Sta 5 APR 26 2000	S (12)	ENGINEERING DATA TRANSMITTAL	Page 1 of 1 1. EDT 628635
-----------------------------	-------------------------	-------------------------------------	-------------------------------------

2. To: (Receiving Organization) Distribution	3. From: (Originating Organization) PFP Project Management	4. Related EDT No.: N/A
5. Proj./Prog./Dept./Div.: Bagless Transfer System, 234-5Z	6. Design Authority/Design Agent/Cog. Engr.: H. R. Risenmay	7. Purchase Order No.: N/A
8. Originator Remarks:		9. Equip./Component No.: N/A
		10. System/Bldg./Facility: /234-5Z/PFP
		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
11. Receiver Remarks:		14. Required Response Date: N/A
11A. Design Baseline Document? ☒ Yes ☐ No		

15. DATA TRANSMITTED					(F)	(G)	(H)	(I)
(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	Approval Design- ator	Reason for Trans- mittal	Origina- tor Dispo- sition	Receiv- er Dispo- sition
1	HNF-6084	1	0	Design Criteria for BTS	N/A			
				Packaging System				

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 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment	4. Reviewed no/comment 5. Reviewed 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		Design Authority	See Cog. Eng.			1	/	W.D. Bartlett			
		Design Agent				1	/	D.R. Speer			
1	/	Cog. Eng.	H.R. Risenmay	4-18-2000		1	/	M.D. Talbot		4/23/00	TS-15
1	/	Cog. Mgr.	R. A. Burk	4/24/00	TS-15	1	/	D.C. Johnston		4/14/00	N2-07
		QA						Central Files			BI-07
		Safety									
		Env.									

18. <i>J.M. Tanke</i> Signature of EDT Originator	19. <i>R.A. Burk</i> Authorized Representative for Receiving Organization	20. <i>H.R. Risenmay</i> Design Authority/ Cognizant Manager	21. DOE APPROVAL (if required) Ctrl No. _____ ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments
Date 4-18-00	Date 4/24/00	Date 4-24-2000	

Design Criteria for BTS Packaging System

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

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

Fluor Hanford

P.O. Box 1000

Richland, Washington

Design Criteria for BTS Packaging System

HR Risenmay
Fluor Hanford

Date Published
April 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
4/25/00
Date

LEGAL DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. 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. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

This report has been reproduced from the best available copy.

Total Pages 37

Printed in the United States of America

**DESIGN CRITERIA
FOR
BTS PACKAGING SYSTEM
(BPS)**

**TO BE INSTALLED IN BUILDING 234-SZ
INCLUDING**

- 1. Bagless Transfer System Module**
- 2. Blend, Sieve and Balance Equipment**
- 3. Supercritical Fluid Extraction Module**

April 2000

**BTS PACKAGING SYSTEM (BPS)
PRELIMINARY
DESIGN CRITERIA
TABLE OF CONTENTS**

1.0 INTRODUCTION	5
1.1 Assumptions	5
1.2 Background	5
1.3 Purpose	6
1.4 System Descriptions	6
1.5 Project Justification	7
1.6 Site Location	7
1.7 Project Integration	7
1.8 Process Description	7
1.9 Future Plans	8
2.0 PROJECT PERFORMANCE REQUIREMENTS	9
2.1 Bagless Transfer System (BTS) Module	9
2.2 Blend, Sieve and Balance Equipment	9
2.3 SFE Module	9
2.4 Component Design Life	9
2.5 Materials of Construction	9
2.6 Required Availability	10
2.7 Operability and Maintainability	10
3.0 SPECIFIC REQUIREMENTS	11
3.1 Bagless Transfer System (BTS) Glovebox Module	11
3.2 Blend, Sieve and Balance Equipment	11
3.3 Supercritical Fluid Extraction Module	11
4.0 FACILITY CRITERIA	14
4.1 Architectural and Civil/Structural	14
4.2 Heating, Ventilation, Air Conditioning	14
4.3 Utilities	14
4.4 Communications Systems	15
4.5 Automatic Data Processing	15
4.6 Energy Conservation	15
4.7 Maintenance	15
5.0 GENERAL REQUIREMENTS	16
5.1 Safety	16
5.2 Environmental Protection and Compliance	17
5.3 Safeguards and Security	18
5.4 Natural Forces	19
5.5 Design Format	19
5.6 Quality Assurance	19
5.7 Decontamination and Decommissioning	19
5.8 Human Factors Considerations	19
5.9 Testing	20
6.0 Project Performance Characteristics	21
6-A Performance Characteristics	21
6-B Specialty Component Specifications	21
6-C Safety Considerations	23
6-D BPS Process Control and Data Management	25
6-E Construction Considerations	25
7.0 PROCESS CRITERIA	29
7.1 Stabilization and Packaging Equipment Support System Process Criteria	29

8.0 APPLICABLE CODES AND STANDARDS.....32
9.0 REFERENCES34
Appendix A35

ABBREVIATIONS AND ACRONYMS

ALARA	As Low As Reasonably Achievable
BPS	BTS Packaging System
BTC	Bagless Transfer Can
BTCC	Bagless Transfer Convenience Can
BTS	Bagless Transfer System
CSER	Criticality Safety Evaluation Report
DBA	Design Basis Accident
DBE	Design Basis Earthquake
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U. S. Department of Energy
FSAR	Final Safety Analysis Report
FH	Fluor Hanford
FHI	Fluor Hanford Incorporated
HLAN	Hanford Local Area Network
HEPA	High Efficiency Particulate Air
HNF	Document designator for Hanford Site after October 1, 1996
HQ	DOE Headquarters
LANL	Los Alamos National Laboratory
LOI	Loss on ignition
LLNL	Lawrence Livermore National Laboratory
LLWTF	Low Level Waste Treatment Facility
NDA	Nondestructive Assay
NMSTG	Nuclear Materials Stabilization Task Group
PFP	Plutonium Finishing Plant
PHMC	Project Hanford Management Contract
PSE	Preliminary Safety Evaluation
Pu	Plutonium
QAPD	Hanford Quality Assurance Program Description
RL	U.S. Department of Energy-Richland Office
SFE	Supercritical Fluid Extraction
SNM	Special nuclear material
SRS	Savannah River Site
TGA	Thermogravimetric Analyzer System

1.0 INTRODUCTION

This document provides the criteria for the design and installation of a Bagless Transfer System (BTS); Blend, Sieve and Balance Equipment; and Supercritical Fluid Extraction System (SFE).

The project consists of 3 major modules:

1. Bagless Transfer System (BTS) Module
2. Blend, Sieve and Balance Equipment
3. Supercritical Fluid Extraction (SFE) Module

1.1 Assumptions

1.1.1 Acceptance of the glovebox 7329 for the BTS/SFE equipment application:

It is assumed that the glovebox 7329 will be acceptable and can be modified as required for this application. If it is not found to be acceptable another glovebox will be required and it may effect the design criteria.

1.1.2 The Bagless Transfer Convenience Can (BTCC) design

The BTCC is the proposed convenience can that will be inserted into the 3013-99 Bagless Transfer Can (BTC) and this can is currently under design being done by others not involved with this project. It is assumed that the design will be acceptable and useable for this project, and there will be no special design considerations necessary for the design criteria.

1.1.3 Formal Design Review

A formal design review will be conducted to finalize the location of the gloveboxes and equipment and to validate the design and process.

1.2 Background

Bagless Transfer System operations have been part of the W-460 Project. PFP management submitted an Advance Work Authorization for procurement of a second BTS for use in building 234-5Z. The second BTS was proposed as a method to reduce cost and radiation exposure to workers. The cost savings and exposure reduction come from the reduction of the following work steps currently planned and budgeted: movement from the vault to line, removal of three outer cans, sampling of some percentage of stabilized material to insure loss on ignition requirements are still met, and packaging into a Bagless Transfer Can (BTC) also referred to as a 3013 inner can.

A Kepner-Tregoe Decision Analysis was conducted to decide on the location of the BTS, Blend/Sieve, and SFE/TGA equipment. The consensus of the participants was that the equipment should be located at the west end of conveyor HA-28 in Room 235B. Originally, the Blend/Sieve glovebox would tie in to HA-28 perpendicularly, the SFE/TGA glovebox tie in to HA-28 in-line, and the BTS glovebox tie in to the other end of the Blend/Sieve glovebox. Subsequent to the K-T Decision Analysis, project participants developed a more streamlined approach. This approach uses the existing glovebox HC-18M, conveyor HA-28, eliminates the TGA, combines the SFE and BTS into a single glovebox and adds a special transition piece, with isolation capability, between conveyor HA-28 and BTS/SFE glovebox.

A BTS is currently being procured and fabricated as part of the W-460 Project. A second BTS will be ordered. Either BTS will be provided to the 234-5Z building to be installed with the BTS/SFE glovebox.

Existing gloveboxes have been located on the Hanford site that are available for use and are of sufficient size to house the various pieces of equipment. Glovebox modifications will be required. These gloveboxes will be certified for use on this project.

The Los Alamos National Laboratory has evaluated the SFE technology for moisture measurement in stabilized plutonium bearing materials. The SFE process is significantly faster and provides a more specific analysis than the loss on ignition (LOI) furnace method. The increase in productivity will reduce the time required for sample analysis results and therein improve throughput rates and reduce the requirements for lag storage.

A Blender will be used to mix material after the material has been through the furnace.

1.3 Purpose

This Project will provide the capability to perform packaging for the inner container of a can complying with the requirements of DOE STD 3013-99 and provide moisture testing for this material. The installation of these systems will reduce the radiation exposure to workers and reduce the overall time for packaging into 3013-99 containers.

1.4 System Descriptions

1.4.1 Bagless Transfer System (BTS) Module

The BTS Module includes the following components:

- BTS/SFE glovebox for housing the BTS and SFE.
- The BTS welding unit, consisting of controls, welder, inert gas system, cooling system and camera for visual weld inspection.
- A failed can cutter, to be located in HA-28.
- A leakage tester, to be located in room 235B.
- A transition piece connecting the BTS/SFE glovebox to HA-28.

The function of the BTS module is to provide confinement in the upper portion of the BTS, receive filled convenience cans containing Pu oxide or Pu metals/alloys, receive 7-inch foodpack cans via a sphincter port, enable the convenience cans to be placed into a container with a contamination-free exterior, fill the inner can head space with helium, weld a plug to the inner wall of the container, and then cut the middle of the weld while maintaining upper glovebox confinement. The completed can will then be leak tested. Included in this module is a closed-loop cooling system for the weld cable and cameras to visually observe the weld/cut area and a can cutter apparatus. The welded container will be provided in accordance with the requirements of 3013-99.

