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1	1	Design Authority CA Petersen	CA Petersen	7/27/98	H6-37	1	1	GL Parsons	GL Parsons	7-27-98	R3-47
6	6	Design Agent JL Ruud			G3-14	1	1	JA Voogd	JA Voogd	7/27/98	H6-37
1	1	Cog.Eng. DA Burbank	DA Burbank	7/27/98	H6-37	1	1	KC Burgard	K C Burgard	7/27/98	H6-37
1	1	Cog. Mgr. RJ Murkowski	RJ Murkowski	7/27/98	H6-37						
1	1	QA JF Bores	J F Bores	7/28/98	G3-21						
1	1	Safety SS Gahir	SS Gahir	7/27/98	R1-43						
1	1	Env. BG Erlandson	BG Erlandson	7/30/98	R1-51						

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DA Burbank (signature) 7/27/98 — Signature of EDT Originator, Date	JA Voogd (signature) 7/27/98 — Authorized Representative for Receiving Organization, Date	CA Petersen (signature) 7/27/98 — Design Authority/ Cognizant Manager, Date	Ctrl. No. [] Approved [] Approved w/comments [] Disapproved w/comments

S

Design Requirements Document for Project W-520, Immobilized Low-Activity Waste Disposal

SC Ashworth, DA Burbank
COGEMA Engineering Corp., Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

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Abstract: This design requirements document (DRD) identifies the functions that must be performed to accept, handle, and dispose of the immobilized low-activity waste (ILAW) produced by the Tank Waste Remediation System (TWRS) private treatment contractors and close the facility. It identifies the requirements that are associated with those functions and that must be met. The functional and performance requirements in this document provide the basis for the conceptual design of the Tank Waste Remediation System Immobilized Low-Activity Waste disposal facility project (W-520) and provides traceability from the program-level requirements to the project design activity.

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DESIGN REQUIREMENTS DOCUMENT FOR PROJECT W-520, IMMOBILIZED LOW-ACTIVITY WASTE DISPOSAL

July 1998

S. C. Ashworth
D. A. Burbank

COGEMA Engineering Corporation
Richland, Washington

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LIST OF TERMS

A-E	architect-engineer
AGA	alternatives generation and analysis
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration, and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
BACT	best available control technology
CFR	Code of Federal Regulations
CM	construction management
CMAA	Crane Manufacturer's Association of America
D&D	decontamination and decommissioning
DBA	design-basis accident
DCG	derived concentration guide
DCS	distributed control system
DF	decontamination factor
DNFSB	Defense Nuclear Facility Safety Board
DOE	U.S. Department of Energy
DOH	Washington State Department of Health
DP	Differential pressure
DRD	design requirements document
EDE	effective dose equivalent
EHSC	environmental hazard safety classification
EPA	U.S. Environmental Protection Agency
ETF	Effluent Treatment Facility
FDC	functional design criteria
FEMP	facility effluent monitoring plan
HLW	high-level waste
HMS	Hanford Site Meteorological Station
HPS	Hanford plant standards; health protection system
HVAC	heating, ventilating, and air-conditioning
ICD	interface control document
IHLW	immobilized high-level waste
ILAW	immobilized low-activity waste
LERF	Liquid Effluent Retention Facility
LETF	Liquid Effluent Treatment Facility
LAW	low-activity waste
LLW	low-level waste
NFPA	National Fire Protection Association
NOC	notice of construction

LIST OF TERMS (continued)

NRC	U.S. Nuclear Regulatory Commission
O&M	operation and maintenance
OSHA	U.S. Occupational Safety and Health Administration
PHMC	Project Hanford Management Contractor
QAPP	quality assurance program plan
RCRA	Resource Conservation and Recovery Act of 1976
RL	U.S. Department of Energy, Richland Operations Office
RLIP	U.S. Department of Energy, Richland Operations Office Implementing Procedure
SDC	standard arch-civil design criteria
SDRD	supplemental design requirements documents
SEWP	systems engineering working plan
SST	single-shell tank
T-BACT	best available control technology for air toxins
TEDF	Treated Effluent Disposal Facility
Tri-Party Agreement	Hanford Federal Facility Agreement and Consent Order
TRU	transuranic
TRS	technical requirements specification
TSD	treatment, storage, and disposal
TWRS	Tank Waste Remediation System
WAC	*Washington Administrative Code*
WHC	Westinghouse Hanford Company
WISHA	Washington Industrial Safety and Health Act

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DESIGN REQUIREMENTS DOCUMENT FOR PROJECT W-520, IMMOBILIZED LOW-ACTIVITY WASTE DISPOSAL

1.0 SCOPE

This design requirements document (DRD) identifies the functions that shall be performed to accept, handle, and dispose of the immobilized low-activity waste (ILAW) produced by the Tank Waste Remediation System (TWRS) private treatment contractors and close the disposal facilities. It also identifies the requirements that are associated with those functions and that must be met. The functional and performance requirements in this document provide the basis for the design of the TWRS ILAW disposal facility project and provides traceability from the program-level requirements to the project design activity. Technical and programmatic risks associated with the TWRS planning basis are discussed in the *Tank Waste Remediation System Risk Management Plan* (Zimmerman 1998).

