

ENGINEERING CHANGE NOTICE

1. ECN 655974  
Proj. ECN

2. ECN Category (mark one) <input type="checkbox"/> Supplemental <input checked="" type="checkbox"/> Direct Revision <input type="checkbox"/> Change ECN <input type="checkbox"/> Temporary <input type="checkbox"/> Standby <input type="checkbox"/> Supersedure <input type="checkbox"/> Cancel/Void	3. Originator's Name, Organization, MSIN, and Telephone No. Blaine A. Crea J4000000 L6-35 376-0205	4. USQ Required? <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No <i>yet 4/25/00</i>	5. Date 04/18/2000	
	6. Project Title/No./Work Order No. <i>Spent Nuclear Fuel Project Cold Vacuum Drying Facility, W-441</i>	7. Bldg./Sys./Fac. No. CVDF 142K	8. Approval Designator <i>M. J. Schliebe</i>	
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) SNF-3072 Rev. 0	10. Related ECN No(s). N/A	11. Related PO No. N/A	

12a. Modification Work <input type="checkbox"/> Yes (fill out Blk. 12b) <input checked="" type="checkbox"/> No (NA Blks. 12b, 12c, 12d)	12b. Work Package No. N/A	12c. Modification Work Completed N/A Design Authority/Cog. Engineer Signature & Date	12d. Restored to Original Condition (Temp. or Standby ECNs only) N/A Design Authority/Cog. Engineer Signature & Date
---	------------------------------	--	--

13a. Description of Change  
 Changes to capture facility AS-BUILT configuration; including change to two (2) operating bays. Also includes general editorial changes from Rev. 0.

13b. Design Baseline Document?  Yes  No  
*m.n. 6/5/00 GS 6/21/00*

DOCUMENT AFFECTED: SNF-3072, REV. 0 - m.n. 6/5/00

USQ No: CVD-00-1041 job 6/5/00

14a. Justification (mark one) <input type="checkbox"/> Criteria Change <input type="checkbox"/> Design Improvement <input type="checkbox"/> Environmental <input type="checkbox"/> Facility Deactivation <input checked="" type="checkbox"/> As-Found <input type="checkbox"/> Facilitate Const. <input type="checkbox"/> Const. Error/Omission <input type="checkbox"/> Design Error/Omission	14b. Justification Details update of SDD is needed to reflect system configuration depicting the latest revision of drawings. <i>yet 6/2/00</i> THE DESIGN VERIFICATION METHOD FOR GS COMPONENTS IS BY INFORMAL REVIEW IN ACCORDANCE WITH EN-6-027-01. DOCUMENTATION OF THIS REVIEW IS ACCOMPLISHED BY THE APPROVAL SIGNATURES PROVIDED ON PAGE 2 OF THIS ECN. <i>ym.k. 6/5/00</i>
--	---

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

<del>Gurdhian Singh</del>	<del>R3-86</del>	<del>(1)</del>
<del>B. A. Crea</del>	<del>L6-35</del>	<del>(2)</del>
<del>M. J. Schliebe</del>	<del>L6-13</del>	<del>(1)</del>
<del>C. S. Haller</del>	<del>R3-86</del>	<del>(1)</del>
<del>J. R. Brehm</del>	<del>R3-26</del>	<del>(1)</del>
<del>R. K. Ramsgate</del>	<del>R3-86</del>	<del>(1)</del>

*see attached dist. 4/25/00*

RELEASE STAMP

DATE: JUN 07 2000

STA: A

HANFORD RELEASE

ID: 2

# ENGINEERING CHANGE NOTICE

Page 2 of 2

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

655974

**16. Design Verification Required**

Yes *6/5/00*  
 No *MJ*

**17. Cost Impact**

ENGINEERING

Additional  \$ N/A  
 Savings  \$ \_\_\_\_\_

CONSTRUCTION

Additional  \$ N/A  
 Savings  \$ \_\_\_\_\_

**18. Schedule Impact (days)**

Improvement  N/A  
 Delay  \_\_\_\_\_

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

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

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

Document Number/Revision	Document Number/Revision	Document Number/Revision
SNF - 3072, REV. 0 <i>m.w. 6/5/00</i>	N/A	N/A

**21. Approvals**

Signature	Date	Signature	Date
Design Authority <u>Gurdhian Singh</u>	<u>4/25/2000</u>	Design Agent _____	_____
Cog. Eng. <u>Blaine A. Crea</u>	<u>4/20/00</u>	PE _____	_____
Cog. Mgr. <u>Mike J. Schliebe</u>	<u>4/20/00</u>	QA _____	_____
QA <u>Robert Pansare</u>	<u>6/2/00</u>	Safety _____	_____
Safety <u>J. BREHM</u>	<u>6/5/00</u>	Design _____	_____
Environ. _____	_____	Environ. _____	_____
Other <u>Carl S. Haller</u>	<u>6/2/00</u>	Other _____	_____
<u>* Approval authorized parallel preparation of USQ screen with implementation of EON per NS-4-001-14</u>			
		<b>DEPARTMENT OF ENERGY</b>	
		Signature or a Control Number that tracks the Approval Signature	
		_____	
		<b>ADDITIONAL</b>	
		_____	
		_____	
		_____	
		_____	

SNF-3072  
Revision 1

# **Cold Vacuum Drying Facility Crane and Hoist System Design Description System 14**

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

# Cold Vacuum Drying Facility Crane and Hoist System Design Description System 14

Y. S. Tran  
Cogema Engineering Group

B. A. Crea  
Fluor Federal Services

Date Published  
June 2000

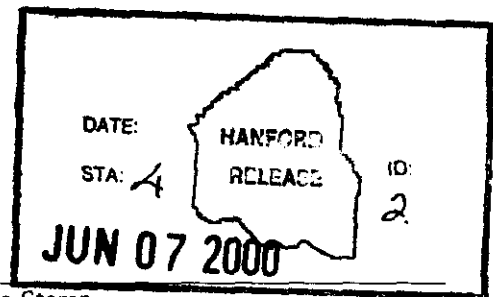
Prepared for the U.S. Department of Energy  
Assistant Secretary for Environmental Management

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

**Fluor Hanford**  
P.O. Box 1000  
Richland, Washington

  
Release Approval

6/7/00  
Date



Release Stamp

**TRADEMARK DISCLAIMER**

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

This report has been reproduced from the best available copy. Available in paper copy and microfiche.

