brackets have been designed for a maximum load of 2500lbs exerted by an I-beam, size S 6x12.5 or lighter, to be used for the festooning trolleys. Attachment details for the I-beam shall be as shown on Drawing H-2-120903. One electrical junction box will be provided by others as shown in Drawing H-2-120903.	X						h) Verified by FDR of MHM
12	3.2.1.7. a	Supplemental Requirements not Covered in ASME NOG-1.	a. Design Life: Non-replaceable parts shall be designed or selected for a design life of 40 years.						X	
13	3.2.1.7. b	Supplemental Requirements not Covered in ASME NOG-1.	b. Crane Coverage Area and Lift: The crane shall meet requirements for cask coverage area, and lifts as shown on DrawingsH-2-120900 and H-2-120903.	X			X			Verified by FDR on MHM and qualification tested by W379-PAT-015-3

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14	3.2.1.7. c	Supplemental Requirements not Covered in ASME NOG-1.	c. Anti-Collision Limit Switches: As shown on DrawingH-2-120900, the coverage areas of the MHM and the Receiving Crane overlap. Inadvertent collision involving the 2 cranes must be prevented. This shall be accomplished using limit switches to match an adjustable 12-inch wide buffer zone just outside of the overlap-zone and alongside the trolley tracks that support the festooned conductor cables. Devices attached the facility to strike the MHM limit switches will be provided by Others. Interlocks and limit switches for the anti-collision system shall be designed single-failure proof. The single-failure proof design shall include appropriate redundancy and consider diversity (depending on reliability) to minimize the possibility of common mode failures of redundant items. Single-failure proof, redundancy, and diversity shall be as described in Item A , Appendix C. Multiple failures resulting from a single occurrence are considered to be a single failure. A description of the features provided to satisfy the requirements of single-failure proof design shall be submitted to the Buyer for review. Passive structural components must be assumed to fail unless designed to withstand the DBE. Anti-collision limit switches and circuits must be labeled in accordance with the requirements of IEEE Standard 603.	X			X			Verified by FDR on MHM (H-2-120916) and qualification tested by W379-PAT-015-3
15	3.2.1.7. d	Supplemental Requirements not Covered in ASME NOG-1.	d. Collision Avoidance System: The MHM shall be provided with a detection system (e.g., electric eyes, radar sensors, contact sensing bumpers, etc.) which are electrically interlocked with the bridge and trolley drives to avoid inadvertent collision with objects left standing on the operating floor. This collision avoidance system shall be designed such that neither the crane nor the cask will collide with any objects taller than 2 inches. This 2 inch height is based on the elevation of the bottom of the Turntable Assembly above the floor with the Retractable Shield Skirt raised. This collision avoidance system is in addition to the anti-collision system described in Para 3.2.1.7.c.	X			X			Verified by FDR on MHM and qualification tested by W379-PAT-015-1
16	3.2.1.7. e	Supplemental Requirements not Covered in ASME NOG-1.	e. Rail-Frogs: As shown on Drawing H-2-120904, the runway rail system must include rail-frogs. The Seller shall adhere to the dimensions for wheel and seismic restraints as shown on Drawing H-2-120904 and the tolerances specified in Paragraph NOG-5452.1. The dimensions for wheels and seismic restraints shown on DrawingH-2-120904 are based on allowable lateral crane displacements of 3/8 inch per side or 3/4inch total. Rail frogs are shown on drawing H-2-120901.	X						Verified by FDR on MHM
17	3.2.1.7. f	Supplemental Requirements not Covered in ASME NOG-1.	f. Electric motors shall be in accordance with Specification Section16150, Motors-Induction. The electrical wiring, components, materials, installation, and connections shall be in accordance with Specification Section 16610, Electrical Requirements for Packaged Equipment.	X						Verified by FDR on MHM
18	3.2.1.8	Crane Height:	The crane box beam height shall be such that there is 9'-0" of nominal clearance between the operating deck and the bottom of the crane beams.	X			X			Verified by FDR on MHM and measured during Installation Component Test Package.

