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WHC-SD-W236B-HSP-001, Initial Pretreatment Module Safety Management Plan/D3071		ECN No. 169391

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1. ECN 169391

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ECN

2. ECN Category (mark one) Supplemental ☐ Direct Revision ☒ Change ECN ☐ Temporary ☐ Standby ☐ Supersedure ☐ Cancel/Void ☐		3. Originator's Name, Organization, MSIN, and Telephone No. D. A. Smith, Project Safety Engineering, G3-20, 376-5551		4. Date January 30, 1995	
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12. Description of Change Complete revision of the document is being done to incorporate changes to the project scope & participant responsibilities.					
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13a. Justification (mark one) As-Found []		Criteria Change [X] Design Improvement [] Facilitate Const.	[X] Design Improvement [] Const. Error/Omission	[] Environmental [] Design Error/Omission	
13b. Justification Details Revise the document to reflect the changes to the IPM Project scope and responsibilities.					
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1. ECN (use no. from pg. 1)

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15. Design Verification Required

☐ Yes☒ No

16. Cost Impact

ENGINEERING

Additional

☐

\$

Savings

☐

\$

CONSTRUCTION

Additional

☐

\$

Savings

☐

\$

17. Schedule Impact (days)

Improvement

☐

Delay

☐

18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.

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

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

Document Number/Revision

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Document Number Revision

20. Approvals

Signature	Date	Signature	Date
<u>OPERATIONS AND ENGINEERING</u>		<u>ARCHITECT-ENGINEER</u>	
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Safety K. K. Chitkara <i>KK Chitkara</i>	<i>1/31/95</i>	Design	
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		Signature or a Control Number that tracks the Approval Signature	
		<u>ADDITIONAL</u>	

RELEASE AUTHORIZATION

Document Number: WHC-SD-W236B-HSP-001, Rev. 1

Document Title: Initial Pretreatment Module Safety Management Plan

Release Date: 2/03/95

**This document was reviewed following the
procedures described in WHC-CM-3-4 and is:**

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

V. L. Birkland
V.L. Birkland

2/3/95

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SUPPORTING DOCUMENT		1. Total Pages ³⁴ 33
2. Title Initial Pretreatment Module Safety Management Plan	3. Number WHC-SD-W236B-HSP-001	4. Rev No. 1
5. Key Words Initial Pretreatment Module, Safety Analysis Report, Safety Review, Organic Destruction Hot Test Facility, Cesium Ion-Exchange Compact Processing Unit APPROVED FOR PUBLIC RELEASE <i>V. Birkland</i>	6. Author Name: D. A. Smith, Project Safety Engineering <i>D.A. Smith</i> Signature Organization/Charge Code 8M200/D3071	
7. Abstract The IPM Safety Management Plan establishes the approach to be utilized for integrating the responsibilities for safety documentation and review with the design, construction and start-up activities. The plan defines the requirements for the safety analysis documentation and the independent safety review to ensure that the design for the facility operation will not present undue risk to the health and safety of the employees, visitors, or members of the public and provides adequate protection of the environment.		
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LIST OF TERMS

CSER	Criticality Safety Evaluation Report
DOE	U.S. Department of Energy
FSAR	Final Safety Analysis Report
IS	WHC TWRS Project Safety Group
IPM	Initial Pretreatment Module
PO	WHC IPM Project Organization
PSAR	Preliminary Safety Analysis Report
PSE	Preliminary Safety Evaluation
RL	DOE Richland Operations Office
SA	Safety Analysis & Nuclear Engineering
SSCs	structures, systems, and components
SARPs	Safety Analysis Reports for Packaging
SMP	Safety Management Plan
TSR	Technical Safety Requirement
TWRS	Tank Waste Remediation Systems
WHC	Westinghouse Hanford Company

SAFETY MANAGEMENT PLAN - INITIAL PRETREATMENT MODULE PROJECT

1.0 INTRODUCTION

This Safety Management Plan (SMP) establishes the approach that will be used to integrate the Initial Pretreatment Module (IPM) Project responsibilities for safety. These responsibilities include safety documentation and independent review requirements with the design, construction, and startup activities. Safety responsibilities for operations, maintenance, and decontamination and decommissioning are not included in this SMP. The SMP will be revised, as appropriate, to identify the safety and safety documentation requirements for testing after the test program has been developed.

The SMP directs implementation of various U.S. Department of Energy (DOE) and Westinghouse Hanford Company (WHC) safety review and analysis requirements including, but not limited to, the following:

- DOE Order 4700.1, *Project Management System*
- DOE Order 5480.3, *Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Wastes*
- DOE Order 5480.9A, *Construction Project Safety and Health Management*
- DOE Order 5480.22, *Technical Safety Requirements*
- DOE Order 5480.23, *Nuclear Safety Analysis Reports*
- DOE Order 5480.24, *Nuclear Criticality Safety*
- DOE Order 5482.1B, *Environment, Safety, and Health Appraisal Program*
- RLIP 4700.1A, *Project Management System*
- WHC-CM-2-14, *Hazardous Material Packaging and Shipping*
- WHC-CM-3-5, *Document Control and Records Management*
- WHC-CM-4-29, *Nuclear Criticality Safety Manual*
- WHC-CM-4-46, *Safety Analysis Manual*.

Chapter 2.0 addresses the safety analysis requirements of DOE Order 5480.23. The activities associated with these requirements will be integrated with the design, construction, and startup activities. Appendixes will be prepared and added to the SMP as needed to provide detailed guidance and planning for specific safety analysis and safety-related design analysis where appropriate.

Chapter 3.0 addresses the applicable requirements of DOE orders and WHC procedures for project line management safety responsibilities.

Chapter 3.0 also provides the program plan to ensure independent safety review and appraisal of the design, construction, and startup activities.

The safety analyses and independent review will ensure the IPM facility can be managed without undue risk to the health and safety of employees, visitors, the public, and the environment. These safety analyses and reviews will also ensure that the design and construction of these facilities comply with DOE Order 6430.1A, *General Design Criteria* and other DOE mandatory standards and industry good practices.