1.4.2 Supercritical Fluid Extraction (SFE) Module and Sample Balance

The SFE Module includes the SFE equipment to be located in the BTS/SFE glovebox and a sample analytical balance for weighing samples. The SFE provides sampling of the materials which have been stabilized after processing is complete to ensure that the moisture content and/or volatile materials meet the requirements for long term storage of the material in accordance with DOE Standard 3013-99, "Criteria for Preparing and Packaging Plutonium Metals and Oxides for Long Term Storage". The Supercritical Fluid Extraction (SFE) process has been selected as an appropriate technology for the measurement of moisture required by the DOE standard. In addition the sample balance will provide very accurate weight measurements of the samples before and after the SFE process.

1.4.3 Blend, Sieve and Balance Equipment

The function of the blend equipment is to homogenize material both prior to stabilization and after the material has completed the stabilization process. In addition, a sieve/shaker will provide capability to ensure that material meets size requirements for the BTS and SFE sampling. The balance will provide the weight of the material in the convenience can. The blend, sieve/shaker and balance will be installed in HC-18M.

1.5 Project Justification

Storage of plutonium special nuclear material (SNM) (metals or oxides of greater than 30 percent by weight plutonium) in a common package for 50 years of safe, stable storage is one of the key elements of the DOE program to stabilize nonreactor nuclear facilities across the United States. This key element is embodied in DOE Standard DOE-STD-3013-99. Although DOE standards are guidelines rather than compliance documents, the Nuclear Materials Stabilization Task Group (NMSTG) has directed compliance with its provisions.

1.6 Site Location

The glovebox and equipment will be installed at the 234-5Z building at the PFP facility and be located in Room 235B.

1.7 Project Integration

Primary programmatic interfaces are briefly discussed below:

The BTS portion of this project will be coordinated with the W-460 Project, which is procuring the BTS welding system. The BTS welding system will be integrated with a glovebox provided by this project.

Plutonium-bearing solids containing greater than 30 weight-percent plutonium and uranium will be processed in a system designed to reduce the material to an oxide form (with the exception of alloyed and unalloyed metals) and to remove volatiles and moisture in preparation for safe, stable 50-year storage. The types of SNM to be handled in the BPS include the following:

- Plutonium Oxides
- Mixed Plutonium-Uranium Oxides (MOX)
- Alloyed and Unalloyed Metals (Packaging Only)

Incoming materials may be in a variety of container configurations and sizes (See Table 1). The system must be capable of receiving material in boats or cans from HA-28.

TABLE 1

DIMENSIONS OF SELECTED CONTAINERS USED AT PFP			
Designation	Type	Diameter	Height
Oversize Can (Outer)	Overpack, Crimp Seal	4.75"	6.75"
7-Inch Foodpack Can	Overpack, Crimp Seal	4.25"	7"
PUREX Secondary Can	Overpack, Crimp Seal	4.0625"	6.25"
Large Tomato Can	Overpack, Crimp Seal	4.25"	4.875"
Small Tomato Can	Overpack, Crimp Seal	4.0625"	4.625"
Hanford Convenience Can (Innermost can of the Hanford Convenience Can Package)	Material, Organic-Free Crimp Seal	3.4375"	8"
0.8L PUREX Slip Lid Can	Material, Slip Lid	3.4375"	5.625"
0.5L Slip Lid Can	Material, Slip Lid	3.5"	3.5"

1.8 Process Description

The design criteria is based on the following process steps:

- Boats of material are transferred from a furnace and are received in HC-18M.
- Material is put through a sieve/shaker.
- Material is mixed in a blender.

- Material is placed in a convenience can.
- A sample of the material is taken and sent to the SFE. Sample material is transferred back to HC-18M and put back in the container or blended with a new batch.
- Upon acceptable sample results the convenience can is transferred to the BTS.
- The convenience can is placed in a 3013 can and welded.
- 3013 cans passing weld inspection are removed from the BTS and transferred to a leakage tester.
- 3013 cans failing weld inspection are pushed into the BTS/SFE glovebox and transferred to the HA-28 conveyor to open the 3013 can and remove the convenience can. The convenience can is placed in another 3013 can and welded.
- 3013 cans passing the leakage test are transferred to another facility for installation of the 3013 outer can or are placed in storage.
- 3013 cans not passing the leakage test are put back into the HA-28 conveyor, opened, and the convenience can is placed into another 3013 can for welding and testing.
- Scrap from 3013 BTC is bagged out through the transition piece.

1.9 Future Plans

1.1.1 In the future two additional gloveboxes near the BTS/SFE glovebox may be added.

- An SFE glovebox will be attached to the transition piece connecting HA-28 and the BTS/SFE glovebox. The SFE equipment from the BTS/SFE glovebox will be relocated to this new glovebox. In addition, the failed can cutter located in HA-28 would be relocated to the BTS/SFE glovebox, in the area where the SFE resided.
- A blender, sieve/shaker and balance glovebox will be attached perpendicularly to HA-28 near the new SFE glovebox. This equipment will eliminate the necessity of transporting the material back to HC-18M for processing after furnace operations are completed.

2.0 PROJECT PERFORMANCE REQUIREMENTS

General performance requirements are provided in this section.

2.1 Bagless Transfer System (BTS) Module

The BTS Module must:

- Produce twelve (12) inner-welded containers (3013-compliant) in a 24-hour steady-state operational period.
- Provide equipment to maintain individual personnel exposure at less than 500 mrem per year (TEDE) and less than 15,000 mrem (skin and extremity) due to the inner can welding operation.
- Receive filled convenience containers and sample vials from HC-18M via the HA-28 conveyor.
- Provide the capability to prepare process waste streams for disposal and allow for removal of welded cans from the module.
- Provide the capability to purge the inner welded can head space with helium after placement of the convenience can and maintain the helium atmosphere during the welding operation.
- Provide the capability to monitor the weld tip and the cutter wheel tolerances and alignment.
- Provide a welded inner container that meets the requirements of DOE STD-3013-99.
- Provide leakage testing for the welded inner containers.
- Provide the capability to open a can in the event of a non-conforming weld or a failed leak test (failed can cutter).

2.2 Blend, Sieve and Balance Equipment

- Provide the capability to receive the powder boat or cans of oxide after stabilization is complete.
- Provide the capability to homogenize the oxide prior to material stability testing.
- Provide the capability to transfer material for samples to the SFE Module for analysis.
- Provide the capability to fill convenience containers for placement into the BTS Module.
- Provide the capability to weigh material and transfer the convenience containers.

2.3 SFE Module

- Provide capability to measure the moisture content per requirements of DOE STD-3013-99.
- Provide the capability to receive the sample material from HA-28.
- Provide the capability to place the sample into an extraction cartridge for analysis by the SFE, and then placing the extraction cartridge into the SFE.
- Provide the capability to weigh the samples for analysis.
- Provide the capability to transfer sample material back to HA-28.

2.4 Component Design Life

The design goal for the stabilization and packaging equipment as well as the interface equipment is 5 years. After the PFP inventory is stored in 3013 packages, it is anticipated the equipment will be decommissioned.

2.5 Materials of Construction

Materials of construction and equipment used in the Project shall be compatible with the radiological and chemical environment to which they will be exposed for the specified design life of that component.

To the extent practicable, process hardware located inside gloveboxes shall be fabricated of Type 300 series stainless steel, or a similar stainless steel with high temperature properties. Commercial stainless steel hardware may be used outside the glovebox.

Gasket materials for equipment shall be chosen as needed for low permeability and compatibility with air, argon, helium, and nitrogen. The design shall specify radiation-resistant gaskets and gaskets which are resistant to oil, if necessary.

Components contacting packaging elements shall be compatible with Type 316 stainless steel.

2.6 Required Availability

The equipment used for stabilization and packaging shall be capable of operating continuously 24 hours a day, 5 days a week for a minimum of 5 years. Support utilities shall be capable of operating for the same duration.

Facility support systems, i.e., ventilation, fire suppression, alarm functions, power and other utilities shall be capable of operating continuously 7 days a week, 24 hours a day, for 20 years.

2.7 Operability and Maintainability

Installation of system interfaces, laboratory equipment, and relocation of existing facility functions shall provide a safe, efficient, and secure system for personnel to operate and maintain.

Principles of human factors engineering shall be considered throughout the design of project systems. Instrumentation and controls shall have the capability of monitoring and controlling all parameters necessary for BPS long term operations. Physical configuration and spacing of fixtures and equipment shall provide for ease of service and operational needs. As much as possible, the design shall utilize standard components that are currently utilized and readily available as spares.

A recommended spare parts list shall be prepared as part of the detailed design.

3.0 SPECIFIC REQUIREMENTS

3.1 Bagless Transfer System (BTS) Glovebox Module

3.1.1 Scope

The scope of the BTS Glovebox Module includes the utilization of an existing BTS welding system procured and fabricated as part of the W-460 Project and the integration of that module into an existing glove box. The glovebox shall be attached to the HA-28 conveyor glovebox via a transition piece. The glovebox shall meet the performance requirements as specified in Section 6-B Specialty Component Specifications. This module includes:

- The BTS (supplied by the W-460 Project), including welder, cutter, and support hardware.
- Integration of the BTS with the glovebox
- Connections of electrical and mechanical equipment, and utilities to the installed equipment.
- Tie-ins to the Plant utilities (electricity, ventilation, support gases, fire protection).
- Design and modification of an existing glovebox to meet the requirements for installation of the equipment.
- Design, fabrication and installation of a transition piece connecting HA-28 to the BTS/SFE glovebox. The transition piece shall seismically isolate the BTS/SFE from HA-28 and contain gloveports and bagout capability, as well as future connection of another glovebox.
- A trolley system for transport of sample vials to and from the transition piece to the SFE.
- Guillotine doors for isolating the transition piece from HA-28, and from the BTS/SFE glovebox.

Note: The BTS welder is currently being fabricated, and was started under the W-460 Project. The W-460 Project will transfer the in-process fabrication to the BPS project. See "Memorandum of Understanding for Supply of a Second Bagless Transfer System to The Plutonium Finishing Plant", Revision 0, March 2000, for additional details.