Available electronically at <http://www.doe.gov/bridge>. Available for a processing fee to the U.S. Department of Energy and its contractors, in paper, from:

U.S. Department of Energy  
Office of Scientific and Technical Information  
P.O. Box 62  
Oak Ridge, TN 37831-0062  
phone: 865-576-8401  
fax: 865-576-5728  
email: [reports@adonis.osti.gov](mailto:reports@adonis.osti.gov)(423) 576-8401

Printed in the United States of America

Total Pages: 31

SNF-3072, MW1

(2) Title  
Cold Vacuum Drying Facility Crane and Hoist System Design Description

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Cog. Engr.	(6) Cog. Mgr. Date
0	(7) EDT No. 626308 - Original Release	C.C. Pitcoff 6/30/99	C.S. Haller 6/30/99
1 <b>RS</b>	ECN No. 655974 - General revision	G. Singh <i>[Signature]</i> 6/25/00	C.S. Haller <i>[Signature]</i> 6/5/00

SNF-3072 Rev. 1

**COLD VACUUM DRYING FACILITY  
CRANE AND HOIST SYSTEM  
DESIGN DESCRIPTION**

**SYSTEM 14**

## TABLE OF CONTENTS

1.0	INTRODUCTION .....	1-1
1.1	System Identification .....	1-1
1.2	Limitations of this SDD .....	1-1
1.3	Ownership of this SDD .....	1-1
1.4	Acronyms .....	1-2
2.0	GENERAL OVERVIEW .....	2-1
2.1	System Functions .....	2-1
2.1.1	Normal Process Functions .....	2-1
2.1.2	Safety Functions .....	2-1
2.2	System Classification .....	2-1
2.3	Basic Operational Overview .....	2-1
3.0	REQUIREMENTS AND BASES .....	3-1
3.1	GENERAL REQUIREMENTS .....	3-1
3.1.1	System Functional Requirements .....	3-1
3.1.2	Subsystems and Major Components .....	3-2
3.1.3	Boundaries and Interfaces .....	3-6
3.1.4	Codes, Standards, and Regulations .....	3-6
3.1.5	Operability .....	3-7
3.2	Special Requirements .....	3-7
3.2.1	Radiation and Other Hazards .....	3-7
3.2.2	As Low As Reasonably Achievable (ALARA) .....	3-8
3.2.3	Nuclear Criticality Safety .....	3-8
3.2.4	Industrial Hazards .....	3-8
3.2.5	Operating Environment and Natural Phenomena .....	3-9
3.2.6	Human Interface Requirements .....	3-9
3.2.7	Specific Commitments .....	3-9
3.3	Engineering Disciplinary Requirements .....	3-9
3.3.1	Civil and Structural .....	3-9
3.3.2	Mechanical and Materials .....	3-9
3.3.3	Chemical and Process .....	3-9
3.3.4	Electrical Power .....	3-10
3.3.5	Instrumentation and Control .....	3-10
3.3.6	Computer Hardware and Software .....	3-10
3.3.7	Fire Protection .....	3-10
3.4	Testing And Maintenance Requirements .....	3-10
3.4.1	Testability .....	3-10
3.4.2	Technical Safety Requirement-Required Surveillance's .....	3-10
3.4.3	Non-Technical Safety Requirement Inspections and Testing .....	3-10
3.4.4	Maintenance .....	3-11
3.5	Other Requirements .....	3-11
3.5.1	Security and Special Nuclear Material Protection .....	3-11
3.5.2	Special Installation Requirements .....	3-11
3.5.3	Reliability, Availability, and Preferred Failure Modes .....	3-11
3.5.4	Quality Assurance .....	3-12



3.5.5	Miscellaneous .....	3-12
4.0	SYSTEM DESCRIPTION .....	4-1
4.1	Configuration .....	4-1
4.1.1	Description of System, Subsystems, and Major Components .....	4-1
4.1.2	Boundaries and Interfaces .....	4-2
4.1.3	Physical Location and Layout .....	4-2
4.1.4	Principles of Operation .....	4-2
4.1.5	System Reliability .....	4-2
4.1.6	System Control Features .....	4-2
4.2	Operations .....	4-2
4.2.1	Initial Configurations (Pre-startup) .....	4-2
4.2.2	System Startup .....	4-2
4.2.3	Normal Operations .....	4-3
4.2.4	Off-Normal Operations .....	4-3
4.2.5	System Shutdown .....	4-3
4.2.6	Safety Management Programs and Administrative Controls .....	4-3
4.3	Testing And Maintenance .....	4-3
4.3.1	Temporary Configurations .....	4-3
4.3.2	Technical Safety Requirement-Required .....	4-3
4.3.3	Non-Technical Safety Requirement Inspections and Testing .....	4-3
4.3.4	Maintenance .....	4-3
5.0	REFERENCES .....	5-1
	APPENDIX A SYSTEM DRAWINGS .....	A-1
	APPENDIX B SYSTEM PROCEDURES .....	B-1

**LIST OF FIGURES**

Figure 1-1.	Location of Crane and Hoist System in the Process Bays. ....	1-3
Figure 2-1.	Cold Vacuum Drying Facility Cranes and Hoists. ....	2-2
Figure 3-1.	The Layout of Hoist and Crane System Control Box in the Active Process Bays. .	3-5

## **1.0 INTRODUCTION**

### **1.1 System Identification**

This system design description (SDD) is for the Cold Vacuum Drying (CVD) Facility overhead crane and hoist system. The overhead crane and hoist system is a general service system. It is located in the process bays of the CVD Facility, supports the processes required to drain the water and dry the spent nuclear fuel (SNF) contained in the multi-canister overpacks (MCOs) after they have been removed from the K-Basins. The location of the system in the process bay is shown in Figure 1-1.

### **1.2 Limitations of this SDD**

This system design document is developed in accordance with the following documents: Safety Analysis Report (SAR), Safety Equipment List, Design Requirements Document (DRD), the Technical Safety Requirements (TSRs), and associated engineering and design change notices to these documents and corresponding drawings.