1.1 ROLES AND RESPONSIBILITIES

The IPM Project participants are as follows.

- DOE Richland Operations Office (RL) - The Tank Waste Project Office has overall responsibility and authority for management of the IPM Project.
- WHC - As the Operations and Engineering Contractor for the Hanford Site, WHC serves as the operating contractor for the IPM Project. The Tank Waste Remediation Systems (TWRS) Projects Safety Group (IS) provides independent safety review for the operating contractor. The IPM Project Organization (PO) has been established to provide project engineering and overall technical direction for the project. The WHC Safety Analysis and Nuclear Engineering Department (SA) provides design review support, performs the safety analysis, and prepares the safety documentation.
- Pacific Northwest Laboratory - Technology and/or applied engineering support for the pretreatment processes and equipment for the IPM will be provided by Pacific Northwest Laboratory and other laboratories, as appropriate.
- Raytheon/British Nuclear Fuels, Ltd. - Raytheon/British Nuclear Fuels Ltd. will provide the Architect/Engineer (A/E) services for the IPM Project. The A/E will perform the conceptual design for the IPM Project with options for performing Title I, II, and III engineering. The A/E responsibilities will include performance of a safety review of the design and performing hazard assessments in support of the design and safety analysis activities.
- General Construction Contractor - A general contractor will be designated to manage the facility construction.

2.0 SAFETY ANALYSIS

2.1 GENERAL DISCUSSION

Chapter 2.0 describes the various safety analysis requirements for the IPM Project, provides details on the responsibilities of the Project participants, and describes the integration of the safety analyses with the design activities. Table 1 summarizes the responsibilities for the preparation and approval of the safety documentation.

2.2 PROJECT MANAGEMENT RESPONSIBILITY FOR SAFETY ANALYSIS

WHC-CM-4-46 outlines the WHC policy for responsibility for safety analyses as follows:

It is the responsibility of the...Project Management...to ensure that facility safety analyses are properly performed, documented, reviewed, and approved.... Use of support organizations to prepare safety analysis documents does not relieve line management from the responsibility for technical cognizance or technical adequacy....

The PO is responsible for preparing and issuing the safety analysis documentation. This effort will be supported by the SA department, which will help ensure a consistent approach and scope to the safety analysis activities and documentation. The A/E is responsible for developing designs meeting all applicable safety criteria. As part of this responsibility, the A/E will perform various design analyses that support the safety analysis documentation (see Section 2.3.5).

2.3 SAFETY ANALYSIS PROCESS

Safety analysis activities will be integrated with the engineering design process to ensure that potential accidents are prevented, controlled, or mitigated. Safety analysis activities are initiated early in the design process and continue through the life of the project. These activities are designed to (1) provide input to the design criteria, (2) assist in the selection of design alternatives, (3) assist in the resolution of design issues, and (4) prepare input to the safety analysis documentation. Safety analyses performed early in the design process will provide guidance for the design evolution. The engineering processes and the associated safety analysis activities are described below. Section 2.4 describes the major safety analysis documentation accompanying these activities.

Table 1. Safety Management Plan Project Responsibilities.

Task description	Responsibility				
	RL	IS	PO	SA	A/E
	Safety analysis requirements ^a				
Hazard Category	R	A	A	P	I,R
Hazards Analyses	R	R	A	I,R	P
Preliminary Safety Evaluation	R	A	A	P	I,R
Preliminary Safety Analysis Report	A	A	A	P	I,R
Final Safety Analysis Report	A	A	A	P	I,R
Technical Safety Requirements	A	A	A	P	I,R
Safety equipment list		A	A	I,R	P,A
Criticality Safety Evaluation Report		A	A	P	R
Safety Analysis Report for Packaging		A	A	P ^b	R

^a safety analysis requirements with A = Approve, R = Review, I = Provide input, and P = Prepare.

^b Prepared by WHC Packaging Safety Engineering.

A/E = Architect/Engineer (i.e. Raytheon/British Nuclear Fuels, Ltd.).

RL = U.S. Department of Energy Richland Operations Office.

PO = WHC IPM Project Organization.

IS = WHC TWRS Projects Safety.

SA = WHC Safety Analysis & Nuclear Engineering.

2.3.1 Site Evaluation

WHC will perform a site evaluation to select a location for the IPM. Safety analysis input and review of the siting alternatives includes, but is not limited to, the following DOE Order 6430.1A specifications:

- Special siting requirements for facilities using or processing hazardous materials
- Health, safety, and environmental protection requirements
- Hazardous operations and consequences of potential accidents in adjacent facilities
- Natural hazards
- Radiological siting requirements.

2.3.2 Engineering Studies

Engineering studies will be performed as necessary to evaluate design and process alternatives. The studies include consideration of potential hazards associated with the design alternatives and processes as well as the facility inventory of radioactive and other hazardous materials.

2.3.3 Technical Baseline Criteria

The Technical Baseline Criteria for the IPM consist of the Functions and Requirements and the Project Design Criteria. Safety criteria are located in a distinct section of the criteria documents. Design requirements for the control of the hazards are established in the Project Design Criteria. The Project Design Criteria provides explicit references to safety-related sections of DOE Order 6430.1A (-99 and Division 13) and other design criteria to identify those portions that apply specifically to the IPM.

2.3.4 Conceptual Design

The A/E will perform hazards analyses with input from WHC. The analyses will be used to assess design alternatives considered during the conceptual design of the IPM. These analyses will identify significant hazards and options for control of these hazards. These analyses screen the potential accident scenarios to be evaluated in the facility safety analysis and begin to form the project safety basis¹ required by DOE Order 5480.23. The hazards analyses will be updated during Title I and II design.

The quantity of radioactive material will provide the basis for the preliminary facility hazard category. The preliminary safety classification of major structures, systems, and components (SSCs) is based on an evaluation of the potential accident consequences. The safety classification is used to determine applicable design criteria. The preliminary facility hazard category, the accident analyses, and the preliminary safety classification are included in the Preliminary Safety Evaluation (PSE). The A/E will also provide planning documents to address the requirements and methodology to address criticality protection, radiation protection and human factors in the design activities.