3.2 Blend, Sieve and Balance Equipment

3.2.1 Scope

The Blend, Sieve and Balance Equipment includes the design, fabrication, and installation of a Sieve/shaker and a Blender for blending material for subsequent sampling and analysis by the SFE. The following items are included:

- Blender with controls, 2 liter capacity, table mounted, to be located in HC-18M.
- Sieve/shaker, for sieving oxides, to be located in HC-18M.
- Balance, for weighing material, to be located in HC-18M.
- Sampling Equipment, to be located in HC-18M.
- Tie-ins to Plant utilities (electricity, ventilation, support gases, fire protection).
- Modifications to HC-18M for installation of blender, sieve/shaker and balance.

3.3 Supercritical Fluid Extraction Module

3.3.1 Scope

The scope of the SFE Module includes the design, fabrication and installation of the SFE and supporting equipment at PFP. This will include the following items:

- Extractor
- FTIR spectrometer
- Restrictor
- Mettler Analytical Balance (Model AB-104, or similar)
- Syringe Pump
- Compressed CO₂ Cylinder

- Compressed air source
- Connections of electrical and mechanical equipment, and utilities to the installed equipment.
- Tie-ins to the Plant utilities.(electricity, ventilation, support gases, fire protection)
- Design and modification of an existing glovebox to meet the requirements for installation of the equipment.

The equipment will be installed in the BTS/SFE glovebox. The glovebox shall meet the performance requirements as specified in Section 6-B Specialty Component Specifications.

3.3.3 SFE CRITERIA

3.3.3.1 Materials to Be Analyzed

Inputs

Inputs consist of 1 to 20 gram quantities of powdered Plutonium bearing materials. The material is introduced to the SFE from HA-28. The SFE samples are sealed in a vial for transport into the glovebox. The SFE samples are put into a 10-ml cartridge for analysis.

Outputs

The output of the sample analysis process is dried powdered Plutonium bearing materials with the moisture removed. The dried material is returned to the original vials and then sent back to the process line for disposition. The moisture and CO₂ carrier fluid is exhausted into the glovebox.

Throughput

The SFE process shall be capable of analyzing a sample in approximately 30 minutes. Sample preparation, weighing and recovery will require approximately fifteen minutes (15). For planning purposes, the equipment will be capable of processing 16 samples during an eight (8) hour shift. The equipment shall be designed to be capable of operating continuously 24 hours a day, 5 days a week.

3.3.3.2 Material Handling

Sample Containers

Vials shall be used contain the sample powders, and to transport them to and from the process line to the SFE. The material is loaded into the glass vial and placed into a carrier tray for transfer into the glovebox. Once inside the glovebox, samples are prepared for the SFE equipment. For the SFE, the sample will be placed into an extraction cartridge. After analysis, the material can be returned to the glass vial, and transferred back to the process line for disposition.

Sample Tray

A sample tray shall be used to ensure that the sample containers can be transported easily. The number of containers that each sample container can hold is not specified herein, but shall be at the discretion of Analytical Laboratory and Stabilization Operations personnel.

3.3.4 Equipment Installation

3.3.4.1 The equipment locations inside or outside of the glovebox are identified below for major components:

INSIDE THE GLOVEBOX	OUTSIDE THE GLOVEBOX
Extractor	Syringe Pump
FTIR	Compressed CO ₂ Supply
Restrictor	

3.3.4.2 The SFE requires a dimensional envelope of 37" wide X 12" high X 32" deep. This spacing will accommodate the equipment and provide adequate access for maintenance and operation.

3.3.4.3 A minimum of 12" is required on the front of the equipment to allow the technicians room to operate the equipment, stage samples, etc.

3.3.4.4 The centerline of the glove ports shall be located for best use.

3.3.5 Interfaces

3.3.5.1 Ventilation

The flow of ventilation shall be provided to ensure that a negative pressure is maintained within the glovebox and transition piece compared to room 235C, and positive pressure to the higher contamination levels in the adjacent thermal stabilization gloveboxes, and conveyor systems.

3.3.6 Utility Requirements

3.3.6.1 Electrical Power

The SFE equipment utilizes 120/230vac, 1Φ, 60 Hz

3.3.6.2 CO₂

Supercritical fluid extraction grade CO₂ is delivered to the SFE extractor at approximately 3000 psi and 140°C.

3.3.7 Safeguards & Security

There are no special requirements for the safeguards and security of this material or equipment that have been identified at this time to meet the requirements of DOE Order 6430.1A. The final design shall be reviewed by Safeguards and Security personnel prior to commissioning.

3.3.8 Decontamination & Decommissioning

The design of the installation and glovebox shall not preclude Decontamination and Decommissioning after the completion of its mission. Features that assure successful Decontamination and Decommissioning are noted in DOE Order 6430.1A (Sections 1300-11.1 and 1300-11.2).

Where reasonable, the installation design shall facilitate the efficient collection of spilled powders.

3.3.9 Component Design Life

The Material Stabilization Project Management Plan, HNF-3605 projects the life span of the stabilization activities to be complete by 2005. The SFE equipment will be required to be utilized until that time. The design life of the glovebox, and accessories, as well as the equipment shall have a design life that meets or exceed this requirement.

3.3.10 Maintainability

The SFE/BTS glovebox shall be designed to allow for ease of maintenance of common parts and replacement items. The glovebox shall be designed to facilitate the complete replacement of the SFE.

4.0 FACILITY CRITERIA

4.1 Architectural and Civil/Structural

Design of components and systems to be installed in the 234-5Z Complex must not interfere with the seismic resistance of existing structures.

All construction, occupancy ratings, and existing building requirements will be governed by NFPA Codes.

4.2 Heating, Ventilation, Air Conditioning

Background information on the existing heating, ventilation, and air conditioning systems in the 234-5Z Building can be found in Appendix A.

Process ventilation for BPS equipment installed for this Project shall exhaust to an existing exhaust stack through testable HEPA filtration stages. The number of testable HEPA filter stages will be confirmed by safety analysis performed during the design activity.

The interface design shall include glovebox gas supplies (inert gas); process exhaust is to be provided by connection to the existing exhaust system. Heat loading and zone control shall be evaluated in the definitive design stage of this Project. Room ventilation requirements shall be analyzed for adequacy.

All nuclear grade filtration equipment and components will be constructed to American Society of Mechanical Engineers (ASME) N509 and tested to requirements of ASME N510.

4.3 Utilities

Utility support services to the gloveboxes shall comply with *DOE/RLID 5480.7A, Glovebox Fire Protection Criteria*. The following new or enhanced utility supplies are required for BPS operation:

- Helium System (for container backfill in the BTS),
- Room ventilation (existing and additional HEPA filters),
- Ventilation Exhaust System from Gloveboxes,
- Welding Gases (argon and helium for welding),
- Plant Instrument Air System (for some instruments),
- 120 VAC 60 HZ Power Supply System,
- 208/220 VAC 60 HZ Power Supply System,

4.3.1 Process Water

Closed loop cooling is required for the BTS Tungsten Inert Gas (TIG) welder cable, using a non-hazardous recirculating fluid. Water for fire suppression (i.e., room sprinklers) is available via existing supply lines to the building fire suppression sprinkler pipe system. There are no direct connections to the 243-Z Low Level Waste Treatment Facility (LLWTF) from 234-5Z facilities. The design should not introduce any liquid process waste that cannot be removed from the facility in a batch-wise method.

4.3.2 Electrical

Electrical supply capacity shall be evaluated during definitive design. The Project requires 120-volt single phase and 208/220 volt single phase power. The capacity requirements for each feed will be determined during definitive design. The electrical power supply evaluation shall include an evaluation of the existing metering data, alternatives of transferring power for external loads to a separate power source, and reducing peak demand requirements for intermittent loads such as welding equipment. Uninterruptible power requirements shall be fulfilled as required.

At the point of connection to the power distribution system, power feeders for the BPS shall meet the requirements of IEEE-591, *"IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems."*

4.3.3 Lighting

The existing building lighting system will provide basic room lighting for installation and operation. Any additional task lighting will be determined and added during the definitive design stage. Temporary lighting for construction will be provided on an as-needed basis.

4.4 Communications Systems

Specific communication system components in the operating area will be specified during definitive design. These components may include an intercom, private automatic exchange (PAX) phone for internal use, a public telephone, and a tie-in to the PFP talk-box system. Due to rearrangements in various facility work spaces, all communications systems now located in the 234-5Z Building shall be analyzed for adequacy and modified as necessary.

4.5 Automatic Data Processing

Any new automatic data processing desired would be incorporated into the operating control system or the NDA laboratory control computers, as required. The automatic data processing shall, at a minimum, process and retain data required by DOE-STD-3013-99 and shall be exportable to standard spreadsheet programs. The automatic data processing shall have reserve capacity to process and retain additional process control information. Data removal will be by media such as diskette or removable hard drive for subsequent analysis.

4.6 Energy Conservation

The design of Facility modifications will implement sensible energy conservation measures to the extent that it does not adversely affect system reliability, maintainability, project costs, maintenance costs or life cycle costs.

4.7 Maintenance

All facility modifications and equipment shall be designed to permit routine maintenance activities and reduce the need for specialized equipment wherever practical and cost effective. Operating systems shall minimize exposure to hazardous or radioactive environments. ALARA practices shall be incorporated into all design for the maintainable and replaceable components as well as all maintenance activities. Equipment selections should be standard components whenever possible.

Mechanical and electrical systems shall be easily maintainable as defined by the demonstrated replacement of wear-critical parts within two hours. Space shall be provided adjacent to all equipment and confinement systems to allow easy access for maintenance.

5.0 GENERAL REQUIREMENTS

Federal, State, and local laws and regulations, and DOE orders and standards, in effect at the start of the design shall apply to the extent specified in the *Plutonium Finishing Plant Standards/Requirements Identification Document*, SD-MP-SRID-003 (S/RID) Rev. 1. International agreements applicable to the PFP in place at time of publication of this document are also listed. Additional agreements may be negotiated during the detail design and implementation of the Project.