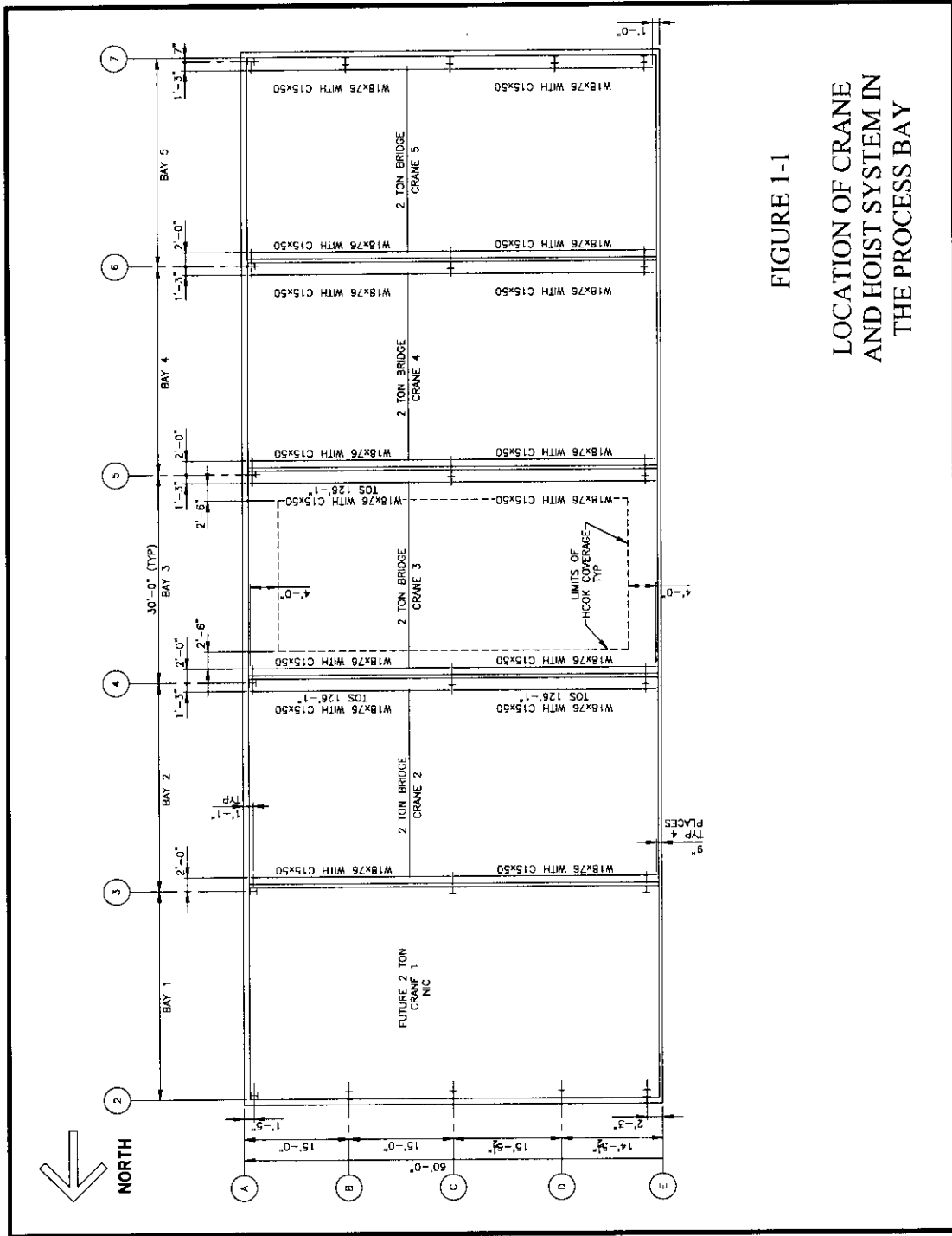
### **1.3 Ownership of this SDD**

The CVD Design Authority assigned to the crane and hoist system is responsible for the accuracy and technical content of this SDD. Any questions on the system or content of this document shall be resolved through the design authority.

**1.4 Acronyms**

ALARA	As Low As Reasonably Achievable
ANSI/ANS	American National Standards/American Nuclear Society
ANSI/ASME	American National Standards/American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
CFR	Code of Federal Regulations
CMAA	Crane Manufacturers Association of America
CVD	Cold Vacuum Drying
DOE	U.S. Department of Energy
DRD	Design Requirements Document
FSAR	Final Safety Analysis Report
IEC	International Electro-Technical Commission
IWRC	Independent Wire Rope Core
MCO	Multi-Canister Overpack
NEC	National Electrical Code
NRC	U.S. Nuclear Regulatory Commission
NEMA	National Electric Manufacturers Association
NFPA	National Fire Protection Association
SAR	Safety Analysis Report
SDD	System Design Description
SNF	Spent Nuclear Fuel
SSC	Structure, System, and Component
TSR	Technical Safety Requirement

Figure 1-1. Location of Crane and Hoist System in the Process Bays.



WMF: CH\_SNF-3072\_F1-1 ACAD FILE: ZBAC0118

## **2.0 GENERAL OVERVIEW**

This section provides a general overview of the crane and hoist system. Section 2.1 describes the system functions and discusses the system's safety functions. Section 2.2 states the system classification and Section 2.3 outlines the basic operation of the system.

### **2.1 System Functions**

#### **2.1.1 Normal Process Functions**

The function of the overhead cranes in the process bays of the CVD Facility is to provide the lifting capability to remove and replace the cask lid from the cask. They also provide the lifting capability for installation/removal of the MCO ventilation/seal ring hood assembly. They will also be used to assist in maintenance activities within the bays as required.

#### **2.1.2 Safety Functions**

The process bay cranes are designated as general service, but are seismically-qualified and considered in the 3 over 1 assessment within the bays. Safety considerations involve following critical lift procedures and required load testing.

### **2.2 System Classification**

The process bay cranes are a subject of the CVD Facility Final Safety Analysis Report (FSAR) (HNF-3553) and classified as general service. They are also classified by the U.S. Nuclear Regulatory Commission (NRC) to be important to safety, category C.

### **2.3 Basin Operational Overview**

Each process bay has an overhead bridge crane riding on a movable bridge girder. The bridge girder has end trucks that run on bridge rails that are fastened (welded connections) to the structural steel frame of the CVD Facility. Each crane has a capacity of 4,000 lbs. The bridge, trolley, and hoist are driven electrically and are capable of operation from the mezzanine level. See Figure 2-1.

Figure 2-1. Cold Vacuum Drying Facility Cranes and Hoists.

