DISTRIBUTION SHEET

To Distribution	From Advance Engineering	Page 1 of 1
		Date 11/10/94
Project Title/Work Order 95L-EWW-252, Phase II Liquid Effluent Treatment & Disposal, FUNCTIONAL DESIGN CRITERIA (Revision 1).		EDT No. N/A
		ECN No. 603992

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
------	------	-----------------------------	-----------	------------------------------	-----------------

U.S. DEPARTMENT OF ENERGY - RICHLAND OPERATIONS OFFICE

W. J. Evelo Jr.	A5-18	X
R. A. Quintero	S7-55	X

U.S. ARMY CORP OF ENGINEERS

T. A. Tevington	A5-20	X (5)
-----------------	-------	-------

MONTGOMERY WATSON

L. J. Bennett (Boise)		X (6)
-----------------------	--	-------

WESTINGHOUSE HANFORD COMPANY

W. C. Alaconis	H6-32	X	
M. C. Arntzen Jr.	L4-93	X	
B. P. Atencio	H6-28	X	
D. G. Black	H6-20	X	
E. M. Bright Jr.	S2-63	X	
A. F. Crane	T7-39	X	
D. S. Davis	T4-17	X	
A. J. DiLiberto	H6-32		X
F. A. Graf Jr.	T7-39	X	
C. E. Hatch	H6-28	X (5)	
D. R. Herman	S2-12	X (2)	
D. P. Hughes	R3-35		X
O. M. Jaka	R3-08	X (4)	
G. A. Johnston	R3-35	X	
J. R. Kelly	R3-28		X
K. J. Lueck	H6-28	X	
K. S. McCullough	H4-68	X	
A. K. McDowell	R1-51	X	
I. G. Papp	T7-39	X	
P. K. Sato	R3-35	X (6)	
T. L. Sweet	T1-06	X (2)	
G. R. Tardiff	R2-70	X (2)	
K. S. Tollefson	H6-21	X	
R. A. Wahlquist	R1-43	X (2)	
J. D. Williams	H6-28		X
R. D. Weissenfels	S6-70	X (4)	

O.S.T.I.	L8-07	X (2)
Central Files	L8-04	X (2)
Project Files	R1-28	X

COMPLETE

ENGINEERING CHANGE NOTICE

Page 1 of 31. ECN **603992**Proj.
ECN **N/A**

2. ECN Category (mark one) Supplemental ☐ Direct Revision ☒ Change ECN ☐ Temporary ☐ Standby ☐ Supersedure ☐ Cancel/Void ☐		3. Originator's Name, Organization, MSIN, and Telephone No. C. E. Hatch, Liquid Effluent Systems Engineering, H6-28, 373-1989		4. Date 4/3/94	
		5. Project Title/No./Work Order No. W-252/Phase II Liquid Effluent Treatment & Disposal		6. Bldg./Sys./Fac. No. 200-E Area	
		7. Impact Level ESQD			
		8. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-W252-FDC-001, REV 0		9. Related ECN No(s). N/A	
		10. Related PO No. N/A			
11a. Modification Work ☐ Yes (fill out Blk. 11b) ☒ No (NA Blks. 11b, 11c, 11d)		11b. Work Package No. N/A		11c. Modification Work Complete N/A	
		11d. Restored to Original Condition (Temp. or Standby ECN only) N/A			
12. Description of Change 1. Remove references to 100-D, 100 Area facilities, 182-D or 183-D in the following sections: Section 1.0, first paragraph, second sentence; section 1.1, first paragraph, first sentence; Table 1; section 1.2, first sentence; section 1.2, first paragraph, fifth bullet, section 2.1, first paragraph, second sentence; section 3.2, third paragraph, last sentence; section 3.3.7, remove entire section (also remove from Table of Contents, page vii); section 4.5, first paragraph, first sentence; section 5.3, first paragraph; Table C-1; Appendix I, remove entire appendix. 2. Page 3, second paragraph. Change W-291 to W-291H. 3. Section 4.5, second paragraph. After the first sentence, insert the following: Additional standby power at the 242-A Evaporator is not required to support the W-252 modifications.					
13a. Justification (mark one) Criteria Change ☒ Design Improvement ☐ Environmental ☐ As-Found ☐ Facilitate Const. ☐ Const. Error/Omission ☐ Design Error/Omission ☐					
13b. Justification Details Item 1. The work involving the 183-D has been removed from the scope of Project W-252. The 183-D deactivation plan was approved by DOE-RL in September, 1993. Item 2. The W-291H project is part of the HEC Line Item project and therefore requires the H in the project number. Item 3. See continuation sheet.					
14. Distribution (include name, MSIN, and no. of copies) See Distribution Sheet for WHC-SD-W252-FDC-001, Revision 1.					
<div style="text-align: right;"> RELEASE STAMP OFFICIAL RELEASE BY WHC DATE NOV 10 1994 <i>Sta. 4</i> </div>					

ENGINEERING CHANGE NOTICE

Page 2 of 3

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

603992

15. Design Verification Required [] Yes [X] No		16. Cost Impact ENGINEERING Additional [] \$ Savings [X] \$1M CONSTRUCTION Additional [] \$ Savings [X] \$2.4M		17. Schedule Impact (days) N/A. Improvement [] Delay []	
18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.					
SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]		[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]
19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.					
Document Number/Revision		Document Number/Revision		Document Number/Revision	
WHC-SD-W252-FDC-001, Rev0					
20. Approvals					
Signature		Date		Signature	
OPERATIONS AND ENGINEERING				ARCHITECT-ENGINEER	
Cog Engineer C. E. Hatch		4/13/94		PE S. L. Petersen	
Cog. Mgr. J. D. Williams		4/14/94		QA N/A	
QA M. C. Arntzen		4-27-94		Safety N/A	
Safety O. M. Jaka		5/2/94		Design N/A	
Security (see FDC, rev 1 approval sheet)		4/22/94		Environ. N/A	
Environ. B. P. Atencio/J. J. Luke		5/12/94		Other	
Projects/Programs D. P. Hughes		4/25/94			
Tank Waste Remediation System		5/3/94			
Facilities Operations D. L. Halgren				DEPARTMENT OF ENERGY	
Liquid Effluent Program Management J. E. Thrasher		4/14/94		Signature or Letter No. 9405116	
Operations & Support Services D. R. Hermon		4-28-94			
IRM				ADDITIONAL	
Other		5/3/94			
Note: See FDC Approval sheet for other approvals.					

ENGINEERING CHANGE NOTICE CONTINUATION SHEET

Page 3 of 3

1. ECN

ECN 603992

Block 13B, continued:

- Item 3. An engineering evaluation has been determined that electrical standby power is not required to support the modifications provided by Project W-252. Reference letter, J. E. Dunks to P. K. Sato, "Project W-252 Power Interface with 242-A Evaporator, " dated October 5, 1993.
-

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

RELEASE AUTHORIZATION

Document Number: WHC-SD-W252-FDC-001, REV.1

Document Title: Functional Design Criteria for Project W-252,
Phase II Liquid Effluent Treatment and Disposal

Release Date: November 10, 1994

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

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Kara M. Broz

November 10, 1994

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

This report has been reproduced from the best available copy. Available in paper copy and microfiche. Printed in the United States of America. Available to the U.S. Department of Energy and its contractors from:

U.S. Department of Energy
Office of Scientific and Technical Information (OSTI)
P.O. Box 62
Oak Ridge, TN 37831
Telephone: (615) 576-8401

Available to the public from: U.S. Department of Commerce
National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
Telephone: (703) 487-4650

SUPPORTING DOCUMENT		1. Total Pages 80
2. Title Functional Design Criteria for Project W-252, Phase II Liquid Effluent Treatment and Disposal		3. Number WHC-SD-W252-FDC-001
4. Rev No. 1		
5. Key Words Phase II liquid effluents, functional design criteria, BAT/AKART, Phase II effluent collection system APPROVED FOR PUBLIC RELEASE <i>KMB 11/10/94</i>		6. Author Name: C. E. Hatch <i>C. E. Hatch</i> Signature Organization/Charge Code Advance Engineering/A2E42 / 86300
7. Abstract This document provides the functional criteria required for W-252. Project W-252 will implement Best Available Technology (BAT) at four facilities in the 200 East Area with Phase II liquid effluents.		
8. PURPOSE AND USE OF DOCUMENT - This document was prepared for use within the U.S. Department of Energy and its contractors. It is to be used only to perform, direct, or integrate work under U.S. Department of Energy contracts. This document is not approved for public release until reviewed. PATENT STATUS - This document is made available in confidence solely for use in performance of work under contracts with the U.S. Department of Energy. This document is not to be published nor its contents otherwise disseminated or used for purposes other than specified above before patent approval for such release or use has been secured, upon request, from the Patent Counsel, U.S. Department of Energy Field Office, Richland, WA. DISCLAIMER - This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.		10. RELEASE STAMP <div style="border: 1px solid black; padding: 5px; text-align: center;"> OFFICIAL RELEASE BY WHC DATE NOV 10 1994 <i>Steve H</i> </div>
9. Impact Level ESQD		

MASTER

FUNCTIONAL DESIGN CRITERIA

for

PROJECT W-252

PHASE II LIQUID EFFLUENT TREATMENT AND DISPOSAL

Prepared by

C. E. Hatch

April, 1994

Westinghouse Hanford Company
Remediation and Restoration
Liquid Waste Disposal

for the

United States Department of Energy
Richland Field Office
Richland, Washington

WHC-SD-W252-FDC-001 Rev. 1

This page intentionally left blank.

FUNCTIONAL DESIGN CRITERIA
PHASE II LIQUID EFFLUENT TREATMENT AND DISPOSAL
PROJECT W-252

Issued by:
WESTINGHOUSE HANFORD COMPANY

April 1994

for the
U. S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
RICHLAND, WASHINGTON

Prepared by: CE Hatch 4/22/94
C. E. Hatch, Principal Engineer Date

WHC APPROVALS:

[Signature] 4/22/94 DG Black 4/22/94
J. D. Williams, Manager Date D. G. Black, Acting Mgr. Date
Liquid Effluent Systems Engineering Regulatory Program Integration

[Signature] 4-28-94 M. N. Islam 5/3/94
J. A. Peltier, Manager Date M. N. Islam, Manager Date
Quality Assurance Nuclear Safety

[Signature] 5/3/94 [Signature] 4/22/94
J. R. Kelly, Manager Date D. S. Davis, Security, Date
Environmental & Effluent Northern Areas
Treatment Projects

[Signature] 4/22/94
J. E. Thrasher, Manager Date
Phase II Effluents Program

DEPARTMENT OF ENERGY APPROVAL*

[Signature] 5/19/94
U. S. Department of Energy Date
Richland Operations Office

* Appendix material is considered as information, not for approval.

This page intentionally left blank.

