START

0027475 108

Sta #10 MAY 10 1991 (23)

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 153711

2. To: (Receiving Organization)
Safety

3. From: (Originating Organization)
Safety Analysis & Regulation Function

4. Related EDT No:
N/A

7. Purchase Order No:
N/A

5. Proj/Prog/Dept/Div: Health and Safety Integration and Policy

6. Cog/Proj Engr: R.R. Lehrschall

9. Equip/Component No:
N/A

8. Originator Remarks:
This guidance is being transmitted to the personnel (identified below) on distribution for review and approval.

10. System/Bldg/Facility:
N/A

12. Major Assm Dwg No:
N/A

11. Receiver Remarks:

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13. Permit/Permit Application No.
N/A

14. Required Response Date:
12/21/90

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No	(D) Rev No.	(E) Title or Description of Data Transmitted	(F) Impact Level	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-GN-ER-304	-	0	Guidance for identifying and documenting conformance with DOE Design Criteria in Safety Analysis Reports	2	1		

16. KEY

Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
1, 2, 3, or 4 see MRP 5.43 and EP-1.7	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

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(See Impact Level for required signatures)

(G) Reason	(H) Disp	(J) Name	(K) Signature	(L) Date	(M) MSIN
1	1	Cog./Proj. Eng	R.R. Lehrschall	12-4-90	B1-35
1	1	Cog./Proj. Eng. Mgr.	D.R. Ellingson	4/11/91	B1-35
1		QA A.L. Fisher	A.L. Fisher	4/11/91	S1-51
1	1	Safety J.C. Wiborg	for J.C. Wiborg	4/19/91	R3-09
1	1	SA&R A.R. Schade		12-4-90	B1-35

(G) Reason / (H) Disp / (J) Name / (K) Signature / (L) Date / (M) MSIN

APR 1991 RECEIVED EDMC

18. Signature of EDT Originator — R.R. Lehrschall 12-4-90 — Date

19. Authorized Representative for Receiving Organization — R.J. Kobelski 4/19/91 — Date

20. Cognizant/Project Engineer's Manager — D.R. Ellingson 4/11/91 — Date

21. DOE APPROVAL (if required)
Ltr No. _____
☐ Approved
☐ Approved w/comments
☐ Disapproved w/comments

BD-7400-17

SUPPORTING DOCUMENT

1. Total Pages 107 ~~106~~

2. Title	3. Number	4. Rev. No.
Guidance for Identifying and Documenting Conformance with DOE "Design Criteria" in Safety Analysis Reports	WHC-SD- GN-ER-304	0

5. Key Words

Safety Design Criteria

6. Author

R. R. Lehrschall
Name (Type or Print)

R. R. Lehrschall
Signature

Health and Safety Integration and Policy
Organization/Charge Code 37300/E64744

7. Abstract

The attached document provides guidance instructions, guide containing safety design criteria and checklist for documenting conformance with criteria.

Per General Counsel the legends have been removed

APPROVED FOR PUBLIC RELEASE CW 5-10-91

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9. Impact Level

2

10. R. J. Kobelski
Authorized Manager's Name (Type or Print)

R. J. Kobelski
Authorized Manager's Signature

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A-6400-073 (07/90)

GUIDANCE FOR IDENTIFYING AND DOCUMENTING CONFORMANCE WITH DOE DESIGN CRITERIA IN SAFETY ANALYSIS REPORTS

Table of Contents

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GUIDANCE FOR IDENTIFYING AND DOCUMENTING CONFORMANCE WITH DOE DESIGN CRITERIA IN SAFETY ANALYSIS REPORTS

1.0 PURPOSE

The instructions identified in this guidance have been prepared to assist in the proper use of a Safety Design Checklist (Attachment 1). The checklist assists the user in identifying the applicable safety design criteria that should be considered in preparation of a Safety Analysis Report (SAR). Where criteria (identified in the checklist) are found to be applicable, they are required by the Department of Energy (DOE) order to be included in the facility design or, where deviations occur, explained in the SAR. This checklist, in conjunction with the rationale developed to explain deviations of design criteria, may provide benefit during operational readiness reviews.

2.0 SCOPE

The criteria identified in the checklist is contained in a Safety Design Criteria document (Attachment 2). This document was developed based on the design criteria that should be considered for evaluating facility safety in SARs as identified in DOE orders 6430.1A, "General Design Criteria", issued April 6, 1989, 5820.2A, "Radioactive Waste Management", issued September 26, 1988, 5400.5, "Radiation Protection of the Public and Environment", issued February 8, 1990, 5480.11, "Radiation Protection For Occupational Workers", issued December 21, 1988, and 5480.5, "Safety of Nuclear Facilities", issued September 23, 1986.

This guidance applies to all existing or planned Westinghouse Hanford Company (WHC) nonreactor facilities or activities that contain or process radiological/non-radiological materials that require SARs.

3.0 RESPONSIBILITIES

3.1 LINE MANAGEMENT

It is the responsibility of line management to assure that a detailed comparison or evaluation of the facility against the design criteria, identified in the Safety Design Checklist, is performed, documented (including justification for requirements that are identified as non-applicable in the checklist) and is provided to the appropriate WHC organizations for review and approval. Line management should document conformance evaluations for modifications to existing facilities and they should assure that the documentation of the evaluations is appended to or referenced in the Final Safety Analysis Report. Line management should also consider maintaining copies of the completed checklists (new projects or modifications to existing facilities) for future reviews or audits.

3.2 SAFETY

3.2.1 INDEPENDENT SAFETY REVIEW ORGANIZATION

It is the responsibility of the Independent Safety Review Organization (ISRO) to review and approve the completed checklist, including the written justification, where required, for deviations from the design criteria.

3.3 QUALITY ASSURANCE

It is the responsibility of Quality Assurance (QA) to review and approve the completed checklist.

3.4 ENVIRONMENTAL ASSURANCE

It is the responsibility of Environmental Assurance to review the completed checklist for compliance with environmental requirements.

4.0 REQUIREMENTS

The DOE Order 5481.1B, "Safety Analysis and Review System", requires that the safety analysis identify and demonstrate conformance with applicable guides, codes, and standards. Furthermore deviations from the current design criteria must be evaluated and documented in the SAR or an appendix. Review of the DOE orders identified the applicable design criteria that should be considered from the requirements as identified below:

-6430.1A "General Design Criteria", Division 13, "Special Facilities",-99 sections, and the general criteria for nuclear facilities, siting, ventilation, confinement, radiation protection and effluent monitoring.

-5820.2A "Radioactive Waste Management"

-5400.5 "Radiation Protection of the Public and Environment"

-5480.11 "Radiation Protection for Occupational Workers"

-5480.5 "Safety of Nuclear Facilities"

4.1 DOCUMENTING CONFORMANCE WITH DESIGN CRITERIA

4.1.1 SAFETY DESIGN CRITERIA

The purpose for Safety Design Criteria list is to provide a guidance document listing design criteria that should be considered in evaluating facility safety in SARs. This guidance provides the user with the specific division, section, subsection, and the individual requirements or a summary of each requirement. The requirements that are summarized in the Safety Design Criteria list are identified with the letters AG denoting additional guidance

and/or explanatory material that can be found in the complete text of the DOE orders (as identified in Section 4.0) under the section, number, and heading cited.

4.1.2 SAFETY DESIGN CHECKLIST

The Safety Design Checklist serves as a convenient tool for more effectively documenting conformance with or documenting justification for requirements identified as non-applicable. The Safety Design Checklist Approval Sheet (Attachment 1) is used to document the reviews and approvals of the appropriate WHC organizations as identified in Section 3.0.

5.0 PROCEDURE

The following instructions provide the guidance for use of the Safety Design Criteria list and instructions for completing the Safety Design Checklist Approval Sheet and the Safety Design Checklist:

1. The Safety Design Criteria list should be used along with the Safety Design Checklist to help assure understanding, interpretation or discussion associated with a specific requirement since the Safety Design Checklist provides a summary of the requirement or key words as contained in the applicable order.

2. The Safety Design Checklist Approval Sheet should be completed by the cognizant engineer providing the project number, title, affected facility/activity, and area this work is located. The engineer should complete the Safety Design Checklist as specified in this section of the guidance. After completing this portion of the guidance the engineer should make the Safety Design Checklist and Safety Design Checklist Approval Sheet available to the appropriate WHC organizations (as identified in Section 3.0) for their review and approval signature on the Safety Design Checklist Approval Sheet.

3. Completing the Safety Design Checklist:

   a) The three brackets listed to the left of each section(1) or requirement with YES, NO, and N/A written above the brackets are there for the user to indicate the applicability of the particular section or the individual requirement.

(1) A section is identified in the Safety Design Checklist by an alpha and numeric designation, title, and is underlined, with brackets to the left, except where there is only one requirement identified. An example would be: [ ] [ ] [ ] <u>100-99.0.1 General Section</u>

b) The section on the top right side of the page with the words JUSTIFICATION FOR N/A is to be filled out by the user if the brackets under N/A are checked. (If enough room is not available on the Safety Design Checklist page, use the space to identify the reference which provides the justification, e. g., attached page _of_, letter No. XXXXX, SD-XX-XX-XXX, etc.).

c) The specific guidance for each category is listed below:

- YES: Checking the "YES" bracket beside the section or requirement indicates applicability and conformance with the criteria. The criterion is included in the design criteria section of the SAR. Where all criteria within a section are "YES", individual requirements in a section do not need to be checked if the bracket for the section is checked.

- NO: Checking the "NO" bracket beside the section or requirement indicates that the user does not or cannot comply with the criterion though criterion is applicable (a deviation or upgrade would be needed and documentation should be included in the design criteria section of the SAR or in an appendix). Where all criteria within a section are "NO", individual requirements in a section do not need to be checked if the bracket for the section is checked.

- N/A: Checking the "N/A" bracket indicates written documentation should be provided under the section identified as justification for N/A or in an attachment. Where all criteria within a section are "N/A", individual requirements in a section do not need to be checked.

- JUSTIFICATION FOR N/A:

To assure an auditable record of the rationale for "not applicable" judgements, the justification for checking the N/A bracket needs to be documented and retained as ready responses to questions which are certain to arise during the design and/or operation of the facility. The space is provided for short narratives or, where longer narratives are needed, for reference to the document providing the explanation.

6.0 REFERENCES

1. DOE Order 6430.1A, "General Design Requirements".

2. DOE Order 5820.2A, "Radioactive Waste Management".

3. DOE Order 5400.5, "Radiation Protection of the Public and Environment".

4. DOE Order 5480.11, "Radiation Protection for Occupational Workers".

5. DOE Order 5480.5, "Safety of Nuclear Facilities".

6. DOE Order 5481.1B, "Safety Analysis and Review System".

ATTACHMENT 1

SAFETY DESIGN CHECKLIST

AND APPROVAL SHEET

Contained in this checklist attachment are excerpts from the DOE orders which are provided for convenience in assisting the user in determining the design criteria that should be considered and documented in evaluating facility safety.

In the event there should be any conflict between these excerpts and the current DOE orders the DOE orders shall prevail.

SAFETY DESIGN CHECKLIST APPROVAL SHEET

Project No. & Title: _____

Facility: _____

Area: _____

_____
Responsible Facility Management

_____
Cognizant Engineer

_____
Health & Safety Assurance Independent Safety Review Organization

_____
Environmental Assurance

_____
Quality Assurance

SAFETY DESIGN CHECKLIST

YES NO N/A | JUSTIFICATION FOR N/A

5820.2A RADIOACTIVE WASTE MANAGEMENT

CHAPTER 1: HIGH LEVEL WASTE

3. Requirements

3.a. Design

(1)Requirements For New Facilities

[ ] [ ] [ ] c) Facilitating retrieval capability in new design

3.b., 2, 3 Storage Operations-Doubly Contained Systems

[ ] [ ] [ ] (2) Storage and Transfer Operations
[ ] [ ] [ ] a) High level waste facilities doubly contained
[ ] [ ] [ ] b) Requirements for use of single contained pipelines
[ ] [ ] [ ] d) Secondary containment / retrieval of leak solutions
[ ] [ ] [ ] f) Systems for maintaining releases within guidelines
[ ] [ ] [ ] g) Engineered features for cathodic protection
[ ] [ ] [ ] h) Engineering controls / inventory data
[ ] [ ] [ ] j) Remote maintenance features
[ ] [ ] [ ] k) Restarting waste transfer equipment

[ ] [ ] [ ] (3) Monitoring Surveillance and Leak Detection
[ ] [ ] [ ] a) Incorporated in engineering systems
[ ] [ ] [ ] b) Failure of primary containment boundary
[ ] [ ] [ ] c) Assessing waste storage system integrity
[ ] [ ] [ ] d) Backup power for leak detection devices
[ ] [ ] [ ] e) Monitoring high-level waste surface water
[ ] [ ] [ ] f) Ground water monitoring wells

3.c.2, 3 Storage Operations-Singly Contained Tank Systems

[ ] [ ] [ ] (2) Storage and Transfer Operations
[ ] [ ] [ ] c) Sensing devices for liquid level / volume inventory data
[ ] [ ] [ ] d) Singly contained pipelines
[ ] [ ] [ ] e) Ventilation guidelines for maintaining releases
[ ] [ ] [ ] g) Remote maintenance features for exposure control
[ ] [ ] [ ] h) Electrical power loss

[ ] [ ] [ ] (3) Monitoring, Surveillance and Leak Detection
[ ] [ ] [ ] a) Surveillance of waste volumes / failed equipment
[ ] [ ] [ ] c) Emergency power
[ ] [ ] [ ] d) Monitoring wells

YES	NO	N/A		JUSTIFICATION FOR N/A
			CHAPTER II: MANAGEMENT OF TRANSURANIC WASTE	
			3. Requirements	
			(e) Temporary Storage at Generating Sites	
[ ]	[ ]	[ ]	5) Minimize accidents / affects to environment	
[ ]	[ ]	[ ]	(g) Interim Storage	
[ ]	[ ]	[ ]	2) Facilities designed consistent with regulations:	
[ ]	[ ]	[ ]	b) Designed / operated to minimize run off	
[ ]	[ ]	[ ]	c) Environmental monitoring to detect releases	
[ ]	[ ]	[ ]	d) Designed to prevent unauthorized personnel entry	
[ ]	[ ]	[ ]	f) Exposure minimization through design	
			CHAPTER III: MANAGEMENT OF LOW-LEVEL WASTE	
			3. Requirements	
			(c) Waste Generation	
[ ]	[ ]	[ ]	(4) Generation of low-level waste reduced by design	
			(8) Disposal Facility and Disposal Site Design	
[ ]	[ ]	[ ]	b) Consider hydrology, geology and waste for selection	
			CHAPTER IV: DECOMMISSIONING OF RADIOACTIVITY CONTAMINATED FACILITIES	
			3. Requirements	
			(b) Facility Design	
[ ]	[ ]	[ ]	b) Simplification for D&D	
			5400.5 RADIATION PROTECTION OF THE PUBLIC AND ENVIRONMENT	
			CHAPTER II: REQUIREMENTS FOR RADIATION PROTECTION OF THE PUBLIC AND ENVIRONMENT	
			3. Management and Control of Radioactive Materials in Liquid Discharges and Phaseout of Soil Columns	
			(a) Discharge of Liquid Waste to Surface Water	
[ ]	[ ]	[ ]	6) Design of new facilities	
			CHAPTER IV: RESIDUAL RADIOACTIVE MATERIAL	
			6. Control of Residual Radioactive Material	
[ ]	[ ]	[ ]	(b) Interim Storage	
[ ]	[ ]	[ ]	1) Control and stabilization features	
[ ]	[ ]	[ ]	2) Design controls for Rn-222:	
[ ]	[ ]	[ ]	a) 100 pCi/L at any point	
[ ]	[ ]	[ ]	b) Annual average 30 pCi/L over facility site	
[ ]	[ ]	[ ]	c) Annual average 3 pCi/L outside facility site	
[ ]	[ ]	[ ]	d) Criteria for radon producing waste	
[ ]	[ ]	[ ]	3) Concentrations of radionuclides in groundwater	
[ ]	[ ]	[ ]	4) Criteria for access control to contaminated property	

YES	NO	N/A		JUSTIFICATION FOR N/A
[ ]	[ ]	[ ]	(d) Long-term Management: Uranium, Thorium, and Their Decay Products	
[ ]	[ ]	[ ]	a) Control and stabilization features	
[ ]	[ ]	[ ]	b) Design controls for Rn-222 wastes	
[ ]	[ ]	[ ]	e) Limiting access to contaminated property	

5480.11 RADIATION PROTECTION FOR OCCUPATIONAL WORKERS

9. Requirements For Radiation Protection of Occupational Workers, Unborn Child, Students, Minors, and Onsite Members of the Public

g. Monitoring

(a) Air Monitoring

[ ]	[ ]	[ ]	Areas that exceed 10% of DAC concentrations	

(b) Radiation Monitoring

[ ]	[ ]	[ ]	Stationary / portable radiation instruments	

[ ]	[ ]	[ ]	j. Design and Control	
[ ]	[ ]	[ ]	j) Facilities designed to control exposures to ALARA	
[ ]	[ ]	[ ]	(1) Design objectives for facilities:	
[ ]	[ ]	[ ]	a) Criteria for optimization principles in design	
[ ]	[ ]	[ ]	b) Objectives for exposure in occupied / unoccupied areas	
[ ]	[ ]	[ ]	c) Minimizing inhalation of radioactive materials	
[ ]	[ ]	[ ]	d) Consider ease of maintenance and decontamination	

l. Entry Control Program

[ ]	[ ]	[ ]	Controls for limiting entry	

q. Nuclear Accident Dosimetry

(2) Fixed Nuclear Accident Dosimeter Units

[ ]	[ ]	[ ]	(f) Placement of dosimeter units	

5480.5 SAFETY OF NUCLEAR FACILITIES

11. Nuclear Criticality Safety Elements

c. (3) Written Plans and Procedures

[ ]	[ ]	[ ]	g) Locations for alarm system installation	

12. Nuclear Criticality Safety Control Parameters

[ ]	[ ]	[ ]	(a) Controlling Factors	
[ ]	[ ]	[ ]	b) Double contingency shall be considered in design	
[ ]	[ ]	[ ]	c) Reliance placed on equipment design	

13. Safe Storage Criteria for Unirradiated Fissionable Material

[ ]	[ ]	[ ]	(b) Operating Requirements For Storage	
[ ]	[ ]	[ ]	10) Areas designed for safely / securely storing materials	
[ ]	[ ]	[ ]	13) Container design shall be appropriate to material form	
[ ]	[ ]	[ ]	16) Plutonium containers designed to prevent leakage	
[ ]	[ ]	[ ]	18) Assure adequate and necessary heat removal	

YES NO N/A | JUSTIFICATION FOR N/A

6430.1A GENERAL DESIGN CRITERIA

DIVISION 1

GENERAL REQUIREMENTS

0110 ARCHITECTURAL AND SPECIAL DESIGN REQUIREMENTS

0110-99 SPECIAL FACILITIES

0110.99.0 Nonreactor Nuclear Facilities - General

[ ] [ ] [ ] 0110-99.0.1 General Section
[ ] [ ] [ ] Compartmentalization of special facilities
[ ] [ ] [ ] Traffic flow design and egress
[ ] [ ] [ ] Support area locations
[ ] [ ] [ ] Space in exit areas
[ ] [ ] [ ] Monitoring stations required for egress
[ ] [ ] [ ] Segregation of hazardous / radioactive materials
[ ] [ ] [ ] Compartmentalization confinement of contaminants
[ ] [ ] [ ] Facility decontamination / decommissioning
[ ] [ ] [ ] Energy conservation

[ ] [ ] [ ] 0110-99.0.2 Building Services and Distribution
[ ] [ ] [ ] Facility access / flexibility
[ ] [ ] [ ] Vertical chase construction codes
[ ] [ ] [ ] Service chase access
[ ] [ ] [ ] UL approved equipment
[ ] [ ] [ ] Controlled access to hazardous areas
[ ] [ ] [ ] Gas cylinder isolation
[ ] [ ] [ ] Service header maintenance
[ ] [ ] [ ] Facility service locations
[ ] [ ] [ ] Piping locations

[ ] [ ] [ ] 0110-99.0.4 Building Layout
[ ] [ ] [ ] Access control / hazardous areas
[ ] [ ] [ ] Process equipment location
[ ] [ ] [ ] Protection of workers
[ ] [ ] [ ] Emergency safe shutdown
[ ] [ ] [ ] NFPA 101 compliance for exits
[ ] [ ] [ ] Egress from hazardous areas
[ ] [ ] [ ] Exposure minimization through confinement
[ ] [ ] [ ] Airflow confinement
[ ] [ ] [ ] Operational space and hazard minimization
[ ] [ ] [ ] Space allocation safety features:
[ ] [ ] [ ] - Facility layout
[ ] [ ] [ ] - Space for shielding
[ ] [ ] [ ] Placement of storage areas
[ ] [ ] [ ] Designed for SNM storage and handling
[ ] [ ] [ ] Storage facility separation
[ ] [ ] [ ] Compartmentalization of stored materials
[ ] [ ] [ ] Corridor and door opening requirements
[ ] [ ] [ ] Door frame placement
[ ] [ ] [ ] Recessed corridor compartmentalization

YES NO N/A | JUSTIFICATION FOR N/A

[ ] [ ] [ ] 0110-99.0.6 Fire Resistance
[ ] [ ] [ ] DBF structural requirements
[ ] [ ] [ ] Fire rating requirements

[ ] [ ] [ ] 0110-99.0.8 Personnel and Public Safety
[ ] [ ] [ ] Automatic monitoring / alarm devices
[ ] [ ] [ ] Controlled entry to hazardous areas
[ ] [ ] [ ] Functional safety alarm systems
[ ] [ ] [ ] Alarms for exposure minimization
[ ] [ ] [ ] Personnel / public exposure requirements
[ ] [ ] [ ] Protection from hazardous materials

0111 STRUCTURAL DESIGN REQUIREMENTS

0111-99 SPECIAL FACILITIES

0111-99.0 Nonreactor Nuclear Facilities - General

[ ] [ ] [ ] 0111-99.0.1 General
[ ] [ ] [ ] Protection of safety class structures
[ ] [ ] [ ] Functioning of safety class items
[ ] [ ] [ ] Protection of safety class structures
[ ] [ ] [ ] Floor loadings / structural design
[ ] [ ] [ ] Integrity of confinement barriers
[ ] [ ] [ ] Combustible loading

0111-99.0.2 Tornado and Extreme Wind
[ ] [ ] [ ] Hazard model for DBT

0111-99.0.3 Floods
[ ] [ ] [ ] Design loads

[ ] [ ] [ ] 0111-99.0.4 Earthquakes
[ ] [ ] [ ] Site parameters for DBE
[ ] [ ] [ ] DBE hazard models
[ ] [ ] [ ] Seismic qualifications / safety class
[ ] [ ] [ ] Safety class equipment
[ ] [ ] [ ] Mounting and anchoring equipment

0111-99.0.5 Aircraft
[ ] [ ] [ ] Confinement structure protection

0111-99.0.6 Nearby Explosions and Externally Generated Missiles
[ ] [ ] [ ] External explosion effects

0111-99.0.7 Explosion, Internal Pressurization, Criticality and Other DBA Causes
[ ] [ ] [ ] Internal effects of blasts or DBAs

[ ] [ ] [ ] 0111-99.0.8 Load Combinations
[ ] [ ] [ ] Structural load requirements
[ ] [ ] [ ] Concrete structural requirements
[ ] [ ] [ ] Steel structural requirements

YES NO N/A | JUSTIFICATION FOR N/A

DIVISION 2

SITE AND CIVIL ENGINEERING

0200 SITE DEVELOPMENT

0200-1 FACILITY SITING

0200-1.2 Radiological Siting Requirements

[ ] [ ] [ ] Site evaluation documentation

0200-1.3 Radiological Siting Guidelines

[ ] [ ] [ ] Siting guidelines criteria

0200-99 SPECIAL FACILITIES

0200-99.0 Nonreactor Nuclear Facilities - General

0200-99.0.1 General

[ ] [ ] [ ] Site selection requirements

0200-99.0.2 Other Facilities and Operations

[ ] [ ] [ ] Potential hazards on-site / off-site

0200-99.0.4 Meteorology

[ ] [ ] [ ] Data considered in design

0262 CORROSION CONTROL

0262-3 Cathodic Protection Systems

[ ] [ ] [ ] Underground tanks / piping for combustible liquids

0273 WATER POLLUTION CONTROLS

0273-99 SPECIAL FACILITIES

[ ] [ ] [ ] 0273-99.0 Nonreactor Nuclear Facilities- General
[ ] [ ] [ ] Segregation of water systems
[ ] [ ] [ ] Installation per UPC and ASCE 37
[ ] [ ] [ ] Monitoring sanitary waste
[ ] [ ] [ ] Segregation of waste / process systems

0275 INDUSTRIAL WASTE WATER TREATMENT

0275-99 SPECIAL FACILITIES

0275-99.0 Nonreactor Nuclear Facilities-General

[ ] [ ] [ ] 0275-99.0.1 Industrial Waste
[ ] [ ] [ ] Treatment of industrial waste
[ ] [ ] [ ] Continuous monitoring of streams

[ ] [ ] [ ] 0275-99.0.2 Process Waste
[ ] [ ] [ ] Monitoring near source of generation
[ ] [ ] [ ] Collection system detectors
[ ] [ ] [ ] Multi-pipe encasement systems
[ ] [ ] [ ] Disposal of leakage