2.3.5 Title I and II Design

The safety analysis and design activities will be continuously evaluated to ensure that the design and design analyses are accurately reflected in the safety analyses. This interaction will also ensure that issues identified through the safety analysis or the design review process are addressed in the design. The safety analysis will provide the bases for the safety classification of major SSCs. The safety classification will establish the design and quality assurance criteria based on the safety function of the SSCs.

¹Safety basis is defined in DOE Order 5480.23 as "the combination of information related to the control of hazards at a nuclear facility (including design, engineering analyses, and administrative controls) upon which DOE depends for its conclusion that activities at the facility can be conducted safely." This definition is very similar to the definition of an "authorization basis" provided in DOE Order 5480.21. DOE Order 5480.21 also provides guidance for determining if a change has an impact on the authorization basis, which is useful for determining impacts to the safety basis.

The A/E will prepare the Safety Equipment List to identify the safety classification of SSCs. The Safety Equipment List will be based on evaluations of system safety functions and the potential consequences of system failure. Appendix A provides additional guidance for determining safety classification and for establishing design criteria for SSCs based on the safety function.

The A/E will perform design analyses to verify design compliance with safety-related criteria. These analyses will include the following:

- Hazards analyses
- Facility response to a design basis accident
- Safety class evaluations
- Seismic analyses
- Interaction analyses
- Design basis fire analysis
- Fire hazards analysis
- Shielding analysis
- ALARA (as low as reasonably achievable) analysis
- Human factors analysis
- Criticality analysis
- Others to be determined.

Safety analyses performed during Title I and II design will establish the project safety basis initiated during conceptual design. The Preliminary Safety Analysis Report (PSAR) will be prepared during Title I and II design and issued and will be approved before construction begins. The PSAR will evaluate the risks of the design basis accidents based on the SSCs safety functions. The PSAR will also assess the consequences of beyond design basis accidents based on the postulated failure of the safety class barriers.

2.3.6 Construction

Design changes that occur during construction will be evaluated for consistency with the project safety basis. The Criticality Safety Evaluation Report (CSER), Final Safety Analysis Report (FSAR), Technical Safety Requirements (TSRs) and any necessary Safety Analysis Reports for Packaging (SARPs) will be issued and approved before the start of hot operation. Until turnover to WHC Operations, the preparation and release of the CSER, FSAR, TSRs, and any necessary SARPs is the responsibility of the PO. The SA department and the Packaging Safety Engineering Group will provide support to the PO for the preparation and maintenance of the safety documentation.

2.4 MAJOR SAFETY ANALYSIS DOCUMENTATION

The major safety analysis documents include the Hazard Category, the PSE, the PSAR, the FSAR, the TSRs, the CSER, and the SARPs (when applicable). The Hazard Category, PSE, PSAR, and FSAR will be prepared in accordance with WHC-CM-4-46. The CSER will be prepared in accordance with WHC-CM-4-29, and the SARP, if applicable, will be prepared in accordance with WHC-CM-2-14. The safety analysis documentation will be prepared and issued in conjunction with the design activities previously discussed in Section 2.3.

2.4.1 Hazards Analyses

Beginning in Conceptual Design the A/E will perform safety analyses of proposed process design to identify significant hazards and the consequences of postulated accidents as required by DOE 5480.23. The hazards to be evaluated include radiological and hazardous materials releases, and criticality situations during normal, abnormal, and accident conditions including Design Basis Accidents. The identification of hazards will be used to identify protection SSCs that prevent or mitigate against the consequences of postulated accidents. Changes to the process design to reduce the risk associated with its hazards shall also be identified and evaluated.

The results of the safety implications of the hazards analysis shall be contained in a report summarizing the major hazards considered and their resolution. Process design development information available in Title I and II phases will be re-assessed to ensure the design is within the project safety basis as identified in Conceptual Design.

2.4.2 Hazard Category

The Hazard Category is initially based on the inventory of radioactive material in accordance with *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, (DOE-STD-1027-92). The Hazard Category is used in a graded approach to establish the level of the safety analysis in accordance with DOE Order 5480.23. The initial facility Hazard Category will be included in the PSE.

The potential effect of the material form, dispersibility, and interaction with available energy sources on the Hazard Category will be considered. If these factors affect the Hazard Category, a final Hazard Category will be established based on hazards analyses.

2.4.3 Preliminary Safety Evaluation

The PSE will be developed during conceptual design and will be issued as part of the Conceptual Design Report. The PSE will (1) identify the hazards associated with the facility operation, (2) analyze potential accidents, and (3) evaluate the adequacy of proposed barriers to prevent or mitigate the consequences of the potential accidents. The PSE will include a preliminary safety classification of major SSCs.

2.4.4 Preliminary Safety Analysis Report

A PSAR will be issued during Title I and II design and will be approved before construction begins. The PO is responsible for the preparation and issuance of the PSAR. The A/E will provide input to the PSAR and will review design-related information. The PSAR will address DOE Order 5480.23 requirements and will document the safety basis for the facility consistent with the level of design detail available. The PSAR will be designed to demonstrate that there is reasonable assurance that the operation can be conducted with an acceptably low risk of impact to the environment and to the

health and safety of the employees and the public. The PSAR will include the following:

- Identification of the potential hazards associated with the facility operation
- Analysis of the adequacy of design features to eliminate, control, or mitigate the identified hazards
- Preliminary evaluation of the criticality safety of equipment and operations involving fissionable materials
- Summary of the safety classification for the safety class 1 and 2 SSCs as required by WHC-CM-4-46, *Safety Analysis Manual*
- Preliminary list of items requiring TSRs.

Design aspects related to facility safety that will require additional information before resolution will be identified in the PSAR. The A/E will establish an auditable system to track the status of these items and to ensure that the technical information is developed before any related design media are released for procurement or construction.