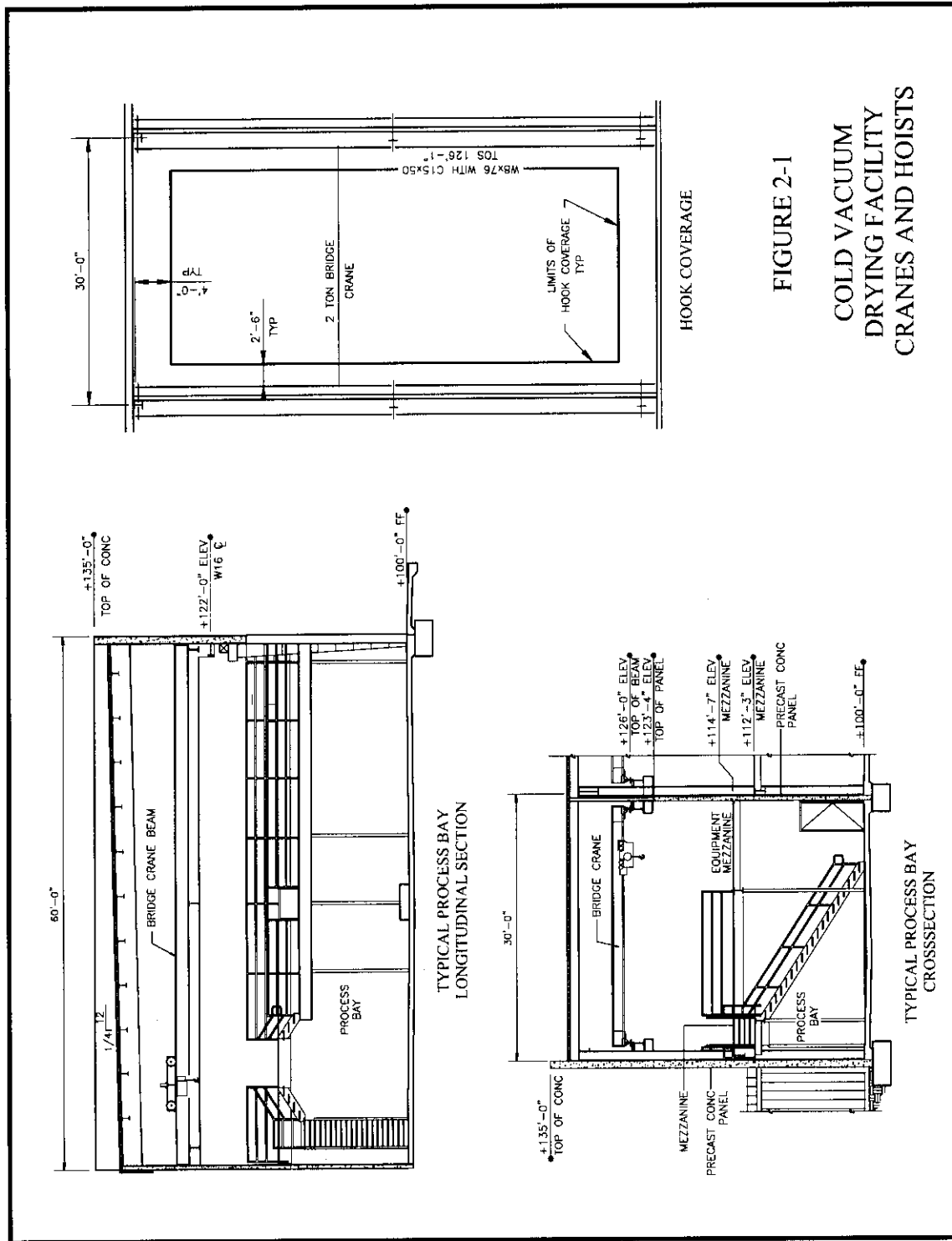


FIGURE 2-1

COLD VACUUM DRYING FACILITY CRANES AND HOISTS

### 3.0 REQUIREMENTS AND BASES

#### 3.1 GENERAL REQUIREMENTS

##### 3.1.1 System Functional Requirements

###### 3.1.1.1 Design Requirements

1. **Requirement:** Each process bay shall be equipped with an overhead bridge crane with a service rating (hoisting capacity) of 4,000 lbs (two tons).

**Basis:** HNF-SD-SNF-DRD-002, Section 6.4.4.w. Functions of the process bay bridge cranes are to remove and install the cask lid and the process hood onto the cask-MCO. The cranes may also be used to assist in maintenance activities within the process bays as needed. The MCO transport trailer supports the cask-MCO during the vacuum drying process. The process does not require the capability to load or unload the cask-MCO from the trailer at any time while it is inside the process bay. Therefore, a service rating of 4,000 lbs was determined to be adequate for the process bay cranes.

**How the system meets the requirement:** This requirement is specified in the Construction Specification for the process bay crane system (W-441-C1) as a product specification for procurement of the crane system.

2. **Requirement:** The crane bridge, trolley, and hoist shall be driven by electric motors. Controls are permanently mounted to the mezzanine guardrail in each process bay.

**Basis:** HNF-SD-SNF-DRD-002, Section 6.4.4.w. Electric motors are the normal motive power sources for bridge cranes. The decision to mount crane controls at a fixed location on the mezzanine level was a design decision.

**How the system meets the requirement:** This requirement is specified in the Construction Specification for the process bay crane system (W-441-C1) as a product specification for procurement of the crane system.

###### 3.1.1.2 Safety Requirements

###### 3.1.1.2.1 Safety Class Requirements

There are no safety class requirements for the crane and hoist system.

###### 3.1.1.2.2 Safety Significant Requirements

There are no safety significant requirements for the crane and hoist system.

### 3.1.1.2.3 Other Safety Requirements

There are no other safety requirements for the crane and hoist system.

### 3.1.1.3 Environmental Requirements

There are no environmental requirements for the crane and hoist system.

### 3.1.1.4 Mission-Critical Requirements

There are no mission-critical requirements for the crane and hoist system.

### 3.1.1.5 General Requirements

There are no unique general requirements for this system.

## 3.1.2 Subsystems and Major Components

The process bay bridge cranes consist of the following subsystems and major components: bridge girder, end trucks, bridge controls, bridge runway, runway electrification components, festooning system, wire rope hoist and trolley, push-button station, hook blocks, hooks, hoist rope, brakes, limit switches, and special tools. This section includes the requirements that characterize each of these components.

### Requirements:

- **Bridge Design:** The process bay bridge cranes are an electric driven, top-running, single girder with capped channel design. They have a 4,000-lb hoisting capacity, and a Class D (heavy service) rating.
- **Bridge Girder:** The bridge girder conforms to the crane manufacturer's load design requirements and the applicable requirements of Crane Manufacturers Association of America (CMAA) 74.
- **End Trucks:** End trucks are driven by dual motors, with a maximum tram speed of 50 ft/min, complete with brakes. Truck frames are constructed of welded steel channels and plates that form a rigid-box configuration. Seismic restraints are provided that prevent the end trucks from lifting off the runway rail during a seismic event.
- **Bridge and Trolley Controls:** Bridge and trolley controls consist of International Electro-Technical Commission (IEC)-rated contactors, 120-volt step-down transformer, thermal overload protection in all three phases, branch circuit motor fusing, and mainline contactor, all housed in a National Electrical Manufacturers Association (NEMA) type 12 enclosure. Speed control of the bridge and trolley is provided through an inverter based variable frequency drive. The movements of the hoist are controllable to within ¼ in. from a complete standstill.



- **Bridge Runway:** The bridge runway is designed with a standard rail-over-runway beam configuration with end stops, sized as required to conform to load design requirements for the crane system.
- **Festooning Systems:** Festoon cables are used to supply power to both the bridge and the trolley. Festooning systems are heavy-duty, flat cable systems similar to the “Duct-O-Wire” series flat cable electrification system manufactured by Duct-O-Wire Company. Festooning systems are provided complete with heavy duty track, end clamp and stop assemblies, trolley/saddle assemblies, cables, support brackets, junction boxes with terminal strips, and all accessories necessary for a complete installation.
- **Electric Wire Rope Hoist and Trolley:** The electric wire rope hoist and trolley have a two-ton capacity, and provide a minimum 27-ft lift at a hoisting speed of 21 ft/min, with an upper and lower limit switch, and motor-driven trolley. The trolley is operable at a maximum speed of 35 ft/min. Inverter-controlled programmable speed controls are provided to control the trolley speed.
- **Pushbutton Stations:** The station is a box that is mounted to the mezzanine guardrail in each active process bay and is powered by 120 volts AC. The layout of the control box is shown in Figure 3-1. The box consists of the following:

On the face of the box:

A key lock on the lower right-hand corner to lock or open the box for maintenance. Only the maintenance personnel hold the key.