5.1 Safety

5.1.1 Safety Classifications

A Preliminary safety analysis for the BTS in the W-460 Project has been performed. The gloveboxes were categorized as Safety Class for criticality purposes and Safety Significant for material confinement. The material in the BTS/SFE glovebox in 234-5Z will be limited based on ALARA (estimated to be approximately 9 kgs including samples), and the safety classification initially set as safety significant for both criticality purposes and material confinement. A safety analysis for installation in 234-5Z will be performed to confirm this classification, and if necessary the safety class will be revised. As part of the scope of the Project, a draft PFP Safety Equipment List will be submitted during the definitive design to include the systems, structures and components installed and modified by the Project.

5.1.2 Criticality

All structures, systems and components shall be designed, fabricated and operated to remain sub-critical for all fissile materials to be stabilized or stored in PFP. If there is a potential for critical concentrations of fissile material in the BPS, criticality analyses shall be provided. All storage units, equipment, vessels, and piping shall be engineered to prevent criticality while balancing the use of nuclear poisons with personnel safety. Project designs shall conform to requirements listed in HNF-PRO-537, *Criticality Safety Control of Fissionable Material*.

As part of the scope of the Project, the Criticality Safety Evaluation Reports (CSER) for the systems shall be provided for the BPS and related equipment.

The 234-5Z criticality detectors shall not be moved from their present locations.

5.1.3 Safety Analysis

The current revision of the PFP FSAR (Rev. O-L) limits the plutonium inventory in certain portions of the facility. Preliminary analysis shall be performed during the definitive design to verify whether the addition of the equipment would change the possession limits and whether criticality limits to be applied to the project would affect the PFP Authorization Basis.

A Preliminary Hazards Assessment (PHA) was completed in conjunction with the original Project W-460 conceptual design. An analysis shall be performed based on the PHA to ensure that the scenarios in the PHA are still applicable and that there are no new scenarios resulting from the project's new mode of execution. Detail descriptions, accident analyses and descriptive changes to the FSAR shall be completed prior to acceptance of the completed project.

5.1.4 Contamination Control

All structures, systems and components designed for the portion of this Project shall confine contamination to the vicinity of the source and minimize contamination spread. Gloveboxes shall be designed such that during glovebox waste removal activities, contamination levels can be verified before removal from confinement. Glovebox 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. Contamination migration by airflow within the BPS shall be minimized.

5.1.5 Radiation Exposure

The maximum annual exposure to a facility worker from all sources must not exceed the cumulative limits set forth in 10 CFR 835, *Occupational Radiation Protection*, and in HSRCM-1, *Hanford Site Radiological Control Manual*, summed over all controlled access areas. The radiation exposure of each operations

worker is limited to no more than 1.0 rem per year, with administrative controls (HSRCM-1, Article 212) and a worker monitoring program which provide hold points starting at a cumulative exposure to any worker at 0.5 rem. Where necessary, shielding shall be provided to maintain personnel radiation exposure levels ALARA as governed by 10 CFR 835, Subpart K, and DOE Order 5480.11, *Radiation Protection for Occupational Workers*. 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)*, DOE STD-1128-98, *Guide to Good Practices for Occupational Radiological Protection in Plutonium Facilities* and DOE/EV/1830.T5, *A Guide to Reducing Radiation Exposure to As Low As Reasonable Achievable (ALARA)*. The source term used for shielding design should be the maximum expected during normal operation. Source terms which may develop in operating and storage areas shall be considered in the design. The minimization of background radiation levels shall also be considered in the design.

Maximum annual dose limits to the public as a result of PFP operations shall be in accordance with SD-CP-SAR-021, *PFP Final Safety Analysis Report*.

Where there is potential for airborne contamination, allowance shall be made for internal deposition of radionuclides in determining the total dose. Maximum allowable airborne contamination levels are provided in HSRCM-1.

There are varying levels of Americium in-growth in the plutonium stored at the PFP. For the calculation of radiation exposures, 85 g Am-241 per 5 kg of Pu oxide should be assumed as an average concentration.

Consideration shall be given to maintenance and decontamination activities associated with a given design option. Design shall be planned to confine total per capita worker radiation exposure to less than 500 mrem annually for these maintenance and decontamination activities. Exposure rate limits apply at points where personnel are located during a particular maintenance or decontamination activity as opposed to general areas. Access categories may be temporarily changed when required for maintenance and decontamination.

5.1.6 Industrial Safety

Industrial safety hazards will be identified in the project's Hazard and Operability (HAZOP) study. The identified hazards will be eliminated or reduced through implementation of safety and health standards, policies and procedures in the Occupational Safety & Health Topic under Project Hanford Policies & Procedures.

5.1.7 Industrial Hygiene

Design and construction shall ensure compliance with applicable industrial health and safety standards (29 CFR 1910 and 29 CFR 1926), policies and procedures in the Occupational Safety & Health Topic under Project Hanford Policies & Procedures. Design and construction shall also ensure compliance with the most recent consensus standards applicable to occupational safety and health (e.g. ACGIH Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices).

5.1.8 Fire Protection

Facility modifications shall be designed in accordance with DOE/RLID 5480.7A, *"Fire Protection"*. The exception is that glovebox and glovebox fire detection and suppression systems shall be designed in accordance with DOE-STD-1066-97 *DOE Standard Fire Protection Design Criteria*, Section 15; and applicable NFPA standards, including NFPA 801, the standard for Facilities Handling Radioactive Materials.

Overheat detection shall be provided in all gloveboxes, spaced at a maximum of 8 feet apart. Areas of ambient heat will require the proper temperature heat detector. The fire-fighting category for areas of building 234-5Z modified by the Project shall be analyzed and updated during definitive design.

5.2 Environmental Protection and Compliance

A Notice of Construction shall be prepared, if required, and submitted to the State of Washington Department of Health and the U.S. Environmental Protection Agency prior to construction. All work that will be performed that has the possibility of radiological or non-radiological emissions shall be brought to

the attention of the PFP gaseous effluent cognizant engineer and the PFP Environmental Compliance Officer (ECO).

All solid waste that will be generated during installation and operation shall be reviewed by the PFP solid waste engineer and disposed of in accordance with PFP waste handling procedures.

No services are currently provided for treating industrial wastewater discharges from 234-5Z. The closed loop cooling liquid for the BTS TIG welding cable may constitute a potentially contaminated liquid stream. Provisions for the transport of the liquid to the 243-5Z building for treatment prior to discharge to the Treated Effluent Disposal Facility will be made.

The Plutonium Finishing Plant Stabilization Environmental Impact Statement provides basic National Environment Policy Act (NEPA) documentation for the Project. However, a review will be conducted to verify any supplemental analysis needed for operation of the systems installed by the Project.

A cultural resource review has been completed for PFP stabilization activities. The Memorandum of Agreement to Mitigate the Historical Significance documentation for the Plutonium Finishing Plant complex has been approved by the Department of Interior. No further review is required.

5.3 Safeguards and Security

The processing of SNM requires physical protection as outlined in the Department of Energy orders: DOE 5632.1C *Protection and Control of Safeguards and Security Interests* and DOE 6430.1A *General Design Criteria*. Material tracking and accountability requirements are provided in the Department of Energy order DOE 5633.3B *Control and Accountability of Nuclear Material*.

A security vulnerability risk analysis for this area will be included as part of a routine annual update and is not included within the scope of the Project.

5.3.1 Safeguards Material Control and Accountability

5.3.1.1 Packaging and Related Equipment

Capability shall be provided for all necessary nuclear material accounting data generated by the BPS to be transmitted to the PFP nuclear material accounting system. This may be accomplished via remote or manual instrumentation, and/or provision for manual collecting of data.

Capability for clean out or measurement of holdup and scrap nuclear materials shall be a design feature of any equipment provided by the Project which will directly contact SNM. The design must accommodate daily administrative checks and a physical inventory every 2 months, with a limit-of-error for inventory differences of less than the smaller of a Category II quantity of special nuclear material or 2% of total throughput and active inventory.

Provision shall be made for access to appropriate nuclear material measurement systems to ensure compliance with domestic safeguards limit-of-error for SNM inventory difference requirements. An SNM safeguards statistical analysis shall define and allocate acceptable uncertainty values to each component of the measurement system.

Package components and the completed packages shall meet safeguards requirements for Category I types and amounts of SNM. Pertinent safeguards concepts embodied in the design of the 3013 package include a permanent and unique item identification number, an inherent tamper-indicating design, and a physical structure which permits accurate NDA of the contents.

Both domestic and international safeguards may require sampling on a periodic basis during processing; it is not yet clear whether sampling for destructive analysis will be required during periodic SNM inventories after processing. The requirement for sampling includes provision of a means to ensure that particles in the batch to be sampled are relatively uniform in nature (if the material is not a powder, a crushing device will be needed) and well-mixed (requires a blender) and a balance which is accurate per safeguards standards plus a means of transferring the sample away from the sampling area to the laboratory.

5.4 Natural Forces

Building 234-5Z was designed to Hanford Plant Standards and the UBC of 1967 for seismic resistance. The 2736-ZB building was designed to Hanford Plant Standards and the UBC of 1976 for seismic resistance. As the 234-5Z building is the primary confinement barrier, the equipment will not be designed to be the primary confinement barrier.

The PFP FSAR contains restrictions on the quantities of plutonium that may be released in a seismic event. The PSE will verify if any other natural phenomena events need be compensated for in the designs for the Project. All plutonium handled outside of the BPS shall be contained as required for storage vault items. Design of BPS interface items and storage components shall ensure that no component jeopardizes the facility classification.

All other equipment shall be secured as required by the NFPA revision in effect at the time of construction. The project is anticipated to be within the analyzed bounds of the PFP Authorization Basis for natural phenomena.

5.5 Design Format

Drawings that interface with existing PFP facility drawings shall provide traceability to these existing drawings by identifying the affected Hanford drawings in accordance with HNF-PRO-1819, *PHMC Engineering Requirements*.

Modifications that affect the accuracy or completeness of any Essential Drawing identified in H-2-99480, *PFP Essential and Support Drawing List*, shall require that revision of the affected Essential Drawing be completed by the Project.

Equipment Component Identifier numbers designated for new equipment shall be defined in accordance with SD-CP-RD-024, *Component Identifying Standard for the PFP*. Labels shall be installed in accordance with drawing H-2-89710 "PFP Labeling Standard."

5.6 Quality Assurance

Quality Assurance and Quality Control services shall be provided for design specification, design, materials procurement, fabrication, installation and acceptance testing activities. Quality Assurance Program requirements are derived or based upon HNF-MP-599, *Project Hanford Quality Assurance Program Description (QAPD)*, which defines the implementation of 10 CFR 830.120, *Nuclear Safety Management Quality Assurance* for PFP as it is designated a non-reactor nuclear facility. ASME NQA-1-1994 may be used to implement 10 CFR 830.120.