GLOSSARY

ALARA	as low as reasonably achievable
AMU	aqueous makeup unit
BAT/AKART	Best Available Technology/All Known, Available, and Reasonable Methods of Prevention, Control and Treatment
BTU	British thermal unit
CASS	Computer-Automated Surveillance System
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DCG	Derived Concentration Guide
DOE	U.S. Department of Energy
DW	dangerous waste
ECL	effluent comparative level
Ecology	State of Washington Department of Ecology
EPA	U.S. Environmental Protection Agency
FDC	Functional Design Criteria
FSAD	Final Safety Analysis Document
FSAR	Final Safety Analysis Report
GPM	gallon per minute
HLAN	Hanford Local Area Network
HVAC	heating, ventilating, and air conditioning
LCCA	Life Cycle Cost Analysis
LCCS	Laboratory Customer Communications System
LCU	Local Control Unit
MCLG	Maximum Contaminant Level Goals
MCS	Monitor and Control System
MSDS	Material safety data sheets
NESHAPS	National Emission Standards for Hazardous Airborne Pollutants
NPDES	National Pollutant Discharge Elimination System
OCS	operator control station
PAX	private automatic exchange
PC	process condensate
PMCL	(Safe Drinking Water Act) Primary Maximum Contaminant Levels
PSAD	Preliminary Safety Analysis Document
PSAR	Preliminary Safety Analysis Report

GLOSSARY (con't)

PSD	Prevention of Significant Deterioration
PSE	Preliminary Safety Evaluation
PTECS	(200 East Area) Phase II Effluent Collection System
QA	Quality Assurance
QAPP	Project Specific Quality Assurance Program Plan
RL	U.S. Department of Energy, Richland Field Office
RMW	radioactive mixed waste
RQ	reportable quantity
RW	radioactive waste
SMCL	Secondary Maximum Contaminant Level
TEDF	Treated Effluent Disposal Facility
TOE	Total operating efficiency
Tri-Party	
Agreement	<i>Hanford Federal Facility Agreement and Consent Order</i>
UPS	Uninterruptable Power Supply
WAC	Washington Administrative Code
WESF	Waste Encapsulation and Storage Facility
Westinghouse	
Hanford	Westinghouse Hanford Company
WRAP	West Central Waste Complex
WTF	Water Treatment Facility

TABLE OF CONTENTS

1.0 INTRODUCTION	1
1.1 BACKGROUND	1
1.2 SCOPE	3
2.0 FUNCTIONAL CRITERIA	5
2.1 SITE LOCATION	6
2.2 PROJECT INTERFACES	6
3.0 PROCESS DESIGN CRITERIA	9
3.1 INSTRUMENTATION AND CONTROL	9
3.1.1 BAT/AKART INSTRUMENTATION AND CONTROL	9
3.1.2 PTECS INSTRUMENTATION AND CONTROL	10
3.2 PIPING	13
3.3 GENERAL MECHANICAL/CHEMICAL PROCESS	13
3.3.1 242-A Evaporator Cooling Water	14
3.3.2 242-A Evaporator Steam Condensate	15
3.3.3 244-AR Vault Cooling Water	15
3.3.4 241-A Tank Farm Cooling Water	16
3.3.5 B Plant Cooling Water	16
3.3.6 284-E Powerhouse Wastewater	17
3.3.8 Collection System	18
3.3.9 Disposal System	19
3.3.10 Sample Collection and Analysis	20
3.3.11 Support Systems	20
4.0 FACILITY DESIGN CRITERIA	21
4.1 ARCHITECTURAL	21
4.2 HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)	22
4.3 UTILITIES	22
4.4 LIGHTING	22
4.5 ELECTRICAL	22
4.6 ENERGY CONSERVATION	22
4.7 MAINTENANCE	23
4.7.1 Equipment	23
4.7.2 Materials	23
4.8 SITE IMPROVEMENTS	23
4.9 DESIGN LIFE	24
4.10 RELIABILITY	24
5.0 GENERAL REQUIREMENTS	25
5.1 SAFETY	25
5.1.1 Criticality	25
5.1.2 Safety Analysis	25
5.1.3 Contamination Control	25
5.1.4 Shielding	26

5.1.5	Industrial	26
5.1.6	Fire Protection	26
5.2	ENVIRONMENTAL PROTECTION	26
5.2.1	Air	26
5.2.2	Liquid Effluents	27
5.2.3	Permitting Documentation	27
5.2.4	Hazardous Material Usage	28
5.3	SAFEGUARDS AND SECURITY	28
5.4	NATURAL FORCES	28
5.5	DESIGN FORMAT	28
5.6	QUALITY ASSURANCE	29
5.7	DECONTAMINATION AND DECOMMISSIONING	29
5.8	OPERATING PERSONNEL AND SERVICES	29
5.9	COMMUNICATIONS	30
6.0	CODES AND STANDARDS	31
7.0	REFERENCES	35
APPENDIX A	200 EAST AREA PTECS PROJECTED FLOW RATE	41
APPENDIX B	WASTE STREAM CHARACTERISTICS AFTER BAT/AKART	45
APPENDIX C	PROPOSED STAFFING PLAN	49
APPENDIX D	MONITOR AND CONTROL SYSTEM	51
APPENDIX E	242-A EVAPORATOR COOLING WATER AND STEAM CONDENSATE BAT/AKART SYSTEM	55
APPENDIX F	244-AR VAULT COOLING WATER BAT/AKART SYSTEM	59
APPENDIX G	B PLANT COOLING WATER BAT/AKART SYSTEM	61
APPENDIX H	284-E POWERPLANT WASTEWATER BAT/AKART SYSTEM	63
APPENDIX J	PROCESS AND SUPPORT FACILITY DESIGN CONSIDERATIONS	69

LIST OF FIGURES

Figure 1	200 East Area PTECS Schematic	7
Figure D-1	Monitor and Control System	53
Figure E-1	242-A Evaporator Cooling System Flow Diagram	57
Figure G-1	B Plant Cooling Water System Flow Diagram	62
Figure H-1	Flow Diagram for 284-E Backwash Treatment	65
Figure H-2	284-E Cooling System Options	66

LIST OF TABLES

Table 1	Project W-252 Wastestreams	2
Table A-1	200 East Area PTECS Projected Flow Rate	43
Table B-1	Waste Stream Characteristics After BAT/AKART	47
Table C-1	Estimated Staff Requirements	49

WHC-SD-W252-FDC-001 Rev. 1

This page intentionally left blank.

**FUNCTIONAL DESIGN CRITERIA
PHASE II LIQUID EFFLUENT TREATMENT AND DISPOSAL
PROJECT W-252**

1.0 INTRODUCTION

This document provides the functional design criteria required for the Phase II Liquid Effluent Treatment and Disposal Project, Project W-252. Project W-252 shall provide new facilities and existing facility modifications required to implement Best Available Technology/All Known, Available, and Reasonable Methods of Prevention, Control, and Treatment (BAT/AKART) for the 200 East Phase II Liquid Effluent Streams (Table 1). The project will also provide a 200 East Area Phase II Effluent Collection System (PTECS) for connection to a disposal system for relevant effluent streams to which BAT/AKART has been applied.

1.1 BACKGROUND

Liquid wastestreams generated in the 200 East Area are currently discharged to the soil column. Included in these wastestreams are cooling water, steam condensate, raw water, and sanitary wastewaters.

It is the policy of the U.S. Department of Energy (DOE) to conduct operations in a safe, cost-effective, and environmentally-sound manner. This includes ensuring that discharges of radioactive and nonradioactive material to the environment meet applicable regulatory requirements, and are as low as reasonably achievable (ALARA). It is also the policy of the DOE that the use of soil columns to treat and retain radionuclides and nonradioactive contaminants be discontinued at the earliest practical time in favor of wastewater treatment and waste minimization. These policies are implemented through DOE Orders and based on federal and state environmental regulations.

In support of these policies, the U.S. Department of Energy, Richland Field Office (RL) issued a document entitled *Plan and Schedule to Discontinue Disposal of Contaminated Liquids into the Soil Column at the Hanford Site* (RL 1987). The Plan and Schedule, and its annual updates, contain a strategy for implementing alternative treatment and disposal systems for each of the thirty-three major waste streams discharged to the soil column. In this strategy, the wastestreams were prioritized into Phase I and Phase II categories. A revised effluent prioritization, based on available information, was presented in the *Annual Status Report of the Plan and Schedule*, WHC-EP-0196-1 and WHC-EP-0196-2, (WHC 1988a and WHC 1989b).

Table 1 Project W-252 Wastestreams

200 East Area

242-A Evaporator Cooling Water
242-A Evaporator Steam Condensate
B Plant Cooling Water
284-E Powerplant Wastewater
241-A Tank Farm Cooling Water
244-AR Vault Cooling Water

✓

The following criteria were utilized to prioritize the effluents:

- o Criterion 1, Radionuclide Concentration--The effluent contains radionuclides in excess of DOE Order 5400.5, Derived Concentration Guide (DCG) values.
- o Criterion 2, Hazardous Waste Characteristics--The effluent exceeds WAC 173-303 dangerous waste threshold levels.
- o Criterion 3, Reportable Quantity or Listed Waste--The effluent released has a potential to contain a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) reportable quantity (RQ) of a hazardous constituent or has the potential to contain a dangerous waste listed in WAC 173-303.
- o Criterion 4, Disposal Facility Life--The duration of the facility mission exceeds the minimum estimated life of the disposal site.

Wastestreams designated as a Phase II effluent did not meet any of the above criteria. Additional information regarding the prioritization and criteria are in the Plan and Schedule (RL 1987) and the 1988 and 1989 status reports (WHC 1988a and WHC 1989).

A key element of the plan is the selection of BAT/AKART for the effluent streams. These studies determine the best management practices to assure discharged effluents meet environmental standards. The completed BAT/AKART

studies will be incorporated into a Washington Administrative Code (WAC) 173-240 Engineering Report and submitted to the State of Washington Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA).

In 1989, the DOE entered into an interagency agreement with Ecology and EPA. This agreement is referred to as the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology, et al. 1989). Project W-252 is one of the projects required to achieve the milestones set forth in the Tri-Party Agreement. One of the milestones, M-17-00B, requires BAT/AKART implementation for Phase II streams by October 1997. The wastestreams included in Project W-252 are the Phase II streams that are not addressed as part of the 200 Area Treated Effluent Disposal Facility (TEDF), Project W-049H and Project W-291H.

This Functional Design Criteria (FDC) document provides the technical baseline required to initiate Project W-252 to meet the Tri-Party Agreement milestone for the application of BAT/AKART to the Phase II effluents.

1.2 SCOPE

Within the scope of Project W-252 is BAT/AKART implementation at five 200 East Area facilities. The following facilities will be impacted by this activity:

- o 242-A Evaporator
- o 244-AR Vault
- o B Plant, including the Waste Encapsulation and Storage Facility (WESF)
- o 284-E Power Plant, including the 283-E Water Treatment Facility, and the 282-E Reservoir

Some of the equipment and systems of these facilities to be impacted by Project W-252 may include, but are not limited to: modification of effluent producing systems such as heating, ventilating, and air conditioning (HVAC), replacement of effluent producing equipment, replacement or modification of once-through cooling water systems, modification of piping systems, and/or additional instrumentation.

BAT/AKART implementation for the 241-A Tank Farms cooling water wastestream (Table 1) is excluded from this project. The systems necessary to implement BAT/AKART for this stream shall be provided by Tank Farms Ventilation Upgrade, Project W-030. Collection and transport of the wastestream remaining after Project W-030 has implemented BAT/AKART will be in the scope of Project W-252.

Project W-252 will provide the PTECS to collect, sample, monitor, and dispose of all Phase II effluents in the 200 East Area after BAT/AKART has been applied. Project W-252 shall evaluate the use of the planned TEDF for the main transport piping and disposal system for the 200 East Area Phase II effluents. This project will interface with and modify the facilities constructed by Project W-049H, as required to support the functional requirements of the 200 East Area PTECS.

The project will include the necessary utilities, communications, fire protection, and other safety-related items or features to make the project operational. In addition, these utilities will be designed to allow this project to be integrated with the 200 Area TEDF. Site improvements will be provided by the project where necessary to construct, maintain, or operate the provided systems.

The final treatment and disposal of secondary solid radioactive mixed waste (RMW), dangerous waste (DW), and/or radioactive waste (RW) is excluded from the scope of this project. Treatment and disposal of these wastes shall utilize existing or planned Hanford Site facilities including:

- o 200 East Burial Grounds
- o 200 West Central Waste Complex (WRAP)
- o 616 Facility.

2.0 FUNCTIONAL CRITERIA

Project W-252 shall provide the necessary systems, components, facility modifications, and buildings required to implement BAT/AKART, collect, and transport the effluents (Table 1) to a common disposal system. The effluents collected for discharge are to meet negotiated permit discharge requirements through the application of BAT/AKART, in accordance with WHC-EP-0137, *Best Available Technology Guidance Document* (WHC 1988j).

Interface points for application of BAT/AKART and connection of the generating facility to the PTECS will be identified during the project conceptual design. The project shall include the necessary utilities, communications, fire protection, safety related systems, features, and site improvements required to make the project operational as required to comply with this Functional Design Criteria (FDC), as well as applicable local, state, and federal codes, regulations, statutes, and standards. The project systems shall be designed to minimize interruptions to existing facility operations.