A key lock on the lower left-hand corner to turn the power supplies on/off to this pushbutton-control station. The shift manager hold the key and delegates to the operator.

Two buttons for bridge crane, one for east direction and the other one for west direction are located between the two key locks.

Two buttons for hoist, one for up and the other for down, are located in the upper left-hand corner.

Two buttons for trolley, one for north direction and the other for south direction, are located in the upper right-hand corner.

One green button for inching up and down is located between the hoist and trolley buttons.

On the side of the box:

One toggle switch (On/Off) controls the inching green colored button on the face of the box.

On red mushroom-shaped button for emergency stop.

- **Hook Blocks:** Hook blocks are constructed of rolled, forged steel and are entirely enclosed except for the rope openings. Lubrication fittings are recessed within the sheave pin or otherwise protected.
- **Hooks:** Hooks are forged steel or forged alloy steel and swivel freely when loaded. The main hook is the single type with a safety latch that is affixed without welding. Each hook is load tested at twice its rated capacity prior to shipping. After load testing, each hook undergoes magnetic particle inspection in accordance with American Society for Testing and Materials (ASTM) A 275. Each hook also is inspected to the requirements of MIL-I-8950B. Submittal of written certification of the test results is required.
- **Hoist Rope:** Wire rope is preformed, uncoated, improved plow steel, regular lay, with independent wire rope core. The rope has a breaking strength equivalent to the rated hoist capacity with a safety factor of five. A sufficient length of rope is provided to give at least two full wraps on the hoist drum when the hook is at its lowest position.
- **Brakes:** Brakes are designed, fabricated, and installed in accordance with CMAA 74. Brakes are adjustable from outside the equipment, and the motor is removable after dismantling or disabling the brake.
- **Limit Switches:** Adjustable control limit switches of an approved type, with automatic reset, are provided to prevent over-travel of the hoist in the raise direction only. Limit switches are the totally enclosed type that is operated by the hook block. Screw-type control limit switches are provided to prevent over-travel of the hoist when lowering.

**Basis:** All of the requirements in this section are included in the Construction Specification for the CVD Facility Project (W-441-C1). These requirements reflect guidance and constraints in imposed standards (particularly CMAA 74 and DOE-RL-92-36, *Hanford Site Hoisting and Rigging Manual*) relating to design, procurement, operation, and maintenance considerations for the crane system, together with supplemental discretionary detailing by the system design engineer to produce a suitably complete description for procurement, construction, and operation.

Figure 3-1. The Layout of Hoist and Crane System Control Box in the Active Process Bays.

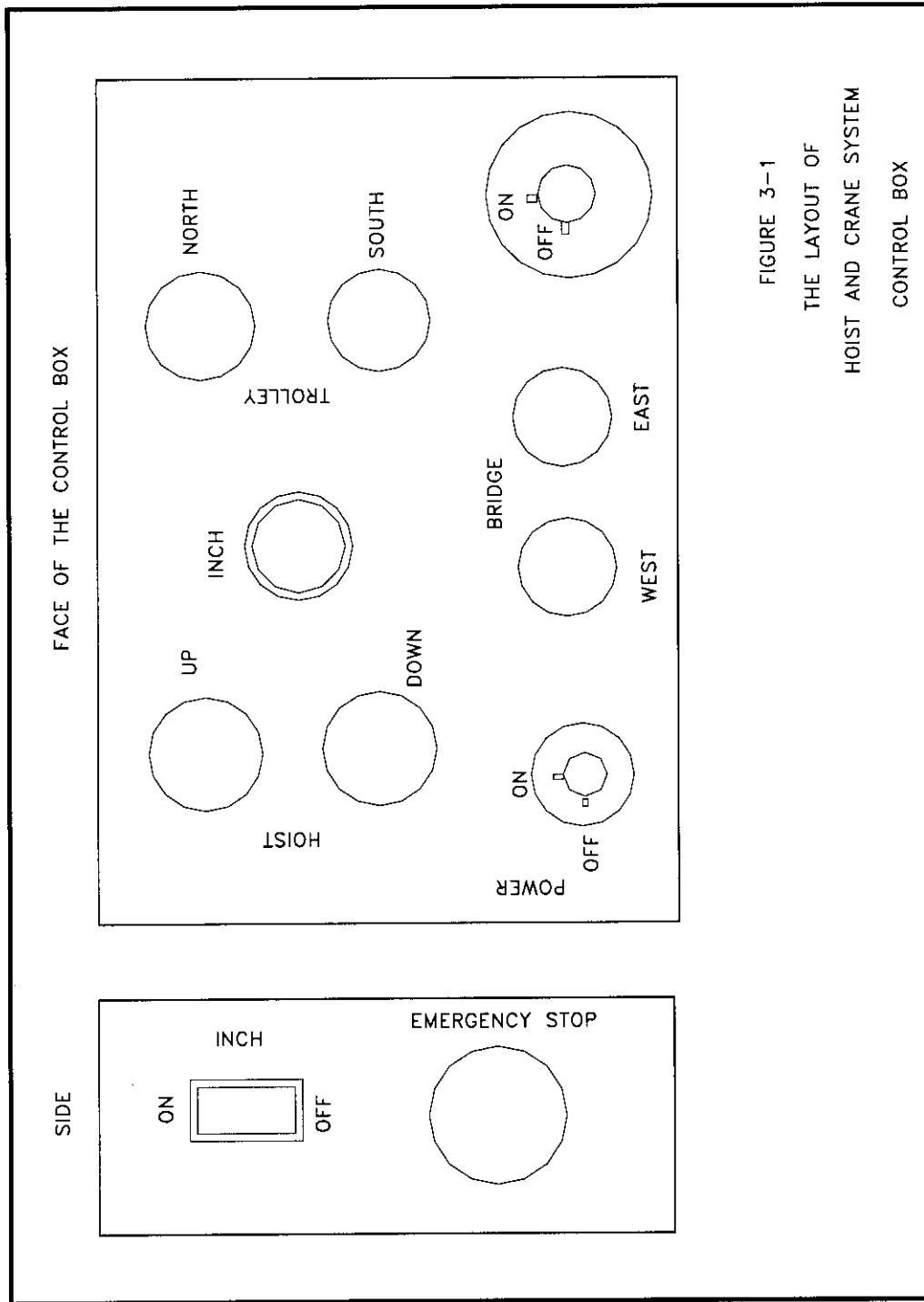


FIGURE 3-1  
THE LAYOUT OF  
HOIST AND CRANE SYSTEM  
CONTROL BOX

**How the system meets the requirement:** All of the requirements in this section were imposed (by inclusion in the Construction Specification for the CVD Facility Project) as product specifications on the procurement of the process bay cranes.

As a related topic, the DRD identifies requirements for design and procurement of the following special tools to assist crane operations in the process bays: Design descriptions and requirements for these tools are provided in a separate SDD (refer to SNF-3076).

- **Cask Lid Lift Fixture.** A lifting sling is provided for each bay to facilitate removal of the cask lid before the installation of the process hood and seal ring.
- **Process Hood Lift Fixture.** A separate sling is provided for each bay to facilitate the installation and removal of the process hood-seal ring to/from the cask.