YES NO N/A | JUSTIFICATION FOR N/A

[ ] [ ] [ ] Criticality safety consideration
[ ] [ ] [ ] Prevent dilution of radioactive waste

0285 SOLID WASTE SYSTEMS

0285-99 SPECIAL FACILITIES

0285-99.0 Nonreactor Nuclear Facilities - General
[ ] [ ] [ ] Criticality safety consideration

DIVISION 9

FINISHES

0900 GENERAL

0900-99 SPECIAL FACILITIES

[ ] [ ] [ ] 0900-99.0 Nonreactor Nuclear Facilities - General
[ ] [ ] [ ] Nuclear material areas
[ ] [ ] [ ] Coating guidelines

DIVISION 11

EQUIPMENT

1161 ENCLOSURES

[ ] [ ] [ ] 1161-1 General Considerations
[ ] [ ] [ ] Personnel exposure prevention
[ ] [ ] [ ] Primary design guidelines
[ ] [ ] [ ] Criticality considerations
[ ] [ ] [ ] Equipment placement
[ ] [ ] [ ] Integrity of enclosure systems

[ ] [ ] [ ] 1161-2 Construction
[ ] [ ] [ ] Fire / corrosion resistant materials
[ ] [ ] [ ] Leak-tight enclosures
[ ] [ ] [ ] Maintaining enclosure confinement
[ ] [ ] [ ] Designed for visual access
[ ] [ ] [ ] Fire resistant windows
[ ] [ ] [ ] Glove port requirements
[ ] [ ] [ ] Sealing confinement barriers
[ ] [ ] [ ] Heat generation safety
[ ] [ ] [ ] Glove box transfer systems
[ ] [ ] [ ] Structural support for shielding
[ ] [ ] [ ] Fire barriers
[ ] [ ] [ ] Automatic / manual control of fire barriers

[ ] [ ] [ ] 1161-3 Fire Protection
[ ] [ ] [ ] Automatic fire suppression provisions
[ ] [ ] [ ] Detection / absence of automatic systems
[ ] [ ] [ ] Manual suppression / fire detection

YES	NO	N/A		JUSTIFICATION FOR N/A
[ ]	[ ]	[ ]	1161-4 Ventilation	
[ ]	[ ]	[ ]	Ventilation requirements for enclosures	
[ ]	[ ]	[ ]	Open-faced hood ventilation	
[ ]	[ ]	[ ]	Safety class emergency power	
[ ]	[ ]	[ ]	Failure of components	
[ ]	[ ]	[ ]	Evaluate potential hazards	
[ ]	[ ]	[ ]	Perchloric acid fume exhaust requirements	
[ ]	[ ]	[ ]	Use of HEPA filters for contamination control	
[ ]	[ ]	[ ]	Reducing HEPA filter loading	
[ ]	[ ]	[ ]	Automatic / adequate inflow of air	
[ ]	[ ]	[ ]	Air velocity standards	
[ ]	[ ]	[ ]	Ventilation enclosure fire protection	
[ ]	[ ]	[ ]	Confinement in enclosures	
[ ]	[ ]	[ ]	Pressure-relief devices	
[ ]	[ ]	[ ]	Hood face locations	
[ ]	[ ]	[ ]	Open-faced air velocity	
[ ]	[ ]	[ ]	Hood air limitations	
[ ]	[ ]	[ ]	Face velocity for open faced hoods	
[ ]	[ ]	[ ]	Recirculation of exhaust air	
			1161-5 Operational Compatibility	
[ ]	[ ]	[ ]	Design criteria for enclosures and process equipment	

DIVISION 12

FURNISHINGS

1260 FURNITURE AND ACCESSORIES

1260-99 SPECIAL FACILITIES

			1260-99.1 Laboratory Facilities (Including Hot Laboratories)	
[ ]	[ ]	[ ]	Shielding material weight	

DIVISION 13

SPECIAL FACILITIES

1300 GENERAL REQUIREMENTS

1300-1 COVERAGE AND OBJECTIVES

[ ]	[ ]	[ ]	1300-1.3 Objectives	
[ ]	[ ]	[ ]	Design of special facilities:	
[ ]	[ ]	[ ]	- Public / personnel protection	
[ ]	[ ]	[ ]	- Nuclear material safety compliance	
[ ]	[ ]	[ ]	- Property / operations protection	
[ ]	[ ]	[ ]	- Minimize personnel exposure	
[ ]	[ ]	[ ]	Considerations for health hazards	
[ ]	[ ]	[ ]	Release of hazardous waste	
[ ]	[ ]	[ ]	DBA risk consideration	
[ ]	[ ]	[ ]	Employee protection	
[ ]	[ ]	[ ]	Mixed-use facilities	

YES NO N/A | JUSTIFICATION FOR N/A

1300-1.4 Guidance on Limiting Exposure of the Public

1300-1.4.1 General

[ ] [ ] [ ] Minimize dose from hazardous material

1300-1.4.2 Accidental Releases

[ ] [ ] [ ] Hazardous material confinement systems

1300-1.4.3 Routine Releases

[ ] [ ] [ ] Radiation dose limitations

1300-1.4.4 Monitoring of Releases

[ ] [ ] [ ] Monitoring requirements

1300-3 SAFETY CLASS CRITERIA

1300-3.1 General

[ ] [ ] [ ] DBA mitigation in facility design

[ ] [ ] [ ] 1300-3.2 Safety Class Items

[ ] [ ] [ ] Safety class standards / requirements

[ ] [ ] [ ] Safety class / non-safety class design

1300-3.3 Single Failure Criteria and Redundancy

[ ] [ ] [ ] Operability of safety class systems

[ ] [ ] [ ] Redundancy for single failures

1300-3.4 Equipment Environment Considerations

1300-3.4.1 General

[ ] [ ] [ ] Compatibility of safety class items

[ ] [ ] [ ] 1300-3.5 Maintenance

[ ] [ ] [ ] Maintainability of equipment

[ ] [ ] [ ] Preventive maintenance of safety class items

[ ] [ ] [ ] Ancillary equipment location

[ ] [ ] [ ] Design of equipment within confinement areas

[ ] [ ] [ ] 1300-3.6 Testing

[ ] [ ] [ ] Provisions for testing safety class items

[ ] [ ] [ ] Testing HEPA filtration systems

[ ] [ ] [ ] 1300-4 Nuclear Criticality Safety

[ ] [ ] [ ] Equipment and procedure criteria

[ ] [ ] [ ] Process design safety factors

[ ] [ ] [ ] Geometrically favorable design

[ ] [ ] [ ] Redundancy in process designs

[ ] [ ] [ ] Designed as safety class items

[ ] [ ] [ ] Control of NCS in facility design

[ ] [ ] [ ] Process system fissile material control

[ ] [ ] [ ] Designed for controlling transfers of fissile material

[ ] [ ] [ ] Geometrically favorable collection systems

[ ] [ ] [ ] Shield design / facility layout:

[ ] [ ] [ ] Egress routes

[ ] [ ] [ ] Escape routes designed

YES	NO	N/A		JUSTIFICATION FOR N/A
[ ]	[ ]	[ ]	Additional shielding requirements	
[ ]	[ ]	[ ]	Crash exiting for personnel	
			1300-5 Source and Special Nuclear Material	
[ ]	[ ]	[ ]	Applying appropriate design based on hazard	
			1300-6 RADIATION PROTECTION	
[ ]	[ ]	[ ]	1300-6.1 General	
[ ]	[ ]	[ ]	Minimize personnel exposures	
[ ]	[ ]	[ ]	Engineered controls for radiation protection	
[ ]	[ ]	[ ]	1300-6.2 Shielding Design	
[ ]	[ ]	[ ]	Exposure limitations through design	
[ ]	[ ]	[ ]	Protection measures for intermittent access	
[ ]	[ ]	[ ]	Concrete shielding specifications	
[ ]	[ ]	[ ]	Shield wall penetration	
			1300-6.3 Hand and Forearm Protection	
[ ]	[ ]	[ ]	Remote shielding to limit exposure	
[ ]	[ ]	[ ]	1300-6.4 Internal Radiation Exposure	
[ ]	[ ]	[ ]	Airborne concentration limits	
[ ]	[ ]	[ ]	Respirators not required in design	
[ ]	[ ]	[ ]	Features for minimizing inhalation of hazardous materials	
			1300-6.5 Monitoring, Warning and Alarm Systems	
			1300-6.5.1 General	
[ ]	[ ]	[ ]	Emergency UPS for radiation monitoring	
			1300-6.5.2 Air Monitoring and Warning Systems	
[ ]	[ ]	[ ]	Monitoring of hazardous materials	
			1300-6.5.3 Personnel Monitoring and Warning Devices	
[ ]	[ ]	[ ]	Monitoring devices (CAMs) in work areas	
			1300-6.5.4 Ionizing Radiation Monitoring System	
[ ]	[ ]	[ ]	Monitoring ionizing radiation	
			1300-6.5.5 Warning and Alarm System Features	
[ ]	[ ]	[ ]	Evacuation alarm system requirements	
			1300-6.5.6 Nuclear Accident Dosimetry	
[ ]	[ ]	[ ]	Requirements for placement of dosimeters	
			1300-6.5.7 Central Radiation Monitoring and Alarm Readout	
[ ]	[ ]	[ ]	Operability of instrumentation following a DBA	
			1300-6.6 Decontamination of Personnel	
[ ]	[ ]	[ ]	Location of decontamination facilities	
[ ]	[ ]	[ ]	1300-6.8 Change Rooms	
[ ]	[ ]	[ ]	Room contamination control	
[ ]	[ ]	[ ]	Exhaust air filtration	

YES	NO	N/A		JUSTIFICATION FOR N/A
			1300-6.9 Breathing Air System	
[ ]	[ ]	[ ]	System requirements	
			1300-7 CONFINEMENT SYSTEMS	
[ ]	[ ]	[ ]	1300-7.2 General	
[ ]	[ ]	[ ]	Airflow within confinement areas	
[ ]	[ ]	[ ]	Achieving system objectives	
[ ]	[ ]	[ ]	System operability during DBA	
[ ]	[ ]	[ ]	Redundancy provided for system failure	
[ ]	[ ]	[ ]	Designed to withstand DBAs and DBFs	
[ ]	[ ]	[ ]	Design incorporates means for decontamination	
[ ]	[ ]	[ ]	Ventilation and off-gas system requirements	
[ ]	[ ]	[ ]	Hazardous material enclosure requirements	
[ ]	[ ]	[ ]	1300-7.3 Access Ways	
[ ]	[ ]	[ ]	Measures to control radioactive airborne materials	
[ ]	[ ]	[ ]	Normal / emergency equipment provisions	
[ ]	[ ]	[ ]	Emergency features	
[ ]	[ ]	[ ]	1300-7.4 Transfer Pipes and Encasements	
[ ]	[ ]	[ ]	Double-walled pipe placement	
[ ]	[ ]	[ ]	Leakage monitoring	
			1300-8 WASTE MANAGEMENT	
[ ]	[ ]	[ ]	1300-8.1 General	
[ ]	[ ]	[ ]	Controlling waste in process systems	
[ ]	[ ]	[ ]	Facilities for safe handling	
[ ]	[ ]	[ ]	Volume reduction equipment	
[ ]	[ ]	[ ]	Waste handling area standards	
[ ]	[ ]	[ ]	Radioactive waste requirements	
[ ]	[ ]	[ ]	1300-8.2 Hazardous Waste Requirements	
[ ]	[ ]	[ ]	Design requirements	
[ ]	[ ]	[ ]	Land disposal facilities	
[ ]	[ ]	[ ]	Land disposal restrictions	
[ ]	[ ]	[ ]	1300-8.3 Mixed Waste	
[ ]	[ ]	[ ]	Minimizing radioactive mixed waste	
[ ]	[ ]	[ ]	Segregation of mixed wastes	
			1300-8.4 Waste Segregation	
[ ]	[ ]	[ ]	Facility designed for waste segregation	
			1300-8.5 Spill Prevention and Control	
[ ]	[ ]	[ ]	Preventing accidental releases	
[ ]	[ ]	[ ]	1300-8.6 Approvals and Permits	
[ ]	[ ]	[ ]	Limits considered in design	
[ ]	[ ]	[ ]	1300-9 EFFLUENT CONTROL AND MONITORING	
[ ]	[ ]	[ ]	Facilities / equipment provided for handling	
[ ]	[ ]	[ ]	Environmental release limits	
[ ]	[ ]	[ ]	Design reducing effluents to ALARA	

YES	NO	N/A		JUSTIFICATION FOR N/A
[ ]	[ ]	[ ]	Site boundary radionuclide limits	
[ ]	[ ]	[ ]	Effluent discharge specifications	
[ ]	[ ]	[ ]	Treatment / discharge system guidelines	
[ ]	[ ]	[ ]	Stream sampling / monitoring requirements	
[ ]	[ ]	[ ]	Design for appropriate groundwater monitoring	

1300-10 PHYSICAL PROTECTION, MATERIAL SAFEGUARDS, AND STORAGE OF SPECIAL NUCLEAR MATERIAL

1300-10.3 Material Control and Accountability (MC&A) Safeguards

[ ]	[ ]	[ ]	1300-10.3.2 Material Control Systems	
[ ]	[ ]	[ ]	Material Access Area (MAA) Boundary	
[ ]	[ ]	[ ]	- Alarmed doors for evacuations	
[ ]	[ ]	[ ]	1300-10.3.3 Material Accounting Systems	
[ ]	[ ]	[ ]	Designed for non-destructive assay of material	
[ ]	[ ]	[ ]	Measurement capability in process areas:	
[ ]	[ ]	[ ]	- Mechanical mixing or sparging	
[ ]	[ ]	[ ]	- Design of recirculating samplers	
[ ]	[ ]	[ ]	- Recalibration capability / liquid-level measurements	
[ ]	[ ]	[ ]	Suitable environment for NDA instrumentation:	
[ ]	[ ]	[ ]	- Location designed for temperature control	
[ ]	[ ]	[ ]	- Equipment location remote from material pathway	
[ ]	[ ]	[ ]	- NDA station location amenable to transportation	
[ ]	[ ]	[ ]	Design should minimize material holdup:	
[ ]	[ ]	[ ]	- Minimize horizontal piping runs	
[ ]	[ ]	[ ]	- Minimize collection points in piping configuration	
[ ]	[ ]	[ ]	- Glove boxes designed for ease of cleaning	
[ ]	[ ]	[ ]	- Capability to measure material holdup	
			1300-10.3.4 Other Systems	
[ ]	[ ]	[ ]	Process monitoring systems for collection of data	

1300-11 DECONTAMINATION AND DECOMMISSIONING

[ ]	[ ]	[ ]	1300-11.1 Decontamination	
[ ]	[ ]	[ ]	Design measures to simplify decontamination	
[ ]	[ ]	[ ]	Service piping, duct work, etc. kept to a minimum	
[ ]	[ ]	[ ]	Ductwork filters	
[ ]	[ ]	[ ]	Strippable coverings	
[ ]	[ ]	[ ]	Requirements for finishes	
[ ]	[ ]	[ ]	1300-11.2 Decommissioning	
[ ]	[ ]	[ ]	Planning / design phase requirements	
[ ]	[ ]	[ ]	Facility features	

1300-12 HUMAN FACTORS ENGINEERING

[ ]	[ ]	[ ]	1300-12.1 Coverage	
[ ]	[ ]	[ ]	Design of work environment	
[ ]	[ ]	[ ]	New construction / retrofitting	

YES	NO	N/A		JUSTIFICATION FOR N/A
			1300-12.2 Objectives	
[ ]	[ ]	[ ]	Human factors engineering considerations	
			1300-12.3 System Development	
			1300-12.3.3 Requirements Analyses	
[ ]	[ ]	[ ]	Design process system analysis	
			1300-12.3.4 Process Systems Design Interfaces	
[ ]	[ ]	[ ]	Human factor design requirements	
			1300-12.4 General Human Factors Implementation Criteria & Considerations	
			1300-12.4.2 Human Dimension Considerations	
[ ]	[ ]	[ ]	Personnel equipment regulations	
[ ]	[ ]	[ ]	1300-12.4.3 Environmental Considerations	
[ ]	[ ]	[ ]	Climate control system	
[ ]	[ ]	[ ]	Ventilation requirements	
[ ]	[ ]	[ ]	Lighting requirements	
[ ]	[ ]	[ ]	Emergency lighting	
[ ]	[ ]	[ ]	Acoustic design specifications	
[ ]	[ ]	[ ]	Vibration limitations	
[ ]	[ ]	[ ]	Aesthetic design considerations	
			1300-12.4.4 Component Arrangement	
[ ]	[ ]	[ ]	User friendly controls arrangement	
[ ]	[ ]	[ ]	1300-12.4.5 Protective Equipment	
[ ]	[ ]	[ ]	Personnel access	
[ ]	[ ]	[ ]	Body size compatibility	
			1300-12.4.6 Display Devices	
[ ]	[ ]	[ ]	Establishing operator informational needs	
[ ]	[ ]	[ ]	1300-12.4.7 System Controls	
[ ]	[ ]	[ ]	System control requirements	
[ ]	[ ]	[ ]	Component activation control	
[ ]	[ ]	[ ]	Coding guidelines	
[ ]	[ ]	[ ]	1300-12.4.8 Warning Annunciator Systems	
[ ]	[ ]	[ ]	Guidelines for alerting personnel	
[ ]	[ ]	[ ]	Alarm acknowledgment	
[ ]	[ ]	[ ]	Awareness alarm conditions	
[ ]	[ ]	[ ]	Visual alarm tiles	
[ ]	[ ]	[ ]	Periodic testing	
			1300-12.4.9 Communication Systems	
[ ]	[ ]	[ ]	User selection analysis	
			130-12.4.10 Maintainability	
[ ]	[ ]	[ ]	System / equipment design guidelines	

YES NO N/A | JUSTIFICATION FOR N/A

[ ] [ ] [ ] 1300-12.4.11 Labels
[ ] [ ] [ ] Equipment identification
[ ] [ ] [ ] Label permanency
[ ] [ ] [ ] Temporary label usage
[ ] [ ] [ ] Labeling requirements

1304 PLUTONIUM PROCESSING AND HANDLING FACILITY (PPHF)

1304-3 NUCLEAR CRITICALITY SAFETY

[ ] [ ] [ ] Enclosures and material transport systems

[ ] [ ] [ ] 1304-4 RADIOACTIVE PROTECTION
[ ] [ ] [ ] Facility design monitoring provisions
[ ] [ ] [ ] Criteria guidelines
[ ] [ ] [ ] Monitoring neutron shields
[ ] [ ] [ ] Air monitor sensitivity

[ ] [ ] [ ] 1304-5 SPECIAL DESIGN FEATURES
[ ] [ ] [ ] Hazardous gas / liquid limitations
[ ] [ ] [ ] Flammable gas specifications
[ ] [ ] [ ] Double-walled piping or conduits
[ ] [ ] [ ] HEPA filtration for exhaust systems
[ ] [ ] [ ] Durability of safety class items

1304-6 CONFINEMENT SYSTEMS

[ ] [ ] [ ] 1304-6.1 General
[ ] [ ] [ ] Confinement barrier effectiveness
[ ] [ ] [ ] Principal confinement system operability

[ ] [ ] [ ] 1304-6.2 Primary Confinement System
[ ] [ ] [ ] Plutonium containment enclosures
[ ] [ ] [ ] Enclosures for dispersible forms of plutonium
[ ] [ ] [ ] System integrity / loss of primary confinement
[ ] [ ] [ ] Exhaust ventilation size
[ ] [ ] [ ] Combustible metal enclosures
[ ] [ ] [ ] Inert atmosphere for pyrophoric materials
[ ] [ ] [ ] Confinement barriers

[ ] [ ] [ ] 1304-6.3 Secondary Confinement System
[ ] [ ] [ ] Secondary confinement integrity
[ ] [ ] [ ] Continuous monitoring
[ ] [ ] [ ] Secondary barrier penetrations
[ ] [ ] [ ] Ventilation airflow velocity

1304-6.4 Tertiary Confinement System
[ ] [ ] [ ] Integrity of confinement system

1304-7 EFFLUENT CONTROL AND MONITORING

[ ] [ ] [ ] 1304-7.1 Radioactive Solid Waste
[ ] [ ] [ ] Locations for handling / packaging

YES	NO	N/A		JUSTIFICATION FOR N/A
[ ]	[ ]	[ ]	1304-7.2 Radioactive Liquid Waste	
[ ]	[ ]	[ ]	Requirements for plutonium contaminated waste	
[ ]	[ ]	[ ]	Plutonium waste concentration limits	
			1304-7.3 Effluents	
[ ]	[ ]	[ ]	1304-7.3.1 Airborne Effluents	
[ ]	[ ]	[ ]	Minimization of plutonium holdup	
[ ]	[ ]	[ ]	Nuclear criticality safety provisions	
[ ]	[ ]	[ ]	Monitoring / control requirements	
[ ]	[ ]	[ ]	Monitoring capability for exhaust outlets	
[ ]	[ ]	[ ]	1304-8 DECONTAMINATION AND DECOMMISSIONING	
[ ]	[ ]	[ ]	Process decontamination areas	
[ ]	[ ]	[ ]	Air cleaning devices	
[ ]	[ ]	[ ]	Strippable coatings	
[ ]	[ ]	[ ]	Smooth operating surfaces	
[ ]	[ ]	[ ]	Contaminated area access	
			1305 PLUTONIUM STORAGE FACILITIES (PSF)	
[ ]	[ ]	[ ]	1305-3 NUCLEAR CRITICALITY SAFETY	
[ ]	[ ]	[ ]	Storage rack design	
[ ]	[ ]	[ ]	Design criteria	
[ ]	[ ]	[ ]	1305-4 SPECIAL DESIGN FEATURES	
[ ]	[ ]	[ ]	Hazardous / natural gas use limitations	
[ ]	[ ]	[ ]	Storage buildings	
[ ]	[ ]	[ ]	Facility layout	
[ ]	[ ]	[ ]	Facility design for storage containers	
[ ]	[ ]	[ ]	New storage facility location	
[ ]	[ ]	[ ]	Combustible material containers	
[ ]	[ ]	[ ]	Geometrically favorable design	
[ ]	[ ]	[ ]	Limiting quantities of material	
[ ]	[ ]	[ ]	Controlling entry to hazardous areas	
[ ]	[ ]	[ ]	Safety alarm system annunciation	
[ ]	[ ]	[ ]	Storage rack design	
[ ]	[ ]	[ ]	Door locations / surveillance systems	
[ ]	[ ]	[ ]	SNM storage location accessibility	
			1305-5 CONFINEMENT SYSTEMS	
[ ]	[ ]	[ ]	1305-5.1 General	
[ ]	[ ]	[ ]	Operation of protection systems	
[ ]	[ ]	[ ]	Controlled access to compartments	
[ ]	[ ]	[ ]	HEPA filtration in ventilation systems	
[ ]	[ ]	[ ]	1305-5.2 Primary Confinement System	
[ ]	[ ]	[ ]	Design features for handling SNM	
[ ]	[ ]	[ ]	Container corrosive-resistant confinement	
[ ]	[ ]	[ ]	Equipment handling systems	
[ ]	[ ]	[ ]	1305-5.3 Secondary Confinement System	
[ ]	[ ]	[ ]	System operability for DBAs	
[ ]	[ ]	[ ]	Contamination prevention	

YES	NO	N/A		JUSTIFICATION FOR N/A
[ ]	[ ]	[ ]	Ventilation systems	
[ ]	[ ]	[ ]	1305-5.4 Tertiary Confinement System	
[ ]	[ ]	[ ]	Building structure guidelines	
[ ]	[ ]	[ ]	Contamination migration prevention	
[ ]	[ ]	[ ]	Accessibility requirements	
			1305-6 EFFLUENT CONTROL AND MONITORING	
			1305-6.1 General	
[ ]	[ ]	[ ]	Handling routine wastes	
			1305-6.2 Radioactive Solid Waste	
[ ]	[ ]	[ ]	Solid waste design objectives	
			1305-6.3 Radioactive Liquid Waste	
[ ]	[ ]	[ ]	1305-6.3.1 Industrial Waste	
[ ]	[ ]	[ ]	Treatment of industrial waste	
[ ]	[ ]	[ ]	Treatment process design	
			1305-6.3.2 Decontamination Wastes	
[ ]	[ ]	[ ]	Waste collection / leak control and monitoring	
			1305-6.4 Effluents	
[ ]	[ ]	[ ]	1305-6.4.1 Airborne Effluents	
[ ]	[ ]	[ ]	Ventilation exhaust system	
[ ]	[ ]	[ ]	Dual monitoring requirements	
			1321 REPROCESSING FACILITIES	
			1321-2 OBJECTIVES	
[ ]	[ ]	[ ]	Guidelines for credible accidents	
[ ]	[ ]	[ ]	1321-3 NUCLEAR CRITICALITY SAFETY	
[ ]	[ ]	[ ]	Confinement of fissile materials	
[ ]	[ ]	[ ]	Prevention of inadvertent fissile material transfers	
[ ]	[ ]	[ ]	Design of heating / cooling jackets	
[ ]	[ ]	[ ]	Prevention of fissile material accumulation	
[ ]	[ ]	[ ]	Assuring criticality safety through design	
[ ]	[ ]	[ ]	Reprocessing facility criteria	
[ ]	[ ]	[ ]	1321-4 SPECIAL DESIGN FEATURES	
[ ]	[ ]	[ ]	Auxiliary / process systems contamination control	
[ ]	[ ]	[ ]	Process equipment fluid transfer	
[ ]	[ ]	[ ]	Integrity of off-gas treatment systems	
[ ]	[ ]	[ ]	Airflow and backflow preventors	
[ ]	[ ]	[ ]	Process off-gas treatment	
[ ]	[ ]	[ ]	Treatment system design to remove particulate	
[ ]	[ ]	[ ]	Radioiodine absorber units	
[ ]	[ ]	[ ]	Chemical reaction prevention	
[ ]	[ ]	[ ]	Fission products design provisions	
[ ]	[ ]	[ ]	Primary confinement component pressurization	
[ ]	[ ]	[ ]	Reprocessing facility criteria	