The project shall incorporate commercially available equipment and technologies, wherever practical. The use of technologies which are not currently used by private industries shall be minimized. The project will be designed to meet the applicable -99 sections and Division 13 of DOE Order 6430.1A (DOE 1989b).

Design of the project shall consider measures to reduce overall life cycle costs by:

- o Utilization of common facilities, components, and manufacturers wherever practical;
- o Siting to minimize operations support requirements and area site improvements such as roadways, fencing, and utility services; and
- o Incorporating flexibility for expansion and modifications required to minimize impacts to the operations of the treatment, disposal, and generating facilities.

The PTECS shall be designed to accommodate flow capacities given in Appendix A. The estimated characterization of each effluent and the combined PTECS stream, after BAT/AKART has been implemented, is given in Appendix B. Equipment that will be in contact with the effluents shall be designed to be compatible with the composition and quantity of the waste.

Although a Total Operating Efficiency (TOE) of 100% is not practical, the TOE of the PTECS shall be maximized to assure the ability of PTECS to continually receive effluents. Effluent generating facilities may be capable of significant flow reductions for a period of time, but to completely

discontinue all discharge to PTECS may not be practical. Therefore, the TOE, in terms of PTECS ability to continually accept some level of effluent input, shall be maximized through such as actions as using redundant backup equipment whenever it is required to keep the effluent flowing to the disposal site.

The staffing plan for each of the BAT/AKART systems implemented is in Appendix C. Design of the systems provided by this project shall support this proposed staffing plan. The PTECS portion of this project will be covered under the staffing of the TEDF and does not add to the proposed staffing plan in the *200 Area Treated Effluent Disposal Facility Functional Design Criteria*, WHC-SD-W049H-FDC-001 (Crane 1992).

2.1 SITE LOCATION

Upgrades and additions required to implement BAT/AKART shall be at, or near, the effluent generating facility. This work will be done at five sites in the 200 East Area ✓. Collection and transport systems for effluents remaining after BAT/AKART application will be located within the 200 East Area. The PTECS will use TEDF piping whenever practical. The use of the TEDF main trunk line will be specifically investigated. A schematic of the PTECS is shown in Figure 1. The TEDF lines shown represent only a portion of that system.

A site evaluation report shall be prepared to assess site location alternatives. The report will be prepared according to the guidance in DOE Order 4320.2C (DOE 1990) and WHC-CM-8-7 (WHC 1988). As part of the site review, a cultural resource review will also be conducted according to WHC-CM-7-5 (WHC 1988).

2.2 PROJECT INTERFACES

The design and construction required for BAT/AKART implementation shall be coordinated and integrated with the individual generating facility. The generating facility will then be responsible for the operation and maintenance of the equipment and processes provided.

For facilities in the 200 East Area (Table 1), the design, construction, and operation of the PTECS collection and transport system will be coordinated with the individual generating facility and the disposal facility.

The PTECS will have extensive interface with the TEDF. This interface will include use of TEDF pipelines, disposal site, and control system. The PTECS will be operated and maintained by TEDF operations, maintenance and engineering groups.

FIGURE 1 200 EAST PTECS SCHEMATIC

WHC-SD-W252-FDC-001 Rev. 1

This page intentionally left blank.

3.0 PROCESS DESIGN CRITERIA

3.1 INSTRUMENTATION AND CONTROL

3.1.1 BAT/AKART INSTRUMENTATION AND CONTROL

Project W-252 shall provide instrumentation for control and monitoring of all systems and equipment associated with BAT/AKART implementation, including connection to existing generating facility instrumentation and control systems. Adequate instrumentation will be provided for monitoring hazardous and radioactive materials to provide environmental and personnel safety. Instrumentation shall be provided to enable self-functioning or automated routine equipment operation. The instrumentation and controls shall be integrated with the facility monitoring and control systems, if available.

Project W-252 shall provide Local Control Units (LCUs) at each of the installed systems. LCU control functions shall have sufficient hardware redundancy to preclude interruption of system operation. Any generator control system add-on equipment shall be of a similar type and same manufacturer as used in the existing system for ease of interface and reduction of maintenance and operating costs.

Local operator interface at all LCUs and/or field instrumentation shall be provided for operations, trouble-shooting, maintenance, and personnel safety. Instrument monitors and sensors shall be located in a non-corrosive environment, rated for corrosive service, or placed in a suitable enclosure. The LCU and associated instrumentation shall comply with applicable referenced standards and provide the following minimum requirements:

- o Failure alarms for individual system and/or unit operation.
- o Pumps and other required equipment shall be automatically switched to the backup units by the respective LCU controller software upon primary pump failure or associated alarm conditions.
- o High radiation/contamination alarms and similar monitoring systems as required for personnel safety.
- o Temperature, conductivity, pH, level, flow, and pressure indication and alarms, where necessary, to assure proper system operation and support preventative maintenance.

- o Position indication on all actuated valves and on any manual valves which are critical to providing routing or process information. Separate on/off confirmation, indication of all positions of multi-way valves, and 0-100% position indication for modulating valves.
- o On/off confirmation for all motor starters, contactors, etc.
- o Current equipment status indication (e.g., rotating equipment).
- o Instrumentation, wiring, enclosures, etc., shall be resistant to washdown and decontamination.
- o Placement and location of local operator interfaces, calibration equipment, and maintenance access areas shall strictly comply with human factors requirements specified in the DOE Orders, Westinghouse Hanford Company (WHC) manual WHC-CM-4-9, *Radiological Design* (WHC 1988c), and NUREG 0700.

3.1.2 PTECS INSTRUMENTATION AND CONTROL

Project W-252 shall provide instrumentation for control and monitoring of the PTECS collection and transport operations, including connection to existing generating facility instrumentation. Adequate instrumentation will be provided for monitoring hazardous and radioactive materials to provide environmental and personnel safety. The PTECS control system shall be integrated with the TEDF Monitor and Control System (MCS) (Appendix D). All MCS functions required by PTECS, which are not provided by TEDF, shall be incorporated into the MCS system by Project W-252. The criteria found in this section for the PTECS are the same as those in the TEDF FDC (Crane 1992). The PTECS instrumentation and controls shall be designed to be readily integrated into the TEDF system. This is most easily accomplished by using the same design with equipment from the same manufacturer.

Project W-252 shall provide Local Control Units (LCUs). The MCS shall provide supervisory control from the control room in Building 2025E, while the LCUs will provide local control. LCU control functions shall have sufficient hardware redundancy to preclude interruption of system operation. Touch screen interfaces at each LCU shall be provided for local control and monitoring to match TEDF equipment requirements. Key operating data from the PTECS and generating facilities shall be transmitted to the control room and archived on the existing laser disc data storage system. Communication

between the MCS, the LCUs, and the generator facilities shall consider the use of fiber optics, microwaves, and/or other technologies, as appropriate to address issues such as limited phone line capacity, data transmission volume, and response time requirements for remote locations. Any MCS add-on equipment shall be of a similar type and same manufacturer as used in TEDF for ease of interface and reduction of maintenance and operating costs.

The control and remote monitoring of the collection and disposal systems shall be from LCUs with supervisory control provided by the MCS. Feedback from the project control system to the respective LCUs shall be provided as appropriate to maintain proper PTECS and generator operations. Monitoring of the instrumentation, equipment operation, and systems status shall be on a real-time basis at the LCU level, while the MCS shall provide for both real-time and historical data collection functions, including equipment and alarm status. At a minimum, individual facility wastestreams shall be monitored for flow and applicable process upset indicating parameters such as pH, conductivity, total alpha, and/or total beta by the generating facilities. Monitoring systems shall have real-time indication and historical recording. The monitoring systems shall indicate alarm conditions at the generator facility with W-252 pick-up and transmission of the appropriate signals to the respective LCU, and the MCS located in the control room. Where appropriate, the monitoring systems shall initiate automated corrective actions to protect the integrity of both the PTECS and discharged effluent.

Instrumentation shall be provided to enable self-functioning or automated routine equipment operation to support the staffing plan. The operational graphics and control logic modifications provided by Project W-252 shall include, but not be limited to, the following:

o Collection System

- Collection system flow
- Pump and equipment status
- Sump and/or basin liquid level
- Generator alarm status
- Generator flow
- Sampling systems
- Process upset indicating parameters (e.g., pH, conductivity, total alpha, total beta)

o Disposal Pond System

- Effluent flow
- Level indication

Local operator interface at all LCUs and/or field instrumentation shall be provided for operations, trouble-shooting, maintenance, and personnel safety. Instrument monitors and sensors shall be located in a non-corrosive environment, rated for corrosive service, or placed in a suitable enclosure. The MCS and associated instrumentation shall comply with applicable referenced standards and provide the following minimum requirements:

- o Real-time level indication and high level alarms.
- o Real-time indication and historical record of influent and effluent wastestream indicating parameters (e.g., flow, conductivity, pH, conductivity, total alpha, total beta).
- o Failure alarms for individual system and/or unit operation.
- o Pumps and other required equipment shall be automatically switched to the backup units by the respective LCU controller software upon primary pump failure or associated alarm conditions.
- o High radiation/contamination alarms and similar monitoring systems as required for personnel safety.
- o Primary leak detection alarms where required.
- o Pressure, temperature, and flow indication and alarms, where necessary, to assure proper system operation and support preventative maintenance.
- o Position indication on all actuated valves and on any manual valves which are critical to providing routing or process information. Separate on/off confirmation, indication of all positions of multi-way valves, and 0-100% position indication for modulating valves.
- o All information concerning the general functions of packaged sampling systems shall be integrated into each respective LCU.
- o On/off confirmation for all motor starters, contactors, etc.
- o Current equipment status indication (e.g., rotating equipment).
- o Instrumentation, wiring, enclosures, etc., shall be resistant to washdown and decontamination.

- o Placement and location of local operator interfaces, calibration equipment, and maintenance access areas shall strictly comply with human factors requirements specified in the DOE Orders, Westinghouse Hanford Company (WHC) manual WHC-CM-4-9, *Radiological Design* (WHC 1988c), and NUREG 0700.

3.2 PIPING

Piping systems shall be provided by Project W-252 for the collection, transport, and disposal of wastewater as required to meet the functional design requirements of the project. Piping system materials of construction shall be compatible with wastestream characteristics, intended service, and existing piping, if applicable.

All piping shall be designed to drain freely with features incorporated for leak detection (as required), location, and repair of failures. Pipe systems will use gravity flow whenever practical and be designed to minimize accidental accumulation of contaminants.

Piping shall be protected from the environmental conditions anticipated for the Hanford Site. Freeze protection will be provided, where required, by burial or other applicable methods. Underground piping shall be marked, within the backfill of the piping, with continuous plastic identification markers. All cross-country pipelines shall be staked, or otherwise marked, providing location, notification requirements, and wastestream identity. Above ground piping shall be labeled to indicate the contents, direction of flow, and any applicable warnings. The piping and installation shall meet the applicable sections of the *Hanford Plant Standards* (RL 1990a). Piping systems at the 283-E Water Treatment Facility (WTF) ✓ shall meet the standards of the American Water Works Association (AWWA 1991).

The piping systems installation will be designed to prevent interruption of generating facility operation, unless specifically approved by WHC.

3.3 GENERAL MECHANICAL/CHEMICAL PROCESS

The systems and processes required to implement BAT/AKART have been determined in the *Phase II Liquid Effluent Program, Project W-252, Engineering Report* (WHC 1992). This section provides the functional criteria for implementation of the selected BAT/AKART.

Project W-252 shall supply all facilities and equipment required to implement BAT/AKART for each of the effluents, as required in WAC 173-216 and the Tri-Party Agreement. The facilities provided by the project shall use

commercially available equipment and technologies where practicable. Existing piping, equipment, and facilities should be used wherever feasible. Any new facility or equipment upgrades shall be designed to minimize interruptions to existing facility operations. Specific criteria are given in the following sections.