### **3.1.3 Boundaries and Interfaces**

In the CVD Facility Project Construction Specification (W-441-C1), the crane runway rails were designated to be part of the crane system (System 14), and the runway support beams were designated as part of the building structural steel (System 06-2). The support beams are shown on Drawing H-1-82132.

Electrical power distributed to panelboards in each of the process bays is 480-V, three-phase power. Power from the panelboards to the process bay cranes is 480 V, three -phase power. The CVD Facility electrical system (System 20) is described in SNF-3075.

### **3.1.4 Codes, Standards, and Regulations**

#### **American Society for Testing and Materials (ASTM)**

- A 36-93a *Standard Specification for Structural Steel*
- A307-93a *Standard Specification for Carbon Steel Externally Threaded Fasteners*
- A325-93 *Standard Specification for High-Strength Bolts for Structural Steel Joints*
- A123-89a *Standard Specification for Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, and Bars*

#### **Crane Manufacturing Association of America (CMAA)**

CMAA 74, 1994, *Specifications for Top Running and Under Running Single Girder Electric Overhead Traveling Cranes Utilizing Under Running Trolley Hoist*, Crane Manufacturing Association of America, Charlotte, North Carolina.

#### **National Fire Protection Association (NFPA)**

NFPA-70 (1996), National Electrical Code (NEC)

## American Society of Mechanical Engineers (ASME)

ANSI/ASME B30.16, 1993, MONORAILS AND UNDERHUNG CRANES

DOE-RL-92-36 section 13.0, 1993, *Hanford Site Hoisting and Rigging Manual*, Overhead and Gantry Cranes, U.S. Department of Energy, Richland Operations Office.

WHC-SD-GN-DGS-30006 Rev 1, 1993, *Seismic Design Guide for Safety Class 3 and 4 Equipment at the Hanford Site*, Westinghouse Hanford Company, Richland, Washington.

### 3.1.5 Operability

The process bay cranes are designed to remain intact (even if they are rendered inoperable) during a design basis seismic event. The mounting provisions for the cranes are such as to preclude them from falling and possibly damaging safety class or safety significant equipment during a seismic event. Additional information on this topic is provided in Section 3.2.1.

1. **Requirement:** After the removal and installation of the cask lid and process hood, respectively, process bay cranes are not permitted to move over the cask-MCO at any time during processing activities. This restriction applies to process bays in the Operation submode only.

**Basis:** This is a TSR control (TSR AC 5.14 -- Bridge Crane Movement Restrictions) imposed on the CVD Facility operation based on safety analysis considerations. The bridge crane movement restriction derives from analyses of MCO internal hydrogen explosion accident (FSAR Section B3.4.2.4) and the thermal runaway reaction accident (FSAR Section B3.4.2.5). Without controls, thermal runaway reactions and MCO overpressurization accidents have consequences that exceed onsite risk evaluation guidelines.

**How the system meets the requirement:** This constraint dictates that controls (either physical or administrative) must be established and maintained to ensure that movement of the crane is prevented from the time that draining operations begin until the proof-of-dryness demonstration is completed and the MCO isolation valves have been closed (except when such action is required as part of an approved recovery plan). Movement of the crane has the potential to damage key process lines (i.e., tempered water, ventilation air, and safety-class helium lines) attached to the process hood, leading to unacceptable accident conditions. Restricting crane movement when the MCO is susceptible to internal hydrogen explosions and thermal runaway reactions reduces the likelihood of these events (SNF-2770, Chapter 6.0).

## 3.2 Special Requirements

### 3.2.1 Radiation and Other Hazards

Design basis accidents for the CVD Facility were evaluated in the FSAR. Three of the accident scenarios considered (internal hydrogen explosion, external hydrogen explosion, and thermal runaway reaction) could feasibly be initiated by crane dropping a load (i.e., a cask lid or process

hood) onto the cask-MCO, damaging the local ventilation air, tempered water, or safety-class helium lines connected to it. The accident assessments in the SAR led to the imposition of a TSR control (TSR AC 5.14 -- Bridge Crane Movement Restrictions) on the operation. This requirement is reviewed in Section 3.1.5.

Because the lifts performed by these cranes (i.e., lifting and lowering cask lids and process hoods) have the capability for damage to the MCO, they are classified as NRC important-to-safety, based on the definition in 10 Code of Federal Regulation (CFR) 72.3 and as implemented in HNF-SD-SNF-DB-003. However, because any damage resulting from a cask lid drop has been determined to be very minor, the important-to-safety Category C classification has been assigned.

The process bay cranes are considered general service. Although they are general service, the cranes were seismically qualified and considered in the seismic 3-over-1 assessment of the process bays (HNF-4291). The crane support structures are anchored to meet the design basis performance category 3 seismic criteria. Engineering calculations demonstrating the adequacy of the CVD Facility process bay cranes to accomplish performance category 3 criteria and 3-over-1 protection of all safety-class and safety-significant structures, systems, and components (SSCs) are listed in SNF-3001.

### **3.2.2 As Low As Reasonably Achievable (ALARA)**

To minimize the exposure of radiation to personnel, ALARA principle is applied. The following practice demonstrates the application of ALARA. The crane controls are positioned on the mezzanine level in all the active process bays. This position enables the crane to be operated at a distance from the immediate area where potential radiation exposure could significantly occur at the upper surface of the cask-MCO.

### **3.2.3 Nuclear Criticality Safety**

Not applicable.

### **3.2.4 Industrial Hazards**

Hazards and safety features related to worker safety were considered in the FSAR. The following provisions were identified to mitigate industrial hazards associated with the operation and improve worker safety:

- Cranes are operated by qualified personnel following established procedures.
- Cranes are designed with overload protection.
- Cranes are designed with over travel protection.
- Crane maintenance is performed according to established procedures.
- All lifts by cranes passing over safety-class equipment are made in accordance with U.S. Department of Energy (DOE) guidelines for critical lifts.
- Health physics personnel are present and provide surveillance of process bay operations, including crane operations.

- Radiological worker training include response procedures for evacuating the process bay in the event the continuous air monitor alarms.

These provisions may be imposed as requirements for CVD Facility process bay operations and maintenance, but do not constitute sources of new or unique requirements for the crane system design.

### **3.2.5 Operating Environment and Natural Phenomena**

The cranes are designed to operate within the indoor environmental conditions described in Section 6.5 of HNF-SD-SNF-DRD-002. The cranes are designed in accordance with requirements for natural phenomena hazards including seismic analysis criteria. They were considered in the seismic 3-over-1 assessment of the process bays (HNF-4291). The crane support structures are anchored for the design basis seismic criteria. The cranes have seismic restraints designed in to prevent the end trucks from lifting off the runway rails during a seismic event.

### **3.2.6 Human Interface Requirements**

The cranes are designed consistent with the requirements in 29 CFR 1910.179 and DOE-RL-92-36, Section 13.0.