YES	NO	N/A		JUSTIFICATION FOR N/A
			1321-5 CONFINEMENT SYSTEMS	
[ ]	[ ]	[ ]	1321-5.1 General	
[ ]	[ ]	[ ]	Process system enclosures	
[ ]	[ ]	[ ]	Change rooms / access ways	
[ ]	[ ]	[ ]	Confinement barrier effectiveness	
[ ]	[ ]	[ ]	Reprocessing facility criteria	
[ ]	[ ]	[ ]	1321-5.2 Primary Confinement System	
[ ]	[ ]	[ ]	System integrity during DBAs	
[ ]	[ ]	[ ]	Impact on secondary confinement	
[ ]	[ ]	[ ]	Chemical reaction prevention	
[ ]	[ ]	[ ]	1321-5.3 Secondary Confinement System	
[ ]	[ ]	[ ]	System integrity during DBAs	
[ ]	[ ]	[ ]	Detection sensors and alarms	
[ ]	[ ]	[ ]	Contamination prevention	
[ ]	[ ]	[ ]	Ventilation system differential pressure	
[ ]	[ ]	[ ]	Process cell exhaust ventilation	
[ ]	[ ]	[ ]	Negative compartment pressure	
[ ]	[ ]	[ ]	Special access features	
			1321-5.4 Tertiary Confinement System	
[ ]	[ ]	[ ]	1321-5.4.1 General	
[ ]	[ ]	[ ]	Performs its function under all conditions	
[ ]	[ ]	[ ]	Withstands effects of DBAs and DBFs	
			1321-5.4.2 Penetrations	
[ ]	[ ]	[ ]	Contamination prevention	
			1321-6 EFFLUENT CONTROL AND MONITORING	
			1321-6.1 Radioactive Solid Waste	
[ ]	[ ]	[ ]	Design for criticality safety considered	
			1321-6.2 Radioactive Liquid Waste	
			1321-6.2.1 Process Waste	
[ ]	[ ]	[ ]	Nuclear criticality considerations	
			1321-6.3 Effluents	
[ ]	[ ]	[ ]	1321-6.3.1 Airborne Effluents	
[ ]	[ ]	[ ]	Minimizing holdup through design	
[ ]	[ ]	[ ]	Dual monitoring system requirements	
			1321-7 DECONTAMINATION AND DECOMMISSIONING	
[ ]	[ ]	[ ]	Permanent decontamination capability	
			1323 RADIOACTIVE LIQUID WASTE FACILITIES (RLWF)	
[ ]	[ ]	[ ]	1323-3 NUCLEAR CRITICALITY SAFETY	
[ ]	[ ]	[ ]	Applicable to process / storage facilities	
[ ]	[ ]	[ ]	Control provisions for RLWFs shall include:	
[ ]	[ ]	[ ]	- Radioactive liquid waste process systems	
[ ]	[ ]	[ ]	- Controls for inadvertent transfers	

YES NO N/A | JUSTIFICATION FOR N/A

[ ] [ ] [ ] - Geometrically favorable vessels
[ ] [ ] [ ] - Process enclosures / floor drain designs
[ ] [ ] [ ] - Fissile material accumulation in sumps

1323-4 SPECIAL DESIGN FEATURES

1323-4.1 General

[ ] [ ] [ ] Control of radioactive liquid waste

[ ] [ ] [ ] 1323-4.2 Collection Systems
[ ] [ ] [ ] Waste measurement capability
[ ] [ ] [ ] Waste stream line segregation
[ ] [ ] [ ] Avoid using traps in RLW lines
[ ] [ ] [ ] Minimizing solids buildup
[ ] [ ] [ ] Avoiding use of waste stream by-passes

[ ] [ ] [ ] 1323-4.3 Storage and Transfer Systems
[ ] [ ] [ ] Spare storage capacity
[ ] [ ] [ ] Provisions for analyzing liquids
[ ] [ ] [ ] Transfer line identification

[ ] [ ] [ ] 1323-4.4 Treatment Systems
[ ] [ ] [ ] Volume reduction / waste solidification
[ ] [ ] [ ] Liquid waste characterization
[ ] [ ] [ ] Environmental waste prevention
[ ] [ ] [ ] Effluent analysis
[ ] [ ] [ ] Closed-loop cooling systems
[ ] [ ] [ ] Instrumentation / control system for monitoring

1323-5 CONFINEMENT SYSTEMS

[ ] [ ] [ ] 1323-5.1 General
[ ] [ ] [ ] Storage / process confinement
[ ] [ ] [ ] Process system integrity during DBAs
[ ] [ ] [ ] System operability following DBE
[ ] [ ] [ ] Preventing or minimizing chemical reactions
[ ] [ ] [ ] Secondary confinement for liquids
[ ] [ ] [ ] Buried storage tank requirements

[ ] [ ] [ ] 1323-5.2 High-Level Liquid Waste Confinement
[ ] [ ] [ ] Confinement systems and guidelines:
[ ] [ ] [ ] - Integrity of confinement systems during DBAs
[ ] [ ] [ ] - System functional preceding / following DBA
[ ] [ ] [ ] - Tertiary confinement system requirements
[ ] [ ] [ ] - Tanks / piping system construction
[ ] [ ] [ ] - Cooling systems / agitation for temperature control
[ ] [ ] [ ] - Confinement boundaries for H-LLW systems
[ ] [ ] [ ] - Spare pipeline installation
[ ] [ ] [ ] Guidelines for radioactive material treatment systems:
[ ] [ ] [ ] - Off-gas pretreatment
[ ] [ ] [ ] - Hydrogen buildup prevention
[ ] [ ] [ ] - Vessel venting
[ ] [ ] [ ] - Tank overflow collection systems
[ ] [ ] [ ] Primary confinement boundary measures:
[ ] [ ] [ ] - Vessel inventory monitoring

YES NO N/A | JUSTIFICATION FOR N/A

[ ] [ ] [ ] - On-line leakage monitoring
[ ] [ ] [ ] - Outside leakage vessel monitoring
[ ] [ ] [ ] - Visual and remote surveillance
[ ] [ ] [ ] - Test coupon evaluation of construction materials
[ ] [ ] [ ] - Other testing measures

[ ] [ ] [ ] 1323-5.3 Low-level Liquid Waste Confinement
[ ] [ ] [ ] Waste confinement system guidelines:
[ ] [ ] [ ] - Diking / means of secondary confinement
[ ] [ ] [ ] - Tertiary system not required
[ ] [ ] [ ] - Process / waste storage vessel vents
[ ] [ ] [ ] - Retention basin monitoring and guidelines
[ ] [ ] [ ] - Containment / recovery of solutions that leak

[ ] [ ] [ ] 1323-5.4 Transuranic-Contaminated Liquid Waste Confinement
[ ] [ ] [ ] Confinement system guidelines:
[ ] [ ] [ ] - Process facility secondary confinement
[ ] [ ] [ ] - Tank / piping construction materials
[ ] [ ] [ ] - Process / waste storage vessel vents
[ ] [ ] [ ] - Tertiary confinement not required
[ ] [ ] [ ] - Primary confinement boundary integrity
[ ] [ ] [ ] - Criticality safety in confinement structures

1323-6 EFFLUENT CONTROL AND MONITORING

1323-6.1 Contaminated Solid Waste

[ ] [ ] [ ] Criticality safety considered in facility design

1323-6.2 Contaminated Liquid Waste

[ ] [ ] [ ] 1323-6.2.1 Process Wastes
[ ] [ ] [ ] Disposal restrictions
[ ] [ ] [ ] Criticality safety considered in facility design

1323-6.3 Effluents

[ ] [ ] [ ] 1323-6.3.1 Airborne Effluents
[ ] [ ] [ ] Minimizing holdup of material
[ ] [ ] [ ] Criticality safety considerations
[ ] [ ] [ ] Exhaust monitoring with dual systems

1324 RADIOACTIVE SOLID WASTE FACILITIES

1324-1 COVERAGE

[ ] [ ] [ ] NRC regulations governing DOE facilities

1324-2 OBJECTIVES

1324-2.2 Siting Design Dose Objective For Normal Operations and Anticipated Operational Occurrences

[ ] [ ] [ ] 1324-2.2.1 Disposal (Permanent Isolation) Facilities
[ ] [ ] [ ] Public exposure limits for DOE regulated facilities
[ ] [ ] [ ] Public exposure limit for NRC regulated DOE facilities

1324-3 NUCLEAR CRITICALITY SAFETY

[ ] [ ] [ ] Applicable to facilities that store / process uranium

YES	NO	N/A		JUSTIFICATION FOR N/A
			1324-4 RADIATION PROTECTION	
[ ]	[ ]	[ ]	Requirements of DOE facilities regulated by the NRC	
			1324-5 SPECIAL DESIGN FEATURES	
[ ]	[ ]	[ ]	1324-5.1 General	
[ ]	[ ]	[ ]	Process / treatment system integrity	
[ ]	[ ]	[ ]	Cooling water / air system requirements	
[ ]	[ ]	[ ]	Control systems / monitoring instrumentation	
[ ]	[ ]	[ ]	1324-5.2 High-Level Waste Disposal Facility Confinement	
[ ]	[ ]	[ ]	Integrity of engineered barriers	
[ ]	[ ]	[ ]	Geological setting confinement	
[ ]	[ ]	[ ]	Waste retrieval capability in design	
[ ]	[ ]	[ ]	1324-5.3 Low-Level Waste Disposal Facility Confinement	
[ ]	[ ]	[ ]	Ground disposal barriers for waste confinement	
[ ]	[ ]	[ ]	Site permeability reduction objectives:	
[ ]	[ ]	[ ]	- Walls for low-level waste confinement	
[ ]	[ ]	[ ]	- Excavated area lining	
[ ]	[ ]	[ ]	- Other permeable reduction methods	
[ ]	[ ]	[ ]	Water contact minimization with waste	
			1324-6 CONFINEMENT SYSTEMS	
[ ]	[ ]	[ ]	1324-6.1 General	
[ ]	[ ]	[ ]	Independent system for corrosive / noxious materials	
[ ]	[ ]	[ ]	Contamination confinement control features	
[ ]	[ ]	[ ]	1324-6.2 Primary Confinement System	
[ ]	[ ]	[ ]	Process system engineered barriers	
[ ]	[ ]	[ ]	Functional process systems following DBE	
[ ]	[ ]	[ ]	1324-6.3 Secondary Confinement Systems	
[ ]	[ ]	[ ]	Barriers intact / system operability following DBE	
[ ]	[ ]	[ ]	Adequate secondary confinement to meet guidelines	
[ ]	[ ]	[ ]	Preventing migration of contamination	
[ ]	[ ]	[ ]	Process cell ventilation for adequate airflow	
[ ]	[ ]	[ ]	Compartment negative pressures	
[ ]	[ ]	[ ]	Access through secondary / tertiary barriers	
[ ]	[ ]	[ ]	1324-6.4 Tertiary Confinement System	
[ ]	[ ]	[ ]	Operability preceding / following DBE	
[ ]	[ ]	[ ]	Functional following DBAs / performance objectives:	
[ ]	[ ]	[ ]	- Maintenance not required following permanent closure	
[ ]	[ ]	[ ]	- Groundwater contaminant levels	
[ ]	[ ]	[ ]	- Controls following permanent closure	
			1324-7 EFFLUENT CONTROL AND MONITORING	
[ ]	[ ]	[ ]	1324-7.1 Radioactive Solid Waste	
[ ]	[ ]	[ ]	Volume reduction / immobilization	
[ ]	[ ]	[ ]	Nuclear criticality safety considerations	

YES NO N/A | JUSTIFICATION FOR N/A

1324-7.2 Radioactive Liquid Waste

1324-7.2.1 Process Wastes

[ ] [ ] [ ] Criticality safety considered regarding solutions

1324-7.3 Effluents

[ ] [ ] [ ] 1324-7.3.1 Airborne Effluents
[ ] [ ] [ ] Minimize holdup of fissile material
[ ] [ ] [ ] Nuclear criticality safety considerations
[ ] [ ] [ ] Dual exhaust outlet monitoring

1325 LABORATORY FACILITIES (INCLUDING HOT LABS)

1325-4 CONFINEMENT

[ ] [ ] [ ] 1325-4.1 General
[ ] [ ] [ ] Process and operations in laboratories considered
[ ] [ ] [ ] Requirements for reducing radioiodine in effluents

[ ] [ ] [ ] 1325-4.2 Primary Confinement System
[ ] [ ] [ ] Ensure integrity for all operational conditions
[ ] [ ] [ ] Compartmentalization for isolation of high-risk areas
[ ] [ ] [ ] Shielding for minimizing radiation exposures
[ ] [ ] [ ] Designed to limit chemical reactions
[ ] [ ] [ ] Design features for primary confinement:
[ ] [ ] [ ] - Safe introduction / removal of material
[ ] [ ] [ ] - Inert gas atmosphere for pyrophoric materials
[ ] [ ] [ ] - Primary / secondary / tertiary system segregation
[ ] [ ] [ ] - Operating negative pressures
[ ] [ ] [ ] - Tank venting to off-gas treatment
[ ] [ ] [ ] - Glove boxes
[ ] [ ] [ ] - Hot cells
[ ] [ ] [ ] Criteria for glove boxes:
[ ] [ ] [ ] - Neutralization of off-gases
[ ] [ ] [ ] - Single filtered exhaust for low-toxicity materials
[ ] [ ] [ ] - Minimum air velocity of 125 linear ft. per minute
[ ] [ ] [ ] - Requirements for inert atmosphere glove boxes
[ ] [ ] [ ] Criteria for hot cells:
[ ] [ ] [ ] - Material control requirements
[ ] [ ] [ ] - Exhaust filter design facilitates changeout
[ ] [ ] [ ] - Backup filter protection during changeout
[ ] [ ] [ ] - Monitoring OSR concentration limits in exhaust
[ ] [ ] [ ] - Retention of process waste for analysis

[ ] [ ] [ ] 1325-4.3 Secondary Confinement System
[ ] [ ] [ ] System operable during all conditions (DBAs) etc.
[ ] [ ] [ ] Design requirements:
[ ] [ ] [ ] - Features confining contamination to operating areas
[ ] [ ] [ ] - Separate ventilation air-cleaning
[ ] [ ] [ ] - Secondary confinement / negative pressures

[ ] [ ] [ ] 1325-4.4 Tertiary Confinement System
[ ] [ ] [ ] Design requirements:
[ ] [ ] [ ] - Protection of confinement systems
[ ] [ ] [ ] - Requirements for DBAs and DBF
[ ] [ ] [ ] - Separate ventilation air-cleaning

YES NO N/A | JUSTIFICATION FOR N/A

[ ] [ ] [ ] - Operating pressures negative in respect to atmosphere
[ ] [ ] [ ] Secondary / tertiary systems shared if acceptable in SAR

1325-5 EFFLUENT CONTROL AND MONITORING

1325-5.1 Radioactive Solid Waste

[ ] [ ] [ ] Facility specific wastes

1325-5.2 Radioactive Liquid Waste

1325-5.2.1 Process Waste

[ ] [ ] [ ] Facility specific wastes

1325-5.3 Effluents

[ ] [ ] [ ] 1325-5.3.1 Airborne Effluents
[ ] [ ] [ ] Fission product gases / particulate
[ ] [ ] [ ] Two monitoring systems for exhaust outlets

1325-6 DECONTAMINATION AND DECOMMISSIONING

[ ] [ ] [ ] Plans for ease of decontamination

DIVISION 15

MECHANICAL

1530 FIRE PROTECTION

1530-99 SPECIAL FACILITIES

[ ] [ ] [ ] 1530-99.0 Nonreactor Nuclear Facilities- General
[ ] [ ] [ ] Protecting facility against DBF / explosion
[ ] [ ] [ ] Fire suppression backup system
[ ] [ ] [ ] Fire system separation
[ ] [ ] [ ] System operability during DBA
[ ] [ ] [ ] Mechanical / fluid system requirements
[ ] [ ] [ ] Safety class system operability
[ ] [ ] [ ] Excluding combustible materials in construction
[ ] [ ] [ ] Maintaining confinement during DBF
[ ] [ ] [ ] Nonaqueous extinguishing systems
[ ] [ ] [ ] Operability during component failure
[ ] [ ] [ ] Fail-safe features
[ ] [ ] [ ] Emergency electrical power
[ ] [ ] [ ] Combustible gases / vapor dilution
[ ] [ ] [ ] Inert-gas purging
[ ] [ ] [ ] Process furnace automatic shutdown
[ ] [ ] [ ] Automatic water sprinkler placement
[ ] [ ] [ ] Water supply sources
[ ] [ ] [ ] Fire protection system features:
[ ] [ ] [ ] - Fire detection devices
[ ] [ ] [ ] - Extinguishing system for heat removal
[ ] [ ] [ ] - Design minimizing over pressurization
[ ] [ ] [ ] Maintaining barrier integrity
[ ] [ ] [ ] Supplemental extinguishing capability

YES	NO	N/A		JUSTIFICATION FOR N/A
[ ]	[ ]	[ ]	Electrical fire prevention	

1540 PLUMBING/SERVICE PIPING

1540-99 SPECIAL FACILITIES

1540-99.0 Nonreactor Nuclear Facilities-General

[ ]	[ ]	[ ]	1540-99.0.1 General Cooling System Criteria (AG)	
[ ]	[ ]	[ ]	System redundancy for emergency conditions	
[ ]	[ ]	[ ]	Heat utilization capability	
[ ]	[ ]	[ ]	Backup water supply	
[ ]	[ ]	[ ]	Piping code / durability following DBE	
[ ]	[ ]	[ ]	Cooling water / motive power	
[ ]	[ ]	[ ]	Isolating leaking components	
[ ]	[ ]	[ ]	System operation control	
[ ]	[ ]	[ ]	Safety class electrical components	
[ ]	[ ]	[ ]	System / heat sink protection	
[ ]	[ ]	[ ]	Equipment qualification for reliable operation	
[ ]	[ ]	[ ]	Cooling and water supply system requirements:	
[ ]	[ ]	[ ]	- Hydrostatic tests	
[ ]	[ ]	[ ]	- Operational performance tests	
[ ]	[ ]	[ ]	- System components inspection	
[ ]	[ ]	[ ]	System redundancy requirements:	
[ ]	[ ]	[ ]	- Two separate water sources	
[ ]	[ ]	[ ]	- Evaluating delivery systems	
[ ]	[ ]	[ ]	Control leakage of radioactive material into coolant	
[ ]	[ ]	[ ]	Coolant leakage control in storage vessels	
[ ]	[ ]	[ ]	1540-99.0.2 Water Collection System	
[ ]	[ ]	[ ]	System provided for runoff	
[ ]	[ ]	[ ]	Size determination	
[ ]	[ ]	[ ]	Fissile facility collection system conditions:	
[ ]	[ ]	[ ]	- Maximum material mass loading	
[ ]	[ ]	[ ]	- Material dispersion	
[ ]	[ ]	[ ]	- Concentration / configuration change	
[ ]	[ ]	[ ]	1540-99.0.3 Other Collection Systems	
[ ]	[ ]	[ ]	Monitoring / collecting contaminants in runoff	
[ ]	[ ]	[ ]	Shower water waste system	
			1540-99.0.5 Water Supplies and Other Utility Services	
[ ]	[ ]	[ ]	Emergency services	
			1540-99.0.6 System Installation	
[ ]	[ ]	[ ]	Piping system criteria for radioactive materials	
			1540-99.15 Reprocessing Facilities	
[ ]	[ ]	[ ]	Heat removal system	
			1540-99.18 Radioactive Solid Waste Facilities	
[ ]	[ ]	[ ]	Required water cooling system	

YES NO N/A | JUSTIFICATION FOR N/A

1550 HEATING, VENTILATING AND AIR-CONDITIONING SYSTEMS

1550-99 SPECIAL FACILITIES

1550-99.0 Nonreactor Nuclear Facilities-General

[ ] [ ] [ ] 1550-99.0.1 General Ventilation and Off-Gas Criteria
[ ] [ ] [ ] System airflow patterns
[ ] [ ] [ ] Damper location
[ ] [ ] [ ] System operability following DBE
[ ] [ ] [ ] Downdraft ventilation
[ ] [ ] [ ] Facility safety class system protection
[ ] [ ] [ ] Hydrogen gas storage
[ ] [ ] [ ] Hazardous material concentration limits
[ ] [ ] [ ] Off-gas stream pretreatment
[ ] [ ] [ ] Electrical component classification
[ ] [ ] [ ] Instrumentation / ventilation system control
[ ] [ ] [ ] Qualified reliable equipment

[ ] [ ] [ ] 1550-99.0.2 Confinement Ventilation Systems
[ ] [ ] [ ] Maintaining airflow control
[ ] [ ] [ ] Confinement during a single failure
[ ] [ ] [ ] Safety class electrical power
[ ] [ ] [ ] Air cleanup systems
[ ] [ ] [ ] General cleanup system requirements:
[ ] [ ] [ ] - Monitoring exhaust systems for radioactivity
[ ] [ ] [ ] - Offsite / onsite dose limitations
[ ] [ ] [ ] - Stack criteria for exhaust discharge
[ ] [ ] [ ] - Safety class air filtration units
[ ] [ ] [ ] - Air sampling criteria
[ ] [ ] [ ] - Filtration stages determined by safety analysis
[ ] [ ] [ ] - Air filtration stages
[ ] [ ] [ ] - Placement of air filtration units
[ ] [ ] [ ] - Transport velocities
[ ] [ ] [ ] - Air filtration radiation shielding
[ ] [ ] [ ] - Fissile material recovery from filters
[ ] [ ] [ ] - Cleanup system operation
[ ] [ ] [ ] - Safety class filtration systems
[ ] [ ] [ ] - Fail-safe backflow prevention
[ ] [ ] [ ] Hot cell exhaust system guidelines:
[ ] [ ] [ ] - Exhaust filter installation
[ ] [ ] [ ] - Standby filter placement
[ ] [ ] [ ] - Exhaust system monitors
[ ] [ ] [ ] Plutonium / enriched uranium process facility requirements:
[ ] [ ] [ ] - Enclosures for confining process work
[ ] [ ] [ ] - Ventilation system shutdown
[ ] [ ] [ ] - Monitoring oxygen levels
[ ] [ ] [ ] - Use of HEPA filters for contamination confinement
[ ] [ ] [ ] - Recirculation of room air
[ ] [ ] [ ] - Emergency power supply (UPS)
[ ] [ ] [ ] - Removing hazardous constituents in exhaust systems
[ ] [ ] [ ] - Filtration stages determined by safety analysis
[ ] [ ] [ ] - HEPA filter placement / testing
[ ] [ ] [ ] - Exhaust ventilation system / filtration stages
[ ] [ ] [ ] - Pressure relief devices

YES	NO	N/A		JUSTIFICATION FOR N/A
[ ]	[ ]	[ ]	- Air cleaning system criteria:	
[ ]	[ ]	[ ]	*. Systems / equipment for air cleaning	
[ ]	[ ]	[ ]	- Airborne contamination cleaning systems	
[ ]	[ ]	[ ]	1550-99.0.3 Off-Gas Systems	
[ ]	[ ]	[ ]	Guidelines for design	
[ ]	[ ]	[ ]	Radioactive material in off-gas systems	
[ ]	[ ]	[ ]	Off-gas system redundancy	
[ ]	[ ]	[ ]	Electrical equipment classification	
[ ]	[ ]	[ ]	Manual / automatic protective features	
[ ]	[ ]	[ ]	Off-gas system maintenance	
[ ]	[ ]	[ ]	System operability / venting	
[ ]	[ ]	[ ]	Design precludes accumulation of hydrogen	
[ ]	[ ]	[ ]	Traps and drains to remove liquid from vents	
[ ]	[ ]	[ ]	System component shielding	
[ ]	[ ]	[ ]	Neutralization of gases / particles	
[ ]	[ ]	[ ]	Maintaining glove box confinement	
[ ]	[ ]	[ ]	Chemical traps for removing radionuclides	
[ ]	[ ]	[ ]	Traps designed for criticality safety	
[ ]	[ ]	[ ]	Vent stream particulate / chemical removal	

1589 AIR POLLUTION CONTROL

1589-99 SPECIAL FACILITIES

1589-99.0 Nonreactor Nuclear Facilities-General

[ ]	[ ]	[ ]	1589-99.0.1 Radioactive Airborne Effluents	
[ ]	[ ]	[ ]	Filtration of particulates / gases	
[ ]	[ ]	[ ]	Exhaust ducts / stack monitoring requirements	
[ ]	[ ]	[ ]	Monitoring systems backup	
[ ]	[ ]	[ ]	Stack sampling / radiation monitoring	
[ ]	[ ]	[ ]	Criteria for representative sampling	
[ ]	[ ]	[ ]	Isokinetic sampling for effluent streams	
[ ]	[ ]	[ ]	Monitoring range capability	
[ ]	[ ]	[ ]	Criticality safety considerations	
[ ]	[ ]	[ ]	1589-99.0.2 Nonradioactive Airborne Effluents	
[ ]	[ ]	[ ]	Release point location	
[ ]	[ ]	[ ]	Effluent release guidelines / requirements	

DIVISION 16

ELECTRICAL

1660 SPECIAL SYSTEMS

1660-3 UNINTERRUPTIBLE POWER SYSTEMS

[ ]	[ ]	[ ]	Standards for continuous power	

YES	NO	N/A		JUSTIFICATION FOR N/A

1660-99 SPECIAL FACILITIES

1660 99.0 Nonreactor Nuclear Facilities-General

[ ]	[ ]	[ ]	1660-99.0.1 Safety Class (Emergency) Electrical Systems	
[ ]	[ ]	[ ]	System criteria	
[ ]	[ ]	[ ]	Emergency back-up systems	
[ ]	[ ]	[ ]	System redundancy and operability capability	
[ ]	[ ]	[ ]	Redundant system protection / criteria	
[ ]	[ ]	[ ]	Minimization of load connections	
[ ]	[ ]	[ ]	Safety class system requirements	
[ ]	[ ]	[ ]	Operability performance testing	
[ ]	[ ]	[ ]	Test capability	
[ ]	[ ]	[ ]	1660-99.0.2 Protection System and Instrumentation and Controls	
[ ]	[ ]	[ ]	Designed to minimize operational risks	
[ ]	[ ]	[ ]	Automatic control of interlocks	
[ ]	[ ]	[ ]	Protective devices for detecting hazardous conditions	
[ ]	[ ]	[ ]	System redundancy / diversity	
[ ]	[ ]	[ ]	Detection of abnormal conditions	
[ ]	[ ]	[ ]	System audible / visual alarms	
[ ]	[ ]	[ ]	Monitoring safety-related variables	
[ ]	[ ]	[ ]	Safety class redundancy / diversity	
			1660-99.0.3 Qualification	
[ ]	[ ]	[ ]	Environmental requirements	
[ ]	[ ]	[ ]	1660-99.0.4 Separation and Physical Protection	
[ ]	[ ]	[ ]	Safety class instrument channels	
[ ]	[ ]	[ ]	Separation of safety class systems from other systems	
			1660-99.0.5 Test and Calibration	
[ ]	[ ]	[ ]	Instrument channels and interlocks	
			1660-99.0.6 Power Sources	
[ ]	[ ]	[ ]	Power requirement for safe shutdown	
			1660-99.0.7 Control Areas	
[ ]	[ ]	[ ]	Redundant protective features for safe shutdown	

ATTACHMENT 2

SAFETY DESIGN CRITERIA FOR

SARs

Contained in this attachment are excerpts from the DOE orders which are provided for convenience in assisting the user in determining the design criteria that should be considered in evaluating facility safety.