3.3.1 242-A Evaporator Cooling Water

The 242-A Evaporator cooling water effluent is mainly non-contact, once-through cooling water from the offgas condensers. There are a number of minor contributors including the air compressor cooling water, compressed air receiver condensate, HVAC steam condensate and cooling water drains, emergency steam turbine condensate, and the water filter catch pan drain.

The off-gas condenser cooling system implemented as BAT/AKART must eliminate the once-through cooling water use. The system must supply a minimum of 30 million British thermal unit (BTU)/hour of heat removal from the condensers. The cooling system will be required to operate whenever evaporator use requires condensing offgas produced, and shall be designed to meet the heat removal requirements at all ambient environmental conditions.

All pumps used to circulate coolant in a closed-loop system shall be redundant. Other pumps used to supply makeup water or secondary loop cooling shall also be redundant. The redundant pump shall be capable of supplying 100% of the required capacity. The pumps shall be electrically powered and connected to the standby power system if required. Pumps and associated valves shall be capable of remote operation and monitoring.

Once-through cooling water for the air compressor shall be eliminated. The appropriate closed-loop cooling system will be supplied by Project W-252 to eliminate this contributor.

Project W-252 shall also provide required changes to implement source controls for the minor contributors as determined by the BAT/AKART evaluation. Applicable source controls include recycle, flow regulation, and administrative controls. All piping associated with terminated or rerouted streams shall be capped or blanked to prevent liquid from entering the abandoned piping.

All contributors remaining after BAT/AKART implementation shall be combined, sampled, monitored, and discharged to the PTECS for transport to a disposal site. Flow proportional sampling capabilities and required monitoring shall be provided. A description of a proposed system to implement BAT/AKART for the cooling water stream is contained in Appendix E.

3.3.2 242-A Evaporator Steam Condensate

The 242-A Evaporator steam condensate effluent is mainly non-contact steam condensate from the evaporator reboiler. There are a number of minor contributors including cooling water and steam condensate from the aqueous makeup unit (AMU) tank jackets, seal water pump drains, sampler cooling water, steam condensate from steam supply traps, separators, and strainers.

The reboiler steam condensate system implemented as BAT/AKART must eliminate the condensate as a liquid effluent contributor. The reboiler must still be supplied with a minimum of 30 million BTU/hour of heating capacity, as currently rated. The system must have the capability to be operational, whenever the evaporator requires heating at the reboiler.

Project W-252 shall also provide required changes to implement source controls for the minor contributors as determined by the BAT/AKART evaluation. Applicable source controls include recycle, flow regulation, and administrative controls. All piping associated with terminated or rerouted streams shall be capped or blanked to prevent liquid from entering the abandoned piping.

All contributors remaining after BAT/AKART implementation shall be combined with the 242-A Evaporator cooling water effluent prior to sampling and discharge to the PTECS for transport to a disposal site. Flow proportional sampling capabilities and required monitoring shall be provided. A description of a proposed system to implement BAT/AKART for the steam condensate stream is contained in Appendix E.

3.3.3 244-AR Vault Cooling Water

The 244-AR Vault cooling water effluent consists of a number of small contributors. The most consistent contributors are the air compressor after cooler and the vessel vent steam heater condensate. Additional sources are HVAC steam condensate and cooling water, blowdown and drains from the cooling tower and associated equipment.

The vessel vent steam heater condensate stream shall be eliminated. Project W-252 shall upgrade the system to eliminate any contribution from the vessel vent heater. The upgrades shall provide a heating capacity equivalent to the existing steam heater, which is rated at 150,000 BTU/hour.

Once-through cooling water for the air compressor, including cooling water to the after-cooler, shall be eliminated. The appropriate closed-loop cooling system will be supplied by Project W-252 to eliminate this contributor.

All contributors remaining after BAT/AKART implementation shall be combined, monitored, sampled, and discharged to the PTECS for transport to a disposal site. Flow proportional sampling capabilities and required monitoring shall be provided. A description of a proposed system to implement BAT/AKART for the cooling water stream is contained in Appendix F.

3.3.4 241-A Tank Farm Cooling Water

BAT/AKART for the 241-A Tank Farm cooling water will be implemented through Project W-030, Tank Farms Tank Ventilation Upgrade. The effluent remaining after BAT/AKART implementation shall be collected, monitored, sampled, and discharged to the PTECS for transport to a disposal site. Collection, sampling, and monitoring equipment will be provided by Project W-252. Existing piping, equipment, and facilities should be used, wherever feasible. Any new facility or equipment upgrades shall be designed to minimize interruptions to existing facility operations.

3.3.5 B Plant Cooling Water

The B Plant cooling water effluent stream is mainly non-contact, once-through cooling water from the WESF pool cell heat exchangers. Periodic contribution is expected to be generated from the emergency well pumps and from stairwell 1 HVAC units.

The cooling system implemented as BAT/AKART must eliminate the once-through cooling water use for the B Plant cooling water contributors. The system must supply a minimum of 7 million BTU/hour of heat removal from the WESF heat exchangers and other equipment. The system shall be designed to meet a variable heat removal demand based on the number of WESF cells being used. The system shall be designed to meet these requirements at all ambient environmental conditions.

All pumps used to circulate coolant in a closed-loop system shall be redundant. Other pumps used to supply makeup water or secondary loop cooling shall also be redundant. The redundant pump shall be capable of supplying 100% of the required capacity. The pumps shall be electrically powered and connected to the standby power system. Pumps and associated valves shall be capable of remote operation and monitoring.

All contributors remaining after BAT/AKART implementation shall be combined, sampled, monitored, and discharged to the PTECS for transport to a disposal site. Flow proportional sampling capabilities and required monitoring shall be provided. A description of a proposed system to implement BAT/AKART for the cooling water stream is contained in Appendix F.

3.3.6 284-E Powerhouse Wastewater

The 284-E Powerhouse wastewater effluent stream consists of contributors from boiler operation in the powerhouse and from the 283-E WTF operations. Contributors from the powerhouse are boiler blowdown, water softener regenerant, cooling water, and floor drains. Current contributors from the water treatment facility are filter backwash, settling basin drain, floor drains, and reservoir and clear-well overflows.

Effluent generating systems or equipment will be impacted by BAT/AKART implementation for the filter backwash, cooling water, drains, and overflow sources. Floor drains shall be modified to prohibit spills or other uncontrolled discharges. All piping associated with terminated or rerouted streams shall be capped or blanked to prevent liquid from entering the abandoned piping. All modifications and additions to systems associated with the 283-E WTF shall meet the requirements of the AWWA standards (AWWA 1991).

The reservoir and clear-well overflow streams shall be eliminated through installation of reservoir and clear-well level controls. The controls shall automatically prohibit excessive incoming water to cause an overflow of the reservoir or clear-well. Redundant controls shall be installed.

Effluent discharge from the filter backwash and settling basin drains shall be eliminated. Project W-252 shall supply a system for suspended solids removal and dewatering from the filter backwash and basin drain streams. The system must be capable of handling the estimated 70,000 gallons of water produced during the 30-minute batch backflush. Each of the four filters is backflushed an average of four times a month. Dewatered solids from the system shall be disposed of in the appropriate manner. The resulting clarified water will be returned to the 282-E reservoir. The 283-E filter backwash treatment system shall be the same design as the system to be installed at the 283-W WTF by Project W-291, 200 Area Effluent BAT/AKART Implementation. The 283-W system is described in the *200 Area Effluent BAT/AKART Implementation Functional Design Criteria* (Brown 1992).

A cooling system shall be installed that will eliminate the use of once through cooling water. The installed cooling system shall be capable of delivering 250,000 BTU/hr of heat removal.

A surge tank shall be installed on the effluent to lessen the flow rate variation caused by the batch blowdown of the boilers in 284-E. The surge tank shall have capacity to store one shifts blowdown and release it to the PTECS in a controlled manner.

All contributors remaining after BAT/AKART implementation shall be combined, sampled, monitored, and discharged to the PTECS for transport to a

disposal site. Flow proportional sampling capabilities and required monitoring shall be provided. A description of a proposed system to implement BAT/AKART for this wastewater stream is contained in Appendix H.

3.3.8 Collection System

The 200 East Area PTECS will utilize existing piping wherever practical and meets the applicable criteria in this FDC. Collected wastestreams shall require no additional treatment before disposal. Pumping equipment and auxiliary features for transport of the wastestreams to the disposal system shall be provided to meet the functional project requirements.

The collection system shall be designed to minimize impacts to the generating facilities through compliance with the following minimum requirements:

- o Pumps shall be redundant to prevent unforeseen interruption or shutdown of either the PTECS or generating facility operations. The redundant pump shall be capable of providing 100% of the design capacity.
- o Pumps shall be electric-powered and connected to standby power, as required.
- o Pumps and motors shall be equipped with monitoring and control features to permit remote operation and surveillance from the control room. Monitoring shall be provided for early warning of equipment wear, deterioration, or failure, and shall alarm on failure.
- o Sumps shall have liquid levels monitored on a real-time basis with high level alarms and other overflow protection, as required to meet the functional requirements of the PTECS.
- o Provision for clean-out and verification of sump integrity shall be provided by design.
- o Flow-proportional composite sampling capability shall be provided at each generator waste interface to the PTECS through the implementation of BAT/AKART.

3.3.9 Disposal System

The PTECS disposal system shall dispose of the combined 200 East Area effluents meeting the permitted release limits to a soil disposal site approved by RL and Ecology under WAC 173-216. The use of the TEDF disposal site will be considered.

Permit limits for effluent constituent concentrations will be negotiated as part of the WAC-173-216 permitting process. The wastestreams discharged to Project W-252 shall meet the discharge requirements established in the WAC-173-216 permit. The TEDF FDC (WHC 1992) contains a list of the conservatively estimated effluent comparative levels (ECLs) for a large number of constituents. The ECLs can be compared with the effluent characterization to identify potential constituents of concern.

3.3.10 Sample Collection and Analysis

All equipment required for sample collection, storage, and analysis to meet the regulatory compliance needs for the PTECS shall be provided by Project W-252. Project W-252 shall upgrade the existing 2025E process control laboratory area, as needed, to meet the functional requirements of both PTECS and TEDF to maintain needed analysis times.

Sampling systems for the PTECS shall be redundant with connection to standby power to provide flow-proportional composite sampling capability. All sampling equipment shall be monitored and controlled via the respective LCUs, with data archived by the MCS. Sampling systems shall be in accordance with the sampling and analysis methods specified by SW-846, "Test Methods for Evaluating Solid Wastes - Physical Chemical Methods" or other appropriate methods.

3.3.11 Support Systems

Secondary solid wastes, derived from the maintenance operations of the PTECS, shall be packaged and shipped utilizing facilities and equipment provided in 2025E.

Utilities and site services for the PTECS and BAT/AKART systems shall be extensions from the nearest available source, if practical. The services shall include, but are not limited to: raw water, sanitary water, sanitary sewer, electrical power, and communication systems. Project W-252 shall provide standby power, as required, utilizing existing standby power systems wherever possible.

4.0 FACILITY DESIGN CRITERIA

The project facilities and systems shall be designed to comply with the laws and regulations applicable to industrial water pollution control found in ANL/ESS TM-264 Rev 1, *Environmental Protection Appraisals: A Suggested Guide for U.S. Department of Energy Field Organizations*. The project shall also give consideration to the guidelines found in the overview of the laws and regulations of the above appraisal. Design criteria for the individual facility implemented BAT/AKART systems and the PTECS are to be based upon the applicable provisions of DOE Order 6430.1A and DOE Order 5400.1.

The modifications under Project W-252 will, as a minimum, comply with the applicable requirements of DOE Order 6430.1A, including Division 0275, "Industrial Waste Facility." Other key DOE Orders pertinent to the project design and function are the following: DOE Orders 5400 series; DOE Order 5440.1C; DOE Orders 5480 series; DOE Order 5820.2A; and DOE Order 5400.1C. In addition, national consensus standards specified in the Orders, including NUREG 0700, are applicable to Project W-252. Project W-252 shall also comply with applicable federal, state, and local regulations specified in Section 6.0.