### **3.2.7 Specific Commitments**

Not applicable.

## **3.3 Engineering Disciplinary Requirements**

### **3.3.1 Civil and Structural**

Process bay crane and hoist loads are considered as live loads, in conjunction with other live loads, in the design of the process bay structure. Live-load criteria for the CVD Facility are given in GC-LOAD-01. This requirement is addressed elsewhere (SNF-3061).

The crane support structure is designed to provide seismic 3-over-1 protection for adjacent safety-class and safety-significant SSCs per WHC-SD-GN-DGS-30006. Requirements for structural components of the process bay cranes (e.g., bridge, rails, end trucks) are discussed in Section 3.1.2 of this SDD.

### **3.3.2 Mechanical and Materials**

Mechanical and materials requirements for the process bay crane system are discussed in Section 3.1.2.

### **3.3.3 Chemical and Process**

There are no chemical and process requirements for this system.

### **3.3.4 Electrical Power**

Electrical power requirements for the process bay crane system are discussed under Sections 3.1.2 and 3.1.3.

### **3.3.5 Instrumentation and Control**

Requirements pertaining to the control system for the process bay cranes are discussed in Section 3.1.2.

### **3.3.6 Computer Hardware and Software**

There are no computer requirements for this system.

### **3.3.7 Fire Protection**

There are no fire protection requirements for this system.

## **3.4 Testing And Maintenance Requirements**

### **3.4.1 Testability**

There are no unique testability requirements for this system

### **3.4.2 Technical Safety Requirement-Required Surveillances**

There are no TSRs based surveillance's required for this system.

### **3.4.3 Non-Technical Safety Requirement Inspections and Testing**

#### **1. Requirement:**

- **Load Testing:** The complete crane assembly is tested with 125% of the rated load on the main hook. This load is raised, lowered, held in any position, and transported at full speed, or as directed. The trolley and bridge are traveled while supporting this load over the full length of their respective runways.
- **Control Test:** Tests are conducted to verify that all applicable requirements for bridge controls have been met by the crane manufacturer and that operability of the control systems conforms to the specifications.

**Basis:** All lifts involving cask-MCO equipment are classified as critical lifts. These requirements are imposed in the SAR to provide the necessary assurances that the equipment (specifically the hoists) is appropriately qualified to perform critical lifts.



**How the system meets the requirement:** This requirement appears in the SAR. Load testing requirements for specific hoist components have been discussed in Section 3.1.2. Load testing requirements are imposed on the procurement of the crane system in the Project Construction Specification (W-441-C1).

2. **Requirement:** One or more turnover packages are prepared for process bay cranes and hoists (CVD Facility System 14). Crane load and control test reports are included in this package.

**Basis:** HNF-SD-SNF-DRD-002, Section 7.6.1. This is a DRD requirement. The purpose of the requirement is to assure that all required deliverables regarding test documentation for the cranes has been received by the CVD Facility operations component when the facility assumes ownership of the system.

**How the system meets the requirement:** Load tests results are identified both as submittals and as products in the Project Construction Specification (W-441-C1).

### 3.4.4 Maintenance

Maintenance is performed per DOE-RL-92-36 and the crane manufacturer's recommended maintenance schedule.

## 3.5 Other Requirements

### 3.5.1 Security and Special Nuclear Material Protection

Not applicable.

### 3.5.2 Special Installation Requirements

Not applicable.

### 3.5.3 Reliability, Availability, and Preferred Failure Modes

A Class D (heavy service) rating has been specified for the crane system. This rating serves to communicate to the system design engineer and the crane manufacturer that a relatively high degree of ruggedness and reliability are expected relative to the system's intended service and hoisting capacity and it invokes additional requirements in CMAA 74 for design and procurement of the system.

Potential failure modes in response to a design basis earthquake were considered in the seismic assessment of the process bays (HNF-4291). Additional information relating to this assessment is provided in Section 3.2.1.

**3.5.4 Quality Assurance**

The cranes meet the quality assurance requirements of 10 CFR 830.120.

**3.5.5 Miscellaneous**

Not applicable.

## 4.0 SYSTEM DESCRIPTION

### 4.1 Configuration

#### 4.1.1 Description of System, Subsystems, and Major Components

Each process bay is equipped with an electrically driven, top running, single-girder two-ton capacity bridge crane consisting of the following components:

- A bridge girder with rigid box-constructed end trucks. The end trucks are dual motor driven with a transverse speed of 50 feet per minute. They are equipped with electric brakes and removable seismic stops, which prevent the end trucks from lifting off the runway rail during a DBE. The bridge girder in bay 5 is 7.0 inches shorter than the ones in the rest of the bays.
- Bridge controls with IEC-rated contactors, 120-volt step-down transformer, thermal overload protection, branch motor fusing, and mainline contactor. The controls are mounted in a NEMA 12-rated unit enclosure on the bridge. All bridge movements are controllable to within  $\frac{1}{4}$  inch from a complete standstill.
- Bridge runway consisting of standard rail mounted on a runway beam with end stops. The runway also includes insulated electrification consisting of conductor bars, hangers, power taps, and collector assemblies and mounting brackets.
- Festooning system with track, end clamps, and stop assemblies, cables, support brackets, and junction boxes with terminal strips.
- Electric motor-driven trolley with an inverter-controlled programmable speed control and maximum speed of 35 feet per minute. The trolley carries the hoist and hook assembly.
- Electric wire hoist with a 27-foot lift at 21 feet per minute with a geared upper and lower limit switch. The hoist rope is preformed, uncoated, improved plow steel, regular lay with Independent Wire Rope Core (IWRC) with a safety factor of 5 above the rated crane capacity.
- Hook of forged steel, single type with safety latch and swivel type connection to the hoist rope. Hook blocks are rolled forged steel and entirely enclosed except for the hook openings.
- The cranes are controlled with a NEMA 12-rated, 4-motion, 8-button and 1-toggle unit enclosure. The controls are marked HOIST UP, HOIST DOWN, TROLLEY NORTH, TROLLEY SOUTH, BRIDGE EAST, BRIDGE WEST, INCH ON/OFF, and EMERGENCY STOP. The movements of the hoist are controllable to within  $\frac{1}{4}$  inch from a complete standstill. The controls are 120 volt AC.

#### **4.1.2 Boundaries and Interfaces**

The crane bridge girder rides on the standard rail bridge runway rail. The limit of hook coverage is 4 feet from either end wall and 2 feet-6 inches from either side wall and has a vertical range of 26 feet as measured from the process bay floor.

#### **4.1.3 Physical Location and Layout**

The cranes are located at a height of 26 feet (top of runway beam) in the process bays. Refer to H-1-82132 for details about the layout and connections of the crane structural support members of the building structure.

#### **4.1.4 Principles of Operation**

Electrically driven hoist, trolley, and bridge controlled with a push button station mounted on the rail at the mezzanine level.

#### **4.1.5 System Reliability**

Not applicable.