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				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
19	3.2.2.1. a, .b, & .c	MHM Cast/Turret System	The MHM cask/turret system shall be permanently mounted on the trolley. The MHM Cask/Turret system shall include but is not limited to the following:	X						Verified by FDR on MHM
			a. The method of attachment of the cask to the cask trolley shall be the responsibility of the supplier. The hoisting system operational rating shall be governed by 80% of the site test weight that can be enclosed in the cask.	X			X			Verified by FDR on MHM and qualification tested by W379-PAT-015-2.
			b. (deleted)							Note: Requirement changed by ECN 652275
			c. (deleted)							
20	3.2.2.1. d.1, .2, .3, .4, .5, ..6, .7, & .8	MCO Hoist System	d. The MHM cask/turret shall be equipped with a 15 ton design capacity CMAA-70 Class D hoisting system of which the "below-the-hook" design capacity of the grapple is 12 tons. Specific operational rating will be according to ASME/ANSI B30.2a section 2-2.2.2(d) and the Manufacturer's recommendations, but not more than the design capacity of 12 tons. Unless approved otherwise by the Manufacturer, the hoist rating will be 80% of the site test weight.	X			X			d) Verified by FDR on MHM and qualification tested on W379-PAT-015-2
			The purpose of this hoist is to raise and lower the MCO, a faulty Shield Plug and the impact absorber. This hoist system shall have the following performance features:							
			1) The hoist shall have a hoisting range from a full up position to a down position such that the grapple can access the bottom of the storage tube (elevation 667'--5-1/2").	X			X			1) Verified by FDR on MHM and qualification tested on W379-PAT-015-3
			2) The MCO hoist shall have lifting and lowering speeds from 0to5.5 ±0.5 ft/min and a combined MCO load and force of acceleration not to exceed the maximum weight of the MCO plus 1000 lbs. The weights of all MCOs will not be the same.	X			X			2) Verified by FDR on MHM and qualification tested on W379-PAT-015-3
			3) (deleted)							
			4) If regreasable bearings are used on the hoist the bearings shall have the capability to be greased through flexible tubes from fittings outside the hoist enclosure. Waste grease shall not be allowed to accumulate in side hoist enclosure.		X					4)Verified by independent Review by Design Authority
			5) (deleted)							
			6) The hoist shall have high and high-high and low limit switches.	X						6) Verified by FDR on MHM
			7) Motor electrical power rating shall be 480V/3-phase/60 Hz.	X						7) Verified by FDR on MHM
			8) The MHM cask and MCO hoist shall be capable of handling the standard impact absorbers as shown on Drawing H-2-120142. The MHM cask shall be designed for a minimum of 40 years life. This life span shall be with normal maintenance as specified in the Seller's Operation and Maintenance Manual.						X	8) N/A

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				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
21	3.2.2.1. d.9	MCO Hoisting System	9) The MCO hoisting system shall meet the following additional requirements:							
			a. Since the MCO grapple operates inside the cask it will be necessary that the hoist's reeving system be located inside as well. The design layout shall have an arrangement whereby the drive train system components remain outside of the cask for enhanced maintenance access. The hoist enclosure shall have access and inspection ports. Lighting for the hoist enclosure shall be provided for inspection and maintenance of internal components and wire rope.	X						a) Verified by FDR on MHM
			b. The hoisting system shall incorporate redundant load holding brakes with sufficient capacity to hold the rated load independently of each other and of the load control brake.	X			X			b) Verified by FDR on MHM and W379-PAT-015-2
			c. The hoisting system shall incorporate a mechanical or power control braking means (i.e. regenerative, dynamic, counter torque, etc.) for controlled lowering of the load with a capacity to stop and hold the rated load independently of the load holding brakes.	X			X			c) Verified by FDR on MHM and W379-PAT-015-2
			d. For emergency measures involving a failed hoisting system the design shall include the following;							d) Verified by FDR MHM
			(1) Manual emergency release system for the brakes in support of emergency hand wind operations.	X						
			(2) A hand wind drive for raising and lowering of the rated load by an operator in case of an emergency. Control of the MCO shall be maintained at all times during an emergency and not be dependent on exceptional strength or dexterity of the operator.	X			X			Verified by FDR on MHM and W379-PAT-015-1
			(3) A grapple elevational position indicating system that is visually accessible from the same location where the emergency hand wind is operated.	X						Verified by FDR MHM
			e. The hoisting system shall be designed to CMAA-70 and so that no credible single failure will result in the loss of capability to stop and hold the MCO. A failure modes and effects analysis for the hoisting system (MCO hoist, grapple, and wire rope) shall be performed using MIL-STD-1629A as a guideline.	X						e) Verified by FDR MHM
			f. The hoisting system design and manufacturing shall meet the requirements of ASME/ANSI NQA-1.		X					f) Independent Review by QA source inspection
			g. The grapple and its connections shall be designed as critical devices in accordance with ANSI N14.6	X						g) Verified by FDR MHM