Reviews, Inspections, and other Oversight services shall be supplemented with any additional services defined by the designers and fabricators as being essential to assuring the adequacy of the design conformance of "as-installed" with the design requirements. Physical work performed On-Site and Off-Site shall be performed in accordance with a QA Plan (QAP), approved prior to contracted work, which shall implement 10 CFR 830.120.

Fire system materials shall be procured and inspected as Quality Level 3 in accordance with HNF-PRO-259, *Graded Quality Assurance* if procured through FHI procurement.

5.7 Decontamination and Decommissioning

All structures, systems and components shall be designed to limit dispersion of radioactive materials, and facilitate decontamination and decommissioning or reuse. All internal surfaces should be finished (ground, polished, etc.) to facilitate decontamination. Within the glovebox, cracks, crevasses and corners shall be minimized to facilitate decontamination. Components anticipated to contact radionuclides should be designed for easy disassembly using common tools, to the extent practical. Disassembled components should be compact enough to fit in an existing type of disposal package such as a 208-liter (55-gallon) drum. Auxiliary equipment that has no requirement to be placed in a surface contamination area should be located in a buffer zone if practical.

5.8 Human Factors Considerations

Human factors engineering shall be considered for all phases of design in the Project.

Operation of the welder shall be primarily monitored and controlled from a remote control interface (computer) in a single location, as feasible. This location will be within view (either direct or via camera), but in a location to limit personnel exposure to ALARA.

All interface/workstations shall allow for varying staff ergonomics and shall be sealed as feasible to allow for easy decontamination.

All hand-operable equipment shall be positioned such that it can be seen by the operator during manipulation. Any support equipment requiring operation while in the BPS operating room must be easily accessible (if within a glovebox, from glove ports) to allow for maintenance. As much as possible, *hand-operable equipment shall be consolidated in a minimal number of gloveboxes to expedite operations.*

Both intercom (PAX) and normal telephone lines shall be within several feet of any control interface/workstation.

The connection of an electronic database to the operator console shall be evaluated and determined by PFP Process Engineering during definitive design.

5.9 Testing

Acceptance and operational testing of all the Project modules shall be in accordance with approved Acceptance Test Procedures (ATP) and Operational Test Procedures (OTP). Operational testing of the BPS may be conducted using surrogate material for plutonium oxide, such as cerium oxide or tungsten oxide, to be determined by PFP Process Engineering. The A-E shall ensure that all required testing apparatus connections are specified and included to support the referenced testing.

6.0 Project Performance Characteristics

6-A Performance Characteristics

6-A.1 Receipt of Nuclear Material

- RA-1** The project shall provide capability for the receipt of existing containers into a glovebox (see Table 1, Section 1.6). The majority of containers shall be accommodated via inlet sphincters, with airlock or bag-in capability of sufficient size to accept the largest storage container as needing to be unloaded.
- RA-2** For material control and accountability, the BPS design shall provide the capability to allow for electronic data collection by installation of spare connectors in the gloveboxes. At the present time, all necessary data for material control and accountability is to be collected manually.
- RA-3** The Receipt Area shall provide capability of receiving existing containers manually.

6-A.2 Transport of Containers within the BTS/SFE Glovebox

- TA-1** The Project shall be capable of transferring containers from the HA-28 conveyor, to/from the BTS/SFE glovebox, and sample vials to/from the SFE. The dissemination of contamination shall be minimized.

6-A.3 Stability Testing of Stabilized Oxide

- LOI-1** The design shall include an in-line capability for determining the moisture / volatile content of a representative batch sample by heating the sample in a Supercritical Fluid Extraction (SFE)
- LOI-2** The plutonium oxide shall be proven to be thermally stabilized to less than 0.5 weight percent loss on ignition (LOI). The equipment shall have the capability to retain this characteristic through final packaging.
- LOI-3** A balance for analytical-quality weighing shall be provided for holding of SFE samples until final weighing is completed.

6-A.4 Filling of Convenience Containers

- FA-1** A balance for weighing of filled convenience cans shall be provided, with 2-place accuracy (i.e. within 0.01 gram).
- FA-2** Provision shall be made to allow filling the convenience container with free-flowing stabilized oxide and avoiding the significant dissemination of powder.

6-A.5 Packaging in Inner Welded Can

- BTS-1** In the BTS Glovebox, all movements of convenience cans and insertion of the convenience can and plug into an inner can shall be done manually. Provisions shall be made for the use of extension tools and Pu handling best practices.
- BTS-2** In the BTS Glovebox, all movements of packaging components shall be done manually.
- BTS-3** The sphincter seal shall be designed for ease of replacement.

6-B Specialty Component Specifications

6-B.1 Gloveboxes

- BOX-1** The design of system gloveboxes shall comply with DOE 6430.1A, Sections 1161-1 and 1161-2, and with the Guidelines for Gloveboxes, American Glovebox Society.
- BOX-2** The design shall specify that the gloveboxes and hood shells shall be at least 7 gauge Type 304 stainless steel. All internal structural members and supports and exterior stands shall be 304 stainless steel. Determination of glovebox skin thickness shall consider structural issues for preventing glovebox floor warpage during BPS operations.
- BOX-3** For gloveboxes requiring lighting from external room lighting, the design shall specify that the windows located on top of the gloveboxes for lighting shall be 1/4 inch wire glass. All other light and viewing windows shall be safety plate glass.

- BOX-4** Glove rings/ports shall be specified in the design to provide a means to install airtight flexible gloves for access and manipulation inside the glovebox. All glove ports/rings shall be of a push-through type design. All glove rings/ports shall be specified in the design to accept airtight plugs and shall be designed to be installed in the vertical walls of the glovebox.
- BOX-5** The glovebox design shall provide storage fixtures inside gloveboxes and hoods for tools and equipment parts. The glovebox design should minimize items welded directly to the gloveboxes to facilitate decontamination and operational flexibility.
- BOX-6** Continuous butt welds are required for the glovebox skin and should be located away from corners or edges. *Whenever possible, gloveboxes shall be welded to one another, to entry cabinets, and to airlocks.* The transition glovebox shall be bolted.
- BOX-7** Gloveboxes shall be designed such that during glovebox waste removal activities, contamination levels can be verified before removal from confinement.
- BOX-8** The design shall specify that all glovebox exterior surfaces that are visible and accessible should have a uniform appearance as near the interior box finish as possible. Surfaces of structural members inside gloveboxes shall correspond to the shell finish. Machined surfaces shall have a 64 to 125 AA finish and rounded corners. Outside structural members shall have a mill finish, aesthetically similar to the exterior shell finish.
- BOX-9** The design shall specify all process and service piping as well as electrical and instrument lines shall enter or exit gloveboxes by means of pass-through connectors that do not compromise leak tightness (e.g., welding, low-permeability gaskets, or potting).
- BOX-10** The design shall specify that all gas supply lines shall be HEPA-filtered before they pass through the glovebox shells in order to prevent migration of contamination into the clean supply lines.
- BOX-11** The design shall specify that utilities (e.g., water, air, gas) serving gloveboxes shall be provided with shutoff or isolation valves outside the glovebox.
- BOX-12** Pneumatic operators within a glovebox shall be designed to use air or nitrogen.

6-B.2 Atmosphere in Enclosures

- ATM-1** The design for the interface between the equipment and the ventilation system shall prevent backflow into the gloveboxes from the facility ventilation system.
- ATM-2** The gas supply line design shall specify a HEPA inlet filter or a backflow prevention device between the supply and the glovebox atmosphere to eliminate backflow of radiological contamination.
- ATM-3** The design shall specify that the glovebox process exhaust lines shall contain HEPA filters to provide initial filtering prior to the process exhaust system. These filters are not included in the two stages of required testable HEPA filtration in the exhaust system. HEPA filters in the exhaust system shall be located as close to the glovebox as practicable to minimize ductwork contamination.
- ATM-4** Any hoods used in the BTS/SFE glovebox shall be designed to minimize the gas flow required to meet/maintain a minimum face velocity of 100 ft/min.
- ATM-5** Differential pressures in the BTS/SFE glovebox shall be such that the flow of air through leakage in the confinement systems will always be from areas of lower contamination to areas of higher contamination, for example, from the general facility, to the room 235B room, to the interior of the gloveboxes or hoods. Backflow of air from a more contaminated area to a lesser contaminated area shall be prohibited via filtration or backflow preventers.
- ATM-6** To prevent glovebox over pressurization, a means of rapidly exhausting the glovebox (e.g., dump valves or similar device) shall be provided on gloveboxes that have a potential pressure source.
- ATM-7** The design of gas inlets to the gloveboxes and furnaces shall preclude dispersal of plutonium oxide from open sample vials.

6-B.3 Electrical Components Within Gloveboxes

- E-1** The design shall specify that electronics, controls, and power supplies shall be contained in cabinets mounted in a rack where possible.
- E-2** The design shall specify that all electrical connectors within gloveboxes shall be dust tight.
- E-3** The design shall specify that the electrical connectors at glovebox walls shall be plug-type disconnects and shall comply with MIL-C-5015.
- E-4** The design shall specify that the lighting fixtures for gloveboxes shall have illuminaries with baffles, or other devices, to diffuse light and to ensure that the bulb is not visible to the operator's eye. The lighting interior and exterior to the glovebox shall provide a method for adjustment to minimize glare. The ease of viewing at working surfaces and points of operation shall be considered during the design of lighting for gloveboxes. A desirable lighting level at these locations is 50-60 foot-candles.
- E-5** Fluorescent lighting with 120 V receptacles is preferred but other types may be used when necessary. Lights may be grouped with a common switch for a number of lights serving a hood or glovebox.
- E-6** Lighting fixtures shall be installed exterior to the gloveboxes to the extent practical to aid in maintenance of the fixtures.
- E-7** Electrical equipment and lighting shall be designed and installed to meet the requirements of NFPA 70 and NFPA 101.