Following initial issuance of the PSAR, any changes resulting from the identification of safety issues or changes to the facility design or operation will be evaluated for impacts to the safety basis as described in the PSAR. The A/E will develop and maintain a tracking system to identify resolution of safety issues and changes to the safety basis. Changes to the safety basis will be documented and approved by the operating contractor before the release of affected design media for procurement or construction. A revision of the PSAR or the FSAR, as appropriate, will include information for closure of items requiring further resolution and changes to the safety basis.

2.4.5 Safety Equipment List

The Hazards Analyses will identify SSCs which prevent or mitigate against unacceptable consequences associated with process design. Based on the postulated consequences and using the guidelines in Appendix A the safety classification of SSCs will be established and evaluated for applicable design criteria according to their safety function. The A/E will prepare a Safety Equipment List identifying the safety function (i.e. protection, mitigation, containment, etc.) of the SSCs, and the associated design criteria and quality assurance requirements for procurement, construction and maintenance.

2.4.6 Criticality Safety Evaluation Report

The CSER will evaluate the criticality safety of the equipment and operations involving fissionable material for normal and credible abnormal conditions. The CSER will confirm that the equipment design and/or administrative controls meet or exceed the margin of safety required by DOE Order 5480.24. The CSER will be issued and approved before operations involving fissionable materials begin.

2.4.7 Final Safety Analysis Report

The FSAR will be based on the completed Title II design and any design changes that occur during construction. The FSAR will address the requirements prescribed in DOE Order 5480.23 and will document the final safety basis for the facility. The purpose of the FSAR will be to demonstrate that the IPM can be operated with an acceptably low risk of impacts to the environment and to the health and safety of the employees and the public. The FSAR will include a summary of the safety class 1 and 2 SSCs as required by WHC-CM-4-46, *Safety Analysis Manual*. The FSAR will be issued and approved before the start of facility operations.

2.4.8 Technical Safety Requirements

The TSRs define the conditions, safe boundaries, and the management or administrative controls necessary to ensure the safe operation of a nuclear facility. The TSRs reduce the potential risk to employees and the public from uncontrolled releases of radioactive materials and radiation exposures due to inadvertent criticality. The TSRs will be developed in accordance with DOE Order 5480.22 and will be based on the operational limits established in the FSAR to ensure that facility operation is maintained within the bounds assumed in the safety analyses. The PSAR will include a preliminary list of items requiring TSRs. The final TSRs will be contained in a separate document issued and approved by DOE before facility hot operations begin. The final TSRs will be summarized and referenced in the FSAR.

2.4.9 Safety Analysis Report for Packaging

Existing SARPs cover many of the shipments and containers used at the Hanford Site. One or more new SARPs may be required if a new shipping container is utilized to support the IPM operation or if the facility shipments are not covered by existing SARPs. The SARPs will address the transportation safety requirements specified in DOE Order 5480.3. SARPs typically analyze such items as shipment of laboratory samples onsite or offsite and the transport of failed equipment for repair or disposal.

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3.0 SAFETY REVIEW RESPONSIBILITIES AND AUTHORITIES

3.1 GENERAL DISCUSSION

Chapter 3.0 describes the line management safety responsibilities for the IPM Project relating to design and/or construction and details the responsibilities and authorities of the IS. The internal laboratory safety program is the responsibility of Pacific Northwest Laboratory and is beyond the scope of this plan.

3.2 LINE MANAGEMENT SAFETY RESPONSIBILITY

The A/E will be responsible for ensuring that the design meets all applicable safety criteria, codes, and standards. The A/E will also provide a qualification and training program to ensure the adequacy of safety-related design and review activities. The A/E will provide a safety review function to monitor and assess how well the safety design requirements are met in the design, construction, and testing of the IPM. The A/E will maintain documentation of the safety review and concurrence with the design media. The A/E will submit design documents to WHC for review and approval or acceptance as specified in *Statement of Work for Architect-Engineer Services Initial Pretreatment Module* (WHC 1994). The A/E is also responsible for maintaining a controlled and auditable list of safety issues, concurrent with baseline changes, and the relationship to schedules of applicable construction and procurement packages.

The PO is responsible for ensuring that applicable safety codes and standards are applied in the siting, design, and construction of nuclear facilities. These codes and standards include the codes and standards contained or referenced in DOE Order 5480.4, *Environmental Protection, Safety, and Health Protection Standards* and all other applicable DOE orders and RL supplements, with due consideration for facility decontamination and decommissioning. PO management is responsible for ensuring the WHC engineering staff is qualified for performing the reviews and safety responsibilities addressed in this section. The SA department will support the PO in reviewing the design for consistency with the hazards analyses and safety documentation.

The PO is responsible for preparing safety analyses, including required Operational Safety Requirements, for new facilities or significant modifications to existing nuclear facilities under their direction. The PO is responsible for keeping the safety analyses current with the design/construction revisions. The Project Manager is responsible for ensuring that the nuclear facility design, operation, and construction issues are addressed appropriately in a safety analysis. The specific safety analyses for the IPM Project were detailed in Chapter 2.0.

WHC-CM-3-5, Section 12.7, "Approval of Environmental, Safety, and Quality Affecting Documents," establishes the approval requirements for project design documents issued by WHC. Project design documents include those prepared by WHC as well as those received from other sources and released by WHC. The PO is responsible for ensuring that safety and operational considerations are addressed. The PO is responsible for

submitting design criteria and other project documents and drawings to the appropriate review organizations for review and approval.

3.3 PROJECT SAFETY GROUP RESPONSIBILITIES

The WHC Safety Organization's responsibilities are to "ensure that environmental, safety, and health protection policies and requirements meet or exceed established DOE and industry codes, standards, requirements, and statutory regulations" (WHC-CM-1).

Independent safety review of IPM Project safety-related documentation prepared by WHC is performed by the IS group in accordance with WHC-CM-3-5, Section 12.7. Safety-related documentation includes project baseline criteria documents, safety analysis documentation (Hazard Category, PSE, PSAR, and FSAR), acceptance test procedures and operating test procedures, and WHC-prepared safety analyses of changes to the safety basis (Chapter 2.0).