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				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
22	3.2.2.1. e	Weighing Device	e. A weighing device shall be provided for determining the weight suspended from the lower block (grapple support, grapple and load/no load). Operation of the hoist drives shall be in accordance with section 3.2.2.1.d.2 and accomplish the following:	X						e) Verified by FDR of MHM
			1) When the hoist is lowering the weighing device shall stop the hoist when the indicated weight is less than the weight of an impact absorber, a tube plug, or the lowest projected partial weight MCO, depending on the mode of operation. This feature is to prevent play out of additional cable if the load/grapple should hang up or reaches its resting position. If the weighing device stops the hoist from this underload a lock out shall be engaged which will prevent further use of the crane, except for raising the load, until a key operated reset is activated on the panel.	X			X			1) Verified by FDR of MHM and qualification tested in W379-PAT-015-1
			2) When the hoist is lifting a load (MCO grapple engaged) this weighing device shall stop the hoist when the indicated load is 1000 lbs over its heaviest normal load or greater. If the weighing device stops the hoist, a lock out shall be engaged which will prevent further use of the crane until a key operated reset is activated on the control panel.	X			X			2) Verified by FDR of MHM and qualification tested in W379-PAT-015-1
			3) If the weighing device stops the hoist, a lock out shall be engaged which will prevent further use of the crane, except for lowering the load, until a key operated reset is activated on the control panel.	X			X			3) Verified by FDR of MHM and qualification tested in W379-PAT-015-2
			4) The weighing device system shall have an accuracy of ± 5% of maximum rated load.							
			5) The weighing device shall have a normal load limit of 50,000lbs and a static overload capacity of 150% of the normal load. The weighing device and associated weighing system shall have be periodically verified against a calibrated load verification system. Loads shall be replaceable.	X			X			4) Verified by the FDR of the MHM and qualification tested in PAT-015-2
									X	5) Specification to be revised
23	3.2.2.1. f, g	MHM Cask/Turret Inside Space	f. The MHM cask/turret inside space shall accommodate an MCO overpack. The handling of an overpack would occur for the off-normal condition where it became necessary to overpack a leaking MCO. A special grapple for the overpack MCO shall be provided by others, if required. The bounding parameters for the over packed MCO were as listed below. MCO Overpack handling is not currently required.	X						Verified by FDR of MHM
			1) Height: 170 inches							
			2) Weight: Maximum of 12 tons							
			3) Diameter: The cask ID shall be a minimum of 27 inches.							
			g. (deleted)							
24	3.2.2.2	Grapple	A grapple shall be used to attach the MCO to the MHM cask hoisting system. A cable reel shall supply compressed air for operating the grapple (engaged/disengaged) and signals from the indicator switches on the grapple.	X						Verified by FDR of MHM