Project W-520 will provide the ILAW facility (ILAW disposal infrastructure, disposal units, and closure barrier systems) required to safely dispose of ILAW produced by treatment vendors under the TWRS privatization initiative. Project W-520 also will provide closure design for Project W-465, ILAW Interim Storage, described in the Conceptual Design Report for Project W-465 (Pickett, 1998). The design shall be robust and useful to meet the needs to the entire disposal mission (i.e., easily modifiable design media to allow deletion or addition of design features to handle waste of varying characteristics).

1.1 IDENTIFICATION

Program: TWRS

Project: TWRS ILAW Disposal (Project W-520)
U.S. Department of Energy (DOE) Line-Item 01L-EEW-520

Mission: The ILAW Disposal project will provide waste acceptance and disposal for ILAW product produced by the privatized TWRS treatment contractors.

Type: Non-critical, non-vital facilities.

1.2 SYSTEM OVERVIEW

The *Hanford Strategic Plan,* (DOE 1996) states "Hanford's environmental management, or cleanup, mission is to protect the health and safety of the public, workers, and the environment; control hazardous materials; and utilize the assets (people, infrastructure, site) for other missions." As part of the Hanford Site mission, the TWRS program identifies the need to store, treat, immobilize, and dispose of the highly radioactive Hanford Site tank waste and encapsulated cesium and strontium materials in an environmentally sound, safe, and cost-effective manner.

1.2.1 Tank Waste Remediation System Environmental Impact Statement

The TWRS Environmental Impact Statement (EIS) (DOE 1996a) describes several alternatives for treating and disposing of the tank waste. Phased implementation, as selected in the Record of Decision (DOE 1997), is identified as the preferred alternative. Key features of the Phased Implementation alternative are presented in Table 1-1.

Table 1-1. Phased Implementation Alternative.

Phase dates	Phase activities
(Phase 1: 1997 to 2012)	Phase 1: Construct two low-activity waste separation and immobilization demonstration facilities (one facility would include high-level waste vitrification). Operate facilities for up to 10 years and treat up to approximately 76 ML (20 Mgal) of the tank waste.
(Phase 2: 2004 to 2040) Preferred Alternative	Phase 2: Construct two combined low-activity waste separation and immobilization facilities and one high-level waste vitrification facility. Retrieve all waste practicable (assumed to be 99 percent) from all single- and double-shell tanks. Separate tank waste into high-level and low-activity waste streams (use sludge washing, caustic leaching, ion exchange, and other separations processes as required). Store high-level waste on site for up to 50 years pending availability of a geologic repository. Dispose of high-level waste off site at a geologic repository. Dispose of low-activity waste on site in near-surface facilities.

1.2.2 *Hanford Federal Facility Agreement and Consent Order* Milestones

The sixth amendment to the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1996) and DOE policy decision form the bases for the TWRS mission. The bases include retrieval of single-shell and double-shell tank waste, separation of the high-level fraction (disposed of off site) and low-level fraction (stored and disposed of on site), and intermediate separations. Change Order M-90-96-01 to the Tri-Party Agreement specifies milestones for ILAW interim storage as shown in Table 1-2.

A systems engineering process is being applied at the Hanford Site and is being implemented by the TWRS to establish the functions and requirements necessary to accomplish the TWRS mission. The initial TWRS technical baseline was established through four levels of functional decomposition. It is documented in the *Tank Waste Remediation System Functions and Requirements* (WHC 1996). The policy and guidance for applying systems engineering throughout the TWRS Program is described in the *Tank Waste Remediation System (TWRS) Systems Engineering Management Plan* (DOE 1994).

The functions that form the basis for the ILAW Disposal Project were developed by extrapolating the systems engineering process from the top-level system requirements. Figure 1-1 shows the TWRS functional hierarchy pertaining to this project as described in the Hanford Site Technical Database (Treat and Raymond, 1998).

1.3 SCHEDULE

Table 1-3 is a summary schedule of major subproject activities as described in the Project Plan (FDH 1998).

Table 1-2. Selected Tri-Party Agreement Milestones (from FDH 1998).