The following subsections define the general requirements that shall be included in the project to meet the functions of Project W-252.

4.1 ARCHITECTURAL.

The auxiliary equipment and control/monitoring equipment and components shall be housed in buildings, structures, enclosures, or otherwise designed to withstand the Hanford environment. The project shall provide any additional fixtures required to accommodate the personnel needed to operate the facility with the modifications provided. No additional building space is anticipated for operations and maintenance personnel. The personnel space requirements for the PTECS shall be provided in 2025E as integrated with the TEDF operation.

Special consideration shall be given to personnel access to elevated portions of the architectural design (e.g. tank supports). Where appropriate, protection shall be provided at openings and clear drops by handrails or other engineered barriers.

Where applicable, a tank(s) shall have but shall not be limited to, ready access at its base for modifications, equipment inspections, maintenance repair, and expedient removal of waste.

4.2 HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

Facilities and systems provided by Project W-252 shall include building and process ventilation in compliance with applicable DOE Orders and WHC procedures referenced in the FDC.

4.3 UTILITIES

The project shall take advantage of existing utilities and site services, wherever practical. The services shall include, but are not limited to: raw water, sanitary water, sanitary sewer, electrical power, and communications systems. The project shall provide air delivery systems for process and ancillary services as required. Oil-less air compressors, air dryers, and dewpoint monitoring shall be provided for the instrument air supply, if needed.

4.4 LIGHTING

Occupied areas shall use white light with water resistant NEMA 4 installations. Exterior areas and parking areas may be lighted by low-pressure sodium, if color rendition is not required for safety or operation. Emergency lighting shall be provided as required.

4.5 ELECTRICAL

Electric power for the BAT/AKART implemented systems shall be provided from existing services located in the 200 East Area ✓ as required by the project design. Electrical modifications shall comply with national and Hanford Site requirements.

Standby electric power for the systems shall be provided from existing sources where practical and shall comply with the National Electrical Code, ANSI/NFPA 70. ✓ Additional standby power at the 242-A Evaporator is not required to support the W-252 modifications. UPS will be provided, where required, to maintain safe operations, compliance with environmental regulations, or where loss of power could require excessive effort for recovery and restart.

4.6 ENERGY CONSERVATION

The systems provided shall comply with the energy conservation requirements and shall be justified by Life Cycle Cost Analysis (LCCA) as defined in DOE Order 6430.1A, 110-12.

4.7 MAINTENANCE

The project will provide the documentation, and the initial complement of equipment and services required, to initiate operation of all systems. This shall include, but not be limited to: office equipment and furniture, equipment identification tags, and necessary computer software development for operations and maintenance activities.

4.7.1 Equipment

Ease of maintenance will be a design goal. Access will be provided for all piping, process and ancillary equipment, for regular maintenance, repair, and replacement. The design shall provide for maintenance activities to be completed in place to minimize exposure, in accordance with ALARA guidelines. The design shall provide for equipment lock out capabilities where applicable. Replacement of equipment or piping will occur with minimal relocation or removal of other equipment and piping. Regular maintenance will include lubrication, calibration, and testing of the equipment and piping. Regular maintenance, repair, and replacement will be completed in a manner to minimize cost of disassembly and interruption of service.

4.7.2 Materials

All equipment will be constructed of materials selected for compatibility with the intended service. Special protective coatings will be considered per DOE Order 6430.1A, 0900-99. Construction materials will be selected to minimize the potential for the buildup of hazardous and/or radioactive materials.

4.8 SITE IMPROVEMENTS

Road access to the process and support services systems and facilities, constructed by this project, shall be provided. Fencing at impacted facilities may require modification. Project W-252 shall provide for fence relocation and modification of installation.

Cross-country pipelines shall be provided with graded, gravel-surfaced access roads to facilitate periodic inspection, maintenance, or emergency access, as required. Access to outdoor pipelines will be adjacent to the pipeline right-of-way to facilitate surveillance and repair. Road access to the PTECS facilities will be provided. Specifically, road access must be included for operations, maintenance, and waste removal. Lighted parking areas will be provided where required.

New roads or extensions will be designed for economical maintenance and upkeep based on their expected service and use. Existing streets and roads disturbed by the installation of the project are to be restored to a condition at least equivalent to that existing prior to the project. Existing roads will be used to the maximum extent practical.

4.9 DESIGN LIFE

All systems shall be designed to function for a minimum of 30 years. Equipment, instrumentation, and consumable components may have a design life less than 30 years if designed to accommodate repair and/or replacement, and are economically justified.

4.10 RELIABILITY

The degree of reliability provided shall be sufficient to ensure the systems, equipment, and components function efficiently and safely throughout the useful life of the facility without undue maintenance and repair. The project design shall provide for ease-of- and cost-effective upgrades to maintain flexibility to service future mission needs.

5.0 GENERAL REQUIREMENTS

5.1 SAFETY

5.1.1 Criticality

The project design goal will be to prevent a criticality event, or any other unacceptable safety consequence through implementation of BAT\AKART. The criteria that at least two unlikely, independent, and concurrent changes (contingencies) in processing and/or operating conditions must happen before a criticality accident is possible is met for systems of this project. A criticality event is anticipated to be an unlikely event for this project. Designs will be in accordance with DOE Order 6430.1A, 1300.4

5.1.2 Safety Analysis

New or revised safety documentation will verify the design features, operating requirements, and administrative controls required of the facilities prior to operation. The documentation shall include as a minimum: a Preliminary Safety Evaluation (PSE), Preliminary Safety Analysis Document (PSAD) or Preliminary Safety Analysis Report (PSAR), Final Safety Analysis Document (FSAD) or Final Safety Analysis Report (FSAR).

New safety documentation to be prepared by the operating and engineering contractor will verify the safety design features, operating requirements, and administrative controls required of the facilities before operation. The interactions of systems, components, and structures between TEDF and PTECS will be analyzed to ensure required safety functions survive under normal and unplanned conditions during W-252 operations. At facilities modified by BAT/AKART implementation the responsible operating organization will be responsible for updating the affected safety documentation. No safety class 1 or 2 equipment has been identified for this project.

5.1.3 Contamination Control

Contamination risks during construction are expected to be relatively low, however, some work shall be performed in and near existing non-reactor nuclear facilities. Existing work procedures will be implemented as appropriate to ensure the safety of the construction and operations personnel.

Facilities provided by this project will greatly reduce the quantity of liquid effluents being discharged and provide additional control measures to assure all discharges meet the permitted limits. Diversion capabilities for the effluents at B Plant and 242-A shall be retained and used if an unplanned

release were to occur. The projected concentration of radionuclides are below the levels requiring secondary containment as specified in DOE Order 5820.2A. The PTECS shall be designed to prevent unacceptable radionuclide or chemical exposures to the operating personnel in the event of an unplanned release to the project by a generating facility.

5.1.4 Shielding

Personnel shall be protected from exposures to potential radiation sources from generator facility upset conditions. The risks of personnel radiation exposure shall be minimized through appropriate shielding methods. The amount of shielding will be determined by analysis and will comply with ALARA principles in DOE Order 6430.1A; WHC-CM-4-9, *Radiological Design* (WHC 1988c); WHC-CM-4-10, *Radiation Protection* (WHC 1988f); and WHC-CM-4-11, *ALARA Program Manual* (WHC 1988g). In any case, personnel radiation exposure shall not exceed 1 rem/yr to the individual (maximum), based on predicted exposure time in normally occupied areas. The use of lead shielding shall be minimized.

5.1.5 Industrial

Risks associated with construction activities are to be considered through applicable, referenced DOE Orders and WHC manuals. Compliance during construction will be considered during design to minimize the risks. Design will ensure that construction of this project is accomplished in accordance with the Code of Federal Regulations, Part 1926, "Occupational Safety and Health Administration, Labor."

5.1.6 Fire Protection

Fire protection will be provided as required by DOE Order 6430.1A and RL Order 5480.7A. Any new fire alarm system provided by this project will be connected to the Hanford Radio Fire Alarm System. Fire extinguishers will be installed as required.

5.2 ENVIRONMENTAL PROTECTION

5.2.1 Air

Air effluent treatment, sampling, and monitoring will be commensurate with Clean Air Act permit requirements, state and local regulations, and Westinghouse Hanford Company (WHC) policy, as defined in the *Environmental Compliance Manual*, WHC-CM-7-5 (WHC 1988). The following will define permit requirements:

- o National Emission Standards for Hazardous Airborne Pollutants (NESHAPS) requirements per 40 CFR 61 (EPA 1991b).
- o Prevention of Significant Deterioration (PSD) permit per 40 CFR 52 (EPA 1991a).
- o Requirements generated under the State of Washington per WAC 173-400, 173-460, 173-480, and 246-247, and the Air Pollution Control Authority of Benton, Franklin, and Walla Walla Counties.

5.2.2 Liquid Effluents

The preferred alternative for the disposal of the treated effluent from the 200 East Area PTECS is a soil column disposal system, permitted in compliance with WAC 173-216, "Waste Discharge Permit Program." Should this alternative become unacceptable because of technical or permitting issues, it will be necessary to pursue a river disposal option under an NPDES permit.

The treated waste disposal system will be capable of meeting the release limits defined by a State of Washington Waste Discharge Permit (WAC 173-216) (Ecology 1990c) or an NPDES permit (40 CFR Parts 121-125 and 129) (EPA 1991c-h). Both are negotiated permits, and require the application of AKART to satisfy the requirements of Ecology, or BAT to satisfy federal EPA requirements. During the permitting process, appropriate pretreatment system designs will be determined by the BAT/AKART processes.

Until the disposal permit is issued and actual discharge requirements are identified, the design of the project will use the ECLs. The discharge targets are intended to be conservative (low) estimates of the potential release limits contained in either a WAC-173-216 or NPDES permit, and are not intended to indicate the level of treatment possible with the generator facilities provided.

5.2.3 Permitting Documentation

The reports, calculations, specifications, and drawings shall be prepared, as required, to support the permitting submittal requirements of the system.

5.2.4 Hazardous Material Usage

The project design shall minimize the use and generation of hazardous substances for the construction, maintenance, operation, and decommissioning of the project. Hazardous substances shall be noted, or otherwise identified, in the definitive design media and, if used, shall be encapsulated to prevent contamination while permitting recovery, recycle, and/or reuse wherever feasible. Encapsulated hazardous materials shall be permanently marked identifying contents. Material safety data sheets (MSDS) shall be provided for all materials utilized in the construction and operation of the facility as required. Examples of materials requiring data sheets include, but are not limited to: paints, sealants, oils, lubricants, chemicals, and instrumentation fluids. Activities at each of the facilities will follow the applicable Hazardous Communication Program.

5.3 SAFEGUARDS AND SECURITY

Project W-252 will be in the 200 East ✓. Design and construction activities will comply with requirements of DOE Order 6430.1A and WHC security procedures. A construction security plan will be prepared for this project. The systems will not contain accountable quantities of special nuclear material.

5.4 NATURAL FORCES

The facility structures provided by this project all comply with the criteria defined in DOE Order 6430.1A, paragraph 0110-5.2. Analysis shall be performed in accordance with *Hanford Plant Standard*, SDC 4.1, Design Loads for Facilities.

5.5 DESIGN FORMAT

As-built drawings for the 200 East Area PTECS, including modifications to TEF facilities and systems, shall be provided by Project W-252. As-built drawings for the BAT/AKART implementation systems, including modifications to the impacted facility, shall also be provided by Project W-252. Existing drawings and project drawings shall be consolidated to the extent practical to enhance facility configuration. Other facility drawings affected by the project shall also be as-built, as required by the DOE and contractor procedures. Logic diagrams required for the MCS shall be in the same format as those provided by TEF. Drawings provided shall be verified after completion of construction as "as-built."