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				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
25	3.2.2.3	HEPA	The MHM cask shall be equipped with a Cask Extract system consisting of a single fan and HEPA filter unit.	X						a) Verified by FDR of MHM and qualification tested in W379-PAT-015-3
			a. The Cask Extract system shall be capable of developing continuous air flow in the normal mode within the cask with the turret system engaged with the storage tube or service pit.	X			X			
			The control system shall have an alarm if high differential filter pressure is detected.							
			b. (deleted)							
			c. The HEPA filter shall be of nuclear grade Flanders® stainless steel R2 size B units with neoprene gaskets located outside the flange perimeter at both ends or equal. The filters shall be designed to ASME N509. They shall be constructed and tested in accordance with IES-RP-CC-001.3, ASME N510, and UL 586 listed.	X						c) Verified by FDR of MHM
			d. The fan shall be directly connected to a 480v/3ph/60Hz motor capable of producing a continuous air flow in the Cask/Turret . Certified fan performance curves shall be provided. Both inlet and discharge ports shall be equipped with 1-1/4-inch NPSC flanges. Fans shall be Rotron® DR 353 blowers with 4-pole motors or equal.	X			X			d) Verified by FDR of MHM and tested in CTP to be performed
			e. (deleted)							
			f. (deleted)							
			g. (deleted)							
			h. (deleted)							
			i. Exhaust path shall have two sample ports for 1/2" NPT connections downstream of the HEPA filter for interface with exhaust monitoring.		X					i) Independent Review by DA
26	3.2.2.4. g	Extract System	g. The Cask Extract system air flow through the Cask and the heat sink of the Cask mass shall be sufficient to maintain the MCO surface at less than 270oF during the 48-hour loss of normal power incident. During loss of power, the operating area room temperature can reach 120oF. The maximum heat source is 835 watt and the initial surface temperature could reach as high as 251oF when it is brought into the MHM.		X					Verified by IDR of thermal analysis
27	3.2.2.8	Operator Control System	The MHM shall include an operator control system that may consist of an integrated system of local control panels and an operator console. The control console layout shall be located logically to match required operator actions. The system shall incorporate power and control wiring separated from low voltage signal wiring, front wired panels for ease of maintenance, wiring labeled in accordance with the electrical schematics and running in raceways, wrapped in groups or in rigid conduits outside the panels. The panels shall have clear indicators for off-normal operating conditions together with keyed interlock by-pass switches to permit recovery for corrective maintenance. Electrical wiring and control panels shall meet the requirements of paragraph. 3.2.2.12, 3.2.2.20 and 3.2.3.20 respectively. The MHM electric power system shall include an emergency power disconnect that shall run separate and removed from any control panel.	X				X		Verified by FDR of MHM and Informal review of Human Factors Reports SNF-4831 and SNF-3907.

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				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
28	3.2.2.10	Interlocks	Those MHM Cask system interlocks which have the function to prevent damage to the MCO shall be redundant, and single failure proof. The MCO shall be considered vulnerable to damage under the following conditions: (1) The height of the MCO body is suspended from the grapple at elevations coincident with the physical interfaces at the bottom of the retractable shield skirt and/or the bottom of the rotatable upper turret. At these elevations, the MCO would be susceptible to damage if the bridge/trolley travel and/or the turret rotate motions were permitted. (2) The MCO inside the unprotected MCO Weld Station which is susceptible to collision by the MHM. (3) (deleted) (4) Collision with the Receiving Crane which would jeopardize the operating deck. (5) Collision with the CSB Service Tent when positioned over the MCO Service Pit.	X						Verified by FDR of MHM
29	3.2.2.11	Painting	Painting of the cask body and the exterior of all components shall be in accordance with Specification Section09900 Table - III letter E FED-STD-595B Safety Yellow - 13591. All other components on the cask shall be painted in accordance with painting requirements of this Specification.	X						Verified by FDR of MHM
30	3.2.2.12	Electrical	The electrical wiring, components, materials, installation, and connections shall be in accordance with Specification Section 16610, Electrical Requirements for Packaged Equipment.	X						Verified by FDR of MHM, see NCR-99-DESH-021
31	3.2.2.15	Operators Platform CAM	The operators platform shall have space and an electric power receptacle for mounting a continuous air monitor (CAM), supplied by others.	X						Verified by FDR of MHM
32	3.2.2.16	CAM Outlet	A 110 volt 60 Hz, 1 phase AC duplex outlet shall be available for power to the CAM. Mounting provisions will be according to Buyer interface requirements. This outlet shall be protected by a 15A single-pole circuit breaker.	X				X		Verified by FDR of MHM
33	3.2.2.17	Induction Motors	Induction motors shall meet the requirements of Specification Section16150. Induction motors for MCO grapple, if used, shall meet requirements of Specification Section 16151.						X	
34	3.2.2.18	Pressure Switches	Pressure switches shall meet the requirements of Specification Section17667.	X						Verified by FDR of MHM
35	3.2.2.19	Instrument piping	Instrument piping materials shall meet the requirements of Specification Section 17703B and pressure tested in accordance with Specification Section 17708B.						X	
36	3.2.2.20	Instruments	Instruments shall be installed, tested, calibrated and checked out in accordance with the requirements of Specification Section 17704B and 17705B.	X			X			Verified by FDR of MHM and qualification tested by W379-PAT-015-1