In the event there should be any conflicts between these excerpts and the current DOE orders the DOE orders shall prevail.

SAFETY DESIGN CRITERIA FOR SARs

5820.2A RADIOACTIVE WASTE MANAGEMENT
9-26-88

CHAPTER 1: HIGH LEVEL WASTE

3. Requirements

3.a Design

(1) Requirements for New Facilities

(c) Designs for new storage facilities shall incorporate features to facilitate retrieval capability.

b. Storage Operations - Doubly Contained Systems

(2) Storage and Transfer Operations

a) All new high-level waste handling, transfer, and storage facilities (e. g., tanks, bins, pipelines, and capsules) shall be doubly contained.

b) Singly contained pipelines may be used routinely for liquid waste that has a total radioactivity concentration of less than 0.05Ci/gal (4.9 times 10^{11} $Bq/m2^{3}$). They may be used on a temporary basis for higher activity waste, if appropriate design and administrative controls are in place to mitigate adverse effects from a pipeline failure.

d) Secondary containment systems shall be capable of containing liquids that leak into them from the primary system and shall be equipped with transfer capability to retrieve the leaked liquid. Secondary containment systems for solidified high-level waste shall provide for physical isolation of the waste from the environment.

f) Where required, ventilation and filtration systems shall be provided to maintain radionuclides releases within the guidelines specified in DOE 5481.1B and applicable EH Orders. Ventilation systems shall be provided where the possibility exists for generating flammable and explosive mixtures of gases (e. g., hydrogen/air or organic/air).

g) Facilities using cathodic corrosion protection systems shall include engineered features that protect against abnormal conditions such as stay currents or system failure. The cathodic protection systems shall be calibrated annually, and all sources of impressed current shall be inspected and/or tested at least every other month.

h) Engineering controls shall be incorporated to provide liquid volume inventory data and to prevent spills, leaks, and overflows from tanks or containment systems. Examples are level-sensing devices, liquid level alarms, and maintenance of sufficient freeboard. The high-level waste shall be stored at pressures lower than those of ancillary systems (e.g., cooling water).

j) Each facility shall utilize remote maintenance features and other appropriate techniques to minimize personnel radiation exposure in accordance with DOE 5481.1B.

k) Upon loss and subsequent recovery of normal electric power, high-level waste transfer equipment shall not have the capability to restart without active operator action.

(3) Monitoring, Surveillance and Leak Detection

a) Monitoring and leak detection capability shall be incorporated in the engineering systems (e. g., liquid level sensing devices and alarms for high-level waste liquid systems) to provide rapid identification of failed containment, and measurement of abnormal temperatures. The following, at a minimum shall be monitored: temperature; pressure; radioactivity in ventilation exhaust; and liquid effluent streams associated with high-level waste facilities. Where the possibility exist for the generation of flammable and explosive mixtures of gases, monitoring shall be conducted. For facilities storing liquid high-level waste, the following should also be monitored: liquid levels; sludge volume; tank chemistry; condensate and cooling water.

b) Leak detection systems (e. g., conductivity probes) shall be designed and operated so that they will detect the failure of the primary containment boundary, the occurrence of waste release, or accumulated liquid in the secondary containment system.

c) A method for periodically assessing waste storage system integrity (e. g., coupons for corrosion testing, photographic and periscopic inspections, leak detectors, liquid level devices) shall be established, documented, reported as required in the Waste Management Plan.

d) Electrical monitoring and leak detection devices essential to safe operations shall be provided with backup power, as appropriate, to ensure operability under emergency conditions.

e) Surface water systems associated with the high-level waste storage area shall be monitored according to applicable National Pollution Discharge Elimination System permits and EH Order requirements.

f) A system of ground water or vadose zone monitoring wells meeting the Resource Conservation and Recovery Act requirements per 40 CFR 264 shall be installed, as a minimum, around clusters of liquid waste storage tanks.

c. Storage Operations - Singly Contained Tank Systems

(2) Storage and Transfer Operations

c) Engineered systems shall be incorporated to provide waste volume inventory data, consistent with the nature of the specific waste stored in singly contained tanks. Examples are surface level sensing devices and interstitial liquid level sensing devices.

d) Singly contained pipelines: (see 3b(2)(b)).

e) Where active ventilation is required, systems shall be provided to maintain radionuclides releases at the point of discharge within the guidelines specified in applicable EH Orders for offsite concentrations and DOE 5480.1B for onsite dose commitment considerations.

g) Each facility shall use remote maintenance features and other appropriate techniques to maintain personnel radiation exposure as low as reasonably achievable.

h) Electrical power loss: (see 3b(2)(k)).

(3) Monitoring, Surveillance and Leak Detection

a) Monitoring and surveillance capability shall exist to provide liquid volume, waste inventory data, and identification of failed containment.

c) Emergency power: (see 3b(3)(d)).

d) Monitoring wells: (see 3b(3)(f)).

CHAPTER II: MANAGEMENT OF TRANSURANIC WASTE

3. Requirements

(e) Temporary Storage at Generating Sites

5) Transuranic waste storage facilities shall be designed, constructed, maintained, and operated to minimize the possibility of fire, explosion, or accidental release of radioactive and/or hazardous components of the waste to the environment.

(g) Interim Storage

(2) New interim storage facilities shall be sited, designed, constructed, and operated consistent with the requirements of applicable Resource and Recovery Act regulations and in a manner which satisfactorily addresses the following considerations at a minimum:

b) The facility shall be designed and operated to minimize the run on and run off of precipitation. The run off control system shall provide for collecting and sampling run off, which may come in contact with the waste packages, prior to releasing the water for discharge.

c) An environmental monitoring system shall be provided to detect any release and migration of major radioactive and hazardous components. Background levels of primary radioactive and hazardous waste components shall be determined.

d) The storage facility design shall minimize the possibility for the unauthorized entry of persons.

f) Waste storage facilities shall be designed and operated to minimize exposure of personnel to radiation and chemicals.

CHAPTER III: MANAGEMENT OF LOW-LEVEL WASTE

3. Requirements

C. Waste Generation

(4) Waste Minimization: Each DOE-low-level waste generator preparing a design for a new process or process change shall incorporate principles into the design that will minimize the generation of low-level waste.

(8) Disposal Facility and Disposal Site Design

b) Disposal units shall be designed consistent with disposal site hydrology, geology, and waste characteristics and in accordance with the National Environmental Policy Act process.

CHAPTER IV: DECOMMISSIONING OF RADIOACTIVELY CONTAMINATED FACILITIES

3. Requirements

(b) Facility Design

Facilities in which radioactive or other hazardous materials are utilized shall be designed to simplify decontamination and decommissioning and/or increase the potential for reuse. Features and procedures that simplify and facilitate decommissioning shall be identified during the planning and design phase based upon a proposed decommissioning method or conversion to other use. Examples of features to be incorporated are identified in DOE Order 6430.1.

5400.5 RADIATION PROTECTION OF THE PUBLIC AND ENVIRONMENT
2-8-90

CHAPTER II: REQUIREMENTS FOR RADIATION POTECTION OF THE PUBLIC AND ENVIRONMENT

3. Management and Control of Radioactive Materials in Liquid Discharges and Phaseout of Soil Columns

(a) Discharge of Liquid Waste to Surface Waters

6) New facilities shall be designed and constructed to meet the discharge requirements in Chapter II, paragraph 3a.

CHAPTER IV: RESIDUAL RADIOACTIVE MATERIAL

6. Control of Residual Radioactive Material

b. Interim Storage

1) Control and stabilization features shall be designed to provide, to the extent reasonably achievable, an effective life of 50 years with a minimum life of at least 25 years.

2) Controls shall be designed such that Rn-222 concentrations in the atmosphere above facility surfaces or openings in addition to background levels, will not exceed:

(a) 100 pCi/L at any given point;

(b) An annual average concentration of 30 pCi/L over the facility site; and

(c) An average annual concentration of 3 pCi/l at or above any location outside the facility site.

(d) Flux rates from the storage of radon producing waste shall not exceed 20 pCi/sq.m-sec., as required by 40 CFR Part 61.

3) Controls shall be designed such that concentrations of radionuclides in the groundwater and quantities of residual radioactive material will not exceed applicable Federal and State standards.

4) Access to a property and use of onsite material contaminated by residual radioactive material should be controlled through appropriate administrative and physical controls such as those described in 40 CFR part 192. These control features should be designed to provide, to the extent reasonable, an effective life of at least 25 years.

d. Long-Term Management:

(1) Uranium, Thorium, and Their Decay Products

(a) Control and stabilization features shall be designed to provide, to the extent reasonably achievable, an effective life of 1,000 years with a minimum life of at least 200 years.

(b) Control and stabilization features shall be designed to limit Rn-222 emanation to the atmosphere from the wastes to less than an annual average release rate of 20 pCi/m2/s and prevent increases in the annual average Rn-222 concentration at or above any location outside the boundary of the contaminated area by more than 0.5 pCi/L. Field verification of emanation rates shall be in accordance with the requirements of 40 CFR Part 61.

(e) Access to a property and use of onsite material contaminated by residual radioactive material should be controlled through appropriate administrative and physical controls such as those described in 40 CFR Part 192. These controls should be designed to be effective to the extent reasonable for at least 200 years.

5480.11 RADIATION PROTECTION FOR OCCUPATIONAL WORKERS
12-21-88

9. Requirements for Radiation Protection of Occupational Workers, Unborn Child, Students, Minors, and Onsite Members of the Public

g. Monitoring

(3) Workplace

(a) Air Monitoring

Ambient air monitoring shall be performed in occupied areas with the potential to exceed 10 percent of any derived air concentration values for occupational workers.

(b) Radiation Monitoring

Appropriate stationary (area) and/or portable radiation instruments shall be available.

j. Design and Control

j) Radiation exposure rates in controlled work place areas should be reduced to as low as reasonably achievable levels by the proper facility design and control. The primary means for maintaining exposures as low as reasonably achievable are to be through physical controls, e. g., confinement, ventilation, remote handing and shielding. Administrative controls and procedural requirements are to be considered supplemental means to achieve control.

(1) Design During the design of facilities, the following objectives shall be applied:

(a) Optimization principles, as discussed in ICRP Publication 37, are to be utilized in developing and justifying facility design and physical controls.

(b) The design objectives for personnel exposure from external sources of radiation in continuously occupied controlled areas are ALARA and not exceeding 0.5 mrem (5 microsieverts) per hour on average. The design objectives for exposure rates for potential exposure to a radiation worker where occupancy is generally not continuous are ALARA and not exceeding 20 percent of the applicable standard in paragraphs 9b(1) and (2).

(c) As a design objective, exposure of personnel to inhalation of airborne radioactive materials is to be avoided under normal operating conditions to the extent reasonably achievable. This will normally be accomplished by confinement and ventilation.

(d) Ease of maintenance and decontamination and decommissioning is to be considered in facility design and selection of materials.

1. Entry Control Program

The level of entry control should be consistent with the degree of hazard. Signs and barricades, control devices on entrances, conspicuous visual and/or audible alarms, locked entrance ways, and/or administrative procedures should be used as appropriate to ensure personnel entry into radiological areas are controlled. For very high radiation areas, the entry control shall include entry locks or automatic control devices. (AG) *

q. Nuclear Accident Dosimetry

(2) Fixed Nuclear Accident Dosimeter Units

The number of dosimeter units needed and their placement will depend on the nature of the operation, structural design of the facility, and accessibility of areas to personnel. (AG)

5480.5 SAFETY OF NUCLEAR FACILITIES
9-23-86

11. Nuclear Criticality Safety Elements

c. Written Plans and Procedures

(3)
g) The criticality alarm system shall be installed in all locations wherein the quanities of fissionable material may exceed 700 grams of uranium-235, 520 grams of uranium-233, 450 grams of plutonium, or 450 grams of any combination of these three nuclides.

12. Nuclear Criticality Safety Control Parameters

a. Controlling Factors

b) Double Contingency Principle: Process designs shall incorporate sufficient safety factors so that at least two unlikely, independent, and concurrent changes in process conditions must occur before an accidental nuclear criticality is possible.

c) Geometry Control: Where practical, reliance shall be placed on equipment design in which dimensions are limited, rather than on administrative controls. Full advantage may be taken of any nuclear characteristics of the process materials. Controls shall be exercised to maintain all dimensions and nuclear properties on which reliance is placed.

* (AG) denotes that additional guidance and/or explanatory material can be found in the complete text of the DOE orders under Section number and heading cited.

13. Safe Storage Criteria for Unirradiated Fissionable Material

b. Operating Requirements for Storage

10) All material shall be stored in racks or equivalent equipment (such as bird cages) capable of securely locating stored material to prevent displacement, to assure spacing control, and to meet designs for safety under operational and credible accident conditions. Floor storage within the storage facility will be permitted only where control of location and other safety requirements (equivalent to those of racks) are inherently provided by the individual containers and their restraints.

13) Container design shall be appropriate to the form of stored material. Criteria for container integrity shall be developed in the course of the required safety analysis and the application of these criteria ascertained by periodic inspection. Containers involving any significant gas buildup, automatic pressure relief, or other venting should be designed to assure that no personnel exposure to any released toxic material will occur under normal storage conditions or, insofar as practical, under accident conditions. Such venting must not permit spread of contamination.

16) Plutonium containers in which gas buildup can occur shall be designed to prevent leakage of gas over the maximum storage period or vented to prevent an accumulation of explosive gases; however, such venting must not permit spread of contamination.

18) Provisions shall be made in a plutonium storage facility to assure necessary and adequate heat removal for plutonium containers as established by the safety assessment.

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DIVISION 1

GENERAL REQUIREMENTS

0110 ARCHITECTURAL AND SPECIAL DESIGN REQUIREMENTS

0110-99 SPECIAL FACILITIES

0110-99.0 Nonreactor Nuclear Facilities - General

0110-99.0.1 General

Whenever feasible, special facilities shall be planned and layout developed on the basis of repetitive or discrete processing steps, grouped according to facilities services and shall be contained in individual process rooms or cells to the extent practical. (AG)

The design professional shall consider the need for safe, normal and emergency access, egress, and internal traffic flow.

Support areas such as health physics laboratories/offices shall be located near the exit from the process area.

The exit areas shall have adequate space for monitoring equipment and personnel circulation/egress.

All normal routes of egress shall be directed through exits that contain monitoring stations.

Radioactive and hazardous materials shall be segregated from each other to minimize the generation of mixed wastes. (AG)

Wherever possible, areas for work with radioactive or other hazardous contaminants shall be located together to simplify solutions to problems of air supply and exhaust, waste disposal, decontamination and cross-contamination.

Areas where radioactive materials are used shall be designed for ease of decontamination during building usage and also for decommissioning after the building life cycle.

Significant energy savings for heating and cooling may be realized, based on LCC effectiveness of energy conservation features; however, any such features shall only be incorporated where they do not compromise the safety and health of personnel.

0110-99.0.2 Building Services and Distribution

Special facility services and utilities shall be planned to achieve maximum flexibility and ease of access. (AG)

Vertical chases shall be provided with fire cutoffs, preferably at each floor level and at the enclosing partitions, consistent with the building construction code classification.

Suitable access doors or removable panels shall be provided in service chases for access to valves, dampers, and so forth.

Equipment selections shall be made from products listed by UL or other approved testing organization.

Access to hazardous areas shall be controlled by locked gates, doors, power panels, or other physical barriers.

Compressed gas cylinders shall be isolated outside of the special facilities building or housed in a special hazardous materials storage room, exhausted gas cabinets, or similar types of containment.

Where continuous services are required, service headers shall be looped and appropriately valved to maintain such services during routine maintenance or system alterations.

Special facility services shall be located to avoid penetration of adjacent facility walls and floors in those cases where routine maintenance or alterations of these services would result in undesirable curtailment or interruption of operations in the adjacent special or other facilities.

All piping shall be located outside hazardous areas whenever possible to reduce personnel exposure during maintenance.

0110-99.0.4 Building Layout

The design of the facility shall include controlled access to areas of potential hazards within the facility.

The arrangement and location of process equipment and its maintenance provisions shall ensure that exposure to radiation and other hazardous materials is within the requirements of DOE 5480.11 and DOE 5480.10, respectively. Exposures shall be maintained ALARA.

The design shall protect workers sufficiently from hazards to ensure that workers can perform actions required during normal operations, anticipated operational occurrences, and postulated DBAs.

Design shall ensure prompt, safe shutdown in emergencies, and allow ready access to areas where manual corrective actions are required and to areas that contain radiation monitoring equipment.

Exits shall comply with NFPA 101.

At least two exits shall be provided in rooms where hazardous materials are handled.

In areas where an accidental breach of a primary confinement system could expose personnel to radioactive material, a distance of 75 feet as measured by the method in the NFPA 101 shall be the maximum travel distance to ensure that personnel can exit through the next confinement barrier.

The assured airflow through the barrier shall be in the direction opposite of exit travel.

The facility design shall provide space to accommodate all planned activities, operations and maintenance. The design shall minimize the hazard of handling flammable and other hazardous materials.

In addition to the usual industrial safety features required in a nuclear facility, the design shall also include, as appropriate, the following safety features:

- Facility layout shall provide specific control and isolation, if possible, of quantities of flammable, toxic and explosive gases, chemicals, and other hazardous materials admitted to the facility.

- Provisions of additional space shall be considered for temporary shielding or for additional shielding in the event that radiation levels are higher than anticipated.

Storage areas (or vaults) shall be located in light of the hazards of materials stored, fire-fighting capabilities, and contamination control.

Where practical, storage buildings shall be rectangular and windowless. The storage building shall be designed to receive, ship, expedite identification of, inventory, place, store and retrieve unirradiated and/or irradiated fissile material or other material capable of sustaining a chain reaction. (AG)

Storage facilities shall be physically separated from process operations; areas shall be provided for the storage of non-nuclear materials or equipment and functions not directly required for storage operations. (AG)

Suitable physical compartmentalization shall be provided to limit the quantities of stored materials in each compartment to safe levels.

All corridors and door openings shall meet NFPA 101 or more stringent requirements as established by the cognizant DOE health and safety authority. (AG)

Where room doors open into corridors, frames shall be recessed to prevent the open doors from encroaching on clear corridor spaces.

Recessed corridors, due to equipment placement, shall be grouped together to the maximum extent possible.

0110-99.0.6 Fire Resistance

The structural shell surrounding the critical areas and their supporting numbers shall remain standing and continue to act as a confinement structure during the DBF under conditions of failure of any fire suppression system not designed as a safety class item. (AG)

In no event shall the fire resistance rating be less than two hours under conditions of failure of any fire suppression system designed as a safety class item.

0110-99.0.8 Personnel and Public Safety

Automatic monitoring and alarm devices shall be provided to detect the presence of significant levels or increases of radioactivity and, if feasible, any other hazardous materials, either released in the special facility or escaping from it. (AG)

Cautionary systems or interlocks shall prevent inadvertent entry into hazardous areas.

All safety alarm systems shall annunciate inside of the special facility to identify hazardous areas.

Where alarms can preclude or minimize exposures outside of the facility, they shall be provided.

In addition to DOE 5480.5 safety requirements, personnel exposure levels shall comply with Section 1300-6.2 and exposure to the public shall comply with 1300-1.4.

Proper consideration shall also be given to chemical toxicity protection, as well as radiation protection. (AG)

0111 STRUCTURAL DESIGN REQUIREMENTS

0111-99 SPECIAL FACILITIES

0111-99.0 Nonreactor Nuclear Facilities - General

0111-99.0.1 General

Safety class items required to function during or following severe natural phenomena or man-made events shall be designed to the requirements in Section 0111-2, Loads. (AG)

Safety class items required to function during or following severe natural phenomena shall not be prevented from performing their required safety functions by the failure of components, systems, or structures that are not designed to the severe national phenomena criteria.

Safety class structures shall be protected against dynamic effects, including effects of wind-driven missiles and discharging fluids, that may result from natural phenomena, accidents at nearby facilities, including military installations and transportation facilities, equipment failure, and similar events and conditions inside and outside the facility. The type of severe events will vary among sites. However, earthquakes, tornados, straight winds, and floods shall be addressed. Design criteria for enclosures of radioactive and other hazardous materials are provided in Section 1161. (AG)

Floor loadings and location of equipment and projections of future additional equipment requirements and their floor loadings shall be considered and provided for in structural planning and design.

Safety class confinement barriers shall be designed to withstand secondary events as well as primary events. (AG)

In no case shall the total combustible loading located in a fire area exceed the fire resistance rating of the area enclosure. (AG)

0111-99.0.2 Tornado and Extreme Wind

DOE site-specific hazard model studies summarized in UCRL 53526, Rev. 1 shall be used to select the DBT and extreme wind characteristics for the design of structures. (AG)

0111-99.0.3 Floods

Design loads from flooding shall comply with UCRL 15910. (AG)

0111-99.0.4 Earthquakes

Site-specific seismic parameters shall be determined for a DBE. The SSE shall be equivalent to the DBE. (AG)

To determine the DBE, site-specific earthquake hazard models and response spectra given in UCRL 53582, Rev. 1, shall be used to select the appropriate seismic ground acceleration. Design guidance in UCRL 15910 shall be used in applying UCRL 53582, Rev. 1. Site-specific studies can be substituted for the UCRL 53582, Rev. 1, where no data exist or where a higher level of detail is required. (AG)

The use of earthquake experience data is an acceptable approach to the seismic qualification of safety class items. (AG)

* Safety class equipment shall be essentially identical to the equipment that has data in the experience data base.

* Equipment shall be mounted and anchored in essentially an identical fashion as that for the experience data base equipment.

0111-99.0.5 Aircraft

Potential aircraft crashes shall be considered among the spectra of man-made missiles that confinement structures shall be designed to withstand or against which they shall be protected.

0111-99.0.6 Nearby Explosions and Externally Generated Missiles

The potential effects of a major explosion at a nearby facility or transportation route shall be considered among the spectra of external blast effects and missiles that confinement structures shall be designed to withstand or against which they shall be protected.

0111-99.0.7 Explosion, Internal Pressurization, Criticality and Other DBA Causes

The probable consequences of DBAs involving internally generated missiles or blast effects shall be considered. Structures required to function following such accidents shall be designed to withstand these DBAs. (AG)

0111-99.0.8 Load Combinations

Safety class structures and structural members shall be designed to resist the appropriate load combinations provided in UCRL 15910.

Concrete structures and structural members for safety class concrete structures shall meet the design and construction requirements of ACI 349 for new construction or original codes for existing construction providing the margin of safety of the overall facility is maintained.

Safety class steel structures shall meet the design, fabrication and erection requirements of AISC N690 for new construction or original codes for existing construction, providing the margin of safety of the overall facility is maintained.