IS shall also review safety-related documents prepared by other project participants that require WHC review or approval. All documentation directly supporting these contractor documents shall be available to IS during the review; however, reviews of the supporting documentation are not required. Instead, "selected technical surveillances" of these documents and other safety-related documents not requiring WHC review or approval will be performed to ensure compliance with safety and health protection standards and requirements.

IS also performs audits, appraisals, and surveillances of selected project participants, including WHC (DOE Order 5482.1B) to ensure compliance with safety standards, regulatory requirements, and DOE Orders. Audits, appraisals, and surveillances are conducted in accordance with WHC Emergency, Safety and Quality Assurance and IS procedures.

The specific documents requiring review and/or approval, at a minimum, are discussed in the following sections. The TWRS Safety manager will assign a lead engineer to the IPM project to act as a single point of contact for review by all relevant safety disciplines. IS will also provide guidance, consultation, and interpretation of safety-related orders, national standards, and design criteria. IS is responsible for ensuring appropriate interface between the PO and the Industrial Hygiene, Industrial Safety, Health Physics, and Fire Protection groups in the WHC Safety Organization.

3.3.1 Criteria and Criteria Changes

The TWRS Safety manager or the group delegate has approval authority for the functions and requirements as specified in WHC-CM-3-5, Section 12.7. The project design criteria prepared by the A/E will also be reviewed by IS and approved by WHC. IS will ensure appropriate portions of these documents are adequately reviewed by all safety disciplines. IS has the authority to request changes to these documents and the IPM Project will provide an administrative means of managing change requests.

3.3.2 Engineering Studies

IS will ensure adequate review of all engineering studies requiring an independent safety review in accordance with WHC-CM-3-5, Section 12.7, or requiring WHC review and/or approval. This responsibility includes ensuring that engineers with adequate experience in appropriate disciplines are available to conduct reviews in a timely fashion. IS will provide, when possible, continuity between selected reviewers and IPM Project design systems.

3.3.3 Preliminary Safety Evaluation/Hazard Category

IS shall review and approve the PSE and Hazard Category documents as part of the review of the Conceptual Design Report.

3.3.4 Conceptual Design Report

The Conceptual Design Report will be approved by the PO. IS will also review the Conceptual Design Report.

3.3.5 PSAR/FSAR/SARP/CSER

IS will review and approve the PSAR, FSAR, and CSER. The SARP will be reviewed and approved by the WHC Safety Organization responsible for packaging and shipping; however, IS will be the point of contact for those documents and will transmit them to the appropriate organization.

3.3.6 Safety Analyses of Changes to the Safety Basis

Following initial issuance of the PSAR, any changes resulting from the identification of safety issues or changes to the facility design or operation shall be evaluated by the PO for impacts to the safety basis as described in the PSAR (see Chapter 2.0). Changes to the safety basis will be documented and approved by IS before construction or procurement of affected safety class SSCs.

3.3.7 Release For Construction/Procurement

In accordance with RLIP 4700.1A, IV(1).g.(3), "Contractor documents shall bear evidence by a representative of the operating contractor's safety staff indicating a complete safety review as required by their procedures." IS will provide auditable documentation of their review of the safety-related portions of construction and procurement packages and associated baseline drawings, design analyses, and safety analyses. The documentation shall include verification that all safety-related hold points have been adequately resolved before WHC Project management sign off of the Release for Construction package.

3.3.8 Acceptance Test Procedures/Operational Test Procedures

IS has the authority and responsibility for review and approval of those acceptance test procedures and operating test procedures requiring independent safety review in accordance with WHC-CM-3-5, Section 12.7.

3.3.9 Operational Readiness Review

The WHC Director of Emergency, Safety, and Quality Services has the authority for concurring in the selection of the Readiness Review Board and for concurring with the "Declaration of Readiness." The responsibilities of the Director include appointing personnel to participate as voting members of the Readiness Review Board, reviewing and approving the readiness plans, and providing for the conduct of audits and appraisals of the readiness review process including verification of completion of post-startup findings.

3.4 CONSTRUCTION SAFETY

The general construction contractor is responsible for construction site safety. RL has primary oversight responsibility for monitoring the general construction contractor's technical performance and compliance with DOE Order 5480.9A.

It is anticipated that the authority to perform the occupational safety and health surveillances at the construction sites will be delegated to the TWRS Safety group on behalf of RL. The inspections shall include both a weekly walkaround inspection of the worksite and reviews of the construction contractor's safety program, subcontractor safety plans, and other safety program documentation. WHC will document the findings of these inspections for the Project files; a copy will be furnished immediately to the Project Office, Construction Branch.

The TWRS Safety group inspections do not in any way reduce general construction contractor responsibilities, contractual obligations, and sole liability for maintenance of safe working conditions on the construction site.

4.0 REFERENCES

- DOE Order 5480.3, *Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Waste*, U.S. Department of Energy, Washington, D.C.
- DOE Order 5480.4, *Environmental Protection, Safety, and Health Protection Standards*, U.S. Department of Energy, Washington, D.C.
- DOE Order 5480.9A, *Construction Project Safety and Health Manual*, U.S. Department of Energy, Washington, D.C.
- DOE Order 5480.21, *Unreviewed Safety Questions*, U.S. Department of Energy, Washington, D.C.
- DOE Order 5480.22, *Technical Safety Requirements*, U.S. Department of Energy, Washington, D.C.
- DOE Order 5480.23, *Nuclear Safety Analysis Reports*, U.S. Department of Energy, Washington, D.C.
- DOE Order 5480.24, *Nuclear Criticality Safety*, U.S. Department of Energy, Washington, D.C.
- DOE Order 5482.1B, *Environment, Safety, and Health Appraisal Program*, U.S. Department of Energy, Washington, D.C.
- DOE Order 6430.1A, *General Design Criteria*, U.S. Department of Energy, Washington, D.C.
- DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*, U.S. Department of Energy, Washington, D.C.
- RLIP 4700.1A, *Project Management System*, U.S. Department of Energy Richland Operations Office Implementing Procedure, Richland, Washington.
- WHC-CM-1, *Company Policies and Charters*, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-2-14, *Hazardous Material Packaging and Shipping*, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-3-5, *Document Control and Records Management*, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-4-29, *Nuclear Criticality Safety Manual*, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-4-46, *Safety Analysis Manual*, Westinghouse Hanford Company, Richland, Washington.