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				Formal Review	Independent Review	Alternate Calculation	Qualification Test	Informal Review	N/A	
37	3.2.3.7	Radiation and Service Life	Radiation and Service Life a. The MHM and its auxiliary equipment shall be designed for a minimum 40-year life. Components with a life expectancy of less than 40 years shall be separately replaceable. The design shall utilize radiation tolerant components where their exposure makes such design appropriate. Seller shall submit the service life expectancy of each component for Buyer. The equipment, including items such as bearings, packings, seals and gaskets, shall be as maintenance free as achievable. The design shall make provisions to improve convenience of maintenance activities. Maintenance schedules and requirements shall be submitted for Buyer review. b. Rotating equipment (motors, gear boxes, bearings, etc.) designed for radiation service shall be provided with lubricants, rated by the manufacturer for prolonged radiation tolerance to exceed the anticipated exposure in accordance with Paragraph 3.2.1.2. c. An event where an inadvertent rotation of the upper turret and/or motion of the bridge and trolley would attempt to shear the MCO is the most critical failure . Design must fully address prevention of this condition. Passive failures of structural components are assumed unless they are designed to withstand the DBE. d. All other failures may be addressed with the following modification of the above criteria. This modification is that passive failures are not to be assumed, unless identified as credible by analysis.	X		X		X	X X X	Verified by FDR of MHM, Informal review of Alternate calculation by M&D Associates (See EDT 627041)
38	3.2.3.9	Decontamination	For decontamination, design and fabrication of cask components and assemblies shall minimize crevices, pockets, absorbent materials or similar voids where contaminants can be trapped. Intermittent welds are not permitted.	X						Verified by FDR of MHM.
39	3.2.3.10	Materials	Materials shall be as follows unless otherwise noted on Drawings. a. Carbon steel shielding shall be in accordance with ASTM specifications listed in ANSI N690, Section Q1.4. b. Technical data of the type of neutron shielding selected by the Seller shall be submitted to the Buyer for approval prior to application. c. Tungsten Shielding, if used, shall be in accordance with ASTM B 777. d. Structural shapes and plate shall be carbon steel in accordance with Specification Section 05120, Structural Steel, or approved equal. e. (deleted) f. (deleted) g. The neutron shield material shall not exceed a flame spread rating of 25 when tested in accordance with UL 723.		X					Verified by independent review by DA.

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40	3.2.3.11	Shielding Skirt Actuator	Retractable Shielding Skirt Actuator a. The motor shall be 480 V, 3-phase, 60 Hz, TEFC, reversible. b. The gear reducer shall be a, one-piece construction cast iron housing, oil reservoir, positive retained input shaft, high strength, case-hardened steel integral input worm and shaft, Boston Gear F/FS 721-20 or equal. c. Flexible couplings shall be Duff-Norton Flex-Rigid gear couplings, or equal, which will allow incremental system adjustment or equal and shall be used at each point where two shaft segments must couple together or approved equal. d. Shafts shall be solid steel, ASTM A36, keyed ends, full diameter of end connections entire length or approved equal. e. Gear boxes shall be mitre gear boxes, oil lubricated, cast iron housings, alloy steel shafting, anti-friction shaft bearings, Duff-Norton SK2519 or equal. f. The actuators shall be a machine screw type, self locking, worm drive, 6:1 reduction, ductile iron housing, Duff-Norton M-9005 or equal.		X					Verified by independent review by DA.
41	3.2.3.12	Turret Actuator	Turret Rotation Actuator a. The motor shall be 480 V, 3-phase, 60 Hz, totally enclosed, reversible, in accordance with Section 2.3. Motor over-torque during rotational travel shall interrupt power. b. (deleted) c. (deleted)	X						Verified by FDR of MHM
42	3.2.3.15	Alignment Camera	TV Alignment Camera System for MHM Positioning: A system for alignment of the MHM with the selected storage opening shall be provided. The system shall provide appropriate marks on the floor or shield plug which may be aligned with a device on the MHM. If more than one aligned point is required they shall both be readily visible at the same time by the device. The system shall make alignment achievable within 3/16-inch tolerance.	X			X			Verified by FDR of MHM and qualification tested in PAT-015-3
43	3.2.3.16	Manual Actuators	Retractable Shield Skirt and Turret Manual Actuator Drives: Systems shall be provided for manually driving the retractable shield skirt and the turret in the event of an electrical drive failure. Each system shall provide a hand operator, which is removable, for driving the actuator system. The drive systems shall also provide any additional gear reduction, if required, to limit manual applied force to a reasonable level. Drive components shall meet requirements for a safety factor of 3.	X						Verified by FDR of MHM
44	3.2.3.19	Limit Switches	Limit switches shall be UL listed and CSA certified, 120 Vac, double pole, Eaton E50 or equal, in accordance with Specification Section 16110, Electrical Requirements for Packaged Equipment.		X					Verified by independent review by DA., UL evaluation pending. (May 16, 2000)
45	3.2.3.20	Control System Panels	Enclosed panels of the control system shall be in accordance with Specification Section 17861B, Control System Panels, unless technical exceptions are approved otherwise.		X					Verified by independent review by DA. (see NCR-99-DESH-0021)
46	3.2.3.22	Pressure Gauges	Pressure gauges shall conform to ASME B40.1 Grade B with a weather resistant steel case, 2-1/2-inch dial, 0 to 160 psig range, 1/4-inch NPT bottom connection, Ashcroft 1005 or equal.		X					Verified by independent review by DA.
47	3.2.3.23	Pressure Transducers	Pressure Transducers shall be 300 series stainless steel, 0 to 60 psig, silicon diaphragm, Omega PX236 or equal.		X					Verified by independent review by DA