DIVISION 2

SITE AND CIVIL ENGINEERING

0200 SITE DEVELOPMENT

0200-1 FACILITY SITING

0200-1.2 Radiological Siting Requirements

Information on the siting evaluation, including the models, parameters, and assumptions used in the dose calculations shall be documented for use in the facility's SAR and emergency response plans.

0200-1.3 Radiological Siting Guidelines

Guidance for implementing the criteria of Section 0200-1.2 is available in LANL LA-10294-MS. However, this guidance does not apply to high-level waste repositories with respect to earthquake siting and design. (AG)

0200-99 SPECIAL FACILITIES

0200-99.0 Nonreactor Nuclear Facilities - General

0200-99.0.1 General

New site selection requirements and procedures are prescribed in DOE 4300.1B. (AG)

0200-99.0.2 Other Facilities and Operations

The potential hazards from other on-site facilities and off-site sources of hazards that could affect the safe operation of the special facility shall be considered. (AG)

0200-99.0.3 Services

Utility systems essential to the support of safety class items shall be designed as safety class items.

0200-99.0.4 Meteorology

Available meteorological data shall be considered to identify conditions that may influence the design and operation of the facility.

0262 CORROSION CONTROL

0262-3 CATHODIC PROTECTION SYSTEMS

Cathodic protection for underground flammable/combustible liquid storage tanks and piping shall comply with NFPA 30.

0273 WATER POLLUTION CONTROLS

0273-99 SPECIAL FACILITIES

0273-99.0 Nonreactor Nuclear Facilities - General

There shall be no interconnections among storm water systems, the sanitary waste system and radioactive or other hazardous material handling systems or areas. (AG)

Installations shall be in compliance with the UPC and ASCE 37.

The sanitary waste system at each facility shall be monitored or sampled and analyzed for radioactivity unless the site sanitary treatment system is monitored.

There shall be no interconnections between the potable water system, the sanitary waste system and process systems.

0275 INDUSTRIAL WASTE WATER TREATMENT

0275-99 SPECIAL FACILITIES

0275-99.0 Nonreactor Nuclear Facilities - General

0275-99.0.1 Industrial Wastes

Industrial wastes shall be collected and transferred to a liquid waste treatment plant or similar treatment area.

Provisions shall be made for the continuous monitoring and recording of radioactivity, flow volume, pH, and other parameters required for material control and proper waste treatment operations while each volume of waste is being received by the plant. The radioactivity monitor shall have an alarm that annunciates locally as well as in an occupied area where corrective action can be initiated. The use of retention systems shall be considered.

0275-99.0.2 Process Wastes

Liquid process wastes containing radioactive or other hazardous material shall be collected and monitored near the source of generation before batch transfer through appropriate pipelines or tank transfer to a liquid waste treatment plant or area. These wastes shall be individually collected at the facility in storage tanks that are equipped with stirrers or other accepted means of mixing, sampling and volume measuring devices and transfer systems. Tanks and lines shall be designed and constructed so that any leakage shall be detected and contained before it reaches the environment.

Radiation, liquid level, or conductivity detectors shall be provided in collection systems. Transfer lines shall have inspection and collection pits at practical intervals into which leakage can drain by gravity.

Double-walled transfer pipelines or multi-pipe encasements shall be used for high-level radioactive liquid wastes and other equally hazardous nonradioactive liquid wastes as defined by safety analysis.

Provisions shall be made for the collection, transfer, and disposal of infiltration into the annulus of double-walled pipelines and for the collection, transfer and storage (as appropriate) of leakage from the pipe of double-walled transfer pipelines.

Nuclear criticality safety shall be considered in the design of liquid radioactive waste processing systems.

Radioactive waste collection, transfer, and storage systems shall be such as to avoid the dilution of radioactive waste by waste of lower level radioactivity or other waste. (AG)

0285 SOLID WASTE SYSTEMS

0285-99 SPECIAL FACILITIES

0285-99.0 Nonreactor Nuclear Facilities - General

Nuclear criticality safety shall be considered in the design of radioactive solid waste facilities. (AG)

DIVISION 9

FINISHES

0900 GENERAL

0900-99 SPECIAL FACILITIES

0900-99.0 Nonreactor Nuclear Facilities - General

Rounded corners and epoxy coated concrete walls and floors shall be considered for nuclear material storage and work areas.

In addition to the coating requirements provided in Section 0950, the design professional shall consider the coating guidelines in ASTM D4256 and ANSI N512 for facilities that require coatings to enhance decontamination of surfaces or because of environmental conditions.

DIVISION 11

EQUIPMENT

1161 ENCLOSURES

1161-1 GENERAL CONSIDERATIONS

The design objective shall be to prevent exposure of the plant personnel to airborne contamination and shall implement ALARA concepts to the extent practical to minimize operator exposures.

The enclosure systems, including its internal and external support structures, shall be designed to withstand the effects of normal operating conditions and the environment. DBAs shall be considered in the design of the enclosures. Enclosure stability during a seismic event shall be based on the seismic parameters in Section 0111-99.0.4.

The criticality considerations should include water or other liquid sources, and a potential liquid level in the enclosure and drains to limit liquid level in the enclosure.

Where practical and without penetrating the enclosure, all equipment components not functionally required to operate directly in the presence of radioactive materials shall be located outside the enclosure. All equipment that must be located within the enclosure shall be designed to allow for in-place maintenance and/or replacement.

The design and operation of support and protection systems, such as fire protection, shall not promote the failure of the enclosure system integrity or the loss of confinement.

1161-2 CONSTRUCTION

Noncombustible or fire-resistant and corrosion-resistant materials shall be used for enclosures and, to the maximum extent practicable, for any required radiation shielding. (AG)

Enclosures shall be designed with the objective of being leak-tight.

In conjunction with their ventilation systems, all enclosures shall be capable of maintaining confinement. Without their associated ventilation systems enclosures shall be designed with appropriate physical features to provide an essentially leak-tight confinement for the contaminants they handle.

Appropriately sized and located windows shall be part of the enclosure design to provide operators with visual access to the enclosed interior.

Viewing windows in enclosures shall be as small as practicable. The windows shall be constructed of noncombustible or approved fire-resistant materials as specified in Section 0727. (AG)

Glove ports shall be located to facilitate both operations and maintenance work inside the enclosure. They shall have flexible gloves attached to allow operating personnel access to all interior surfaces and equipment. They shall be designed to allow replacement of gloves without losing contamination control and with minimum exposure to the operator. When gloves are not in place, a noncombustible shield or cover for each glove port shall be provided.

Closure devices or permanent seals shall be provided on entrances and exits of piping, ducts, or conduits penetrating confinement barriers. Such closures or seals shall have an integrity equal to or greater than the barrier itself.

Where pertinent to safety, the enclosure design shall consider the heat generation in the enclosure. (AG)

Consideration shall be given to incorporating transfer systems such as a double-door, sealed transfer system for removal of hazardous material from a glove box. (AG)

Consideration shall be given to modular construction, versatility, relocation and incorporation of shielding. Structural support shall be provided to accommodate any anticipated loading resulting from shielding. (AG)

Discrete work stations or process areas shall be separated from each other by a barrier designed to prevent the spread of fire based on safety analysis review. Generally, the fire barriers within and between enclosures will be normally closed. Where operations require that the fire barrier be in an open position, it shall automatically close on activation of the fire detection system or by release of a fusible device.

Design of the enclosure system shall allow automatic closure of the fire barrier without loss of confinement, without degradation of the enclosure system's integrity and without injury to personnel. The fire barrier shall be capable of being opened or closed manually from the exterior or interior of the enclosure. Allowable open area around a fire barrier shall be minimized.

1161-3 FIRE PROTECTION

Automatic fire suppression provisions shall comply with Section 1530-99. (AG)

Where automatic systems are not required, fire detection shall be installed.

Provisions shall also be made for manual fire suppression where deemed necessary. Fire detection systems shall be integrated with any central alarm location and any associated automatic fire suppression systems.

1161-4 VENTILATION

A ventilation system shall be installed on all enclosure systems to maintain a minimum negative pressure differential of 0.3 inches of water inside the enclosure with respect to the operating area.

Open-face hoods shall be ventilated in such a way that flow from the operating area into the hood is maintained.

Safety class items of the ventilation system shall be supplied with emergency power.

Failure of any single component or control function shall not compromise minimum adequate ventilation.

The design professional shall consider the possible necessity to remove moisture, heat, and explosive and corrosive gases, as well as other contaminants.

Perchloric acid fume exhaust systems shall comply with NFPA 45, Chapter 6.

HEPA filters shall be provided at the interface of the enclosure outlet and the ventilation system to minimize the contamination of ductwork and at the enclosure inlet to prevent movement of contamination within the enclosure to the operating area in the event of a flow reversal.

A roughing filter should be installed to reduce HEPA filter loading. The system shall be designed to automatically ensure adequate inflow of air through a credible breach in the enclosure system.

Minimum inward air velocity shall be 125 plus or minus 25 linear feet/minute or as determined from guidance provided in the ACGIH Industrial Ventilation Manual.

The design of the enclosure ventilation flow pattern shall minimize the spread of fire, and fire screens shall be provided where necessary.

For enclosures where over pressurization is possible, a system shall be provided to ensure that confinement is not breached.

Small enclosure systems with positive-pressure supplied gases shall have positive-acting, pressure-relief devices to prevent pressurization of the enclosure.

Hood faces shall not be located within 10 feet of the closest air supply or exhaust point. Hoods shall not be located in or along normal traffic routes.

An open-faced hood shall be designed and located to provide a minimum air velocity of 125 plus or minus 25 linear feet/minute over the hood face area.

A hood should not be used in a location where room air currents of >50 linear feet/minute at the face of the hood will disrupt uniform air entrance.

All open-faced hoods shall be designed to provide appropriate face velocity to ensure capture of contaminants in the hood exhaust.

Exhaust air from a hood shall not be recirculated to occupied areas.

1161-5 OPERATIONAL COMPATIBILITY

Shielding, size, shape, and any other pertinent design criteria for all enclosures, glove boxes, conveyor tunnels, hoods, and process equipment should be coordinated with operations requirements to ensure continuity and performance of operations; and by the Safeguards and Security Group to ensure that SNM control and accountability considerations have been considered along with other DOE physical protection requirements (DOE 5632 series).

DIVISION 12

FURNISHINGS

1260 FURNITURE AND ACCESSORIES

1260-99 SPECIAL FACILITIES

1260-99.1 Laboratory Facilities (Including Hot Laboratories)

In laboratories handling radioactive materials, the weight of shielding material to be placed on bench tops and hoods shall be considered in specifying bases and cabinets.

DIVISION 13

SPECIAL FACILITIES

1300 GENERAL REQUIREMENTS

1300-1 COVERAGE & OBJECTIVES

1300-1.3 Objectives

Design of special facilities shall:

- Protect the public and facility personnel from hazards associated with the use of radioactive and other hazardous materials as a

result of normal operations, anticipated operational occurrences, DBA conditions, including the effects of natural phenomena pertinent to the site, and maintain these effects ALARA.

- Ensure compliance with DOE policies of nuclear safety, criticality safety, radiation safety, explosives safety, industrial safety, fire protection, environmental protection, and Safeguards and Security protection for special nuclear material.

- Protect government property and essential operations from effects of potential accidents.

- Minimize exposures of personnel and the general public to hazardous materials by emphasizing ALARA concerns during all design, construction, and operational phases of special facilities.

Design of new or modification of existing facilities shall address health hazards represented by all hazardous materials in enclosures, general work areas, and noncontaminated areas.

Release of hazardous waste under normal operating conditions and anticipated operational upset occurrences shall be designed to be less than release guideline limits to the extent practical. Such releases shall be maintained ALARA.

Consideration shall be given to the frequency of occurrence and effects of DBAs in the design features of special facilities.

Protection of employees within the facility and at nearby facilities shall be a requirement in all aspects of design. Protection shall be provided for normal operation and for those accidents that can be anticipated as occurring during the facility lifetime (i.e. spills and small fires). Occupational exposure shall be limited according to DOE 5480.11. Design goals shall be established to maintain radiation exposure of employees to ALARA levels. The nature of the hazardous material in the facility, including radionuclides, shall be considered in the assessment of potential employee exposure.

For mixed-use facilities, such as those combining PPHF's and PSF's, the design of either part of that facility shall not jeopardize the safety requirements of the other.

1300-1.4 Guidance on Limiting Exposure of the Public

1300-1.4.1 General

The confinement of hazardous materials produced, processed or stored in special facilities shall be designed to minimize dose to the public.

1300-1.4.2 Accidental Releases

Releases of hazardous material postulated to occur as a result of DBAs shall be limited by designing facilities such that at least one confinement system remains fully functional following any credible DBA. Facility design shall provide attenuation features that preclude offsite releases that would cause doses in excess of DOE 5400 series

limits. ALARA concepts shall be applied when designing special facilities to mitigate post-DBA releases of hazardous materials, to the extent possible. (AG)

1300-1.4.3 Routine Releases

The annual dose resulting from postulated, planned or expected releases shall be considered in combination with the annual doses resulting from planned or expected releases from other facilities at the same site. The sum of the doses shall be limited according to DOE radiation standards in the 5400 series.

1300-1.4.4 Monitoring of Releases

Releases shall be monitored in accordance with the DOE 5400 series.

1300-3 SAFETY CLASS CRITERIA

1300-3.1 General

Special facility components, systems and structures shall be designed, fabricated, erected, and tested to standards and quality commensurate with the hazards and potential consequences associated with both the facility and role of each component, system, and structure in mitigating the consequences of DBAs.

1300-3.2 Safety Class Items

Safety class items shall be subject to appropriately higher-quality design, fabrication, and industrial test standards and codes such as those specified in Section 0106, Regulatory Requirements, and Section 0109, Reference Standards and Guides, to increase the reliability of the item and allow credit to be taken for its capabilities in a safety analysis. Safety class items shall be designed to the ASME Boiler and Pressure Vessel Code (Section III, Class II) or to other comparable safety-related codes and standards that are appropriate for the system being designed.

The Design of systems, components and structures that are not safety class items shall, as a minimum, be subject to conventional industrial design standards, codes, and quality standards. Failure of these items shall not adversely affect the environment or the safety and health of the public. In addition, their failure shall not prevent safety class items from performing their required functions.

1300-3.3 Single Failure Criterion and Redundancy

The design shall ensure that a single failure does not result in the loss of capability of a safety class system to accomplish its required safety functions.

To protect against single failures, the design shall include appropriate redundancy and shall consider diversity to minimize the possibility of concurrent common-mode failures of redundant items.

1300-3.4. Equipment Environment Considerations

1300-3.4.1 General

Safety class items shall be designed to withstand the effects of, and be compatible with, the environmental conditions associated with operation, maintenance, shutdown, testing, and accidents. (AG)

1300-3.5 Maintenance

The design shall consider the maintainability factors peculiar to the specific equipment to be used in the facility. Facility design shall provide for routine maintenance, repair, or replacement of equipment subject to failure.

Safety class items shall be designed to allow inspection, maintenance, and testing to ensure their continued functioning, and readiness for operation and accuracy.

Ancillary equipment shall be located in areas least likely to be contaminated.

The design of equipment that must be located within confinement systems shall allow for in place maintenance or replacement. The necessary provisions for confinement, ventilation and waste control shall be provided for the maintenance of contaminated equipment that cannot be repaired in place. The design of all process equipment shall include features to minimize self-contamination of the equipment, piping, and confinement areas.

1300-3.6 Testing

Design shall include provisions for periodic testing of monitoring, surveillance, and alarm systems (including testing of safety class items) under simulated emergency condition. (AG)

The facility design shall allow for routine in-place testing of HEPA filtration systems as outlined by ASME N510.

1300-4 NUCLEAR CRITICALITY SAFETY

The design of nuclear criticality control provisions, including equipment and procedures shall meet as a minimum, the requirements of DOE 5480.5 and the ANS 8 series on Nuclear Criticality Safety.

The design shall ensure that material shall not be displaced or allowed to accumulate to form a critical mass in the event of an internal or external accident.

The design shall emphasize geometrically favorable compartments or spacing to minimize reliance on administrative control, and shall prevent the unsafe accumulation of moderator or reflection materials (e. g., water from a fire sprinkler system). Also, heating and cooling jackets in the safe dimension of geometrically safe vessels shall preclude a leak in the jacket that causes an increase in the system's reactivity.

Process designs shall incorporate sufficient factors of safety so that at least two unlikely and independent concurrent changes must occur in process conditions before a criticality accident is possible.

Structures, systems, and components that provide nuclear criticality safety shall be designed as safety class systems and be capable of performing their functions during and following DBAs and events. A criticality monitoring and alarm system shall be provided where necessary to meet the requirement of DOE 5480.5 and ANS 8.3.

The design of the facility shall emphasize engineered safeguards and shall not rely strictly on administrative controls.

Process systems shall be designed to prevent the carryover of fissile material and other material capable of sustaining a chain reaction from geometrically favorable portions of the facility to other areas.

A system of positive control and backflow prevention shall be used to prevent inadvertent transfer of fissile material and other material capable of sustaining a chain reaction from geometrically favorable or poisoned containers to unsafe containers.
Locations where a potential critical mass could occur in the event of accidental flooding by water from fire protection systems shall be protected by geometrically favorable curbed areas or collection systems.

Where frequency estimates for a specific operation at a specific location shows the frequency of a criticality accident to exceed 10-6 per year, the combination of shield design and facility layout shall minimize radiation doses to adjacent work stations and exit routes:

* Egress routes shall be provided that take into account the locations where postulated criticality accidents would normally be expected to occur.

* The design objective should be to provide escape routes that have the lowest potential for radiation exposure to exiting personnel.

* For facilities where the design cannot avoid evacuation through areas of potentially high exposure, the use of additional shielding in such areas shall be considered.

* All barriers along the egress routes shall be designed to allow crash exiting of evacuating personnel.

1300-5 SOURCE AND SPECIAL NUCLEAR MATERIAL

When the safety analysis identifies the source and SNM that will be handled, the criteria for the most hazardous material shall be applied to the design. The criteria of ANSI N16.1 shall apply. In-process source or SNM shall be stored in storage containers to be approved by facility management, and simple physical barriers shall be used to segregate materials and provide a level of confinement and safety consistent with the hazard of the material.

1300-6 RADIATION PROTECTION

1300-6.1 General

Special facilities shall be designed to minimize personnel exposures to external and internal radiological hazards, provide adequate radiation monitoring and alarm systems, and provide adequate space for health physics activities.

Primary radiation protection shall be provided by the use of engineered controls (e. g., confinement, ventilation, remote handling, equipment layout and shielding). (AG)

1300-6.2 Shielding Design

The shielding design basis shall be to limit the maximum exposure to an individual worker to one-fifth of the annual occupational external exposure limits specified in DOE 5480.11. (AG)

Shielding and other radiation protection measures shall be provided for areas requiring intermittent access, such as: preventive maintenance, component changes, adjustment of systems and equipment, and so forth. The projected dose rates based on occupancy, time, and frequency of exposure shall not exceed 1 rem/y.

Concrete radiation shielding design shall comply with ANS 6.4 and ACI 349 and shall consider the material specifications of ANS 6.4.2 where it provides a critical confinement or structural function. For other shields, ACI 318 is appropriate and provides adequate strength for DBE loads.

Straight-line penetration of shield walls shall be avoided.

1300-6.3 Hand and Forearm Protection

Remote shielded operations shall be considered where it is anticipated that exposures to hand and forearms would otherwise approach the dose guidance in 5480.11 or where contaminated puncture wounds could occur.

1300-6.4 Internal Radiation Exposure

The design shall ensure that occupied operating areas do not exceed airborne concentration limits of the DOE 5480 series for normal operating conditions. To the extent practical, the concept of ALARA shall be used when designing confinement and ventilation systems to limit airborne contamination levels.

The design shall ensure that respirators are not required to meet the dose limits for normal operations.

Engineered controls and features shall also be provided to minimize potential inhalation of radioactive and other hazardous material under all conditions.

1300-6.5 Monitor, Warning and Alarm Systems

1300-6.5.1 General

All radiation monitoring, alarm and warning systems that are required to function during a loss of normal power shall be provided with an emergency UPS unless it is demonstrated that they can tolerate a temporary loss of function without losing needed data and they are provided with standby or emergency power. (AG)

1300-6.5.2 Air Monitoring and Warning Systems

Air monitoring and warning systems shall be installed in work areas where hazardous materials are stored or handled and where hazardous airborne particles or vapors may be present. Air monitoring shall comply with ANSI N13.1.

1300-6.5.3 Personnel Monitoring and Warning Devices

Provisions shall be made for personnel monitoring devices in the vicinity of work stations. Installed monitors shall be used to monitor personnel exiting in operating areas through access ways. CAMSs shall be provided to detect and to activate alarms at prescribed airborne radioactivity levels.

1300-6.5.4 Ionizing Radiation Monitoring System

Where ionizing radiation is present, an area radiation monitoring and alarm system shall be provided.

1300-6.5.5 Warning and Alarm System Features

Evacuation alarm systems shall comply with ANSI N2.3.

1300-6.5.6 Nuclear Accident Dosimetry

Where there is the potential for a criticality excursion causing personnel exposures, nuclear accident dosimeters shall be provided with performance features and placement consistent with DOE 5480.11.

1300-6.5.7 Central Radiation Monitoring and Alarm Readout

In addition to a local station alarm, radiation monitoring systems shall have central readout and alarm panels that are accessible after a DBA to evaluate internal conditions.

1300-6.6 Decontamination of Personnel

Design shall provide for personnel decontamination facilities close to areas that represent sources of potential contamination.

1300-6.8 Change Rooms

Change rooms shall be designed to ensure that clean clothing and protective clothing are segregated. The design shall ensure that the storage of contaminated protective clothing will control contamination so that it does not spread beyond the storage container.

The change room exhaust air shall be HEPA-filtered if dispersible radionuclides are handled in the process area it serves.

1300-6.9 Breathing Air System

Breathing air supply systems shall comply with ANSI Z88.2 and 29 CFR 1910.134.

1300-7 CONFINEMENT SYSTEMS

1300-7.2 General

Confinement capabilities shall maintain a controlled, continuous airflow pattern from the environment into the confinement building, and then from noncontaminated areas of the building to potentially contaminated areas, and then to normal contaminated areas.

Engineering evaluations, trade-offs, and experience shall be used to develop practical design that achieves confinement system objectives. (AG)

Although individual confinement systems are not required to withstand the effects of every accident, they shall effectively perform their required functions for the DBAs they are required to withstand. (AG)

Sufficient redundancy shall be provided in the unlikely event of a confinement system failure.

At least one of the confinement systems shall be designed to ensure that it can withstand the effects of severe natural phenomena and man-made events, including the postulated DBAs and DBF initiated by these events, and remain functional to the extent that the guidelines of Section 1300-1.4.2 are not violated. ALARA concepts shall be applied to the design of all confinement systems. (AG)

Design of confinement areas shall provide adequate means for decontamination of the areas prior to entry or breaching for maintenance and repair purposes. (AG)

Confinement system ventilation and off-gas system requirements are provided in Section 1550-99.

For enclosures of radioactive and other hazardous material, see Section 1161.

1300-7.3 Access Ways

Special features shall be considered for access through confinement barriers to minimize the impact of facility access requirements on the ventilation system and to prevent the release of radioactive airborne materials.

Provisions for normal and emergency equipment shall be provided in or adjacent to the access ways.

Consideration shall be given to emergency lighting, paging systems, automatic access door switches, hand and foot monitors, storage for

clothing and emergency equipment, warning lights, air sampling, and breathing air outlets.

1300-7.4 Transfer Pipes and Encasements

Double-walled pipes within a secondary confinement structure encasement shall be used in all areas where the primary pipe leaves the facility. Within the facility, double-walled piping shall be considered.

Leakage monitoring shall be provided to detect leakage into the space between the primary pipe and the secondary confinement barrier.

1300-8 WASTE MANAGEMENT

1300-8.1 General

The process systems shall minimize the production of wastes at the sources and minimize the mixing of radioactive and nonradioactive hazardous wastes.

The waste management systems shall provide facilities and equipment to handle wastes safely and effectively.

Volume reduction equipment for both liquid and solid wastes shall be required where feasible and shall be designed for process capability and capacity commensurate with the types and quantities of wastes expected.

Waste handling areas shall comply with the standards of confinement and ventilation requirements commensurate with the potential for spreading contamination by the waste packages/forms handled.

Specific DOE design and operating requirements for radioactive wastes appear in DOE 5820.2A. (AG)

1300-8.2 Hazardous Waste Requirements

Hazardous waste requirements appear in DOE 5480.1B, Chapter 2. Additionally, the RCRA, as amended, 40 CFR 264 and 40 CFR 265, contain specific design and operating requirements and standards for owners and operators of hazardous waste TSD facilities.

Part 267 of RCRA contains interim standards for new hazardous waste land disposal facilities.

Part 268 of RCRA contains land disposal restrictions and treatment standards for hazardous waste.

1300-8.3 Mixed Waste

Radioactive mixed wastes shall be avoided where practicable.

Mixed wastes shall be segregated and handled separately from other types of wastes in accordance with DOE 5400.3.

1300-8.4 Waste Segregation

Facility design shall provide for the segregation of hazardous waste into compatible groups for storage in accordance with the DOE 5400 and 5480 series. Suggested compatibility groups are acids, caustics, flammable materials, and organic materials.

1300-8.5 Spill Prevention and Control

Spill prevention and control shall be considered in the design stage of the facility to minimize the possibility of accidentally releasing hazardous waste to the environment.

1300-8.6 Approvals and Permits

The limits specified in discharge permits for these effluents shall be considered during the design of the facility.