6-B.4 Seismic Considerations for Support Structures and Platforms

- SSP-1** All structures, systems and component supports shall be designed per the criteria found in the References in Section 8 for the appropriate Performance Category of the SSC.
- SSP-2** Existing structures, systems and components used for this equipment shall be reviewed and upgraded, if necessary, to ensure their capability to withstand applicable loading, if affected by this Project. Existing structures, systems and components which are not going to be used for the BPS, and are left as is in the area of the project location, will be reviewed for seismic interaction affecting safety related BPS equipment.
- SSP-3** Concrete anchorage will be designed using the guidelines of HNF-PRO-097 *Engineering Design and Evaluation* and DOE-STD-1020-94 *Natural Phenomena Hazards Design and Evaluation Criteria for Department of energy facilities*.
- SSP-4** Equipment supports will be designed to avoid resonance resulting from the harmony between the natural frequency of the structure and the operating frequency of supported reciprocation or rotating equipment per DOE 6430.1A, section 0111-2.8.1.
- SSP-5** Seismic loads for concrete anchorage of fixtures and equipment in building 234-5Z shall be calculated using References in Section 8.

6-C Safety Considerations**6-C.1 Industrial Safety**

- SAFE-1** The design shall protect workers sufficiently from hazards to ensure that workers can perform actions required during normal operations, anticipated operational occurrences, and postulated accidents.
- SAFE-2** The design shall ensure prompt, safe shutdown in emergencies, and allow ready access to areas where manual corrective actions are required.
- SAFE-3** The design shall ensure that "Safety Class" components will continue to perform their functions during all normal operations and anticipated operational occurrences and during and after any postulated emergency or accident condition. Safety Class components or items shall continue to operate until appropriate corrective actions can be taken to bring the facility or system to a safe condition and the function of the Safety Class item is no longer required.

- SAFE-4** The design of the gloveboxes and the equipment, or location of equipment, in the gloveboxes shall prevent pinch points and shall prohibit sharp corners and protrusions that can puncture glovebox gloves. All corners shall be smooth and rounded to a minimum radius of about 5/8 inches.
- SAFE-5** Machine Guarding: The design shall specify machine guards where machinery and moving parts are accessible to prevent injury from inadvertent contact. Machine guards shall meet the requirements of 29 CFR 1910, Subpart O, Machinery and Machine Guarding, and including section 212, General Requirements for All Machines. The Blender may be excluded from this requirement provided that its operation is controlled external to the glovebox (i.e., the operators hands are outside the glovebox during operation of the blender).
- SAFE-6** Electrical Safety: All electrical components shall be designed to meet all local and site code requirements as well as those in 29 CFR 1910, Subpart S, Electrical Standards, and including sections 302 to 308, Design Standards for Electrical Systems.
- SAFE-7** Lock-Out/Tag-Out Requirements: Potential sources of hazardous energy (i.e. electrical, hydraulic, high pressure lines, etc.) will be designed to have the capability to be locked out in accordance with 29 CFR 1910, Section 147, *Control of Hazardous Energy Sources*.
- SAFE-8** Work Platforms and Work Surfaces: Work platforms and surfaces shall be designed to meet the requirements of 29 CFR 1910, Subpart O, Walking and Working Surfaces, and including section 23(c), Protection of Open Sided Floors, Platforms and Runways, and section 24, Fixed Industrial Stairs.
- SAFE-9** Compressed Gases: The design of the storage facilities and systems for compressed gases shall meet the requirements of 29 CFR 1910, Subpart M, Compressed Gases and Compressed Air Equipment, and all incorporated references.

As good engineering practice, fittings for the inert gases will be developed to ensure that compressed air or oxygen cylinders cannot be inadvertently connected to the systems which are used to inert glove boxes and enclosures. The use of compressed air to power pneumatic machinery in areas of the process where there is the potential for ignition of plutonium or other materials shall be minimized to the extent practical.

6-C.2 Radiation Shielding Requirements

- RAD-1** Shielding shall be included in the design of the gloveboxes. The design criteria for the BPS equipment shielding shall not exceed 1000 mrem, which is 20 percent of the allowable per 10CFR835.202. Operator exposures shall be maintained ALARA with a goal of less than 500 mrem per year (TEDE) and less than 15,000 mrem (skin and extremity) due to the BPS operation. Measured or calculated exposures should include the logged time/dose for all processing steps in the BPS, including those performed both inside and outside the gloveboxes.
- RAD-2** In glovebox areas, stainless steel, lead or other acceptable material shall be used to shield gamma radiation and solid hydrogenous materials shall be used to shield neutron radiation, if required. Any flammable shielding materials to be employed must be outside of the gloveboxes and encased in nonflammable materials. Windows shall use leaded glass or plastic to shield gamma and neutron radiation.

6-C.3 Design for Nuclear Safety

- CRIT-1** Engineered controls shall be included in the design of the glovebox system to ensure that the materials, as applicable, are always in a desirable configuration and array to prevent criticality. Configuration control of the material and array using administrative controls shall be allowed only if no other practical control method can be used.
- CRIT-2** All glovebox criticality limits will be based on maintaining a system with moderation sufficient to represent operator's arms in the glovebox.
- CRIT-3** The equipment shall be designed to remain subcritical if flooded.
- CRIT-4** The design shall enable the weighing of the incoming container to minimize the likelihood of inserting the wrong container into the system due to a paperwork or human error.

- CRIT-5** All gloveboxes shall have designated, fixed-array locations with restraints for unit masses of plutonium, with edge-to-edge spacing in accordance with the CSER.

6-D BPS Process Control and Data Management

6-D.1 Process Control System

- PCS-1** The design shall specify equipment safety interlocks as required by the PSE, followed by rigorous hazard analysis during definitive design.
- PCS-2** The design shall specify components to monitor and control environmental conditions within the stabilization and packaging processes for radiological contamination and inert gas atmosphere integrity.
- PCS-3** The design shall specify components to obtain selected data inputs of stabilization and packaging process information, either by keypad entry or by reading data manually or via bar code reader. In addition, the design shall include an automatic data recording system to record for the welding process parameters, and shall alarm anytime the process parameters are not met.
- PCS-4** The design shall specify the components necessary to control automatic operations within the packaging processes.
- PCS-5** The design shall specify the components necessary to weigh the material going into the inner containers and weigh the loaded inner containers. Each balance requires a minimum range of 0 to 1.5 times the maximum package weight in grams. Balances shall meet the requirements of DOE Order 5633.3B for accuracy and repeatability. Balances shall have the capability to interface with remote recording equipment.
- PCS-6** The design shall specify the components necessary to alert operators of off-normal situations. Alarms and indicators for manual work stations shall be both local and at the process control computer.

6-D.2 Data Management System

- DMS-1** The design shall specify the components necessary to accumulate data to support the 3013 storage package certification requirements.
- DMS-2** The design shall specify the components necessary to provide system operational information, for trending equipment performance and use.

6.E Construction Considerations

6-E.1 Protective Coatings and Cleaning

- COAT-1** The design shall specify that after fabrication and inspections have been completed, all system components shall be thoroughly cleaned, descaled, and degreased. All surfaces shall be cleaned to remove such debris and contaminants as weld flux, oil, grease, shop dust, masking tape, cutting fluids, grinding residue and temporary markings. Cleaning may be accomplished by mechanical means, with non-halogenated solvents, or by using water, steam or non-halogenated detergent cleaning agents or any combination thereof. Caustic or acid cleaning shall not be used. Final wash and rinse shall be accomplished with potable water meeting the requirements of the Public Health Service Drinking Water Standards. Drying after final rinsing shall be accomplished using forced dry air. Compressed air used for drying shall be free of water and oil.
- COAT-2** The design shall specify that no stainless steel surfaces, interior or exterior, shall be painted unless specifically called for in this functional design criteria. All unfinished carbon steel components of the equipment shall be specified to be thoroughly cleaned by sandblasting or pickling to remove all chemical contamination, mill scale, rust scale and rust and shall be painted with one coat of epoxy paint. No paint shall be applied within 2 inches of field weld areas.

6-E.2 System Quality Factors

- SYS-1** The equipment shall have a design life of a minimum of 5 years. The equipment used for packaging shall be designed to be capable of operating continuously 24 hours a day, 5 days a week for 5 years.

- SYS-2** The system shall be designed to be easily maintainable as defined by the demonstrated replacement of wear critical parts within two shifts. Wear critical parts are defined as any parts, critical to the operation of the BPS, that are expected to require replacement or repair during the 5 year design life.
- SYS-3** Routine maintenance operations should generate no more waste than an equivalent normal shift operation.
- SYS-4** The design shall specify sufficient space be provided adjacent to all equipment and confinement systems to allow easy access for maintenance.
- SYS-5** The design shall ensure that equipment and components inside gloveboxes shall be maintainable from the exterior of the glovebox.
- SYS-6** The radiation shielding for gloveboxes should be designed to facilitate installation, removal, and decommissioning of BPS equipment.

6-E.3 Environmental Conditions

- ENVR-1** All equipment and associated components shall be designed to function at ground level elevations ranging from 0 to 1000 feet above sea level.
- ENVR-2** The design shall specify components which will function properly in a nitrogen, helium or argon environment at temperatures 55F to 100F.

6-E.4 Materials of Construction

- MATL-1** The design shall specify that gasket materials have low permeation, be compatible with low humidity, argon, and be resistant to radiation and oil.
- MATL-2** The design shall specify that special hardware inside the gloveboxes shall be Type 300 series stainless steel, however, galling characteristics of special hardware with respect to 300 series stainless steels shall be evaluated. Commercial stainless steel hardware may be used outside the glovebox for handles and hinges.

6-E.5 Toxic Products and Formulations

- TOX-1** The design shall specify that asbestos or asbestos-bearing materials and Polychlorinated biphenyls (PCB) or PCB-bearing materials shall not be used.
- TOX-2** The design shall specify that mercury or mercury-bearing materials shall not be used, except in the external, commercial fluorescent lighting on top of the gloveboxes.
- TOX-3** Metallic lead, which may be used for radiation shielding purposes, shall be encapsulated.
- TOX-4** All materials installed or used shall be used in accordance with OSHA Material Safety Data Sheets (MSDS) requirements in reference 29 CFR 1910, Subpart Z.

6-E.6 Use of Standard and Commercial Parts

- PART-1** The design shall specify that the mechanical fasteners shall be of either US or metric standard dimensions, materials, and strengths.
- PART-2** The design shall specify that electrical components shall be NEMA or equivalent. Motor control shall be IEC. Protective devices shall have Type 2 Coordination, as a minimum.
- PART-3** The design shall consider the controls necessary for controlling suspect/counterfeit items per HNF-PRO-301 *Control of Suspect/Counterfeit Items*.