WHC, 1994, *Statement of Work for Architect-Engineer Services Initial Pretreatment Module*, WHC-SD-W236B-SOW-001, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

APPENDIX

APPROACH TO SAFETY CLASSIFICATION

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LIST OF TERMS

CM	controlled manual
DBA	design basis accidents
DOE	U.S. Department of Energy
EDE	effective dose equivalent
EHSC	environmental hazards safety classification
ERPG	emergency response planning guideline
HERPG	Hanford Emergency Response Planning Guideline
IDLH	immediately dangerous to life and health
PAG	protective action guideline
SSCs	systems, structures, and components
TLV	threshold level valve
WHC	Westinghouse Hanford Company

1.0 INTRODUCTION

This appendix describes the safety classification approach used for the Initial Pretreatment Module Project. The approach is consistent with the requirements of WHC-CM-1-3, *Management Requirements and Procedures*, MRP 5.46, "Safety Classification of Systems, Structures, and Components." The safety classification process systematically evaluates the safety functions of barriers for the protection of the public, workers, and the environment. The process also evaluates the support systems and the systems required to maintain the operating conditions within the design limits for the safety class systems, structures, and components (SSCs).

The approach also provides guidance for establishing the design and Quality Assurance requirements and ensures that the SSCs will reliably perform the required safety functions when needed. The approach is intended to supplement and interpret the criteria and guidance in WHC-CM-4-46, *Safety Analysis Manual*, Section 9.0, "Assigning Safety Classes to Systems, Structures, and Components".

WHC-CM-4-46 establishes a graded approach for the safety classification of SSCs based on the potential consequences of their failure. Table A-1 establishes the safety class criteria for designating the safety classification as safety class 1, 2, 3, or 4. The safety class 1 category is equivalent to "safety class items" as defined in U.S. Department of Energy (DOE) Order 6430.1A, *General Design Criteria*, Section 1300-3.2. The structures and systems are assigned a safety classification corresponding to highest applicable safety class.

Table A-1. Safety Class Criteria (WHC-CM-4-46). (2 sheets)

System, structures, and components, including portions of process systems, whose failure could: (assign highest applicable safety class)	Safety class
PERSONNEL SAFETY	
1. Result in offsite public exposure in excess of 500 mrem effective dose equivalent (EDE). Ingestion is not included as a dose pathway.	1
2. Result in exposure in excess of 5 rem EDE for the onsite worker.	2
3. Preclude implementing the ALARA (as low as reasonably achievable) principles for exposure to radioactive materials.	3
4. Result in offsite airborne concentration of toxic material in excess of applicable chemical ERPG-2 limit. Where ERPG-2 limits do not exist for specific chemicals, similar values shall be used (e.g., HERPG, IDLH, PAG, TLV).	1
5. Result in airborne concentration of toxic material, for the onsite worker, in excess of the applicable chemical ERPG-3 limit. Where ERPG-3 limits do not exist for specific chemicals, similar values shall be used (e.g., HERPG, IDLH, PAG, TLV).	2
6. Preclude implementing ALARA principles for exposure to toxic materials.	3
7. Cause significant harm to facility workers due to industrial safety hazards. (Injury sources include: high temperatures, degraded O ₂ monitoring, and high energy components and systems [e.g., high pressure piping and rotating machinery]).	3
8. Result in exposure in excess of 5 rem EDE or an airborne concentration of toxic material in excess of the applicable chemical ERPG-3 limit to facility operators, which are relied upon to perform the safe shutdown function of criterion 15.	1
9. Result in exposure in excess of 5 rem EDE or an airborne concentration of toxic material in excess of the applicable chemical ERPG-3 limit to facility operators, which are relied upon to perform the safe shutdown function of criterion 16.	2
ENVIRONMENTAL PROTECTION	
10. Result in an environmental hazard safety classification (EHSC) value $\geq 1,000,000$. Refer to Appendixes C and D of this procedure and to MRP 5.46. The EHSCs due to toxic and radioactive materials are applied separately for this criterion.	1
11. Result in an EHSC value $< 1,000,000$ and $\geq 500,000$. Refer to Appendixes C and D of this procedure and to MRP 5.46. The EHSCs due to toxic and radioactive materials are applied separately for this criterion.	2
12. Result in an offsite radioactive soil contamination, due to an airborne release, in excess of 20X the concentrations listed in WHC-CM-7-5, Part K, Table K-1.	1
13. Cause an unanticipated radioactive, chemical, or thermal release to the environment, which requires reporting to Washington State or Federal agencies under applicable laws, regulations, permits, DOE orders or agreements and an EHSC value $< 500,000$.	3
14. Prevent monitoring the unanticipated releases of criterion 13 or normal radioactive, chemical, or thermal releases to the environment.	3
SAFE SHUTDOWN AND OPERATION	
15. Preclude safely placing or maintaining the operating process in a safe shutdown condition where the consequences to the public or environment may exceed criteria 1, 4, 10, or 12 above.	1
16. Preclude safely placing or maintaining the operating process in a safe shutdown condition where the consequences to the onsite worker or the environment may exceed criteria 2, 5, or 11 above.	2
17. Result in loss of double contingency protection for an accidental nuclear criticality (as defined in DOE 5480.5), independent of the dose consequences. See Appendix A, Example 1.	1

Table A-1. Safety Class Criteria (WHC-CM-4-46). (2 sheets)