Milestone number	Title	Date
M-90-00	Complete acquisition of new facilities, modification of existing facilities, and/or modification of planned facilities as necessary for disposal of Hanford Site IHLW and ILAW, and storage of ILAW.	6 months after approval of PMP
M-90-01	Submit interim storage and disposal ILAW, and interim storage IHLW Project Management Plans (PMP) to Ecology pursuant to Agreement section 11.5.	December 1997
M-90-02T	Complete ILAW interim storage facility conceptual design.	June 1998
M-90-07T	Complete Conceptual Design of ILAW Additional Storage Facilities	June 2000
M-20-57	Submit interim ILAW facility Part B Permit application to Ecology	December 2000
M-90-03	Initiate ILAW interim storage facility construction.	June 2001
M-90-04T	Complete ILAW interim storage facility detailed design.	June 2001
M-90-06	Initiate hot operations of ILAW interim storage facility.	December 2002
M-90-09T	Compose detailed design–ILAW Additional Storage and Disposal	March 2003
M-90-08	Key Decision 3 - Initiate Construction–ILAW Additional Storage and Disposal	June 2003
M-20-00	Submit Part B permit application or closure/post-closure plans for all RCRA TSD units. Permit applications, closure, and post-closure plans will be submitted to Ecology and/or EPA for approval in accordance with their respective authorities	December 2003
M-20-58	Submit interim ILAW disposal facility Part B Permit application to Ecology	December 2003
M-90-05T	Submit Final PA to Ecology for Review	March 2004
M-90-10	Initiate Hot Operations-ILAW Disposal Module 1	December 2005

Ecology = Washington State Department of Ecology.
EPA = U.S. Environmental Protection Agency.
IHLW = immobilized high-level waste.
ILAW = immobilized low-activity waste.
PA = performance assessment.
PMP = project management plans.
RCRA = *Resource Conservation and Recovery Act of 1976*
TSD = treatment, storage, and disposal

Figure 1-1. Systems Engineering Functional Hierarchy.

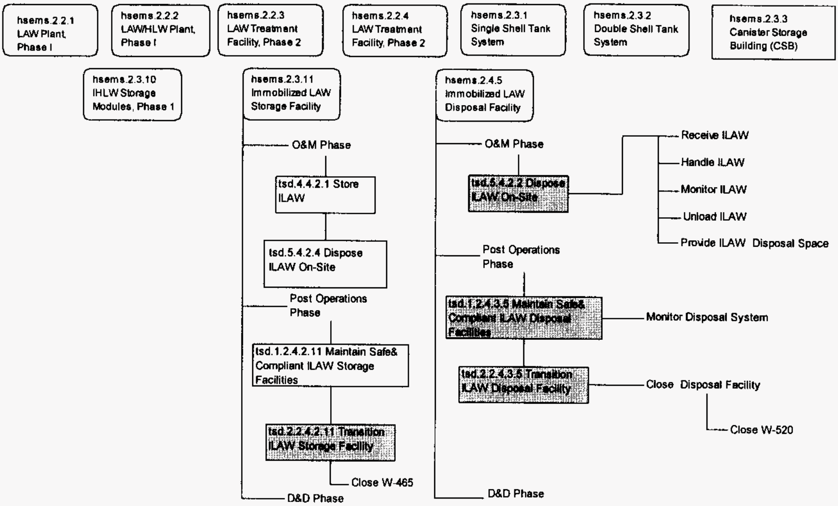

Table 1-3. Major Subproject Activities and Activity Durations.

Activity	Start	Finish
Phase 1		
W-465 Conceptual Design	2-97	12-97
NEPA/RCRA	10-97	10-01
Safety Authorization Basis	10-97	5-02
W-465 Adv Conceptual Design	10-98	9-99
W-465 Detailed Design	10-99	3-01
Modify Vaults	7-00	4-02
Operations	6-02	8-05
Phase 2		
Performance Assessment	10-97	12-01
Safety Authorization Basis	10-97	9-00
W-520 Conceptual Design	2-98	12-98
W-520 Adv Conceptual Design	1-99	9-00
Permits	9-99	3-03
W-520 Detailed Design	10-00	9-02
W-520 Construction	10-02	10-04
Operations	9-05	9-11

NEPA = National Environmental Policy Act of 1969
RCRA = Resource Conservation And Recovery Act of 1976

2.0 APPLICABLE DOCUMENTS

The documents listed in Tables 2-1 through 2-3 shall form a part of this specification to the extent specified. In the event of conflict between the contents of the documents referenced in the tables and the contents of this specification, the contents of this specification shall take precedence. All documents listed are the latest versions for the purposes of this DRD.