6-E.8 Nameplates and Product Marking

- NAME-1** The design shall specify that all equipment, controls, instruments, and panels included shall use vendor drawings and vendor references for identification.
- NAME-2** The design shall provide a Master Equipment List containing the equipment ID numbers, description, part number, and specifications (e.g., range, set point, alarm point).
- NAME-3** The design shall comply with PFP labeling standards.

6-E.9 Construction for Ease of Decontamination

- DECON-1** Crevices and sharp corners shall be eliminated from the glovebox design, including equipment installed in the glovebox, to prevent the accumulation of contaminated materials that are inaccessible for cleanup. The design of the glovebox and the installation of the equipment in the glovebox shall not create areas that are inaccessible for cleaning. Seals that can collect materials that cannot be removed shall be avoided.
- DECON-2** The design shall specify that gloveboxes shall have metal surfaces polished to a #4 finish to promote contamination control and to provide for enhanced cleanup. The objective should be that all interior surfaces are smooth to facilitate cleaning and decontamination.
- DECON-3** The design shall specify that porous surfaces in the BPS process area should be sealed or provided with a surface liner to prevent entrapment of contamination to facilitate the cleanup of the process area.
- DECON-4** The design shall specify that gloveboxes and large, heavy components should be provided with appropriate lifting lugs to facilitate dismantlement and decontamination activities
- DECON-5** Equipment and gloveboxes subject to contamination should be designed for easy and effective decontamination and dismantlement. This enhances the effectiveness of the eventual decontamination, dismantlement, and relocation of process equipment.

6-E.10 Human Factors Engineering

- HENG-1** The design shall specify that gloveboxes and hoods may be single wall construction with the main working surface 36 to 38 inches from the floor, where possible. The height and depth shall be determined to provide optimum orientation and access to the equipment in each enclosure.
- HENG-2** The design shall ensure that internal supports be placed to minimize interference with normal operation and maintenance.
- HENG-3** Human Dimensions Considerations - The dimensions of the human body shall be considered when selecting equipment and designing systems for use on the project. Equipment shall be arranged in a manner to provide easy access for operations, maintenance, and repair. Tools, platforms and other operator aids shall be provided as required. Equipment shall accommodate the fifth to ninety-fifth percentile of population.
- HENG-4** Process Controls - The design shall develop a process control strategy and should provide for centralized monitoring and a readily identifiable control hierarchy.
- HENG-5** *Process Controls* - The design shall provide operating procedures that provide clear, concise guidance for manual system operations under normal, abnormal, and emergency operating conditions.
- HENG-6** Display Devices - The control system display must be designed to provide the operators with sufficient information to control the process, without compromising their ability to respond to upset conditions due to cognitive overload. Control panel layouts should permit easy access to controls and visual indications. Computer graphics screens should consider the use of color, contrast, and text size in formulating displays. Dynamic process data (process parameters, equipment status) should be readily interpreted, and abnormal conditions should be clearly identifiable to the operator.
- HENG-7** Warning Indicators - The design shall ensure that operators be advised of abnormal or potentially hazardous situations in a clear, concise and timely manner. Local and remote indication shall be included as appropriate to notify operators of process alarms.
- HENG-8** Labeling - The design shall specify that equipment and instrumentation be labeled to permit proper identification during normal, abnormal, emergency and surveillance operations.
- HENG-9** Handicap Access - Fire, criticality, and radiological hazards will require rapid evacuation of the project areas. Due to this constraint, access to the area by handicapped people will be restricted. Specific exemption from the Architectural Barriers Act, Public Law 90-480, shall be addressed in accordance with 41 CFR 101-19.6 during the definitive design phase.

HENG-10 Environmental Conditions - The environmental conditions under which operation and control actions are performed affect the performance that may be expected of operators. To provide operators with conditions to support the proper execution of required tasks, ambient temperature, humidity, air flow, noise level, and illumination should be controlled within acceptable limits. The design shall ensure compliance with UCRL-15763, *Human Factors Design Guidelines for Maintainability of Department of Energy Nuclear Facilities*.

HENG-11 Project designs will minimize equipment located underneath gloveboxes.

6-E.11 Quality Assurance Requirements

QUAL-1 Design, fabrication, and procurement of equipment for the Project shall meet the requirements of a Quality Assurance Program which meets the requirements of 10 CFR 830.120 and its related Implementation Guide. The preferred standard for the quality assurance program to implement the quality assurance provisions of the rule is ASME NQA-1-1994, *Quality Assurance Program Requirements for Nuclear Facilities Applications*. If a quality assurance standard other than 10 CFR 830.120 is used, a matrix will be necessary to show how the applicable quality assurance criterion are implemented.

QUAL-2 The design work shall comply with all quality and design requirements contained in the contract documents.

6-E.12 Delivery Requirements

TRANS-1 Care shall be taken to package components and subassemblies to ensure minimal breakage en route to the construction site. Electronic components and equipment shall be wrapped in shielded packaging to minimize failure due to static electricity encountered until installation. All items delivered to the Hanford Site are subject to receipt inspection; packaging shall be constructed to allow inspection without destruction of packaging components.

TRANS-2 Delivery methods shall be chosen to minimize cost while meeting required schedules.

TRANS-3 All safety class items shall be prepared for delivery in accordance with the requirements similar to ASME NQA-1-1994, Subpart 2.2, "Quality Assurance Requirements for Packaging, Shipping, Receiving, Storage, and Handling of Items for Nuclear Power Plants."

TRANS-4 All equipment will be crated in wood. Any loose items within the gloveboxes or subsystems will be secured. All equipment will be suitably protected from exposure to the natural environment.

TRANS-5 All penetrations and openings in gloveboxes shall be sealed to protect the opening and sealing surfaces.

TRANS-6 Sealing tape in direct contact with stainless steel shall have a chloride content of less than 50 ppm.

7.0 PROCESS CRITERIA

7.1 Stabilization and Packaging Equipment Support System Process Criteria

Process criteria for systems and components that interface with this equipment are described in this section.

7.1.1 Utility Interfaces for BPS

The following table indicates the utilities required for the equipment which are the responsibility of the Project to design and install. Capacities for each utility shall be verified during definitive design.

TABLE 2. UTILITY REQUIREMENTS FOR THE EQUIPMENT

Utility	Description	Utility Needs
1. Glovebox Ventilation Supply	Supply air for the BTS/SFE glovebox.	Supply air from duct level with pressure regulating valve.
2.. Glovebox Ventilation Exhaust	The exhaust system exhausts the gloveboxes and filters the ventilation flow with HEPA filters. The exhaust system maintains a negative pressure in the gloveboxes.	
3. Helium Supply	Helium is supplied to the process to fill the head space of the inner and outer containers for leak detection.	Helium bottles or a higher capacity supply will be installed outside the building to supply the required volume of gas.
4. Welding Gases	This system supplies argon for the BTS Welder shroud gas during the TIG welding process.	Argon bottles or a higher capacity supply will be installed outside the building to supply the required volume of gas.
5. Instrument Air System	This system provides instrument air for operation of valves and controls, if required.	System may require upgrade if required to operate.
6. 120 VAC Power Supply System	This system supplies electrical power to the glovebox system.	Spare breakers could be used to supply the needs of this system.
7. 208/230VAC Power Supply System	This system supplies electrical power to the BTS welder.	
8 Compressed CO2 Supply	To support SFE operation.	

It is likely that certain large flows will be intermittent, thus overall capacities will be analyzed for reduction at the start of definitive design.

7.1.2 Instrumentation and Control

Where feasible, support system controls shall be incorporated with the overall control system. Control panels should, where possible, be located at a sufficient distance from the gloveboxes and material handling operations to minimize radiological dose to operations staff.

The project shall provide instrumentation and controls necessary to monitor and control operation of the equipment. The project shall provide an operator console near the BPS at a sufficient distance from the gloveboxes and material handling operations to minimize radiological dose to operations staff.

7.1.3 Software and Video/Electronics

Any software utilized by support systems controllers shall be developed, acquired, and used in accordance with HNF-PRO-309, *Computer Software Quality Assurance Requirements* and HNF-PRO-310, *Computer Security Within the Procurement Cycle*.

For all Modules, (except Module #1), where software and operator interface station/electronics are provided by this project, a software Acceptance Test Procedure (ATP) will be written by the Architect-Engineering (A-E) company and approved by PFP Engineering. Module #1 software ATP will be written by WSRC and approved by PFP Engineering. PFP personnel shall witness the test. The software ATP shall test all software over the range of function, shall test the response to abnormal inputs, and shall specify an integrated test over the range of system operation. The A-E shall compile a test report to document the test results. Functional field tests will be conducted and an Operational Test Procedure (OTP) shall be written by PFP Engineering to exercise all hardware and software components utilized in the performance of the BPS; a test report shall be compiled by PFP Engineering to document the test results and shall be issued as a Hanford Site supporting document.

7.1.4 Piping and Vessels

Piping and vessels for system utilities and support systems shall be designed in accordance with applicable ASME codes and standards. All glovebox structures are designated Safety Significant for criticality purposes and Safety Significant for material confinement. The safety classification of all piping and vessels inside the glovebox shall be determined in accordance with HNF-PRO-430, *Safety Analysis Program* and SD-CP-SAR-021, Rev. O-L, *PFP Final Safety Analysis Report (FSAR)*.

This Project shall provide for extensive cleaning of piping after construction, but before connection to equipment, to ensure the lines are free of foreign material. Flushes should include a detergent solution in turbulent flow to remove grease and carry away all particulate material followed by an extensive demineralized water rinse. Finally, the lines shall be completely dried using a dry nitrogen purge. The lines shall be capped until ready for connection to the equipment. Care shall be taken to prevent any foreign material from entering the system while making the connections.

Piping for the utility support system shall have a constant slope to ensure complete drainage when flushed.

7.1.5 Electrical

Electrical power for the BPS shall be supplied from the existing capacity in the 234-5Z facility.
7.1.6 Ventilation and Air Conditioning

The ventilation systems for the process area may require modification to accommodate this Project. The modifications are within the Project scope. New components of the ventilation systems shall be designed in accordance with DOE Order 6430.1A, *General Design Criteria*, DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, DOE STD 1066-97, and ASME N509-1989, *Nuclear Power Plant Air-Cleaning Units and Components*. Existing ventilation systems may require upgrades as necessary to ensure adequate ventilation during normal operations and design basis accident (DBA) conditions. These upgrades are within the scope of this Project. Any major new ventilation system components shall meet the current design requirements for new systems.