1300-9 EFFLUENT CONTROL AND MONITORING

Waste management systems shall provide facilities and equipment to handle solid, liquid and gaseous wastes safely, effectively, and in an environmentally responsible manner.

Hazardous effluents released to the environment shall not exceed the limits referenced in DOE 5400.1 and in the DOE 5400 series.

Emphasis shall be placed on reducing effluents released to the environment to ALARA levels using the best tecnology economically available at the time of design. (AG)

During normal operations, the effluent concentration of radionuclides measured at the site boundary shall not exceed the DCGs specified in the DOE 5400 series.

At the point of discharge of the facility, the effluent concentration shall not exceed the DCGs specified in DOE 5480.11. (AG)

The guidance on radiation protection referenced in Section 1300-1.4.3, shall also apply to effluent treatment and discharge systems.

All effluent streams shall be sampled or monitored in accordance with the requirements of DOE 5400.1 and the directive on Radiological Effluent Monitoring and Environmental Surveillance in the DOE 5400 series. (AG)

The design of the facility shall include appropriate groundwater monitoring unless a site-wide program is provided. This monitoring shall be designed to detect releases of contaminants to the ground or groundwater. (AG)

1300-10 PHYSICAL PROTECTION, MATERIAL SAFEGUARDS, AND STORAGE OF SPECIAL NUCLEAR MATERIAL

1300-10.3 Material Control and Accountability (MC&A) Safeguards

1300-10.3.2 Material Control Systems

Material Access Area (MAA) Boundary

- In processing areas, provisions shall be made for planned and emergency evacuations. Where this evacuation occurs through the MAA boundary, alarmed doors shall be provided, as it is too expensive (and probably not operationally sound) to try to use personnel portal monitors. In such cases, provision shall be made to assure that evacuations do not provide a theft opportunity.

1300-10.3.3 Material Accounting Systems

The location of MBA boundaries do imply measurement requirements, and this shall be considered in facility design. If the measurement is by NDA, the material will have to be brought to the NDA equipment or vice versa. If the measurement is destructive, similar considerations apply to sampling capability (AG)

Measurement systems shall be either installed in the process equipment, located in the process area, or located in an entirely separate laboratory area.

- The capability should be available to mix the tank to a state of homogeneity. This can be accomplished by mechanical mixing or sparging techniques. Considerations of criticality safety and mixing are often in conflict. Some tanks are extremely difficult to homogenize. Slab tanks may need more than one agitation device to provide for adequate mixing.

- The sampling systems used should not dilute or concentrate the sample they are generating. Recirculating samplers are used to make sure samples are representative and not biased by previously drawn samples. In systems that will lift liquid streams in recirculating samplers by injecting air into the upflow side, the possibility exists that evaporation will occur, especially if circulation is for some reason slowed.

- Liquid-level measurements in tanks are generally established by either sight glasses, capacitance probes, or bubbler systems (whose back-pressure is measured in a variety of ways.) Bubbler-probe systems are generally the most accurate, but provision has to be made for connection to the plant air supply. Tanks containing nuclear material at the time of an inventory or tanks used to establish the input or output values for an MBA shall be recalibrated regularly.

- NDA techniques at nuclear processing facilities generally involve radiation measurement (active or passive) or calorimetry.

Facility design shall provide such instrumentation with a suitable environment as follows:

- Specialized NDA instruments sometimes require friendly environments in terms of temperature, humidity and vibration. Specifications set down by the instrument manufacturer shall be consulted. It may be necessary to isolate the instrument against electromagnetic interference. High-resolution gamma ray systems will need to be supplied with liquid nitrogen.

- Background radiation levels (both static and transitory spikes caused by movement of material) shall be considered in choosing the location of all radiation-sensing equipment.

- The location of the NDA station should take into account the need to transport materials to the station from the process, and the health/safety impacts of such movement. Certain types of measurements may be impractical if materials have to be repacked simply to measure them.

The design goal shall be to minimize nuclear material holdup. For example:

- Minimize the use of horizontal piping runs for high concentration solutions, and allow enough slope for the pipe to drain.

- Eliminate piping configurations where material can collect, especially dead-end piping.

- Design equipment for easy cleanout; this applies especially to glove boxes and incinerators. Minimize sharp angles and hard-to-access corners where material can collect. Provide adequate lighting.

- Where material cannot be cleaned out, but potential exists for significant holdup, designed-in NDA measurement capabilities shall be considered. It is often important to experiment with the response of these instruments and establish calibration data before the process goes hot.

1300-10.3.4 Other Systems

Process Monitoring/Near-Real-Time Accountancy (NRTA)

Process monitoring systems collect data on process variables (liquid levels, densities, valve positions) and perform consistency checks that may reveal anomalies if material is diverted or if other important procedures are not being followed (for examples, if a tank is not sampled before transfer, or not sparged before it is sampled). Processes involving large tanks can be instrumented in this manner relatively easily, resulting in an additional detection mechanism as well as better (more reliable) accountability measurements. Such instrumentation shall be considered. Because of the need for frequent computation of material balances, NDA instrumentation shall be considered.

1300-11 DECONTAMINATION AND DECOMMISSIONING

1300-11.1 Decontamination

Design of areas in a facility that may become contaminated shall incorporate measures to simplify future decontamination.

Items such as service piping, conduits and ductwork shall be kept to a minimum.

Filters shall be positioned in ventilation systems in locations that minimize contamination of ductwork.

Walls, ceilings, and floors shall be finished with washable or strippable coverings.

Finishes shall comply with Section 0900-99. (AG)

1300-11.2 Decommissioning

During the planning and design phases, designs consistent with the requirements of DOE 5820.2A shall be developed.

The facility design shall include features that will facilitate decontamination for future decommissioning, increase the potential for other uses, or both. (AG)

1300-12 HUMAN FACTORS ENGINEERING

1300-12.1 Coverage

These criteria shall apply to new construction and to retrofitting of existing facilities.

1300-12.2 Objectives

Human factors engineering considerations shall be included during the conceptual, preliminary, and design phases of a project.

1300-12.3 System Development

1300-12.3.3 Requirements Analyses

A system requirements analysis shall be performed as an integral part of the design process and shall include human factors engineering consideration. (AG)

1300-12.3.4 Process System Design Interfaces

Human factors engineering input to the system design process shall be presented as specific and quantitative design requirements where possible. (AG)

1300-12.4 General Human Factors Implementation Criteria & Considerations

1300-12.4.2 Human Dimension Considerations

Equipment that is to be used by personnel shall be designed or selected to accommodate their bodily dimensions. See URG 0700, Section 6.1, and MIL-STD-1472C, Section 5.6. (AG)

1300-12.4.3 Environmental Considerations

An effective climate control system shall maintain temperature and humidity at an acceptable level between the human and the environment. See NUREG 0700, Section 6.1 and UCRL 15673, Section 3.2.4.5.

See Section 1550-1.5, Ventilation - Exhaust System Design Requirements for guidelines concerning ventilation.

See Section 1655, Interior Lighting and NUREG 0700, Section 6.1 for lighting consideration. (AG)

Emergency lighting systems shall be provided as required by NFPA 101. Control room emergency lighting levels shall be in accordance with NUREG 0700, Section 6.1.5.4. (AG)

Acoustic design shall minimize noise levels where practical and ensure that the limits of DOE 5480.10 are not exceeded; ensure that verbal communications are not impaired; ensure that auditory signals are readily detectable; and minimize auditory distraction and irritation that can cause operator fatigue.

For further considerations see NUREG 0700, Section 6 and UCRL 15673, Section 3.2.4.2. Vibration shall be reduced to the extent practical to minimize operator irritation and distraction. See UCRL 15673, Section 3.2.4.3 for further considerations. (AG)

Cosmetic and aesthetic design considerations shall be reviewed for compatibility with the work area.

1300-12.4.4 Component Arrangement

The arrangement of controls and displays on a control panel shall promote efficient use of task-related components, rapid location of any given component, and maximum operator awareness of plant conditions. See EPRI NP3659, Chapter 4, and NUREG 0700, Sections 6.8 and 6.9 for guidelines. (AG)

1300-12.4.5 Protective Equipment

Personnel who work in a hazardous environment or who may be temporarily exposed to such hazards shall have convenient access to the appropriate protective equipment necessary for the successful and safe completion of their work. (AG)

Personal protection equipment shall be compatible with the body sizes of personnel performing their tasks. Guidance is provided in NUREG 0700, Section 6.1.4. (AG)

1300-12.4.6 Display Devices

Operator task analysis results shall be the basis for establishing operator informational needs. See NUREG 0700, Section 6.5 and MIL-STD-1472C, Section 5.2 for further information. (AG)

1300-12.4.7 System Controls

See EPRI NP 3659, Chapter 4; NUREG 0700, Sections 6.1, 6.3, 6.7 and 6.9; and Van Cott and Kincade, Human Engineering Guide to Equipment Design, Chapter 9 for considerations concerning System Controls. (AG)

Control components shall be durable, compatible with nontypical apparel where required and not prone to accidental activation. (AG)

Selection of controls shall consider the use of coding methods. For coding guidelines see NUREG 0700, Section 6.4. (AG)

1300-12.4.8 Warning and Annunciator Systems

An effective warning system shall alert personnel to a problem or abnormal condition and shall provide sufficient time to respond. Several warning guidelines are formed in MIL-STD-1472C, Section 5.3. For control room annunciators see NUREG 0700, Section 6.3. (AG)

Provisions shall be made for active acknowledgment and for silencing of auditory alarms after they have been acknowledged.

Provisions shall be made for maintaining personnel awareness of alarm conditions until they have been corrected or "cleared". Clearing of the alarm shall require a positive response from the assigned personnel.

Visual alarm tiles shall be grouped by function or system within panels having horizontal and vertical alphanumerical labels. (AG)

It shall be possible to periodically test the warning system.

1300-12.4.9 Communication Systems

A user requirement analysis shall be performed to determine which of the various types of communication systems is most appropriate for the user conditions and what characteristics the selected system shall have. Specific criteria applied to each type of communication system are discussed in MIL-STD-1472C; Van Cott and Kincade, Chapter 5 and NUREG 0700, Section 6.2. (AG)

1300-12.4.10 Maintainability

UCRL 15673 shall be considered for system design. The design of equipment shall incorporate the objective of efficient maintainability. (AG)

1300-12.4.11 Labels

Equipment and any parts of that equipment to be used by personnel shall be identified with appropriate labels which clearly and concisely indicate the function and purpose of the item being labeled.

Hierarchical labeling also shall be used to facilitate component location on control panels. (AG)

Permanent labels shall be attached in such a manner that environmental conditions or usage by personnel will not remove or destroy the label.

Temporary labels shall be used only when necessary.

Labeling considerations are addressed in NUREG 0700, Section 6.6 and MIL-STD-1472C, Section 5.5. (AG)

1304 PLUTONIUM PROCESSING AND HANDLING FACILITY (PPHF)

1304-3 NUCLEAR CRITICALITY SAFETY

Enclosures and material transport and transfer control systems shall be designed so that plutonium and moderating material in excess of posted limits cannot be added to otherwise critically favorable enclosures or areas.

1304-4 RADIOACTIVE PROTECTION

Facility design shall provide for the continuous monitoring of external radiation exposure levels in process areas such as hot cells and canyons during entries required for maintenance or repair operations.

The design professional shall consider the criteria provided in USNRC R.G. 3.35 for applicability to PPHFs.

Neutron shields in the form of water jackets shall be monitored for water loss.

Installed (fixed) air monitors for radioactive materials shall be designed with a minimum sensitivity of 8 DAC-hours.

1304-5 SPECIAL DESIGN FEATURES

Only hazardous gases or liquids that are necessary for a process shall be used in PPHFs. No natural gas for heating purposes shall be used unless heating occurs in a separate building that is clearly isolated from the primary facility.

Flammable gases that are necessary for a process shall be provided by a hard-piped system with the gas supply located outside of the facility in cylinders rather than from large capacity sources so as to limit the total quantity available in the event of a fire or explosion.

Pipes or other conduits for the transfer of plutonium in a product or waste liquid shall be at least double-walled or run within an enclosure that shall provide a second leak-tight barrier in the event of a DBA. Leakage from the primary pipe shall be collected in a geometrically favorable location. It shall be continuously detectable by a liquid-detection system or by a radiation-detection system.

Exhaust ventilation systems shall be provided with HEPA filtration to minimize the release of plutonium and other hazardous materials through the exhaust path. Intake ventilation systems shall also be provided

with either HEPA filtration or fail-safe backflow prevention to minimize the release of plutonium or other hazardous materials through the inlet path. Additional requirements and guidelines are provided in Section 1550-99.

Structures housing safety class items shall be designed to withstand DBAs postulated for the PPHF. (AG)

1304-6 CONFINEMENT SYSTEMS

1304-6.1 General

The effectiveness of each confinement barrier shall be checked analytically against all challenges it is expected to withstand without loss of function. (AG)

Operation of support and protection systems such as fire protection system shall not promote a failure of the principal confinement system. Confinement systems shall be designed in accordance with ALARA concepts.

1304-6.2 Primary Confinement System

Primary confinement barriers shall be provided for enclosures, glove boxes, piping, vessels, tanks, and the like that contain plutonium.

Primary confinement of plutonium processes that involve readily dispersible forms shall be provided by glove boxes or other fully confining enclosures. (AG)

The integrity of the primary confinement system shall be maintainable through all normal operations, anticipated operational occurrences and any DBA the primary barrier is required to withstand. Breaches in the primary confinement barrier that cannot be totally avoided or ruled out must be compensated for by provision of adequate inflow of air or safe collection of spilled liquid.

The exhaust ventilation system shall be sized to ensure radiological doses are maintained at ALARA levels in the event of the largest credible breach.

Confinement enclosures for combustible metals shall provide self-contained fire detection and extinguishing capability. (AG)

An inert atmosphere shall be required when pyrophoric forms of materials are being handled in the confinement enclosure. Halon systems shall not be used for enclosures handling pyrophoric metals.

Primary confinement barrier(s) shall be provided between the process material and any auxiliary system in a manner that minimizes risk of material transfer to an unsafe location or introduction of an undesirable medium into the process area. Differential pressure across the barrier(s) shall be used when appropriate. (AG)

1304-6.3 Secondary Confinement System

The integrity of the secondary confinement (confinement barriers and associated ventilation systems) shall be maintainable through all

normal operations, anticipated operational occurrences, and any DBAs the secondary barrier is required to withstand. ALARA concepts shall be incorporated in secondary confinement system design to minimize consequence on the operators, the public and the environment. (AG)

Continuous monitoring capability shall be provided to detect loss of proper differential pressure with respect to the process area. Release of hazardous material to the operating area shall also be continuously monitored. (AG)

Penetrations of the secondary barrier shall have positive seals on permanent penetrations or double closures with controlled secondary to primary leakage on pass through penetrations.

Ventilation systems associated with confinement shall be designed with adequate capacity to ensure proper direction and velocity of air flow in the event of the largest credible breach in the barrier.

1304-6.4 Tertiary Confinement System

The integrity of the tertiary confinement system (building or outer structure) shall be maintainable throughout normal operations, anticipated operational occurrences, and any DBA it is required to withstand. (AG)

1304-7 EFFLUENT CONTROL AND MONITORING

1304-7.1 Radioactive Solid Waste

Plutonium-contaminated solid waste shall be collected and handled in a location specifically designed to provide favorable geometry for criticality safety and means for packing and safe transfer of TRU waste.

1304-7.2 Radioactive Liquid Waste

Plutonium-contaminated liquid waste shall be collected in favorable geometry tanks with stirrers or other accepted mixing methods, sampling devices, and volume measuring devices. An appropriate transfer system shall be provided that includes sufficient holdup capacity to allow conclusive sampling before transfer to treatment locations. Fire suppression water drains shall be designed to minimize transfer of SNM to other locations.

Liquid radioactive wastes require treatment for removal of plutonium. Appropriate design, monitoring, and administrative controls shall ensure that liquid effluent radioactive concentrations are below the limits on discharge specified in DOE 5400 series. (AG)

1304-7.3 Effluents

1304-7.3.1 Airborne Effluents

The design of airborne effluent systems shall consider and minimize plutonium holdup at locations in off-gas and ventilation ductwork and include provisions to detect and monitor the buildup of material and for its recovery.

Appropriate nuclear criticality safety provisions shall be applied to the airborne effluent systems.

Effluent monitoring and controls shall comply with the requirements of 40 CFR 61 and DOE 5400 series, and all applicable Federal, State, and local requirements.

All exhaust outlets that may contain plutonium contaminants shall be provided with two monitoring systems and these systems shall comply with Section 1589-99.0.1. The monitoring capability shall cover the range from normal effluent concentrations to the maximum concentration expected from a credible accidental release.

1304-8 DECONTAMINATION AND DECOMMISSIONING

The PPHF shall include a decontamination area within the process or operating area.

Air cleaning devices shall be located as close to the source of contamination as practicable. This would include the filtration of glove box exhaust air prior to the exhaust air entering a duct leading to a plenum.

Protection in the form of strippable coatings or durable coatings for which effective cleaning methods have been developed shall be provided for bare floors, walls, and ceilings, particularly for structurally important parts of the building.

Surfaces in operating or process areas shall have no seams, cracks or rough or absorbent surfaces.

In areas that are most likely to become contaminated, adequate access shall be provided, such as crawl spaces, piping tunnels, and hatches into ductwork, to facilitate decontamination.

1305 PLUTONIUM STORAGE FACILITIES (PSF)

1305-3 NUCLEAR CRITICALITY SAFETY

The criteria within ANS 8.6 shall apply. Storage racks shall be designed to maintain their integrity during and following a DBE, and the DBAs they are required to withstand. (AG)

The design professional shall consider the criteria provided in R.G. 3.43 for applicability to PSFs.

1305-4 SPECIAL DESIGN FEATURES

No hazardous gases or liquids shall be used in PSFs. No natural gas for heating purposes shall be used unless heating occurs in a separate building that is clearly isolated from the primary facility. (AG)

The storage building(s), where practical, shall be rectangular, windowless and arranged in repetitive bays and compartments.

Facility layout shall provide for efficient cleaning, maintenance and ease of inspection.

Facility design shall facilitate expeditious identification, inventory, placement and retrieval of storage containers.

New storage facilities shall be physically separated from process operations, storage of non-nuclear materials or equipment, and functions not directly required for storage operations.

Combustible packaging materials shall be stored in metal containers or structures outside of a PSF in a location that shall not endanger the storage facility or stored material if a fire occurs in the packaging material.

Design of storage tanks for aqueous solutions of plutonium shall ensure that they are geometrically favorable with respect to nuclear criticality. When there is a tendency for solids to precipitate, vessels shall be instrumented to detect the buildup of solids and designed to facilitate removal of solids.

Suitable physical compartmentalization shall be provided, as determined from the safety analysis, to limit the quantity of stored mass in each compartment to safe levels.

Cautionary systems or interlocks shall be provided to prevent inadvertent entry into hazardous areas.

All safety alarm systems shall annunciate inside and outside of the PSF so as to identify hazardous areas to anyone present in either area.

Storage racks shall be noncombustible and designed to securely hold storage containers in place, ensure proper separation of storage containers, and maintain structural integrity under normal operations, anticipated operational occurrences, and DBA conditions. These racks shall be designed as safety class items. (AG)

Door locations shall comply with NFPA 101. An automated vault surveillance system shall be provided where excess radiation exposure would result from entering for material control and accountability purposes.

Those areas of the facility where attractive SNM is stored should be located in the least accessible area of the plant. (AG)

1305-5 CONFINEMENT SYSTEMS

1305-5.1 General

Operation of support and protection systems such as fire protection shall not promote the failure of the principal confinement systems. (AG)

Ingress and egress to the compartments shall be controlled through the use of access ways.

Exhaust ventilation systems shall be provided with HEPA filtration to minimize the release of plutonium or other hazardous material through the exhaust path. Inlet ventilation systems shall be provided with either HEPA filtration or fail-safe backflow prevention to minimize the

release of plutonium or other hazardous materials through the inlet path.

1305-5.2 Primary Confinement System

Special design features shall be considered to ensure safe introduction, removal, and handling of stored plutonium. These handling systems and equipment shall be designed to protect against the dropping of storage containers, fuel assemblies, and other items on the stored plutonium.

1305-5.3 Secondary Confinement System

The secondary confinement (compartments and their ventilation systems) system shall be designed to function during normal operations, anticipated operational occurrences, and for all DBAs it is required to withstand. It shall be designed as a safety class system and be capable of performing its necessary functions following a DBE.

Penetrations of the secondary confinement barrier shall have positive seals to prevent the migration of contamination.

The need for special ventilation systems for confinement purposes shall be based on the results of the safety analysis. Each compartment shall be supplied with ventilation air from the building ventilation system, and shall be provided with separate exhaust ventilation handled by a system with sufficient capacity to ensure an adequate ventilation flow in the event of a credible breach in the compartment confinement barrier. Pressure in the compartments shall be negative with respect to the building ventilation system.

1305-5.4 Tertiary Confinement System

The tertiary confinement system (building and ventilation system) shall be designed to prevent a massive collapse of building structures or the dropping of heavy objects onto the stored plutonium as a result of building structural failures and remain functional to the extent that the guidelines in Section 1300-1.4.2 are not violated.

Penetrations of the building confinement barriers shall have positive seals to prevent the migration of contamination.

Air locks or enclosed vestibules shall be provided for access through confinement barriers.

1305-6 EFFLUENT CONTROL AND MONITORING

1305-6.1 General

Routine wastes from PSFs will normally be in the form of uncontaminated and radioactive solids and liquids. A principal design objective for the waste management systems shall be to provide facilities and equipment to handle these waste safely and effectively.

1305-6.2 Radioactive Solid Waste

The design shall include provisions for including allocation of adequate space for sorting and safe temporary storage of solid waste,

equipment for assay of the waste, and facilities for volume reduction. (AG)

1305-6.3 Radioactive Liquid Waste

1305-6.3.1 Industrial Wastes

Industrial wastes shall be collected and transferred to a liquid waste treatment facility or similar type of treatment area.

Treatment processes shall be designed to reduce radioactive materials to concentrations well below the guidelines in the DOE 5400 series, using the best available technology economically achievable.

1305-6.3.2 Decontamination Wastes

Decontamination wastes shall be collected and monitored near the source of generation before batch-wise discharge through appropriate pipelines or by tank transfer to a liquid waste treatment facility or area. These wastes shall be individually collected at the PSF in storage tanks that are equipped with stirrers or other accepted mixing methods, sampling devices, volume measuring devices, and transfer systems. Waste storage tanks and transfer lines shall be designed and constructed so that any leakage shall be detected and contained before it reaches the environment. Transfer lines shall have inspection/-collection pits at practicable intervals into which leakage can drain by gravity. Nuclear criticality safety shall be considered in the design of these collection and monitoring systems. (AG)

1305-6.4 Effluents

1305-6.4.1 Airborne Effluents

All airborne effluents from confinement areas shall be exhausted through a ventilation system designed to remove particulate material, vapors, and gases as needed to comply with Section 1300-1.4.3

All exhaust outlets that may contain plutonium contaminants shall be provided with two monitoring systems that comply with Section 1589-99.0.1.

1321 REPROCESSING FACILITIES

1321-2 OBJECTIVES

The design objective shall be to ensure that conservatively estimated consequences of normal operations and credible accidents are limited in accordance with the guidelines contained in Section 1300-1.4.

1321-3 NUCLEAR CRITICALITY SAFETY

Process systems shall be designed to prevent the carry-over of sludges, fines or precipitates of fissile material and other material capable of sustaining a chain reaction from geometrically favorable portions of the facility to other areas of the facility.

A system of positive control and backflow prevention shall be provided to prevent inadvertent transfer of fissile materials and other material

capable of sustaining a chain reaction from geometrically favorable or poisoned containers to unsafe containers.

Heating or cooling jackets in the favorable dimension of geometrically favorable vessels shall be incorporated into the design to preclude a leak in the jacket causing an unacceptable reduction of the margin of subcriticality.

Sumps shall be designed so that nuclear criticality safety is ensured if a credible mechanism exists for accumulating fissile material or other material capable of sustaining a chain reaction.

Structures, systems, and components whose failure could in any way result in a criticality shall be designed as safety class items and shall be capable of providing their function following a DBE.

The design professional shall consider the criteria provided in R.G. 3.33 for applicability to reprocessing facilities.

1321-4 SPECIAL DESIGN FEATURES

Process system and auxiliary system differential pressure shall be maintained to inhibit backflow of contamination into auxiliary systems.

The process equipment for transferring toxic and corrosive fluids shall use vacuum and gravity where possible. Pumps and jets shall have pressure capacity no greater than 10 percent above needed transfer capacity.

The integrity of process equipment off-gas treatment systems shall be ensured for normal operations, anticipated operational occurrences, and the DBAs they are required to withstand.

The use of directed airflow and backflow preventors to feed areas is required.

Mechanical chopper and dissolver off-gas and other process vents shall be treated by an off-gas treatment system for removal of nuclides.

At a minimum, the treatment system shall be designed for particulate removal and shall control the release of airborne radionuclides to the extent that the guidelines referenced in Section 1300-1.4.3 are not exceeded. The design shall incorporate ALARA concepts to minimize impacts on operators and the public/environment.