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48	3.2.3.25	Pressure Regulators	The air pressure regulators shall be a 1/4 inch size, 250psig, 175 °F rated regulator-filter combination. The unit shall be a metal body and bowl with Pyrex® sight glass. The regulator shall be diaphragm operated, dial gauge and adjustable outlet pressure range from 10 to 60 psig, set at 35psig. The filter shall be reusable and remove particles to 5microns with a manual drain. The unit shall be Parker Hannifin 06E or equal.		X					Verified by independent review by DA
49	3.2.3.26	Pressure Monitors	Air Pressure Monitor: The pressure in the air supply line downstream of the regulators shall be monitored. Conditions of either high pressure or low pressure shall sound and audible alarm and light a panel trouble light, indicating which condition has occurred.	X			X			Verified by FDR of MHM and qualification tested by W379-PAT-015-1
50	3.2.3.27	Air Control Valves	Air control valves shall be 316 stainless steel, 3-way solenoid valves, 4-valve manifolds, 120 V ac, 60 Hz, 30 to 175°F operating temperature. They shall be Honeywell 3131BSA6QN00BBTIJIP3 or equal.		X					Verified by independent review by DA
51	3.2.3.28	Check Valves	Check valves shall be 316 series stainless steel with viton seals and a minimum Cv=1.6, 1 psig cracking pressure, Parker Hannifin O-ring poppet check valve or equal.		X					Verified by independent review by DA
52	3.2.3.29	Hose Couplings	Hose couplings shall be 1/2-inch size quick disconnects, double shutoff type, NPT threaded ends, 300 series stainless steel, Parker Hannifin 60series or equal.		X					Verified by independent review by DA
53	3.2.3.30	Air Hose	Flexible air hose shall be abrasion and oil resistant nylon, 1/4 inch size, 250 psig working pressure, with 300 series stainless steel end connections, Parker Hannifin NN-4-035 or equal.						X	No flex hose on MHM
54	3.2.3.31	Tubing	Rigid tubing and tube fittings for instrument air service shall be in accordance with Specification Section 17703B, Instrument Piping Materials, Class ZJ or equal.		X					Verified by independent review by DA
55	3.2.3.32	Supports	Supports for components for the compressed air system shall be carbon steel materials in accordance with the Specification Section 17703B, Instrument Piping Materials, Class ZZ.		X					Verified by independent review by DA
56	3.2.3.33	Shut Off Valves	Shut off valves shall be 316 or CF-8M stainless steel, meet MSS SP-82, reinforced teflon seats and seals, Parker Hannifin V500SS series ball valves or equal.		X					Verified by independent review by DA
57	3.2.3.34	Guards	Equipment guards and housings shall be fabricated from 16 gauge (minimum) perforated or solid carbon steel sheet, ASTM A 570 or equal. Guards shall be removable.		X					Verified by independent review by DA
58	3.2.3.35	Fasteners	Structural fasteners including bolts, nuts and washers shall be in accordance with the Specification Section 05120, Structural Steel. Bolts subjected to shear loading or providing structural support shall be high strength.		X			X		Verified by independent review by FDI and DA
59	3.2.3.37	Maintenance Rack	The maintenance rack shall be designed so as to support the retractable shield skirt and allow access for any maintenance that the bottom nose may require.						X	
60	3.2.3.39	Motors	Electrical motors shall be in accordance with Specification Section16150, Motors-Induction. (already in 3.2.2.12)	X						Verified by FDR of MHM
61	3.2.4.3	Plug Hoist	The design shall provide appropriate safety factor for lifting a 5,500 lb. tube plug.	X			X			Verified by FDR of MHM and qualification tested in W379-PAT-015-2
62	3.2.5.1	MHM Grapple	The MHM grapple shall grip and carry MCOs within the MHM turret. It shall operate with the hoist.	X			X			Verified by FDR of MHM and qualification tested in W379-PAT-015-2
63	3.2.5.2	Payload	The MCO payload is approximately 10.5 tons. The grapple shall accommodate a 12 ton lift capacity. The MHM hoist load cell shall provide the signals for grappled weight indication and also shall be used to ensure that the grapple is not overloaded.	X			X			Verified in FDR of MHM and Qualification tested in W379-PAT-015-3.