System, structures, and components, including portions of process systems, whose failure could: (assign highest applicable safety class)	Safety class
18. Prevent monitoring the accidental release of radioactive and/or toxic materials to the environment during and after a design basis accident (DBA), where the monitor's output initiates Emergency Response Plan actions or operator actions to place the operating process in a safe condition per criterion 15 above.	1
19. Prevent monitoring the accidental release of radioactive and/or toxic materials to the environment during and after a DBA, where the monitor's output initiates Emergency Response Plan actions or operator actions to place the operating process in a safe condition per criterion 16 above.	2
20. Preclude maintaining operating parameters within the Operational Safety Requirements (defined in WHC-CM-4-46, Section 5.0) used to protect the environment (per criteria 10 or 12) or the public (per criterion 1 or 4).	1
21. Preclude maintaining operating parameters within the operational safety requirements that protect the environment (per criterion 11) or the onsite worker (per criteria 2 or 5).	2
22. Preclude providing facility fire protection system capability.	3
EQUIPMENT INTERACTION	
23. Prevent a separate safety class 1 SSCs from performing its safety or environmental protection function, either by loss of control function or by damage. See Appendix A, Example 2.	1
24. Prevent a separate safety class 2 SSCs from performing its safety or environmental protection function, either by loss of control function or by damage. See Appendix A, Example 2.	2
25. SSCs whose failure has no significant importance to safety, health or environmental protection.	nonsafety class 4

CM = controlled manual.
 DBA = design basis accident.
 DOE = U.S. Department of Energy.
 EDE = effective dose equivalent.
 EHSC = environmental hazard safety classification.
 ERPG = emergency response planning guideline.
 HERPG = Hanford Emergency Response Planning Guideline.
 IDLH = immediately dangerous to life and health.
 PAG = protective action guideline.
 SSCs = systems, structures, and components.
 TLV = threshold level value.
 WHC = Westinghouse Hanford Company.

2.0 PURPOSE

The safety classification process identifies the SSCs of which safety or environmental protection functions are necessary for the mitigation or prevention of adverse consequences during abnormal or accident conditions. The SSC safety classification is used to determine design and quality assurance requirements to those design features that provide the necessary safety function. The SSC safety classification is also used to identify review and approval requirements in accordance with WHC-CM-3-5, *Document Control and Records Management Manual*, Section 12.7. The safety classification process also identifies the safety functions and SSCs that are "important to safety" for the purposes of evaluating changes to operating

facilities for unreviewed safety questions in accordance with DOE Order 5480.21, *Unreviewed Safety Questions*.

3.0 SAFETY CLASSIFICATION PROCESS

The safety classification process consists of the following steps:

- Hazards identification
- Consequence evaluation
- Identification of safety class barriers
- Evaluation of support systems
- Safety function classification
- Interaction evaluation
- Component safety classification.

Each step is discussed in more detail below.

3.1 HAZARDS IDENTIFICATION

The first step of the hazards identification process is to identify potential radiological and toxicological hazards associated with the design. This step will be performed by the Architect/Engineer as part of the process hazards assessments. The hazards assessments will also identify barriers that prevent or mitigate the consequences of each hazard. The barriers may be SSCs, an administrative control, or a combination of these.

3.2 CONSEQUENCE EVALUATION

Accident analyses are performed to determine if the unmitigated consequences for radiological and nonradiological exposure associated with the identified hazards could exceed the safety class 1 or 2 criteria. Analyses are also required to evaluate the potential environmental consequences (e.g., ground contamination, releases to the soil) of the system failure.

3.3 SAFETY CLASS BARRIERS

The criteria for assigning safety class based on the consequences is provided in WHC-CM-4-46, Section 9.0. A safety class 1 or 2 barrier is warranted if the consequences could exceed the safety class 1 or 2 criteria, except in certain circumstances where an administrative control can be used to prevent the accident.

Selection of the safety class barrier is a function of (1) which barrier will adequately prevent or mitigate the consequences and (2) which barrier is the most cost effective. In general, passive barriers are preferred over active barriers. A barrier that prevents an accident is more effective in protecting the public, the workers, and the environment than a barrier that mitigates the accident consequences.

Administrative controls are generally limited to preventing the accident initiators in cases where it is impractical to provide engineered safety features. An example of this is a control on the feed composition to maintain the facility inventory within the values used in the accident analysis. The likelihood of human error needs to be considered for the use of administrative controls.

The Architect/Engineer is responsible for identification and design of the safety class barriers with input and review by Westinghouse Hanford Company (WHC). The WHC operating organization will provide input to the selection of safety class barriers since the selection will impact the operating requirements and technical safety requirements for the facility operation.

3.4 SUPPORT SYSTEM EVALUATION

The next step is to systematically identify the function of each of the structures and systems and determine those that are a support system for the safety class barriers. The support systems are those systems that assure the primary system will perform its required safety function. These support systems include those required for the safety function (e.g., power to active primary systems) and those required to maintain conditions within the primary system design limits (e.g., temperature control). Support systems required for the primary system to perform its required safety function are assigned the same safety classification as the primary system.

3.5 SAFETY FUNCTIONS

Systems that perform a safety function may also be assigned a safety classification independent of accident consequences. This independent assignment is based on the criteria in Table A-1. These include systems that provide (1) double contingency for prevention of a nuclear criticality, (2) facility fire protection, or (3) monitoring of facility releases.

3.6 INTERACTION EVALUATION

Once safety functions are defined, the next step is to identify those systems of which failure could result in the loss of the safety function of another system even though the systems are not functionally related. Interaction evaluations will be performed to identify system failures (e.g., impact loading, flooding) that could result in the loss of safety function. The safety classification of the impacting system is the same as the safety classification of the system performing the safety function.

3.7 COMPONENT SAFETY CLASSIFICATION

Design, procurement, installation, and maintenance requirements should be based on the specific attributes that (1) provide the safety function or (2) are necessary to support the safety function. The attribute may be specific to a system component or a specific feature of a structural member (e.g., the pressure boundary of a valve, a structure's anchorage).

Classification at a component level needs to consider, as a minimum, the following items:

- Safety function of the parent item
- Function of the part within the parent item
- Identification of credible failure modes of the component
- Effect of the component failure on the safety function of the parent item.