5.6 QUALITY ASSURANCE

Quality Assurance (QA) activities for all contractors involved in the design, construction, testing, and inspection of the proposed project shall be formulated and executed through the use of a Project Specific Quality Assurance Program Plan (QAPP). The QAPP shall establish quality assurance program requirements used for verification, inspection, and testing activities. The QAPP shall provide the means to ensure the facility complies with program requirements; the project plans and specifications are adequate; and tests and inspections are sufficient to confirm the adequacy of design and the quality of construction and manufactured components. The quality assurance program requirements will be in accordance with DOE Order 6430.1A, 0140, *Quality Assurance*; DOE Order 5700.6C, *Quality Assurance* (DOE 1991b); and WHC-CM-4-2, *Quality Assurance Manual* (WHC 1989d).

The QA program requirements are based on impact levels and safety classifications that are established in accordance with documented procedures. Safety classification of systems, components, and structures will be determined by risk analyses in accordance with WHC-CM-1-3, MRP 5.46. Details on safety classification will be listed in the QAPP and verified in subsequent safety documentation. A final safety equipment list will be included in a Final Safety Analysis Document/Final Safety Analysis Report (FSAD/FSAR). All safety classifications are to be supported by documented analysis. Impact levels are determined in accordance with WHC-CM-1-3, MRP 5.43.

5.7 DECONTAMINATION AND DECOMMISSIONING

The design will incorporate ease of decontamination and decommissioning of all project systems, in accordance with DOE Order 6430.1A and other referenced standards. The project shall minimize the buildup of residual contamination by avoiding practices (such as socket weld fittings) which promote accumulation of contamination in piping or equipment. All equipment and components provided by the project shall be designed to facilitate eventual decontamination and decommissioning. All underground piping removed from service by this project shall be isolated in an environmentally acceptable manner.

5.8 OPERATING PERSONNEL AND SERVICES

The design will consider human factors for maintenance and operations activities, including equipment, valve location and orientation, secondary waste handling, and building layout. To the extent practical, design will

follow the guidelines and standards of DOE Order 6430.1A, 1300-12, NUREG 0700, Mil-STD 1472D and WHC-CM-4-9, *Radiological Manual* (WHC 1988c):

- o Rapid, safe, economical operations and maintenance.
- o Anthropometric design for male and female personnel.
- o Minimal distraction, discomfort, stress, and fatigue during operations and maintenance.

The completed project will, to the extent possible, accommodate physical limitations such as hearing impairment and color blindness. Gauges, instruments, etc., shall be placed in accordance with the human factors requirements of the referenced standards.

5.9 COMMUNICATIONS AND TELECOMMUNICATIONS SYSTEMS

Radio station communications, telephones, and extensions to the private automatic exchange (PAX) associated with each facility shall be provided, as required to support the functional requirements of the project. Telephones will be installed in the occupied work areas to permit communications within the new facilities and with other area facilities. The number of telephones installed will be determined in the definitive design. Crash alarm phones, evacuation sirens, and other safety-related communications will be provided in accordance with safety standards.

Connections to the Computer-Automated Surveillance System (CASS), Hanford Local Area Network (HLAN), and a data link to the laboratories, via a Laboratory Customer Communications System (LCCS) terminal, will be provided as required to meet the functional requirements of this project.

6.0 CODES AND STANDARDS

The project will be designed to handle low-level radioactive wastestreams which are below the requirements of secondary containment found in DOE Order 5820.2A. Design criteria for Project W-252 are to be based upon the applicable provisions of DOE Order 6430.1A and DOE Order 5400.1.

The following list identifies the appropriate codes, standards, regulations, guidelines, orders, etc., which are not defined within DOE Order 6430.1A. Revisions to the codes and standards during the project shall be administered by the project, with assessments prepared to identify the impact of these revisions. Impacts shall be managed in accordance with DOE, contractor, and project specific requirements and procedures.

Utilize the codes and standards established for the 200 Area TEF for interconnecting piping and instrumentation and as much as possible for all other comparable equipment.

- o RL Implementing Procedure 4700.1A, *Project Management System* (RL 1991)
- o RL Order 5440.1A, *Implementation of the National Environmental Policy Act at the Richland Operations Office* (RL 1987)
- o DOE Order 5440.1D, *National Environmental Policy Act Compliance Program* (DOE 1991a)
- o DOE Order 5400.2A, *Environmental Compliance Issue Coordination* (DOE 1989a)
- o RL Order 5480.1A, *Environmental Safety and Health Program for Department of Energy Operations for Richland Operations* (RL 1988)
- o RL Order 5480.3, *Safety Requirements for the Packaging of Hazardous Materials, Hazardous Substances, and Hazardous Wastes* (DOE 1985)
- o RL Order 5480.4B, *Environmental Protection, Safety and Health Protection Standards* (RL 1989)
- o RL Implementation Procedure 5480.7, *Fire Protection* (RL 1990b)
- o RL Order 5480.10, *Industrial Hygiene Program* (RL 1990c)
- o DOE Order 5400.1, *General Environmental Protection Program*, (DOE 1988)

- o RL Order 5481.1, *Safety Analysis and Review System* (RL 1983)
- o DOE Order 5481.1B, *Safety Analysis and Review System* (DOE 1986)
- o DOE Order 5483.1A, *Occupational Safety and Health Program for Department of Energy Contractor Employees at Government Owned-Company Operated Facilities* (DOE 1983)
- o RL Order 5484.1, *Environmental Protection, Safety, and Health Protection Information Reporting Requirements* (RL 1983a)
- o DOE Order 5700.6C, *Quality Assurance* (DOE 1991b)
- o DOE Order 5820.2A, *Radioactive Waste Management* (DOE 1990)
- o WAC 173-201, *Water Quality Standards for Waters of the State of Washington* (Ecology 1987)
- o WAC 173-216, *Waste Discharge Permit* (Ecology 1986)
- o WAC 173-303, *Dangerous Waste Regulation* (Ecology 1991a)
- o WAC 246-247, *Radiation Protection - Air Emissions* (Ecology 1991b)
- o WHC-CM-1-3, *Management Requirements and Procedures* (WHC 1991)
- o WHC-CM-4-2, *Quality Assurance Manual* (WHC 1988a)
- o WHC-CM-4-3, *Industrial Safety Manual* (WHC 1988b)
- o WHC-CM-4-40, *Industrial Hygiene Manual* (WHC 1992)
- o WHC-CM-4-11, *ALARA Program Manual* (WHC 1988c)
- o WHC-CM-4-46, *Non-reactor Facility Safety Manual* (WHC 1988d)
- o WHC-CM-6-1, *Standard Engineering Practices* (WHC 1988e)
- o WHC-CM-6-2, *Project Management* (WHC 1988f)
- o WHC-CM-7-5, *Environmental Compliance* (WHC 1988g)
- o WHC-EP-0063, *Hanford Radioactive Solid Waste Packaging Storage and Disposal Requirements* (WHC 1988h)

In addition to the above standards, applicable national consensus codes and standards and pertinent state and local codes and standards will be used. The latest edition of all codes and standards at the time of the conceptual design will be used.

WHC-SD-W252-FDC-001 Rev. 1

This page intentionally left blank.

7.0 REFERENCES

- Army 1991, *Human Engineering Design Criteria for Military Systems, Equipment and Facilities*, MIL-STD 1472D, U.S. Department of the Army, Washington, D.C.
- AWWA, 1991, *Standards*, (latest edition), American Water Works Association, Denver, CO.
- Barisas, S., Polich, J., 1985, *Environmental Protection Appraisals: A Suggested Guide for U.S. Department of Energy Field Organizations*, ANL/EES-TM-264, Argonne National Laboratories, Argonne, Illinois.
- Clean Air Act*, 1955, 42 USC 7401 et seq.
- Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, 42 USC 9601 et seq.
- Brown, M.J., 1992, *200 Area Effluent BAT/AKART Implementation Functional Design Criteria*, WHC-SD-W291-FDC-001, Westinghouse Hanford Company, Richland, Washington.
- Crane, A.F., 1992, *200 Area Treated Effluent Disposal Facility Functional Design Criteria*, WHC-SD-W049H-FDC-001, Rev. 1, Westinghouse Hanford Company, Richland, Washington.
- Davis, J.D., 1991, *Site Evaluation Report - Site Screening, Evaluation and Selection: Project W-049H, 200 Area Treated Effluent Disposal System*, WHC-SD-W049H-SE-004, Rev 0, Westinghouse Hanford Company, Richland, Washington.
- DOE 1985, *National Environmental Policy Act*, DOE Order 5440.1C, U.S. Department of Energy, Washington, D.C.
- DOE 1988a, *Radioactive Waste Management*, DOE Order 5820.2A, U.S. Department of Energy, Washington, D.C.
- DOE 1988b, *Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Wastes*, DOE Order 5480.3, U.S. Department of Energy, Washington, D.C.
- DOE 1989a, *Environmental Compliance Issue Coordination*, DOE Order 5400.2A, U.S. Department of Energy, Washington, D.C.
- DOE 1989b, *General Design Criteria*, DOE Order 6430.1A, U.S. Department of Energy, Washington, D.C.

- DOE 1990a, *General Environmental Protection Program*, DOE Order 5400.1, U.S. Department of Energy, Washington, D.C.
- DOE 1990b, *Radiation Protection of the Public and the Environment*, DOE Order 5400.5, U.S. Department of Energy, Washington, D.C.
- DOE 1991a, *National Environmental Policy Act Compliance Program* DOE Order 5440.1D, U.S. Department of Energy, Washington, D.C.
- DOE 1991b, *Quality Assurance*, DOE Order 5700.6C, U.S. Department of Energy, Washington, D.C.
- DOE 1992, *Imposition of Proposed Nuclear Safety Requirements*, DOE Order 5480.5, U.S. Department of Energy, Washington, D.C.
- Ecology 1990a, "Submission of Plans and Reports for Construction of Wastewater Facilities," *Washington Administrative Code*, Chapter 173-240, as amended, Washington State Department of Ecology, Olympia, Washington.
- Ecology 1990b, "Dangerous Waste Regulations," *Washington Administrative Code*, Chapter 173-303, as amended, Washington State Department of Ecology, Olympia, Washington.
- Ecology 1990c, "State Waste Discharge Permit Program," *Washington Administrative Code*, Chapter 173-216, as amended, Washington State Department of Ecology, Olympia, Washington.
- Ecology 1990d, "General Regulations for Air Pollution Sources," *Washington Administrative Code*, Chapter 173-400 through 495, as amended, Washington State Department of Ecology, Olympia, Washington.
- Ecology 1990e, "Controls for New Sources of Toxic Air Pollutants," *Washington Administrative Code*, Chapter 173-460, as amended, Washington State Department of Ecology, Olympia, Washington (1991).
- Ecology 1990f, "Ambient Air Quality Standards and Emission Limits for Radionuclides," *Washington Administrative Code*, Chapter 173-480, as amended, Washington State Department of Ecology, Olympia, Washington.
- Ecology 1990g, "Water Quality Standards of the State of Washington," *Washington Administrative Code*, Chapter 173-200, as amended, Washington State Department of Ecology, Olympia, Washington.
- Ecology 1990h, "Minimum Functional Standards for Solid Waste Handling," *Washington Administrative Code*, Chapter 173-304, as amended, Washington State Department of Ecology, Olympia, Washington.