Radioiodine absorber units in the exhaust ventilation/off-gas system are required to reduce the radioiodine concentration in the effluent to the extent that the guidelines specified in the references listed in Section 1300-1.4.3 are not exceeded. These releases shall be ALARA. Acceptable criteria for the design of these units are found in ERDA 76-21. (AG)

Process equipment shall be designed to operate under process conditions that prevent or minimize the probability of potentially explosive chemical reactions.

Process system design shall include provisions for all fission product oxidation states expected during processing.

Systems shall be provided to minimize the probability and consequences of pressurizing a primary confinement component as a result of an anticipated operational occurrence or DBA.

The design professional shall consider the criteria provided in the following USNRC Regulatory Guides for applicability to reprocessing facilities: R.G. 3.14; R.G. 3.17; R.G. 3.22; R.G. 3.27; R.G. 3.20.

1321-5 CONFINEMENT SYSTEMS

1321-5.1 General

In reprocessing facilities where the processes require the use of corrosive or noxious materials, the process system shall be totally enclosed and provided with its own vent system and off-gas cleanup system. (AG)

Features such as change rooms and special access ways shall be used to minimize the spread of contamination within the facility.

The effectiveness of each confinement barrier shall be checked analytically against all challenges it is expected to withstand without loss of function. This applies to any form of the hazardous material and its carrying medium.

The design professional shall consider the criteria provided in R.G. 3.18 and R.G. 3.32 for applicability to reprocessing facilities.

1321-5.2 Primary Confinement System

The integrity of the primary confinement system (process systems equipment and its associated off-gas system) shall be ensured for all normal operations, anticipated operational occurrences and for the DBAs it is required to withstand.

Failures of process equipment shall not cause failure of the secondary confinement system.

The process equipment shall be designed to operate under process conditions that prevent or minimize the probability of potential explosive chemical reactions.

1321-5.3 Secondary Confinement System

The secondary confinement system (process cell barriers and cell ventilation systems) shall be designed to remain functional during normal operations and anticipated operational occurrences. It shall be capable of performing its necessary safety functions during and following the DBAs it is required to withstand.

Secondary confinement areas shall be equipped with sensors to detect abnormal releases of hazardous material from the primary confinement boundary and provide appropriate alarms. (AG)

All penetrations of the secondary confinement shall have positive seals to prevent the migration of contamination out of the secondary confinement area.

The ventilation system shall be designed to maintain a negative differential pressure during the removal of cell covers and for normal in-leakage at cell cover joints.

Process cells shall be supplied with ventilation air from the building ventilation system, and shall have exhaust ventilation with sufficient capacity to ensure an adequate controlled ventilation flow as required in the event of a credible breach in the secondary confinement barrier.

Pressure in the compartments shall be negative with respect to the building ventilation system.

Special features shall be considered for access through secondary and tertiary confinement barriers.

1321-5.4 Tertiary Confinement System

1321-5.4.1 General

The tertiary confinement system (process building and associated ventilation system) shall be designed to function during normal operations and anticipated operational occurrences. It shall be capable of performing its necessary functions during and following the DBAs it is required to withstand.

The tertiary confinement shall be designed to ensure that it can withstand the effects of severe natural phenomena and man-made events, including the postulated DBAs and DBF mitigated by those events, and remain functional to the extent that guidelines in Section 1300-1.4.2 are not violated.

1321-5.4.2 Penetrations

Penetrations of the building confinement barriers shall have positive seals to prevent the migration of contamination.

1321-6 EFFLUENT CONTROL AND MONITORING

1321-6.1 Radioactive Solid Waste

Nuclear criticality safety shall be considered in the design of the solid radioactive waste processing facility.

1321-6.2 Radioactive Liquid Waste

1321-6.2.1 Process Wastes

Nuclear criticality safety shall be considered in the design of the liquid radioactive waste processing facility.

1321-6.3 Effluents

1321-6.3.1 Airborne Effluents

Effluent system designs shall preclude the holdup or collection of fissile material and other material capable of sustaining a chain reaction in portions of the system that are not geometrically

favorable. Nuclear criticality safety shall be considered in the design of airborne radioactive effluent systems.

All exhaust outlets that may contain transuranics or fission products shall be provided with two monitoring systems that comply with Section 1589-99.0.1

1321-7 DECONTAMINATION AND DECOMMISSIONING

The facility shall include a special, permanent decontamination process capability in a dedicated area that has the appropriate equipment and utilities for decontamination of all or as much equipment as practical.

1323 RADIOACTIVE LIQUID WASTE FACILITIES (RLWF)

1323-3 NUCLEAR CRITICALITY SAFETY

Nuclear criticality safety at RLWFs is applicable to those facilities that store or process enriched uranium, uranium - 223, or transuranic-contaminated liquid waste. For other RLWFs, nuclear criticality safety is not a design or operational consideration.

Nuclear criticality control provisions for RLWFs shall include:

- Radioactive liquid waste process systems shall minimize the carry-over of sludges, fines, or precipitates of fissile material and other material capable of sustaining a chain reaction from geometrically favorable portions of the facility to other areas of the facility.

- A system of positive control and backflow prevention shall prevent inadvertent transfer of fissile materials and other material capable of sustaining a chain reaction from geometrically favorable or poisoned containers to unsafe containers.

- Heating or cooling jackets in the favorable dimension of geometrically favorable vessels shall preclude a leak in the jacket that causes an unacceptable reduction of the margin of sub-criticality.

- Process enclosures and floor drain designs shall preclude the accumulation of fissile materials and other material capable of sustaining a chain reaction in the associated traps and piping (i.e. dams and drain plugs).

- Sumps shall be designed for nuclear criticality safety if a credible mechanism exists for accumulating fissile material and other material capable of sustaining a chain reaction (i.e, due to leakage from or failure of the primary confinement boundary).

1323-4 SPECIAL DESIGN FEATURES

1323-4.1 General

The use of multiple barriers shall be emphasized when necessary to restrict the movement of radioactive liquid waste that has the

potential for human contact or for reducing groundwater quality below the requirements in DOE 5400.1.

1323-4.2 Collection Systems

Measurement capability shall be provided to determine the volume and radioactivity of wastes fed to collection tank(s).

Individual lines shall be used for each waste stream fed to central collection tanks where necessary.

The use of traps in RLW lines shall be avoided.

Piping shall be designed to minimize entrapment and buildup of solids in the system.

Bypasses that would allow waste streams to be routed around collection tanks shall be avoided.

1323-4.3 Storage and Transfer Systems

Equipment, waste routing, and spare storage volume shall be installed and available to transfer the contents of one tank to another if a tank shows indications of excessive leakage or other conditions that warrant taking the tank out of service. The minimum spare volume shall exceed the maximum liquid content of any one tank.

Provisions shall be made so that liquids can be analyzed prior to transfer.

All transfer lines shall have individual identification.

1323-4.4 Treatment Systems

To the extent practical, features shall be included to allow volume reduction and/or waste solidification to forms required for long-term isolation. (AG)

Provisions shall be made to adjust liquid waste characteristics prior to treatment to minimize adverse chemical reactions in the treatment system.

There shall be no bypass or drains in the RLW treatment system by which waste may inadvertently be released directly to the environment.

Provisions shall be made so that effluents from a treatment system can be analyzed.

Recirculating closed-loop cooling systems shall be required for facilities and equipment associated with the storage or treatment of high-heat, high-level RLW. Minimum compliance requirements are contained in Section 1540-99.

Instrumentation and control systems shall be required at a RLWF to provide monitoring and control capabilities associated with confinement, nuclear criticality safety, and/or radiation protection.

1323-5 CONFINEMENT SYSTEMS

1323-5.1 General

The degree of confinement required in a RLWF is both storage specific and process-specific, but in either case shall suit the most restrictive case anticipated. (AG)

Systems, components, and structures that compose the process system and/or primary storage tanks shall be designed to ensure their integrity for all normal operations, anticipated operational occurrences, and DBAs they are required to withstand.

Unless it can be demonstrated that the risk is acceptable, the process system and/or primary storage tanks and associated supports shall be designed to remain functional following a DBE, and shall facilitate the maintenance of a safe shutdown condition. As a minimum, portions of the process system and/or primary storage tanks whose failure would result in an unacceptable risk and whose functions are necessary to facilitate a safe shutdown condition shall be designed to remain functional following a DBE.

The primary confinement system consisting of the process equipment and/or primary storage tanks shall be designed to operate under process conditions that prevent or minimize the probability of potential explosive chemical reactions.

Spills, overflow, or leakage from storage vessels or other primary confinement structures shall be collected and retained within a suitable secondary confinement structure. The capability shall exist to transfer such collected liquid from the secondary confinement structure to a suitable storage location. (AG)

Directly buried storage tanks shall be designed in accordance with applicable requirements in DOE 5400.1. The use of directly buried storage tanks should be avoided.

1323-5.2 High-Level Liquid Waste Confinement

The following shall apply to high-level liquid waste confinement systems:

- At least one confinement system shall be designed to withstand the effects of man-made events and DBAs.

- The process cell and/or secondary storage tank confinement and associated ventilation systems shall be designed to remain functional during normal operations, anticipated operational occurrences and for the DBAs they are required to withstand.

- The tertiary confinement system shall be designed to function during normal operations, anticipated operational occurrences and for DBAs it is required to withstand. It shall be designed to ensure that it can withstand the effects of severe natural phenomena and man-made events including DBAs and the DBF initiated by these events, and remain functional to the extent that the guidelines in Section 1300-1.4.2 are not violated.

- Tanks and piping systems used for high-level liquid waste collection, treatment and storage shall be of welded construction to the fullest extent practical. Materials of construction shall be selected to minimize all forms of corrosion. (AG)

- Potential nonuniform distribution of decay heat caused by solids in the waste shall be considered in the design of the storage tanks and any associated cooling system. Agitation of tank contents shall be provided, when necessary, to maintain temperature gradients in the waste within acceptable limits.

- Double-walled piping, multi-pipe encasements, and double-walled tanks shall be used to establish primary and secondary confinement boundaries in the underground portions of the H-LLW systems. Provisions shall be made to detect leakage from the primary confinement to the interspace.

- Installation of spare pipe lines between transfer points shall be considered.

Process and waste storage vessels shall be vented through appropriate treatment systems that control the release of radioactive material in gaseous effluents to the extent that 1300-1.4.3 guidelines are not exceeded and these releases are ALARA. The design shall ensure the following:

- Off-gas will be suitably pretreated upstream of off-gas treatment equipment to remove or reduce the concentration of chemicals that may adversely affect system operation.

- The venting system will prevent over pressure or vacuum conditions occuring within vessels.

- The venting system will prevent the buildup of hydrogen from radiolysis.

- Tank overflows will be directed to collection systems.

Integrity of the primary confinement boundary shall be determined by some or all of the following measures:

- Vessel inventory monitoring.

- On-line leakage monitoring for the interspace between double-walled vessels.

- Leakage monitoring outside confinement vessels.

- Capability for periodic visual surveillance, including remote visual surveillance with CCTV.

- Periodic evaluation of test coupons of primary tank construction materials that were installed before the tank was placed in service.

- Other appropriate surveillance or testing measures.

1323-5.3 Low-Level Liquid Waste Confinement

The following shall be applicable to the low level liquid waste confinement system:

- A dike or berm around the process system shall provide secondary confinement for low-level liquid waste.
- A tertiary confinement system is not required.
- Process and waste storage vessel vents shall be provided as discussed in Section 1323-5.2.
- Retention basins shall comply with DOE 5400.1 and shall be lined, fenced, and posted with appropriate radiation warning signs. A system for monitoring radionuclide migration from the basin shall be available.
- An impervious berm or dike shall be capable of retaining the maximum radioactive liquid waste inventory that may be released by a leak or failure of a primary confinement vessel. A capability shall exist to transfer waste that has leaked into the secondary confinement.

1323-5.4 Transuranic-Contaminated Liquid Waste Confinement

The following shall be applicable to the transuranic-contaminated liquid waste confinement system:

- Storage or process building shall provide secondary confinement for transuranic-contaminated liquid wastes.
- Tertiary confinement not required.
- Tank and piping systems used for waste collection, treatment, and storage shall be of welded construction to the fullest extent practical. Construction materials shall be selected to minimize all forms of corrosion. Consideration shall be given to stress relieving, welding parameter controls, etc., depending on the materials used. Fatigue failure should be a design consideration where temperature cycling is required.
- Process and waste storage vessel vents shall be provided as discussed Section 1323-5.2
- Integrity of the primary confinement boundary shall be determined as discussed in Section 1323-5.2.
- Nuclear criticality safety shall be considered in the design of primary and secondary confinement structures and components.

1323-6 EFFLUENT CONTROL AND MONITORING

1323-6.1 Contaminated Solid Waste

Nuclear criticality safety shall be considered in the design of the solid radioactive waste processing facility.

1323-6.2 Contaminated Liquid Waste

1323-6.2.1 Process Wastes

Disposal operations involving discharge of low-level liquid waste directly to the environment or on natural soil columns is prohibited, unless specifically approved by the cognizant DOE authority. Techniques such as solidification prior to disposal or in-place immobilization shall be used.

Nuclear criticality safety shall be considered in the design of the liquid radioactive waste processing facility. (AG)

1323-6.3 Effluents

1323-6.3.1 Airborne Effluents

Effluent systems designs shall preclude the holdup or collection of fissile material or other material capable of sustaining a chain reaction in portions of the system that are not geometrically favorable. (AG)

Nuclear criticality safety shall be considered in the design of airborne effluent systems.

All exhaust outlets that may contain radioisotopes other than ambient levels of those naturally occurring in the environment shall be provided with two monitoring systems. These monitoring systems shall comply with Section 1589-99.0.1.

1324 RADIOACTIVE SOLID WASTE FACILITIES

1324-1 COVERAGE

For those DOE facilities regulated by the NRC the requirements specified in 10 CFR 60 and 10 CFR 61 shall take precedence if a conflict arises between those regulations and criteria in Division 13, Section 1300.

1324-2 OBJECTIVES

1324-2.2 Siting Design Dose Objective For Normal Operations and Anticipated Operational Occurrences

1324-2.2.1 Disposal (Permanent Isolation) Facilities

For those DOE facilities not regulated by the NRC, the combined annual dose equivalent to any member of the public in the general environment resulting from discharges of radioactive material and direct radiation shall not exceed 25 mrem to the whole body and 75 mrem to any organ. WIPP operations are subject to these dose limits. Section 1300-1.4.3 provides references of additional limits that are applicable to these facilities.

For those DOE facilities regulated by the NRC, the combined annual dose equivalent to any member of the public in the general environment resulting from discharges of radioactive material and direct radiation shall not exceed 25 mrem to the whole body, 75 mrem to the thyroid and

25 mrem to any other organ. Additional requirements specific to these facilities are provided in 10 CFR 60 and 10 CFR 61.

1324-3 NUCLEAR CRITICALITY SAFETY

Nuclear criticality safety at RSWFs is applicable to those facilities that store or process enriched uranium, uranium-233 or transuranic contaminated solid waste. (AG)

1324-4 RADIATION PROTECTION

For those DOE facilities regulated by the NRC, the occupational radiation protection requirements specified in 10 CFR 20 and DOE 5480.11, both apply (the most conservative limits taking precedent).

1324-5 SPECIAL DESIGN FEATURES

1324-5.1 General

Process equipment off-gas treatment systems shall be designed to ensure their integrity for normal operations, anticipated operational occurrences, and for the DBAs they are required to withstand.

Cooling water systems or cooling air systems shall be provided, where required, for facilities and equipment associated with the interim storage or treatment of high-level radioactive solid waste, and to ensure the long-term integrity of the primary confinement boundary. As a minimum, cooling water systems shall comply with Section 1540-99. To the extent practicable, passive cooling means shall be used for air cooling systems. If a cooling air system is provided to ensure an acceptable temperature of the stored material, it shall be designed as a safety class system.

Instrumentation and control systems shall be required at a RSWF to provide monitoring and control capabilities associated with confinement, nuclear criticality safety, and radiation protection.

1324-5.2 High-Level Waste Disposal Facility Confinement

During the short-term period following emplacement when short-lived nuclides dominate the hazard associated with a disposal facility, the engineered system of barriers shall remain effective and shall contain the emplaced wastes. This time period is considered to include at least 300 years but not more than 1,000 years following permanent closure. (AG)

During the long-term period, reliance shall not be placed on the engineered system of barriers to contain emplaced waste. Confinement during the long-term period shall be accomplished by the geologic setting. (AG)

The facility shall be designed to allow retrieval of wastes during the 50-year period following emplacement and before permanent closure of the facility.

1324-5.3 Low-Level Waste Disposal Facility Confinement

Low-level solid waste that is disposed to the ground shall be confined by a site-specific system of barriers that may include, but not necessarily be limited to, waste form, waste packaging, and geologic setting.

When site permeability characteristics do provide the required confinement capabilities, the confinement system shall be augmented by the following:

- Constructing low permeability walls around the low-level waste.
- Lining the walls and bottom of the excavated area with low permeability material.
- Other suitable methods for reducing permeability.

Means shall be provided to minimize contact of emplaced low-level waste with water. Active water control measures shall not be required following permanent closure. (AG)

1324-6 CONFINEMENT SYSTEMS

1324-6.1 General

In RSWFs where the processes or storage include corrosive or noxious materials, the radioactive solid waste process or storage system shall be totally enclosed and provided with its own ventilation system and off-gas cleanup system. (AG)

In addition to principal confinement systems, features such as change rooms and special access ways shall be used to minimize the spread of radioactive contamination within the facility.

1324-6.2 Primary Confinement System

Systems, components, and structures that compose the process system and/or storage containers shall be designed to ensure their integrity for normal operations, anticipated operational occurrences, and for the DBAs they are required to withstand.

As a minimum, portions of the process system and/or storage containers whose failure would result in an unacceptable risk and whose functions are necessary to facilitate a safe shutdown condition shall be designed to remain functional following a DBE. (AG)

1324-6.3 Secondary Confinement System

The process cell and/or building confinement barriers and associated ventilation systems shall be capable of performing their necessary functions following a DBE.

The secondary confinement shall be designed to ensure that it can withstand the effects of severe natural phenomena and man-made events, including the DBAs and DBF initiated by these events, and remain functional to the extent that the guidelines in Section 1300-1.4.2 are not violated.

All penetrations of the secondary confinement shall have positive seals to prevent the migration of contamination out of the secondary confinement area.

Process cells shall be supplied with ventilation air from the building ventilation system, and shall be provided exhaust ventilation with sufficient capacity to ensure an adequate controlled ventilation flow as required in the event of a credible breach in the secondary confinement barrier.

Pressure in the compartments shall be negative with respect to the building ventilation system.

Special features shall be considered for access through secondary and tertiary confinement barriers.

1324-6.4 Tertiary Confinement System

The tertiary confinement system (natural geologic setting) shall function during normal operations, anticipated operational occurrences, and the DBAs it is required to withstand. It shall be capable of performing its necessary functions following a DBE.

The tertiary confinement shall remain functional following DBAs and the severe natural phenomena postulated for the facility site. In addition, the tertiary confinement system shall meet the following performance objectives:

- Following permanent closure, ongoing site maintenance shall not be needed.

- In the absence of unplanned natural processes or human contact with a low-level waste disposal facility, calculated contaminant levels in groundwater at the site boundary shall not exceed the maximum contaminant levels established in 40 CFR 141.

- In the event of human-induced activities following permanent closure, or reasonability foreseeable but unplanned natural processes, the guidelines of Section 1300-1.4.2 shall not be violated. Institutional controls may be relied on for a limited time (not more than 100 years following permanent closure) following closure to preclude reclamation activities at a low-level waste disposal site.

1324-7 EFFLUENT CONTROL AND MONITORING

1324-7.1 Radioactive Solid Waste

To the extent practicable features shall be included to allow volume reduction and/or immobilization.

Nuclear criticality safety shall be considered in the design of the solid radioactive waste processing facility.

1324-7.2 Radioactive Liquid Waste

1324-7.2.1 Process Wastes

The liquid radioactive wastes typically associated with RSWFs that shall be considered during the design include but are not limited to decontamination solutions, wash down solutions, water collection systems, and contaminated laundry waste. Nuclear criticality safety shall be considered in the design of the radioactive liquid waste processing facility.

1324-7.3 Effluents

1324-7.3.1 Airborne Effluents

Effluent system designs shall preclude the holdup or collection of fissile material or other material capable of sustaining a chain reaction in portions of the system not geometrically favorable.

Nuclear criticality safety shall be considered in the design of airborne effluent systems.

Exhaust outlets that may contain transuranics or fission products shall be provided with two monitoring systems that comply with Section 1589-99.0.1.

1325 LABORATORY FACILITIES (INCLUDING HOT LABORATORIES)

1325-4 CONFINEMENT SYSTEMS

1325-4.1 General

The confinement of the process and operation is to be considered in the design criteria for a laboratory facility.

Consideration shall be given to the installation of radioiodine absorber units in the exhaust ventilation/off-gas system to reduce the radioiodine concentration in the effluent to the extent that the limits in the references specified in Section 1300-1.4.3, Routine Releases, are not exceeded. Additionally, the design shall incorporate ALARA concepts to minimize impact on both the operators, the public, and the environment. Acceptable criteria for the design of these units is found in ERDA 76-21.

1325-4.2 Primary Confinement System

The integrity of the primary confinement system shall be ensured for normal operations and anticipated operational occurrences.

The primary confinement volume and isolation systems, as appropriate, shall be compartmentalized to isolate high-risk areas and to minimize the potential effects of the DBAs they are required to withstand.

The primary confinement system, including the ventilation and off-gas system, shall be shielded, as appropriate, to maintain occupational radiation exposure ALARA and within the limits specified in DOE 5480.11.

The primary confinement system(s) shall be designed to operate under process conditions that prevent or minimize the probability of potential explosive chemical reactions and shall use ALARA design principles to minimize exposures.

Design features for primary confinement for laboratory facilities and processes are facility-specific. The following requirements shall be appropriately applied in the design of a laboratory facility primary confinement system(s):

- Design features for introduction and removal stations to ensure the safe introduction and removal of material and maintenance equipment to and from the primary confinement.
- Separate ventilation system or off-gas treatment system with appropriate air-cleaning capability (e.g., HEPA filtration, radioiodine absorbers, scrubbers). The use of an inert gas atmosphere within the primary confinement shall be considered when handling pyrophoric material or tritium.
- The ventilation and cleanup systems associated with the primary confinement shall generally not be shared with secondary and tertiary confinement systems.
- The operating pressure in the primary confinement shall be negative with respect to the secondary confinement.
- Tanks within the primary confinement shall vent to the off-gas treatment system.
- Glove boxes
- Hot cells

Glove boxes shall meet the following criteria:

- Corrosive gases or particles from vats, scrubbers, and similar equipment shall be neutralized prior to reaching HEPA off-gas filters.
- A single filtered exhaust path shall be acceptable when working with low-toxicity materials that do not require dilution or continuous cooling.
- Required exhaust flow rates (for air-ventilated glove boxes) shall have the ability to safely confine in-box contaminants when an access port is opened or a glove ruptures (minimum air velocity of 125 linear ft per minute).
- If the glove box is filled with an inert atmosphere, specific design criteria for emergencies (i.e., ruptured glove) shall be incorporated on a case-by-case basis to suit a particular situation (e.g., pyrophoric materials).

Hot cells shall meet the following criteria:

- Space and equipment shall be provided as needed to support accountability, process monitoring, and material control

requirements and to meet the performance requirements contained in DOE 5633.3.

- Exhaust prefilters and HEPA filters shall be installed in such a manner as to facilitate filter changing and repairs.

- Stand-by filters shall be incorporated for backup protection during filter changes to allow filter changing without shutting down the exhaust fans. Stand-by filters shall be installed outside the cell and sealed in an acceptable enclosure for direct maintenance.

- All exhaust systems shall have monitors that will provide an alarm if the concentration of the hazardous material in the exhaust exceeds the limits specified in the facility OSR.

- Sufficient holdup capacity shall be provided for the retention of liquid process wastes until they can be analyzed to determine the need for processing or shown to be within acceptable discharge limits.

1325-4.3 Secondary Confinement System

The secondary confinement system shall remain functional for all normal operations, anticipated operational occurrences, and for the DBAs it is required to withstand.

The following design requirements shall be incorporated into secondary confinement systems:

- Design features to minimize the probability of the spread of potential contamination from within the laboratory facility operating areas to areas that are not normally contaminated.

- The use of a ventilation system separate from the primary confinement ventilation system with appropriate air-cleaning capability (e.g., HEPA filtration, radioiodine absorbers, scrubbers).

- Measures to ensure that the operating pressure in the secondary confinement shall be negative with respect to the tertiary confinement.

1325-4.4 Tertiary Confinement System

The following design requirements shall be incorporated into tertiary confinement systems:

- Measures to ensure that the confinement building provides protection for the primary and secondary confinement barriers and for enclosed equipment against the effects of severe natural phenomena and missiles.

- Measures to ensure that the tertiary confinement can withstand the effects of severe natural phenomena and man-made events, including the DBAs and DBF initiated by these events, and remain functional to the extent that the guidelines in Section 1300-1.4.2, Accidental Releases, are not violated.

- The use of a ventilation system separate from the primary confinement ventilation system with appropriate air-cleaning capabilities (e.g., HEPA filtration, radioiodine absorbers, scrubbers).

- Measures to ensure that the operating pressure in the tertiary confinement is negative with respect to the atmosphere.

The secondary and tertiary confinement ventilation systems may be shared if safety analysis indicates that this type of design is acceptable.