Depending on the level of complexity of the system, this can be done with logic models (i.e., fault trees) or by inspection.

4.0 SAFETY CLASS DOCUMENTATION

The safety classification of SSCs is an integral part of the safety analysis and design process. The process for assigning the safety classification is the same for each design phase. The level at which the safety classification is performed depends on the amount of design information and accident analysis performed.

A preliminary determination of safety class 1 and 2 SSCs will be performed during the conceptual design and will be included in the Preliminary Safety Evaluation. This evaluation is prepared and issued by WHC for incorporation into the Conceptual Design Report by the Architect/Engineer. Limited accident analysis will be performed during the conceptual design. The determination of safety class 1 and 2 items will be based on the potential accident consequences for those systems involved in the accident scenarios. Engineering judgement will be used to assign preliminary safety classifications to other major SSCs based on similar safety functions. The interaction evaluations to determine failures that could impact safety class system functions will be primarily limited to considering consequences of building failures. Generally, interaction evaluations for other systems requires the detailed facility layouts developed during definitive design.

A safety equipment list identifying the safety class 1, 2, and 3 SSCs will be developed during Title I design and summarized in the Preliminary Safety Analysis Report. This list will be prepared and issued by the Architect/Engineer with input from WHC, and it will reflect the design information developed during Title I design. Evaluations will be performed by the assigned evaluator to establish the safety function and rationale for the safety classification. These evaluations will be performed as necessary based on the accident analysis developed for the Preliminary Safety Analysis Report. This report is prepared and issued by WHC.

The Safety Equipment List will be expanded to establish the safety classification of subsystems and components as required to support the procurement activities during Title II design. This list will also identify the safety class rationale, the specific safety function of the SSCs and the attribute of the SSCs required for the safety function. The Safety Equipment List will be revised as required to reflect changes in the design and will be summarized in the Final Safety Analysis Report.

5.0 SAFETY CLASS DESIGN CRITERIA

The design criteria for safety class items shall be in accordance with WHC-CM-4-46. The WHC safety class 1 designation is equivalent to "safety class items" as defined in DOE Order 6430.1A. Safety class 2, 3, and 4 items shall meet the design requirements for "non safety class" items in DOE Order 6430.1A and the applicable criteria in WHC-CM-4-46.

The SSCs shall be capable of performing their required safety functions during normal, abnormal and design basis accident (DBA) conditions (DOE Order 6430.1A). The DBA conditions that the SSCs are required to withstand shall be commensurate with the safety classification in accordance with SDC-4.1, *Standard Architectural-Civil Design Criteria - Design Loads for Facilities*. It should be noted that the safety class SSCs may not have a required safety function during all of the DBAs. The safety class SSCs are required to withstand only those DBAs for which the safety function is required to avoid exceeding the safety class criteria. Also, the safety class SSCs do not have to withstand the DBA if adequate recovery time is available for restoration of the safety function. The recovery time may only be used to relax the design requirements and does not impact the safety classification of the SSCs. Guidance on the use of recovery time is provided in WHC-CM-4-46. The application of some of the design criteria is discussed below.

5.1 NATURAL PHENOMENA HAZARDS

The design and analysis for natural phenomena hazards shall be in accordance with SDC-4.1. The seismic loading will consider the requirements established in DOE Order 5480.28, *Natural Phenomena Hazards Mitigation*. Safety class items of which failure could result in loss of the safety function will not need to be seismically qualified if it can be demonstrated that adequate recovery time is available for restoration of the function. The storage for spare parts necessary for restoring the safety function is required to protect them from damage resulting from the seismic event.

5.2 ENVIRONMENTAL QUALIFICATION

The safety class equipment shall be capable of performing its required safety function during normal, abnormal, or DBA conditions (DOE Order 6430.1A). Environmental qualification shall provide assurance that safety class items will be capable of performing required safety functions under DBA conditions. The qualification will demonstrate that the equipment can at least perform for the period of time that the functions are required. As discussed above, the SSCs are only required to be qualified for those DBAs that require the safety function.

5.3 SINGLE FAILURE

The design shall ensure that a single failure does not result in the loss of capability of a safety class system to perform its required safety function in accordance with DOE Order 6430.1A and WHC-CM-4-46 for safety class 1 and 2 items, respectively. The design of the SSCs shall ensure that a single failure does not result in the loss of the capability of the SSCs to

perform its required safety function (DOE Order 6430.1A). Arbitrary failure of seismically qualified structures and passive components need not be considered; however, potential failure mechanisms not related to a seismic event do need to be considered for safety class 1 passive SSCs.

Redundancy is not required for safety class SSCs that could result in loss of the safety function if it can be demonstrated that adequate recovery time is available for the restoration of the safety function. Consideration needs to be given to the Technical Safety Requirements necessary to assure that the time period allowed for loss of the safety function is not exceeded.

5.4 BACKUP POWER

Backup power shall meet the design criteria in WHC-SD-GN-DGS-303. Backup power is not required if it can be demonstrated that adequate time is available for the recovery of normal power for safety functions requiring power.

5.5 QUALITY ASSURANCE

Initial Pretreatment Module Quality Assurance Program Plan for 236-B (Sparks 1994), will be based on the Quality Assurance requirements in 10 CFR 830.120, "Quality Assurance Requirements", and ASME NQA-1, *Quality Assurance Program Requirements for Nuclear Facilities*. Specific guidance for development of Quality Assurance requirements based on the safety classification will be provided in the program plan.

6.0 REFERENCES

- ASME NQA-1, 1989, *Quality Assurance Program Requirements for Nuclear Facilities*, American Society of Mechanical Engineers, New York, New York.
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- Sparks, J.S., 1994, *Initial Pretreatment Module Quality Assurance Program Plan for 236-B*, WHC-SD-W236B-QAPP-001 Draft, Westinghouse Hanford Company, Richland, Washington.
- 10 CFR 830.120, "Quality Assurance Requirements," *Code of Federal Regulations*, as amended.

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