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64	3.2.5.3	Storage Tube	The CSB storage tube is nominal 27 inch I.D., with standard API pipe tolerances.						X	.
65	3.2.5.4	MCO Grapple Configuration	The MCO to be grappled and carried by the grapple is shown on drawings H-2-828041 and H-2-828042.	X			X			Verified in FDR of MHM and Qualification tested in W379-PAT-015-3.
66	3.2.5.5	Grapple Locking	The grapple shall incorporate a positive locking mechanism.	X						Verified in FDR of MHM
67	3.2.5.6	Grapple Design	The grapple shall be designed in accordance with ANSI N14.6 with the MCO as a critical item.	X						Verified in FDR of MHM (see requirement in 3.2.2.1.d.9)
68	3.2.5.7	Grapple Tolerances	The grapple shall be capable of retrieving MCOs that are offset to one side of the CSB storage tube and/or positioned in the maximum tilt configuration possible within the storage tube, accounting for worst case tube tolerances.	X			X			Verified in FDR of MHM and FAT for MHM.
69	3.2.5.8	Power	The maximum power available is 480 V ac.						X	
70	3.2.5.9	Grapple Recovery	The grapple design shall address recovery from a condition where the grapple fails to disengage.	X			X			Verified in FDR of MHM and tested in CTP-CSB (W-379)-015-11-072, IC02.
71	3.2.5.10	Mechanical Locking	The grapple shall be designed with mechanical positive locking to not disengage under load.	X			X			Verified in FDR of MHM and qualification tested in W379-PAT-015-1
72	4	Design Services							X	
73	5	Fabrication							X	
74	6	Quality Assurance							X	
75	7	Inspection , testing, and Installation							X	
76	8	Submittals							X	
77	9	Additional Requirements							X	
78										

APPENDIX C

DESIGN VERIFICATION STATUS QUESTIONNAIRE

(1a) SNF SUB-PROJECT:
(1b) Phase:

(2) Assessment Date:

(9) Brief description of remaining actions

(3) Self-Assessment prepared by:
(10) Independent Assessment done by:

(13) Overall Status of Verification activities:

0	(0%)	requirements have been checked as 'met' or 'acceptable'
16	(100%)	requirements needs complementary actions
0	(0%)	requirements are not met or not assessed