The air handled for the process area in the 234-5Z Building shall be that which is required for continuous cooling and contamination control via relative pressure zones, and shall include the infiltration air from outdoors. The ventilation system shall provide enough airflow to maintain a comfortable work environment per DOE Order 5480.11, *Radiation Protection for Occupational Workers*.

For equipment supplied as part of the Project, sufficient redundancy and/or spare capacity shall be provided as necessary to ensure adequate ventilation during normal operations and design basis accident (DBA) conditions. Refer to Appendix A and SD-CP-SAR-021, Rev. O-L, *PFP Final Safety Analysis Report (FSAR)*, Section 5.2.3.7, for a functional and physical description of the system. It is permissible that the

ventilation systems fail to a static condition during a DBA, provided that each system remains physically whole to provide radiological confinement.

8.0 APPLICABLE CODES AND STANDARDS

The following documents shall be used to govern the design concepts for this Project. In the event of conflict between a general requirement document listed below and specific criteria in this document, the specific criteria shall be considered to supersede the general requirement.

Federal, State, and local laws and regulations, and DOE orders and standards, in effect at the start of the design shall apply to the extent specified in the *Plutonium Finishing Plant Standards/Requirements Identification Document*, SD-MP-SRID-003 Rev. 1. International agreements applicable to the PFP in place at time of publication of this document are also listed. Additional agreements may be negotiated during the detail design and implementation of Project W-460.

Federal Regulations

- 10 CFR 830.120, "Nuclear Safety Management Quality Assurance Requirements"
- 10 CFR 835, "Occupational Radiation Protection"
- 29 CFR 1910, "Occupational Safety and Health Standards"
- 29 CFR 1926, "Safety and Health Regulations for Construction"
- 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants"
- 40 CFR 262, Standards Applicable to Generators of Hazardous Waste
- 41 CFR 101-19.6, Accommodations for the Physically Handicapped
- 49 CFR 178, Specification for Packaging
- 42 USC 2011, Atomic Energy Act
- 42 USC 4321, National Environmental Policy Act of 1969
- 42 USC 6901, Resource Conservation and Recovery Act

Department of Energy National Orders, Standards, Contracts and Guidelines

- DOE 5400.5, "Radiation Protection of the Public and the Environment"
- DOE 5480.7A, Fire Protection
- DOE 5480.11, "Radiation Protection for Occupational Workers"
- DOE 5480.24, Nuclear Criticality Safety
- DOE 5632.1C, "Protection and Control Of Safeguards and Security Interests"
- DOE 5633.3B, "Control and Accountability of Nuclear Material"
- DOE G 440.1-5, "Fire Safety", U.S. Department of Energy, Washington, D.C.
- DOE O 430.1A, "Life Cycle Asset Management"
- DOE 6430.1A, "General Design Criteria"
- DOE/EH-0256-T, DOE Radiological Control Manual
- DOE/EM/0199, "Plutonium Vulnerability Management Plan"
- DOE/EV/1830.T5, "A Guide to Reducing Radiation Exposure to As Low As Reasonable Achievable (ALARA)"
- DOE-STD-1020-94, "Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities"
- DOE-STD-1021-94, "Natural Phenomena Hazards Performance Categorization Criteria for Structures, Systems and Components"
- DOE-STD-1022-94, "Natural Phenomena Hazards Characterization Criteria", U.S. Department of Energy, Washington D.C.
- DOE-STD-1066-97, ADOE Standard Fire Protection Design Criteria
- DOE-STD-3013-99, "Stabilization, Packaging, and Storage of Plutonium-Bearing Materials"
- DOE STD-1128-98, "Guide to Good Practices for Occupational Radiological Protection in Plutonium Facilities"

National Consensus Standards

- ACGIH, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices
- ACI-349, Code Requirements for Nuclear Safety Related Concrete Structures
- AG-1, Code on Nuclear Air and Gas Treatment Systems, 1991; with Addendum SA of 1993

American Glovebox Society, Guidelines for Gloveboxes

ANSI/AISC N690, Nuclear Facilities -- Steel Safety-Related Concrete Structures for Design, Fabrication and Erection

ANSI B19, Safety Code for Compressed Air Machinery, 1938

ANSI N14.5, Standard for Radioactive Material, Leakage Tests on Packages for Shipment

ANSI Z136.1, Standard for Safe Use of Lasers, 1993

ANSI/ANS-8.1, Guide for Nuclear Criticality Safety in the Storage of Fissile Materials, 1975.

ASCE 4, Seismic Analysis of Safety Related Nuclear Structures and Commentary

ASCE 7, Minimum Design Loads for Buildings and Other Structures

ASME N509-1989, Nuclear Power Plant Air-Cleaning Units and Components

ASME N510-1989, Testing of Nuclear Air Treatment Systems

ASME NQA-1-1994, Quality Assurance Requirements For Nuclear Facility Applications

IEEE-591, IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems

NFPA 70, National Electrical Code

NFPA 72, National Fire Alarm Code

NFPA 101, Life Safety Code

NFPA 801, Standard for Facilities Handling Radioactive Materials Uniform Fire Code

Washington State Regulations

Washington Administrative Code (WAC) 173-303, "Dangerous Waste Regulations"

WAC 246-247, Radiation Protection for Air Emissions

Washington Administrative Code 51, Energy Code

Washington Administrative Code WAC-246-290-490, *Public Water Supplies, Cross-Connection Control*

Hanford Implementing Directives and Manuals

The BPS Project will comply with all Department of Energy, Richland Office, Implementing Directives/Procedures and Project Hanford Management Contract (PHMC) manuals according to the PFP S/RID. All site-wide manuals were re-designated to start with "HNF" in December 1996, and are referred to within this document in that manner for ease of retrieval. The documents shown below are highlighted for special attention during the project:

RLID 5480.7, "Fire Protection"

HSRCM-1, "Hanford Site Radiological Control Manual"

Technical Documents

LA-10860-MS, Critical Dimensions of Systems Containing ^{235}U , ^{239}Pu , and ^{233}U , 1986

SAIC/RFFO-96-003, Loss on Ignition (LOI) Measurements on Plutonium Oxide, 1996

UCRL-15673 (University of California), Human Factors Design Guidelines for Maintainability of Department of Energy Nuclear Facilities, 1985

9.0 REFERENCES

DOE-STD-3013-99, "Criteria for Safe Storage of Plutonium Metals and Oxides", U. S. Department of Energy, Washington, D.C.

DNFSB, 1994, Recommendation 94-1 to the Secretary of Energy, pursuant to 42 U.S. C. 2286 a(5) Atomic Energy Act of 1954, as amended, Defense Nuclear Facilities Safety Board, Washington, D.C.

H-2-99480, *Plutonium Finishing Plant Essential and Support Drawing List*, Fluor Daniel Hanford Company, Richland, Washington.

HNF-PRO-088, *Electrical Work Safety*, Fluor Daniel Hanford Company, Richland, Washington.

HNF-PRO-089, *Electrical Installation Safety*, Fluor Daniel Hanford Company, Richland, Washington.

HNF-PRO-097, *Engineering Design and Evaluation*, Fluor Daniel Hanford Company.

HNF-PRO-259, *Graded Quality Assurance*, Fluor Daniel Hanford Company, Richland, Washington.

HNF-PRO-301, *Control of Suspect/Counterfeit Items*, Fluor Daniel Hanford Company, Richland, Washington.

HNF-PRO-309, *Computer Software Quality Assurance Requirements*, Fluor Daniel Hanford Company, Richland, Washington.

HNF-PRO-310, *Computer Security Within the Procurement Cycle*, Fluor Daniel Hanford Company, Richland, Washington.

HNF-MP-599, *Project Hanford Quality Assurance Program Description*, Fluor Daniel Hanford Company, Richland, Washington.

HNF-PRO-430, *Safety Analysis Program*, Fluor Daniel Hanford Company, Richland, Washington.

HNF-PRO-537, *Criticality Safety Control Of Fissionable Material*, Fluor Daniel Hanford Company, Richland, Washington.

HNF-PRO-1819, *PHMC Engineering Requirements*, Fluor Daniel Hanford Company, Richland, Washington.

HNF-SD-MP-SRID-003 Rev. 1, *Plutonium Finishing Plant Standards/Requirements Identification Document*, Fluor Daniel Hanford Company, Richland, Washington.

IP-1043, *FDH Occupational ALARA Program*, Fluor Daniel Hanford Company, Richland, Washington.

Letter to J. E. Mecca, "Completion of Dose Estimate for PFP Stabilization Operations", 9652258, from Westinghouse Hanford Company, Richland, Washington, dated May 17, 1996.

PNL-6577, *Health Physics Manual of Good Practices for Reducing Exposure to Levels that are as Low as Reasonably Achievable*, Pacific Northwest Laboratories, 1994, Richland, Washington.

SD-CP-OSR-010, *Plutonium Finishing Plant Operational Safety Requirements*, Fluor Daniel Hanford Company, Richland, Washington.

SD-CP-RD-024, *Component Identifying Standard for the PFP*, Fluor Daniel Hanford Company, Richland, Washington.

SD-CP-SAR-021, Rev. 0, *Plutonium Finishing Plant Final Safety Analysis Report*, Fluor Daniel Hanford Company, Richland, Washington.

SD-GN-DGS-30011, *Radiological Design Guide*, Fluor Daniel Hanford Company, Richland, Washington.

DRAFT "Preliminary Hazard/Safety Evaluation Supercritical Fluid Extraction Process for Residual H₂O Measurement"

Appendix A

A walkdown of the ventilation system was performed March 29, 2000 by John Dick and Jose Mejia. The following details are provided:

- The existing air supply for HA-28 conveyor does not have enough capacity to supply air to the new BTS/SFE glovebox. Supply air will need to come from the duct level and will require approximately 40 feet of 4 inch pipe. There are existing blanks in the floors/ceilings to route the pipe. New penetrations will not be required.
- A pressure reducing valve (PRV) will be required for hookup to the supply air at the duct level. An existing PRV was located on the floor. This PRV will have to be evaluated for potential use.
- Exhaust from the BTS/SFE glovebox can be routed to E-4, which is in Room 235B. This will require approximately 10 feet of pipe.