#### **4.1.6 System Control Features**

The system can be controlled from the mezzanine level within the process bays at a push button station.

### **4.2 Operations**

Component Test Procedures have been executed to ensure that the cranes will operate as designed. Appendix C contains a list of the procedures applicable to this system.

#### **4.2.1 Initial Configurations (Pre-startup)**

Not applicable.

#### **4.2.2 System Startup**

The system is operational by energizing the crane from the applicable CVD Facility electrical distribution panel located in each bay and using the push button control pendulum to operate the crane. A detailed test specification will be developed to identify all prerequisite tests and alignments to support system startup.

### **4.2.3 Normal Operations**

The crane is used to lift the cask lid and place it on the laydown area. It also places the hood connection on the cask/MCO. Operating procedures will be developed to provide specific requirements.

### **4.2.4 Off-Normal Operations**

The system will not operate on loss of power.

### **4.2.5 System Shutdown**

The system is shut down when power is no longer available.

### **4.2.6 Safety Management Programs and Administrative Controls**

The safety management programs and administrative controls for this SDD will be integrated into the SNF Project Integrated Safety Management System.

## **4.3 Testing And Maintenance**

### **4.3.1 Temporary Configurations**

Not applicable.

### **4.3.2 Technical Safety Requirement-Required**

Process bay cranes are not permitted to move over the cask-MCO at any time during processing activities. This restriction applies to process bays in the Operation submode only. This is a TSR control (TSR AC 5.14 -- Bridge Crane Movement Restrictions) imposed on the CVD Facility operation based on safety analysis considerations.

### **4.3.3 Non-Technical Safety Requirement Inspections and Testing**

The crane is tested with 125% of rated load on the main hook. The load test is considered a critical lift and procedures are written with detailed instructions per DOE-RL-92-36. After load testing, each hook is inspected nondestructively by magnetic particle according to ASTM A 275. The hooks are also inspected to the requirements of MIL-I-8950B after the testing.

### **4.3.4 Maintenance**

Due to the short operating lifetime of the CVD Facility, no specific crane maintenance is expected other than that required by the crane manufacturer's recommended maintenance schedule. All maintenance is to be carried out in accordance with DOE-RL-92-36, Section 13.9

## 5.0 REFERENCES

- CMAA 74, 1994, *Specifications for Top Running and Under Running Single Girder Electric Overhead Traveling Cranes Utilizing Under Running Trolley Hoist*, Crane Manufacturing Association of America, Charlotte, North Carolina.
- GC-LOAD-01, *Standard Architectural-Civil Design Criteria, Design Loads for Facilities*, ICF Kaiser Hanford Company, Richland, Washington.
- HNF-3553, Rev. 0, 1999, *Final Safety Analysis Report for the Cold Vacuum Drying Facility (draft)*, Fluor Daniel Hanford, Inc., Richland, Washington.
- HNF-4291, 1999, *Seismic Adequacy Review of Non-Safety Class (PC-0,1,2) Systems, Components, and Equipment that are Potential Seismic Interaction Hazards with Safety Class (PC3) Equipment at the CVD Facility*, Numatec Hanford Corporation, Richland, Washington.
- HNF-SD-SNF-DB-003, 1997, *Spent Nuclear Fuel Project Path Forward, Additional NRC Requirements*, Rev. 3, Westinghouse Hanford Company, Richland, Washington.
- SNF-2770, 1998, *Cold Vacuum Drying Facility Design Basis Accident Analysis Documentation*, Rev. 0, Fluor Daniel Hanford, Inc., Richland, Washington.
- SNF-3001, 1998, *Cold Vacuum Drying Facility Supporting Data and Calculation Database*, Fluor Daniel Hanford, Inc., Richland, Washington.
- SNF-3061, 1999, *Cold Vacuum Drying Facility, Civil/Structural System - System Design Description*, COGEMA Engineering Corporation, Richland, Washington.
- SNF-3075, 1999, *Cold Vacuum Drying Facility, Electrical System - System Design Description*, COGEMA Engineering Corporation, Richland, Washington.
- SNF-3076, 1999, *Cold Vacuum Drying Facility, Specialty Equipment and Special Tools - System Design Description*, COGEMA Engineering Corporation, Richland, Washington.
- W-441-C1, Rev 1, *Construction Specification for Project W-441, Cold Vacuum Drying Facility*, Merrick and Company,
- WHC-SD-GN-DGS-30006, Rev 2, *Guidelines for Assessing the Seismic Adequacy of Existing Performance Category Equipment at the Hanford Site*, Fluor Daniel Hanford, Inc., Richland, Washington.

**APPENDIX A**  
**SYSTEM DRAWINGS**

H-1-82104, Cold Vacuum Drying Facility Architectural Section.

H-1-82132, Sheet. 1, Structural Crane Plan, Sections, Details.

H-1-82297, Cold Vacuum Drying Facility Instrumentation Control System Conduit Plan.



**APPENDIX B**  
**SYSTEM PROCEDURES**

1. Component Test Procedures

SNF-CTP-EE-24 CRANE INSPECTION (DE-ENERGIZED)

SNF-CTP-EE-25 CRANE INSPECTION (ENERGIZED)

2. Operating procedures

OP-14-001V PERFORM PRE-USE TEST ON CVD CRANES AND HOISTS

3. Maintenance Procedures

MP-14-001V TEST AND INSPECT BRIDGE CRANES

## DISTRIBUTION SHEET

To	From	Page 1 of 1			
Distribution	Spent Nuclear Fuel – Cold Vacuum Drying	Date 6/6/00			
Project Title/Work Order		EDT No. N/A			
Cold Vacuum Drying Facility Crane and Hoist System Design Description		ECN No. 655974			
Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only

Spent Nuclear Fuel Project

W. C. Alaconis	X3-79	X			
P. G. Beaudet	S8-07	X			
J. R. Brehm	R3-26	X			
D. B. Cole	X3-78	X			
M. D. Evarts	N1-29	X			
J. R. Gregory	X3-78	X			
C. S. Haller	X3-78	X			
J. J. Irwin	R3-86	X			
K. McCracken	S1-53	X			
C. R. Miska	R3-86	X			
P. A. Morrell	G1-50	X			
T. Nuxall	R3-86	X			
B. M. Parker	R3-86	X			
L. W. Price	R3-26	X			
R. K. Ramsgate	R3-86	X			
M. J. Schliebe	L6-13	X			
B. J. Shapley	R3-86	X			
G. Singh	X3-78	X			
Y. S. Tran	R3-86	X			
C. Van Katwijk	R3-47	X			
D. R. Whitwoth	R3-11	X			
T. L. Wood	S2-45	X			
CVD Library (A. Artzer, 2 copies)	R3-86	X			
CVD Satellite Library	X3-25	X			
SNF Project Files	R3-11	X			
SNF Startup Library	B2-64	X			
 Kelly Bartlett (Through Lou Oliveros)					
Meier Enterprise		X			
8697 Gage Boulevard					
Kennewick, WA 99336					