(4) VERIFICATION REQUIREMENTS ACCORDING TO AP EN-6-027-01	(5) QUESTIONS	Facts or project self-assessment ("X" in 1 column)							Independent assessment ("X" in 1 column)			
		(6a) Yes	(6b) Not yet	(6c) Partly	(6d) N/A	(7a) Doc Exist	(7b) Doc TBD	(8) REMARK	(11a) Not Accept.	(11b) To be Compl.	(12) REMARK	(11c) Accept.
PLAN AND ORGANIZE THE VERIFICATION												
1 Ensure Project Requirements are identified	Have all project requirements been identified in one or several documents?	X				X		SNF-6442		X	Exhaustive assessment	
2 Identify Verification methods to be applied on each design requirements	Does a matrix or document exist, defining verification methods for each requirement?	X				X		SNF-6442		X	Exhaustive assessment	
3 Ensure Design Verification responsibilities are defined both internally to PHMC, but also with subcontractors	Does one or several documents exist, defining verification responsibilities within the project team, but also between PHMC and its subcontractors?	X				X		FDI Design Control Procedures Manual		X	Exhaustive assessment	
4 Ensure PHMC and subcontractor personnel involved in Design verification is adequately qualified	Is the qualification of the personnel involved in verification activities adequate and documented?		X				X			X	Random assessment	
5 Develop detailed qualification test planning documentation	Have all project requirements subject to qualification testing been included in a test plan ?	X				X		See latest revision of SNF Startup Preoperational Acceptance Test Status for status of CSB System Test Specifications: SNF-W379-TS-001; SNF-W379-TS-003; SNF-W379-TS-004; SNF-W379-TS-005; SNF-W379-TS-006; SNF-W379-TS-007; SNF-W379-TS-010; SNF-W379-TS-011; SNF-W379-TS-012-1; SNF-W379-TS-013; SNF-W379-TS-014-1; SNF-W379-TS-014-2; SNF-W379-TS-015-1; SNF-W379-TS-015-2; SNF-W379-TS-015-3; SNF-W379-TS-015-4; SNF-W379-TS-016; SNF-W379-TS-017-1; SNF-W379-TS-017-2; SNF-W379-TS-018; SNF-W379-TS-019; SNF-W379-TS-020-1; SNF-W379-TS-021; SNF-W379-TS-022-1; SNF-W379-TS-023; SNF-W379-TS-024-1; SNF-W379-TS-025-1; SNF-W379-TBD Building/Balance of Equipment; SNF-W443-001-1; Cask Transportation System		X	Random assessment	
PERFORM THE VERIFICATION												
6 Ensure design verification has been done on all aspect and at all phases of the design	Have all aspects of the design, including: Functional requirements, Design inputs, Design products, As-built documentation, Design changes, Interfaces, Computer software and pressure vessel code items, been subject to verification.		X				X			X	Random assessment (but on each aspect)	
7 Ensure the ALARA principles have been considered	Is there some evidence of ALARA and Radiological design reviews conducted on the project?	X					X	SNF Canister Storage Building ALARA Analysis Rev. 10, in Release Process		X	Exhaustive assessment	
DOCUMENT THE VERIFICATION												
8 Demonstrate that all design documents have been identified.	Does a complete list of Design documents ('Project file') exist?	X				X		See ABU Checklist, Drawing Index, Specification Index, and Calculation Index.		X	Exhaustive assessment	
9 Demonstrate that all design documents have been adequately verified.	Are there appropriate approval information and signature on EDT and ECN associated to each design document?		X				X	Some EDTs still need to be released.		X	Random assessment	
10 Demonstrate final design meets initial requirements	Does a requirement compliance matrix exist?	X				X		SNF-6442		X	Exhaustive assessment	
11 Gather all elements necessary to demonstrate verification activities have been performed.	Does a final Design Verification Report exist?	X				X		SNF-6442		X	Exhaustive assessment	
12 Demonstrate documents subject of independent review have been adequately verified.	Is there evidence of comments recorded and approval documented for each document subject to independent review?			X		X		Compiled list of conference notes. Some Design review Completion documentation not found.		X	Random assessment	
13 Demonstrate calculation notes subject to alternate calculation have been adequately verified	Does an alternate calculation evidence exist for each calculation subject to alternate calculation requirement?			X		X		All Quality Level I calculations do not have an Independent Design Review		X	Random assessment	
14 Demonstrate Design Reviews have been adequately documented.	Does a Design Review Report, and if necessary a Design Review Completion Report, exist for each formal Design Review?	X				X		Formal reviews documented, e.g., MHM, Security System, Weld Station.		X	Random assessment	
15 Demonstrate tests results have been documented	Is each qualification test result documented in a test report?			X			X	6 Test Reports issued, all others planned or under development. See latest revision of SNF Startup Preoperational Acceptance Test Status Summary for latest status.		X	Random assessment	
16 Demonstrate comments from verification activities have been dispositioned or taken into account	Have the comments raised during verification activities been dispositioned or considered?			X			X	Some design Review Completion documentation is not available. See conference notes listed for design reviews		X	Random assessment	