1325-5 EFFLUENT CONTROL AND MONITORING

1325-5.1 Radioactive Solid Waste

The solid radioactive wastes typically associated with laboratory facilities including hot laboratories that shall be considered during the design include but are not limited to broken and/or obsolete laboratory equipment from primary confinements, general process trash (e.g., filters, waste paper, gloves, plastic bags). Since hot laboratories often contain a large variety of processes within the facilities, the potential solid radioactive wastes to be processed shall be considered on a facility-specific basis.

1325-5.2 Radioactive Liquid Waste

1325-5.2.1 Process Wastes

The liquid radioactive wastes typically associated with hot laboratories that shall be considered during the design include but are not limited to uranium, plutonium, and other radioactive contaminated liquid wastes, contaminated solvents, contaminated oils, and decontamination solutions. Since hot laboratories often contain a large variety of processes within the facilities, the potential liquid radioactive wastes to be processed shall be considered on a facility-specific basis.

1325-5.3 Effluents

1325-5.3.1 Airborne Effluents

The airborne radioactive wastes typically associated with hot laboratories that shall be considered during the design include but are not limited to relatively short-lived fission product gases and airborne particulate matter. Since hot laboratories often contain a large variety of processes within the facilities, the potential airborne radioactive wastes to be processed shall be considered on a facility-specific basis.

All exhaust outlets that may contain radiological contamination shall be provided with two monitoring systems. These monitoring systems shall meet with the requirement specified in Section 1589-90.0.1, Radioactive Airborne Effluents.

1325-6 DECONTAMINATION AND DECOMMISSIONING

Due to the nature of some laboratory facilities (including hot laboratories), their life times may be relatively short when compared to production-scale facilities; thus, consideration shall be given during the design of the facility to plans for decommissioning. All designs shall provide for ease of decontamination for this purpose.

DIVISION 15

MECHANICAL

1530 FIRE PROTECTION

1530-99 SPECIAL FACILITIES

1530-99.0 Nonreactor Nuclear Facilities - General

Fire protection systems shall not: (1) prevent a facility from achieving and maintaining a safe shutdown condition, (2) prevent the mitigation of DBA consequences, or (3) cause an inadvertent nuclear criticality.

Total reliance shall not be placed on a single fire suppression system. Appropriate backup capability shall be provided.

The facility design shall provide appropriate separation against fire, explosion, and failure of fire suppression systems.

Fire protection systems, or portions of them, that must function to control effects of a DBA event shall be designed to be functional for all conditions included in the accident scenario.

Mechanical- and fluid - system portions of the fire protection system shall meet the appropriate NFPA requirements.

The operation or failure of a fire protection system that interfaces with a safety class system, shall not prevent the safety class system from completing its safety functions when required. (AG)

Combustible materials shall not be used in the construction of process system confinement barriers, to the extent practicable.

Confinement systems shall be designed with the capability of retaining the confinement function during the DBF.

When the use of water sprinkler coverage is precluded because of nuclear criticality or other hazards, nonaqueous extinguishing systems shall be used.

Fire protection systems shall be designed so that the failure of any active component shall not disable the fire protection system.

Fire protection systems and components shall have fail-safe features and audible and visual alarms for operability and trouble indications.

An emergency source of electrical power shall be provided to operate fire protection systems. Fire protection systems shall be capable of operating during a normal power outage. The emergency power sources and the electrical distribution circuits shall have independence and testability to ensure performance of their safety functions assuming any single failure.

When the process uses or produces combustible gases or vapors, the design shall include features to provide dilution required to maintain the concentration of gases or vapors below the lower limit for flammability.

Entry of air into furnaces operating with reducing gas shall be precluded by the use of inert-gas purged locks or other suitable means at the furnace entry and exit. Furnace gas shall be exhausted through a filtered exhaust system.

Process furnaces shall be provided with a system for automatically shutting off the furnace gas and purging with inert gas in the event of power failure, loss of coolant water, loss of exhaust ventilation, over temperature, or detection of hydrogen in the vicinity of the furnace.

Automatic water sprinkler coverage shall be provided throughout the facility except in areas where nuclear criticality or other hazards specifically preclude its use or where Halon systems are required to reduce equipment damage.

The water supply for the permanent fire protection installation shall have a minimum of two reliable, independent sources each with sufficient capacity for fire fighting until other sources become available. Only one of these two sources shall be required to be DBE qualified.

Fire protection systems shall include the following features:

- Automatic and redundant fire detection devices.

- A fire-extinguishing system to rapidly remove heat produced by fire to prevent or minimize the pressurization of a process confinement and to rapidly extinguish a fire to minimize the loading of ventilation system filters with combustion products.

- The introduction of the extinguishing agent in a way that does not result in over pressurization of the confinement barriers.

Where fire barriers are penetrated by the confinement system's ventilation ducting, fire dampers shall be appropriately used to maintain the barrier integrity. The closure of such dampers shall not compromise the functions of the confinement system where the loss of confinement might pose a greater threat than the spread of fire. In such cases, alternative fire protection means shall be used as a substitute for fire barrier closure. In no case shall a sprinkler system be considered a fire barrier substitute.

Where the risk of uranium or plutonium metal fire is high, the operator shall be provided with a supplemental capability to extinguish a fire.

Because of flammable or potentially flammable atmospheres, electrical installations in hazardous process locations shall be designed to preclude the introduction of any ignition source by the electrical equipment.

1540 PLUMBING/SERVICE PIPING

1540-99 SPECIAL FACILITIES

1540-99.0 Nonreactor Nuclear Facilities - General

1540-99.0.1 General Cooling System Criteria (AG)

Water systems shall be designed to incorporate sufficient redundancy and independence to ensure that served systems and structures are adequately cooled and that adequate emergency supplies of water are available during normal operations, anticipated operational occurrences, and DBA conditions with the addition of a single failure of a component in the water system.

The cooling water system shall have a heat utilization capability at least equal to the maximum heat load imposed under any mode of normal operations, anticipated operational occurrences and DBA conditions.

The water supply system shall be capable of supplying the long-term water needs of a facility following a loss of normal water supply or other accident.

The water system shall be designed to a national piping code. The design of systems that must provide cooling water following a DBE shall include the forces resulting from a DBE. (AG)

The cooling water system shall be provided with at least two sources of motive power.

The water system design shall include provisions for isolating leaking components such as heat exchangers.

Adequate instrumentation and controls shall be provided to assess water system performance and allow the necessary control of system operation.

Components of the water system that are powered by electricity only shall be considered as safety class loads.

The water system and the ultimate heat sink shall be protected against the effects of severe natural phenomena and man-made events, as required to provide necessary cooling.

Equipment in the cooling water system shall be appropriately qualified to ensure reliable operation under normal operations, anticipated operational occurrences and DBA conditions.

Pumps, valves, filters and other components associated with cooling and water supply systems shall be readily accessible for maintenance.

System redundancy requirements shall include the following:

- The cooling system shall be composed of a least two water sources, each capable of performing the necessary safety functions, unless it can be demonstrated by safety analysis that there is an extremely low probability of losing the capability of a single source.

- Where conduits and pumps are required as a part of the cooling system, the use of at least two complete delivery systems shall be considered.

Means shall be provided to detect and control leakage of radioactive material into the coolant. The consequences of such leakage shall not significantly degrade system performance or endanger personnel.

Leakage of coolant into waste storage vessels shall be detectable, and the volume of coolant that may enter the waste tank shall be controlled to prevent overflow.

1540-99.0.2 Water Collection System

Collection systems shall be provided for water runoff, such as from fire fighting activities, from areas within special facilities containing radioactive material. (AG)

The size of the collection system for firefighting water shall be based on the maximum amount of water that would be collected in fighting the DBF.(AG)

For facilities that process, handle, or store fissile or other material capable of sustaining a chain reaction, the water runoff collection system shall be designed with the following nuclear criticality safety conditions:

- The maximum material mass loading that could be in the runoff system.

- The most disadvantageous material concentrations, particle size and material dispersion in the water slurry.

- The change in concentration of material and geometric configuration of the slurry as the particulate matter settles out of the water.

1540-99.0.3 Other Collection Systems

Consideration shall be given to the collection and monitoring of radioactive and nonradioactive contaminants in natural runoff and blow downs from heating and cooling systems before discharge to the environment.

Safety shower water and personnel decontamination shower water shall drain to the contaminated process water waste system.

1540-99.0.5 Water Supplies and Other Utility Services

On-site water supplies and other utilities shall be provided as necessary for emergency use. (AG)

1540-99.0.6 System Installation

The design professional shall consider the applicability of the criteria in R.G. 8.8 for piping systems carrying radioactive materials. (AG)

1540-99.15 Reprocessing Facilities

A cooling system shall be provided as a heat sink for heat removal from high-level liquid waste handling and storage systems.

1540-99.18 Radioactive Solid Waste Facilities

Facilities and equipment associated with the interim storage or treatment of high-level radioactive solid waste shall require a safety class water cooling system to remove decay heat from the waste and to ensure the long-term integrity of the primary confinement boundary. (AG)

1550 HEATING, VENTILATING AND AIR-CONDITIONING SYSTEMS

1550-99 SPECIAL FACILITIES

1550-99.0 Nonreactor Nuclear Facilities General

1550-99.0.1 General Ventilation and Off-Gas Criteria

Ventilation systems shall be designed to provide a continuous airflow pattern from the environment into the building and then from noncontaminated areas of the building to potentially contaminated areas and then to normally contaminated areas.

Dampers shall be located so that cross-contamination will not occur in case of a localized release of material. (AG)

Portions of ventilation and off-gas systems that provide required functions following a seismic event shall be designed to be functional following a DBE.

The use of downdraft ventilation within occupied process areas shall be considered as a means to reduce the potential inhalation of contamination.

The failure of ventilation and off-gas systems not designed as safety class systems shall not prevent other facility safety class systems from performing their required safety functions.

Hydrogen gas storage areas and process areas that use hydrogen shall have provisions for sufficient ventilation to ensure that under all conditions the hydrogen concentration in the air and/or off-gas will never exceed 4 percent by volume.

Gas storage areas and process areas that use hazardous materials shall have ventilation systems designed to ensure that the hazardous material concentrations do not exceed the limits referenced in DOE 5480.10 and are ALARA in the work place environment. Effective loss-of-ventilation alarms shall be provided in all of these areas.

Suitable off-gas stream pretreatment shall be provided upstream of the off-gas cleanup system to remove or reduce the concentration of chemicals that would adversely affect system operation.

Components of ventilation and off-gas systems that require electric power to perform their safety functions shall be considered safety class loads.

Adequate instrumentation and controls shall be provided to assess ventilation or off-gas system performance and allow the necessary control of system operation.

Equipment in ventilation and off-gas systems shall be appropriately qualified to ensure reliable operation during normal operating conditions, anticipated operational occurrences, and during and following a DBE.

1550-99.0.2 Confinement Ventilation Systems

The design of a confinement ventilation system shall ensure the ability to maintain desired airflow characteristics when personnel access doors or hatches are open.

The ventilation system design shall provide the required confinement capability under all credible circumstances with the addition of a single failure in the system. (AG)

If the maintenance of a controlled continuous confinement airflow is required, electrical equipment and components required to provide this airflow shall be supplied with safety class electric power and provided with an emergency power source.

Air cleanup systems shall be provided in confinement ventilation exhaust systems to limit the release of radioactive and other hazardous material to the environment and to minimize the spread of contamination within the facility as determined by the safety analysis.

The following general cleanup system requirements shall be met, as appropriate, for ventilation system design:

- The level of radioactive material in confinement exhaust systems shall be continuously monitored. Alarms shall be provided. Appropriate manual or automatic protective features that prevent an uncontrolled release of radioactive material to the environment or work place shall be provided.

- To limit onsite doses and to reduce offsite doses by enhancing atmospheric dispersion, elevated confinement exhaust discharge locations are required. The height of the exhaust discharge location shall ensure that the calculated consequences of normal or accidental releases shall not exceed the radiological guidance in Section 1300-1.4. To the extent practical, all normal and accidental releases shall be maintained at ALARA levels.

- An elevated stack shall be used for confinement exhaust discharge. Provisions shall be made to ensure an adequate ventilation exhaust discharge path in the event of stack failure. The stack shall be

located so that it cannot fall on the facility or an adjacent facility containing safety class items. (AG)

- Safety class air filtration units shall be designed to remain functional throughout DBAs and to retain collected radioactive material after the accident.

- Air sampling locations shall meet ACGIH/ASHRAE criteria. Sample collecting devices shall be located as close to the sampling probe as possible.

- The number of air filtration stages required for any area of a facility shall be determined by safety analysis based on the quantity and type of radioactive materials to be confined.

- Air filtration units shall be installed as close as practical to the source of contaminants to minimize the contamination of ventilation system ductwork.

- Ducts shall be sized for the transport velocities needed to convey, without settling, all particulate contaminants.

- Air filtration units shall be located and provided with appropriate radiation shielding to maintain occupational doses ALARA during operations and maintenance.

- Air filtration units shall be designed for ease of recovery of fissile material and other material capable of sustaining a chain reaction in case of an accident as well as during normal operations.

- The cleanup system shall have installed test and measuring devices and shall facilitate monitoring operations, maintenance, and periodic inspection and testing during equipment operation or shutdown, as appropriate.

- Where spaces, such as control room, are to be occupied during abnormal events, safety class filtration systems shall be provided on the air inlets. As a minimum, air inlets shall be filtered to limit the loading of exhaust filters with normal atmospheric dust.

- Either HEPA filtration or fail-safe backflow prevention for process area intake ventilation systems shall be provided. (AG)

Hot cell exhaust systems shall be as follows:

- Exhaust prefilters and HEPA filters shall be installed in such a manner as to facilitate filter changing and repairs.

- Standby filters shall be installed outside the cell and sealed in an acceptable enclosure for direct maintenance.

- All exhaust systems shall have monitors that provide an alarm if the concentration of the hazardous material in the exhaust exceeds specified limits.

In facilities where plutonium or enriched uranium is processed, the following additional requirements shall be met:

- Whenever possible, the designer shall provide enclosures for confining the process work on plutonium and enriched uranium. Design criteria are provided in Section 1161. If a recirculation ventilation system is provided, the design shall provide a suitable means for switching from the recirculation mode to a once-through ventilation system. (AG)

- If advantageous to operations, maintenance, or emergency personnel, the ventilation system shall have provisions for independent shutdown. When a system is shutdown, positive means of controlling backflow of air to noncontaminated spaces shall be provided by positive shutoff dampers, blind flanges, or other devices. (AG)

- Equipment to continuously monitor oxygen levels shall be provided for occupied working areas of facilities equipped with significant quantities of inert or oxygen-deficient process glove box lines.

- The supply air to enclosures that confine the processing of plutonium and enriched uranium shall be filtered by HEPA filters at the ventilation inlets to the enclosures and area confinement barriers to prevent the transport of radioactive contamination in the event of a flow reversal.

- If room air is recirculated, at least one stage of HEPA filtration shall be provided in the recirculation circuit. Process enclosure air shall be treated and exhausted without any potential for recirculation to occupied areas. (AG)

- Ventilation system components and controls that require electric power to perform safety functions shall be supplied with a safety class UPS and/or emergency power supply as is determined to be required by a systems design/safety analysis.

- The designer shall specify and locate components in the exhaust systems to remove radioactive materials and noxious chemicals before the air is discharged to the environment. These systems shall be designed to operate under DBA conditions including the DBF. (AG)

- The number of required exhaust filtration stages shall be determined by safety analysis. (AG)

- HEPA filters shall be installed at the interface between the enclosures that confine the process and the exhaust ventilation system. Prefilters shall be installed ahead of HEPA filters. The filtration system shall be designed to allow reliable in-place testing of the HEPA filter and simplify filter replacement.

- Separate exhaust ventilation system ductwork and the initial two stages of filtration shall be designed for exhaust air from enclosures that confine the process. These systems shall maintain a negative pressure inside the enclosure with respect to the operating area. These systems shall be designed to remove moisture, heat, and explosive and corrosive gases, as well as other contaminants. The system shall be designed to automatically ensure adequate inflow of air through a credible breach in the enclosure confinement.

- Enclosures that confine the process and are supplied with gases at positive pressure shall have positive acting pressure-relief valves that relieve the exhaust system to prevent over-pressurization of the process confinement system.

- The design of air cleaning systems for normal operations, anticipated operational occurrences, and DBA conditions shall include the use of the following equipment as directed by the cognizant DOE authority and these criteria:

    - o prefilters, scrubbers, process vessel vent systems -HEPA filters, sand filters, glass filters, radioiodine absorbers, demisters, condensers, distribution baffles and pressure and flow measurement devices.

- Airborne contaminant cleaning systems shall be designed for convenient maintenance and the ability to decontaminate components and replace components in the supply, exhaust and cleanup systems without exposure of maintenance or service personnel to hazardous materials. Filtration systems shall be designed so that a bank of filters can be completely isolated from the ventilation systems during filter element replacement.

1550-99.0.3 Off-Gas Systems

The design of the off-gas system shall ensure that off-site doses resulting from normal system operation are maintained within the guidelines of Section 1300-1.4.3 and are ALARA.

The sources and characteristics of radioactive material in the off-gas systems shall be identified and the systems designed commensurate with the characteristics of the radioactive material in the off-gas and the risk associated with its release as an effluent.

Portions of off-gas systems and components that are required to control or limit the release of radioactive material to the environment or for safe operation of the system shall be provided with redundancy.

Electrical equipment and components of off-gas systems that require electric power to perform their safety function shall be considered safety class loads.

Adequate instrumentation shall be provided to monitor and assess system performance and to provide necessary alarms. Appropriate manual or automatic protective features shall be provided to prevent an uncontrolled release of radioactive material to the environment and to minimize the spread of contamination within the facility.

The off-gas systems shall be designed to allow periodic maintenance, inspection and testing of components.

The systems capacity shall be consistent with the needs for handling off-gas from components and systems during normal operations, anticipated operational occurrences, and DBA conditions. Process system tanks and other sealed components shall be vented to an off-gas system.

The design of process confinement off-gas treatment systems shall preclude the accumulation of potentially flammable quantities of hydrogen generated by radiolysis or chemical reactions within process equipment.

Vents from liquid components shall be provided with traps and drains to prevent inadvertent flooding of off-gas systems.

Adequate shielding shall be provided for filters, absorbers, scrubbers, and other off-gas treatment system components to maintain occupational exposures within the limits specified in DOE 5480.11. The shielding design shall use ALARA principles to minimize overall exposures, to the extent practical.

Corrosive gases and particles from vats, scrubbers, and similar equipment in glove boxes shall be neutralized prior to reaching the HEPA off-gas filters.

Air ventilated glove boxes shall have the ability to safely contain in-box contaminants when an access port is opened or a glove ruptures.

Vent streams containing UF_6 shall be equipped with chemical traps to remove radionuclides from the gases before they are vented to the atmosphere. (AG)

Traps shall be designed for nuclear criticality safety under conditions of design loading of fissile or other material capable of sustaining a chain reaction. The design shall also minimize the spread of contamination during replacement.

All vent streams having the potential of containing significant quantities of radioactive material shall be processed by an off-gas cleanup system before being exhausted to the environment. The cleanup systems shall be designed to remove particulate and noxious chemicals and control the release of gaseous radionuclides.

1589 AIR POLLUTION CONTROL

1589-99 SPECIAL FACILITIES

1589-99.0 Nonreactor Nuclear Facilities - General

1589-99.0.1 Radioactive Airborne Effluents

All airborne effluents from confinement areas shall be exhausted through a ventilation system designed to remove particulate material, vapors, and gases as needed to comply with the guidance provided in Section 1300-1.4.3 and, if other hazardous materials are additionally present, with DOE 5400.1. ALARA design principles shall be implemented.

All exhaust ducts (or stacks) that may contain radioactive airborne effluents shall be provided with effluent monitoring systems that are designed in accordance with applicable requirements contained in the DOE 5400 series.

Backup capability for monitoring systems shall be considered in the design.

Continuous stack sampling and continuous radiation detection shall be considered.

Sampling systems shall be designed in accordance with ANSI N13.1 and associated appendixes to ensure representative sampling of the effluent stream.

Isokinetic sampling shall be provided for effluent streams that are expected to contain particulate radionuclides.

The range capability of continuous monitors shall cover from routine to potential DBA releases of radionuclides.

Nuclear criticality safety shall be considered in the design of equipment used to treat and discharge radioactive airborne effluents.

1589-99.0.2 Nonradioactive Airborne Effluents

For nonradioactive hazardous gaseous or airborne effluents, the point of release shall be considered the point at which the effluent exits the stack, vent, etc.

Releases of nonradioactive gaseous or airborne effluents shall not exceed the guidelines in DOE 5400.1 and shall comply with all other applicable Federal, State and local requirements. To the extent practical, ALARA principles shall be applied to minimize adverse impacts to the public and the environment.

DIVISION 16

ELECTRICAL

1660 SPECIAL SYSTEMS

1660-3 UNINTERRUPTIBLE POWER SYSTEMS

Uninterruptible power supplies shall be provided for those loads requiring guaranteed continuous power. Application of UPSs shall comply with IEEE 446, as modified by the cognizant DOE authority. UPS installations may be Safety Class 1 or standby type dependent on the classification of the loads served.

1660-99 SPECIAL FACILITIES

1660-99.0 Nonreactor Nuclear Facilities - General

1660-99.0.1 Safety Class (Emergency) Electrical Systems

Electric power and electrical instrumentation and control systems are designated safety class electric if they are required to satisfy the safety class criteria in Section 1300-3.1 through Section 1300-3.4. These components and systems are subject to the basic approach outlined in the IEEE 308 standards and to higher quality assurance requirements as needed.

For safety class items that require electric power to perform their safety functions, the design shall provide safety class emergency electric power systems. The design shall define the type, capacity, performance characteristics, and features of the safety class electric systems, including generator and batteries, required to meet safety class system needs.

Safety class electric systems shall be provided with suitable redundancy and separation to ensure that adequate capacity and capability are available with the addition of a single failure.

Redundant safety class electric systems shall be physically protected or separated to prevent a common external event from causing a failure of the redundant systems. IEEE 379 and IEEE 384 shall be used as redundancy and separation criteria.

The connection of loads that do not require safety class power to safety class buses shall be minimized. (AG)

Safety class electric systems shall be qualified to the requirements in Section 1300-3.4 and as appropriate, to the structural requirements imposed on safety class items in Section 0111-99.

Testing or a combination of testing and analysis shall be the preferred method of demonstrating the operability of instrumentation and electrical equipment that are required to operate during and following a DBE. (AG)

The capability to periodically test safety class electric systems and to verify system performance shall be provided.

1660-99.0.2 Protection System and Instrumentation and Controls

The design shall provide, as necessary, safety class protection systems and safety class instrumentation and control systems to minimize the risk associated with facility operation.

The protection system shall provide automatic initiation of protective actions that require rapid response and automatic control of interlocks the prevent unsafe operator actions.

Protection systems shall be designed to sense potentially hazardous conditions and to initiate actions to ensure that specific acceptable design limits are not exceeded as a result of anticipated operational occurrences. The protection system shall automatically activate safety class systems and components that are required to ensure the safety of operating personnel and the public. It shall provide audible and visual indication of system status. Automatically initiated protective actions shall be provided with a manually initiated backup.

The design of the protection system shall provide suitable redundancy and diversity to ensure that safety functions can be completed, when required, and that no single failure will result in the loss of the protective functions. The protection system shall be designed to fail in a safe state following a component or channel failure or loss of power.

Safety class instrumentation shall sense abnormal conditions affecting safety and subsequently provide an alarm.

Safety class instrumentation and control systems shall provide audible and visual alarms so that the operator can take timely corrective actions to ensure the safety of operating personnel and the public.

The safety class instrumentation shall be designed to monitor safety-related variables and safety class systems over expected ranges for normal operations, anticipated operational occurrences, DBA conditions, and for safe shutdown. Safety class controls shall be provided when they are necessary to control these variables. (AG)

The design of safety class instrumentation and controls shall provide suitable redundancy and diversity to ensure that safety functions can be completed when required, and that no single failure will result in the loss of the protective functions. The safety class instrumentation and controls shall fail in a safe state following a component or channel failure or loss of power.

1660-99.0.3 Qualification

Protection systems and safety class instrumentation and control equipment shall be qualified to the environmental qualification requirements in Section 1300-3.4.

1660-99.0.4 Separation and Physical Protection

Redundant protection system and safety class instrument channels shall be physically protected or separated to prevent a common external event or failure of one channel from causing a failure in the redundant channel.

The safety class protection system and safety class instrumentation and control system shall be appropriately separated or isolated from other instrumentation and control systems to the extent that a failure in these other systems will not degrade the safety class systems to the extent that they are unable to perform their necessary safety functions.

1660-99.0.5 Test and Calibration

The design of protection system and safety class instrumentation and control systems shall provide for the periodic in-place testing and calibration of instrument channels and interlocks. The design shall allow periodic testing of protective functions to determine whether failure or loss of redundancy may have occurred.

1660-99.0.6 Power Sources

An analysis shall be made to determine power requirements for safe shutdown of the process. Safety class electric power or a safety class control air system shall be provided unless adequate system performance including fail-safe shutdown can be demonstrated when only the conventional power sources are used.

1660-99.0.7 Control Areas

Control areas or a control room shall be designed to allow occupancy and actions to be taken to operate the facility safely under normal conditions, anticipated operational occurrences, and DBA conditions to achieve and maintain a safe shutdown condition including the remote manual initiation and control of safety functions, if used. In the event that a control area or control room is disabled, there shall be sufficient redundancy and capability to allow the facility to be placed in a safe shutdown condition.

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