- Ecology 1990i, "Implementation of Regulations for Air Containment Sources," *Washington Administrative Code*, Chapter 173-403, as amended, Washington State Department of Ecology, Olympia, Washington.
- Ecology 1990j, "Permits for Developments on Shorelines of the State," *Washington Administrative Code* Chapter 173-14, Washington State Department of Ecology, Olympia, Washington.
- Ecology 1990k, "Water Quality Standards for Surface Waters of the State of Washington," *Washington Administrative Code* Chapter 173-201, Washington State Department of Ecology, Olympia, Washington.
- Ecology, EPA, and DOE 1989, *Hanford Federal Facility Agreement and Consent Order*, 2 vols, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.
- EPA 1986, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, SW-846, 3rd Edition, U.S. Environmental Protection Agency, Washington, D.C.
- EPA 1989, *Docket Report on Health-Based Levels and Solubilities Used in the Evaluation of Delisting Petitions Submitted Under 40 CFR 260.00 and 260.22*, Science Applications International Corporation for U.S. Environmental Protection Agency, Washington, D.C.
- EPA 1991a, "Approval and Promulgation of Implementation Plans," Title 40, *Code of Federal Regulations*, Part 52, as amended, U.S. Environmental Protection Agency, Washington, D.C.
- EPA 1991b, "National Emission Standards for Hazardous Airborne Pollutants," Title 40, *Code of Federal Regulations*, Part 61, as amended, U.S. Environmental Protection Agency, Washington, D.C.
- EPA 1991c, "State Certification of Activities Requiring a Federal License or Permit," Title 40, *Code of Federal Regulations*, Part 121, as amended, U.S. Environmental Protection Agency, Washington, D.C.
- EPA 1991d, "EPA Administered Permit Programs: The National Pollutant Discharge Elimination System", Title 40, *Code of Federal Regulations*, Part 122, as amended, U.S. Environmental Protection Agency, Washington, D.C.
- EPA 1991e, "State Program Requirements," Title 40, *Code of Federal Regulations*, Part 123, as amended, U.S. Environmental Protection Agency, Washington, D.C.
- EPA 1991f, "Procedures for Decision Making," Title 40, *Code of Federal Regulations*, Part 124, as amended, U.S. Environmental Protection Agency, Washington, D.C.

- EPA 1991g, "Criteria and Standards for the National Pollutant Discharge Elimination System," Title 40, *Code of Federal Regulations*, Part 125, as amended, U.S. Environmental Protection Agency, Washington, D.C.
- EPA 1991h, "Toxic Pollutant Effluent Standards," Title 40, *Code of Federal Regulations*, Part 129, as amended, U.S. Environmental Protection Agency, Washington, D.C.
- EPA 1991i, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," Title 40, *Code of Federal Regulations*, Part 264, as amended, U.S. Environmental Protection Agency, Washington, D.C.
- EPA 1991j, "Land Disposal Restrictions," Title 40, *Code of Federal Regulations*, Part 268, as amended, U.S. Environmental Protection Agency, Washington, D.C.
- Fisheries 1990, "Hydraulic Code Rules," *Washington Administrative Code*, Chapter 220-110, Washington State Department of Fisheries, Olympia, Washington.
- Jackson, R. L., 1990, *Strategy for Handling and Disposing of Purgewater on the Hanford Site*, Washington, WHC-MR-0039, Westinghouse Hanford Company, Richland, Washington.
- NFPA 1990, *National Electrical Code*, NFPA 70, National Fire Protection Association, Quincy, Massachusetts.
- NRC 1981, *Guidelines for Control Room Design Reviews*, NUREG 0700, U.S. Nuclear Regulatory Commission, Washington, D.C.
- OSHA 1991, *Code of Federal Regulations*, Title 29, Part 1926, as amended, Occupational Safety and Health Administration - Labor, Washington, D.C.
- RL 1983a, *Environmental Protection, Safety, and Health Protection Information Reporting Requirements*, RL Order 5484.1, U.S. Department of Energy, Richland Field Office, Richland, Washington.
- RL 1983b, *Safety Analysis and Review System*, RL Order 5481.1, U.S. Department of Energy, Richland Field Office, Richland, Washington.
- RL 1987a, *Fire Protection*, RL Order 5480.7, U.S. Department of Energy, Richland Field Office, Richland, Washington.
- RL 1987b, *Implementation of the National Environmental Policy Act at the Richland Operations Office*, RL Order 5440.1A, U.S. Department of Energy, Richland Field Office, Richland, Washington.

- RL 1987c, *Plan and Schedule to Discontinue Disposal of Contaminated Liquids into the Soil Column at the Hanford Site*, unnumbered, U.S. Department of Energy, Richland Field Office, Richland, Washington.
- RL 1988, *Environment, Safety, and Health Program for DOE-RL Operations*, RL Order 5480.1A, U.S. Department of Energy, Richland Field Office, Richland, Washington.
- RL 1989a, *Environmental Protection, Safety, and Health Protection Standards for DOE-RL Operations*, RL Order 5480.4B, U.S. Department of Energy, Richland Field Office, Richland, Washington.
- RL 1989c, *Project Management Systems*, RL Order 4700.1, U.S. Department of Energy, Richland Field Office, Richland, Washington.
- RL 1990a, *Hanford Plant Standards (HPS) Program*, RL Order 6430.1C, U.S. Department of Energy, Richland Field Office, Richland, Washington.
- RL 1990b, *Industrial Hygiene Program*, RL Order 5480.10, U.S. Department of Energy, Richland Field Office, Richland, Washington.
- RL 1990c, *Site Selection*, RL Order 4320.2C, U.S. Department of Energy, Richland Field Office, Richland, Washington.
- RL 1991, *Radiation Protection For Occupational Workers* RL Order 5480.11, U.S. Department of Energy, Richland Field Office, Richland, Washington.
- Safe Drinking Water Act of 1974*, 42 USC 300f et seq.
- WDOH 1990a, "Radiation Protection Air Emissions," *Washington Administrative Code*, Chapter 246-247, as amended, Washington State Department of Health, Olympia, Washington.
- WDOH 1990b, "Monitoring and Enforcement of Air Quality and Emission Standards for Radionuclides," *Washington Administrative Code*, Chapter 402-480, as amended, also RCW 70.98.000, Washington State Department of Health, Olympia, Washington.
- WHC 1988a, *Annual Status Report of the Plan and Schedule to Discontinue Disposal of Contaminated Liquids into the Soil Column at the Hanford Site*, WHC-EP-0196-1, Westinghouse Hanford Company, Richland, Washington.
- WHC 1988b, *Best Available Technology (Economically Achievable) Guidance Document for the Hanford Site*, WHC-EP-0137, Westinghouse Hanford Company, Richland, Washington.

- WHC 1989, *Annual Status Report of the Plan and Schedule to Discontinue Disposal of Contaminated Liquids into the Soil Column at the Hanford Site*, WHC-EP-0196-2, Westinghouse Hanford Company, Richland, Washington.
- WHC, 1992, *Phase II Liquid Effluent Program, Project W-252, Engineering Report*, WHC-SD-W252-ER-001, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-1-3, *Management Requirements and Procedures*, as amended, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-4-2, *Quality Assurance Manual*, as amended, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-4-3, *Industrial Safety Manual*, as amended, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-4-9, *Radiological Design*, as amended, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-4-10, *Radiation Protection*, as amended, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-4-11, *ALARA Program Manual*, as amended, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-4-46, *Nonreactor Facility Safety Manual*, as amended, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-5-5, *Operations, General Administration*, as amended, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-6-1, *Standard Engineering Practices*, as amended, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-6-2, *Project Management*, as amended, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-6-4, *Hanford Hoisting and Rigging Manual*, as amended, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-7-5, *Environmental Compliance Manual*, as amended, Westinghouse Hanford Company, Richland, Washington.
- WHC-CM-8-7, *Operation Support Services*, as amended, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A

200 EAST AREA PTECS PROJECTED FLOW RATE

This Appendix for A/E Information Only

This page intentionally left blank.

Appendix A

Table A-1 200 East Area PTECS Projected Flow Rate

Stream	Annualized Average Flow Rate/(gpm) ¹	Maximum Flow Rate (gpm) ²
242-A Evaporator Cooling Water	17	61
244-AR Vault Cooling Water	9.5	22
241-A Tank Farm Cooling Water	3	10
B Plant Cooling Water	5	15
284-E Powerhouse Wastewater	<u>33</u>	<u>103</u>
TOTAL	67.5	211

¹ Based on a cooling tower concentration cycle of 4. The probable range for the concentration cycles is 2 to 6, 4 being the median. A concentration cycle of six would reduce the total average flow rate to 57 gpm.

² Flow rates are based on a cooling tower concentration cycle of two.

Note 1: The flow rates in this table differ from the rates reported in the W252 Engineering Report. The rates reported there are based on an average flow rate at a cooling tower concentration of two and a maximum flow rate 30% greater. Rates reported in this report are more accurate estimates.

Note 2: The design capacity of the 200 East Area PTECS shall be based upon maximum flow rates, while collection system grades are to be designed for self-cleaning velocities based upon annualized average flows.

This page intentionally left blank.

APPENDIX B

WASTE STREAM CHARACTERISTICS AFTER BAT/AKART

This Appendix for A/E Information Only

WHC-SD-W252-FDC-001 Rev. 1

This page intentionally left blank.

Table B-1 Waste Stream Characteristics After BAT/AKART

STREAM	241-A TANK FARM COOLING WATER	242-A EVAPORATOR COOLING WATER	284-E POWER PLANT WASTEWATER	244-AR VAULT COOLING WATER	B PLANT COOLING WATER	COMBINED STREAM
FLOW RATE (gpm)	3	17	33	9.5	5	67.5
(ppb unless noted) ORGANICS						
1-Butanol	-	-	16.0	2.83	-	8.22
Trichloromethane	56.0	56.0	20.7	21.6	56.0	24.6
INORGANICS						
Aluminum	600	600	398	212	600	446
Ammonia	100	100	60.0	80.5	100	77.7
Arsenic	5.0	5.0	2.85	3.25	5.0	3.70
Barium	58.0	58.0	60.8	37.7	58.0	56.5
Boron	36.0	36.0	51.2	20.0	36.0	41.1
Cadmium	1.0	1.0	0.57	2.1	1.0	0.94
Calcium	38000	38000	25900	22500	38000	29,902
Chloride	5800	5800	159000	24500	5800	83,329
Chromium	20.0	20.0	11.4	13.2	20.0	14.8
Copper	50.0	50.0	28.5	93.5	50.0	45.6
Cyanide	20.0	20.0	11.4	12.7	20.0	14.7
Fluoride	260	260	172	395	260	235
Iron	66.0	66.0	145	209	66.0	124
Lead	10.0	10.0	5.69	16.1	10.0	8.75
Magnesium	8800	8800	18100	5130	8800	12,830
Manganese	20.0	20.0	7.37	15.4	20.0	13.1
Mercury	1.0	0.2	0.47	0.13	1.0	0.42
Nickel	20.0	20.0	11.4	13.2	20.0	14.8
Nitrate (as NO3)	1000	1000	591	860	1000	780
Phosphate	2000	2000	1140	1270	2000	1,476
Potassium	1460	1460	943	997	1460	1,142

STREAM	241-A TANK FARM COOLING WATER	242-A EVAPORATOR COOLING WATER	284-E POWER PLANT WASTEWATER	244-AR VAULT COOLING WATER	B PLANT COOLING WATER	COMBINED STREAM
FLOW RATE (gpm)	3	17	33	9.5	5	67.5
Selenium	10.0	10.0	5.69	6.35	10.0	7.38
Silicon	4200	4200	3280	2850	4200	3,560
Silver	20.0	20.0	11.4	12.7	20.0	14.7
Sodium	4200	4200	76800	18500	4200	41,705
Strontium	190	190	237	261	190	222
Sulfate	28000	28000	18700	13100	28000	21,356
Uranium	0.5	0.5	0.48	0.77	0.5	0.53
Vanadium	10.0	10.0	5.69	6.35	10.0	7.38
Zinc	118	118	21.1	22.5	118	57.1
RADIONUCLIDES						
Alpha Activity (pCi/l)	4.6	4.6	2.62	2.0	4.6	3.27
Beta Activity (pCi/l)	8.6	8.6	2.67	6.38	8.6	5.39

NOTE: The derivation of the estimated stream characteristic data is in each individual BAT analysis in the W-252 Engineering Report.

APPENDIX C**PROPOSED STAFFING PLAN**

This appendix presents the proposed staffing plan for the additions and modifications implemented as BAT/AKART for the Phase II streams at the facilities in the scope of this Functional Design Criteria.

The estimated staffing requirements presented in Table B-1 are based on the following assumptions:

- All additions or modifications implemented as BAT/AKART will be operated and maintained by the existing operations and maintenance groups for that facility.
- The PTECS will be operated as an expansion of the 200 Area TEDF by Liquid Waste Disposal. A single control room will be used for operation of the combined system.
- This staffing is based on long term operation of the systems. Additional personnel may be required during start-up of the systems.

Table C-1 Estimated Staff Requirements

Facility	Operators	Maintenance	Engineers	TOTAL
242-A Evaporator	1	1	1	3
244-AR Vault	0	0	0	0
B Plant	1	1	0	2
284-E/283-E	5	2	1	8
✓PTECS	0	0	0	0
TOTAL	7	4	2	13

NOTE: Administrative and clean area assumes accommodations for the physically handicapped.

This Appendix for A/E Information Only

WHC-SD-W252-FDC-001 Rev. 1

This page intentionally left blank.

APPENDIX D
MONITOR AND CONTROL SYSTEM

This Appendix for A/E Information Only

WHC-SD-W252-FDC-001 Rev. 1

This page intentionally left blank.

FIGURE D-1 MONITOR AND CONTROL SYSTEM

WHC-SD-W252-FDC-001 Rev. 1

This page intentionally left blank.

APPENDIX E

242-A EVAPORATOR COOLING WATER AND STEAM CONDENSATE BAT/AKART SYSTEM

Installation of a cooling tower that can provide a minimum of 30 million BTU/hr was the selected alternative of the 242-A Cooling Water BAT Evaluation in the W-252 Engineering Report (WHC 1992). The cooling tower will eliminate the once through condenser cooling water effluent. The exact type of wet cooling tower (e.g. open tower, closed tower) will be determined in the subsequent design process.

As part of the cooling tower system, equipment and facilities shall be installed to supply chemicals such as biocides and scale inhibitors as required for proper cooling tower operation and maintenance. Capability to perform routine cooling tower water quality checks using simple analytical methods shall also be provided in the support facility. Freeze protection will be required for the tower and outside pipelines. The use of filtration shall be considered as a means to keep solids from building up in the system.

All pumps used for circulating liquid in the cooling loop, supplying cooling water, and supplying makeup or return water shall be redundant. The redundant pump shall supply 100% of the required capacity. Controls shall be supplied that will automatically energize the backup pump on failure of the primary pump. Any other equipment or controls identified during subsequent design as critical to the operation of the cooling system shall have a redundant backup. Such redundancy will reduce the possibility of interruption of the cooling tower system operation during evaporator campaigns.

The W-252 Engineering Report directs that the reboiler steam condensate be eliminated through recycle to the cooling tower as makeup. Use of the steam condensates and other miscellaneous streams as makeup water to the cooling tower will allow elimination of additional effluents. A flow diagram for the cooling system including recycle to the cooling tower is shown in Figure E-1. A description of the action to be taken for the contributors to the cooling water and steam condensate effluents follows.

- o Condenser Cooling Water - The cooling water to the EC-1, EC-2, and EC-3 condensers will be supplied from the cooling tower system. After passing through the condensers the water is returned to the tower.

This Appendix for A/E Information Only

- o Steam Condensate (including minor contributors) - The steam condensate effluent will continue to be routed to the 207-A Basins for verification sampling. After verification the steam condensate will be recycled as makeup water to the cooling tower. If the condensate in a basin should fail the verification test it will be returned to the appropriate double-shell tank.
- o Compressor Cooling Water - The compressor cooling water will be eliminated by installation of a dedicated closed-loop system. The new cooling system will be sized to service both compressors and the aftercooler.
- o Compressor Air Receiver Condensate - Condensate from the air receiver tank and the separator shall be collected in a container. The condensate will be allowed to evaporate back to the atmosphere. Any residue will be periodically disposed of.
- o Drains - Remaining drains, including the stream turbine and catch pan drains, will be routed to the cooling tower as makeup water. The floor drains in the HVAC room shall have removable plugs or standpipes installed to prevent spills from entering the drains.

WHC-SD-W252-FDC-001 Rev. 1

FIGURE E-1 242-A EVAPORATOR COOLING SYSTEM FLOW DIAGRAM

This page intentionally left blank.

APPENDIX F

244-AR VAULT COOLING WATER BAT/AKART SYSTEM

According to the BAT Evaluation, the two most consistent contributors to the effluent shall be eliminated. The vessel vent steam heater shall be eliminated by replacement with a heater that will deliver 150,000 BTU/hour and not produce an effluent. The project shall consider installation of an electric heater. It is anticipated the heater will require an explosion-proof rating.

There are two air compressors at 244-AR, the main compressor and the backup compressor. The main compressor is cooled from an existing closed-loop chilled system. The project shall consider the possibility of providing cooling for the aftercooler or backup compressor, or both, from the existing closed-loop system. Providing closed-loop cooling to the aftercooler from the existing system takes priority. The backup compressor is not presently operational and this project should only provide closed-loop cooling for the backup compressor if the planned compressor renovation is completed.

The W-252 Engineering Report directed that an additional source control at 244-AR be implemented. This source control removes the water softeners from the 244-AR cooling tower makeup water conditioning process. The water softener regeneration contributor would be eliminated. Implementation would require piping changes. The cooling towers are not currently operational and will not be required unless the facility is used for future waste handling operations. The decision to implement this change, under Project W-252, will be determined by the identification of a need for future operation of the cooling towers.

This Appendix for A/E Information Only

WHC-SD-W252-FDC-001 Rev. 1

This page intentionally left blank.

APPENDIX G

B PLANT COOLING WATER BAT/AKART SYSTEM

Installation of a cooling tower that can provide a minimum of 7 million BTU/hr was the selected alternative of the B Plant Cooling Water BAT Evaluation in the W-252 Engineering Report. The cooling tower will eliminate the once through condenser cooling water effluent, as shown in Figure G-1. The exact type of wet cooling tower (e.g. open tower, closed tower) will be determined in the subsequent design process.

As part of the cooling tower system, equipment and facilities will be installed to supply chemicals, such as biocides and scale inhibitors, as required for proper cooling tower operation and maintenance. Capability to perform routine cooling tower water quality checks shall also be provided in the support facility. Freeze protection will be required for the tower and outside pipelines. The use of filtration shall be considered as a means to keep solids from building up in the system.

All pumps used for circulating liquid in the cooling loop, supplying cooling water, and supplying makeup or return water shall be redundant. The redundant pump shall supply 100% of the required capacity. Controls shall be supplied that will automatically energize the backup pump on failure of the primary pump. Any other equipment or controls identified during subsequent design as critical to the operation of the cooling system shall have a redundant backup. Such redundancy will reduce the possibility of interruption of the cooling tower system operation.

Routing of the emergency water supply wells, 282-B and 282-BA, shall be changed to supply well water as makeup to the cooling tower during loss of normal makeup water supply. The well will not directly supply cooling water to the condensers.

Contributors to the existing B Plant cooling water effluent that would not be eliminated by installation of closed-loop cooling will be used as makeup water to the cooling tower. This includes the demineralized water flushed from the WESF pool cells and the steam condensate from the Stairwell No.1 HVAC system. Piping changes will be required to route these contributors to the cooling tower thus eliminating them from the effluent. A flow diagram of the system is shown in Figure G-1.

This Appendix for A/E Information Only

FIGURE G-1 B PLANT COOLING WATER SYSTEM FLOW DIAGRAM

APPENDIX H

284-E POWERPLANT WASTEWATER BAT/AKART SYSTEM

The 284-E Powerplant BAT Evaluation used technology transfer from similar municipal facilities to determine suspended solids removal is BAT for the 283-E WTF filter backwash. The recommended removal process is shown in Figure H-1. It includes discharging the filter backwash to a clarification step for settling of the solids. Flocculents or settling enhancement additives may be added to aid the clarification. A sump and pump would be required for this transfer if gravity flow is not possible. The clarified supernatant will be stored in a surge tank before being pumped back to the 282-E reservoir. The sludge from the bottom of the thickener is transferred to the drying step. After the sludge is dried it is disposed of in a landfill.

The filter backwash treatment system shall be sized to handle the estimated 70,000 gallons of backwash produced over the 30 minute event. If a sump pump is required, residence time of the backwash in the sump shall be kept to a minimum to preclude excessive solids settling in the sump. In addition, the sump shall have an agitator installed to keep the solids dispersed. Redundant pumps are required in the sump. All downstream equipment shall be sized to handle the peak flow condition. The 283-E filter backwash treatment system shall be the same system that will be installed at 283-W prior to 1997, by the 200 Area Effluent BAT/AKART Implementation Project (Brown 1992).

Instrumentation that will allow optimization of the backwash cycle shall be provided. This includes, but is not limited to, turbidity and flow meters (with totalizers) on the backwash line from each filter, flow meter (with totalizer) on the backwash supply line.

Overflows of the 282-E reservoir and the 283-E clearwells shall be prevented by installation of level controls and associated equipment. The controls will adjust the incoming water flow rate to maintain the proper level in the reservoir. A redundant, discrete, high level control loop will be supplied to ensure overflows do not occur. The 283-E clearwell overflow line will be routed back to the 282-E reservoir.

Floor drains in the 284-E Powerhouse and 283-E WTF will have removable plugs installed to provide additional administrative control over discharges from the drains.

This Appendix for A/E Information Only

Once through cooling water to the equipment such as air compressors, pumps, turbines, generators, and boiler jackets shall be eliminated. The project shall consider several different methods of providing the required 250,000 BTU/hour cooling, as shown in Figure H-2. The method with the probable least impact on the current operating routine is installation of an intermediate heat exchanger with a closed-loop to the equipment. Cooling will be supplied to the heat exchanger by raw water from the 282-E reservoir. After passing through the heat exchanger the raw water is routed to the area raw water supply line leaving the reservoir or back to the reservoir. If further design effort shows this method is not feasible the project shall consider installation of a closed-loop cooling tower.

Batch blowdown of the 284-E boilers causes a large surge in the flow rate of the 284-E effluent. In order to reduce the size of the required pipeline to the main collection line and meet probable flow limits for the TEDF, a surge tank will be installed on the effluent line at 284-E. The tank will be sized to store the maximum batch blowdown from one shift. The tank will have level alarms and controlled flow out of the tank.

Figure H-1 283-E FILTER BACKWASH TREATMENT SYSTEM FLOW DIAGRAM

FIGURE H-2 284-E COOLING SYSTEM OPTIONS

WHC-SD-W252-FDC-001 Rev. 1

WHC-SD-W252-FDC-001 Rev.1

APPENDIX J

PROCESS AND SUPPORT FACILITY DESIGN CONSIDERATIONS

The design of the Project W-252 systems shall consider the following design features:

- o Heating, ventilation, and air conditioning (HVAC) systems will be installed in facilities as required for BAT/AKART implementation and PTECS support facilities. The purpose of the HVAC systems will be to control airborne contamination, provide environmental control for instrumentation and electrical systems, and maintain human comfort in areas of personnel occupancy.
- o Equipment and services required to flush and decontaminate internal components and exterior surfaces of Project W-252 systems and support facility building interior surfaces will be provided to maintain them in a relatively clean condition.
- o Safety showers and eyewash stations in compliance with DOE Order 6430.1A requirements will be installed.
- o Permanent and/or portable breathing air systems will be provided where required to support maintenance activities or recovery from postulated accident conditions.
- o Posts, guards, and other types of protection needed to prevent damage to equipment, piping, and structures will be installed.
- o Guard rails, or other fall protection, around all pits, platforms, and surfaces where a fall from more than four feet could occur will be installed.
- o A system of cranes and/or hoists (including monorail systems) and equipment for equipment handling and transport will be installed as necessary for maintenance.
- o A network of stairways, walkways, and maintenance platforms for access to equipment and instrumentation where routine or frequent maintenance and surveillance inspections will be required. Elevators will be considered for use when frequent and rapid access is needed to higher elevations in facilities where bulky or heavy items must be moved. The use of ladders shall be minimized.
- o Service doors will be installed to enable movement of equipment to and from the facility.

This Appendix for A/E Information Only