2.1 GOVERNMENT DOCUMENTS

Federal and Washington State regulations, along with DOE orders, have been reviewed to determine constraints applicable to the design, construction, and operation of the ILAW Disposal Project to the extent specified. To the extent specified, the references listed in Table 2-1 represent requirements imposed on the ILAW Disposal Project by sources outside the TWRS program.

Table 2-1. Applicable Constraint Documents. (4 sheets)

Document Identifier	Title
10 CFR 20	Standards for Protection Against Radiation
10 CFR 61	Licensing Requirements for Land Disposal of Radioactive Waste
10 CFR 830	Nuclear Safety Management, Subpart A, General Provisions, Section 830.120, Quality Assurance Requirements
10 CFR 834	Radiation Protection Standards
10 CFR 835	Occupational Radiation Protection
10 CFR 962	Byproduct Material
10 CFR 1021	National Environmental Policy Act
29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1926	Safety and Health Regulations for Construction
36 CFR 800	Protection of Historic and Cultural Properties
40 CFR 50	EPA Regulations on National Primary and Secondary Air Quality Standards
40 CFR 52	Approval and Promulgation of Implementation Plans
40 CFR 61	National Emission Standards for Hazardous Air Pollutants
40 CFR 141	National Primary Drinking Water Standards
40 CFR 260	Hazardous Waste Management System: General
40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste

Table 2-1. Applicable Constraint Documents. (4 sheets)

Document Identifier	Title
40 CFR 264	Standards for Owners and Operators of Hazardous Waste Treatment, Disposal, and Disposal Facilities
40 CFR 268	Land Disposal Restrictions
49 CFR 172	Hazardous Materials Designations
49 CFR 173	Hazardous Materials Packaging Requirements
50 CFR 402	Interagency Cooperation—Endangered Species Act
Bernero 1993	Bernero, NRC letter dated March 2, 1993
DOE/EIS-0189, SEN-35-91	Radioactive Air Emissions, Nuclear Safety Policy
DOE 96-RTI-035	Infrastructure/Transportation
DOE RL 91-28	Hanford RCRA Permit
DOE Order 430.1	Life-Cycle Asset Management
DOE M 435.1	Radioactive Waste Manual
DOE Order 1540.2	Hazardous Material Packaging for Transportation - Administrative Procedures
DOE Order 5400.1	General Environmental Protection Program
DOE Order 5400.5	Radiation Protection of the Public and the Environment
DOE Order 5440.1E	National Environmental Policy Act Compliance Program
DOE Order 5480.3	Safety Requirements for the Packaging and Transportation of Hazardous Materials, Hazardous Substances, and Hazardous Waste
DOE Order 5480.4	Environmental Protection, Safety, and Health Protection Standards
DOE Order 5480.7A	Fire Protection
RL ID 5480.7	Fire Protection
DOE Order 5480.10	Contractor Industrial Hygiene Program
DOE Order 5480.11	Radiation Protection for Occupational Workers
DOE Order 5480.19	Conduct of Operations Requirements for DOE Facilities
DOE Order 5480.20A	Personnel Selection, Qualification, Training, and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities
DOE Order 5480.21	Unreviewed Safety Questions
DOE Order 5480.22	Technical Safety Requirements
DOE Order 5480.23	Nuclear Safety Analysis Reports
DOE Order 5480.24	Nuclear Criticality Safety
DOE Order 5480.28	Natural Phenomena Hazards Mitigation
DOE Order 5481.1B	Safety Analysis and Review System

Table 2-1. Applicable Constraint Documents. (4 sheets)

Document Identifier	Title
DOE Order 5483.1A	Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned Contractor-Operated Facilities
DOE Order 5500.7B	Emergency Operations Records Protection Program
DOE Order 5700.6C	Quality Assurance
DOE Order 5820.2A	Radioactive Waste Management
DOE Order 6430.1A	General Design Criteria
DOE-STD-1073-93	Documentation
MIL-STD-1472E	Human Engineering Design Criteria for Military System Equipment and Facilities
Tri-Party Agreement	Hanford Federal Facility Agreement and Consent Order (Amendment 6)
WAC 173-216	200 Area Liquid Waste Disposal Acceptance Criteria
WAC 173-303	Dangerous Waste Regulations
WAC 173-304	Minimum Functional Standards for Solid Waste Handling
WAC 173-400	General Regulations for Air Pollution Sources
WAC 173-401	Operating Permit Regulation
WAC 173-460	Controls for New Sources of Toxic Air Pollutants
WAC 173-480	Ambient Air Quality Standards and Emission Limits for Radionuclides
WAC 197-11	Washington State Environmental Policy Act Rules, Department of Ecology
WAC 246-220	Radiation Protection--General Provisions
WAC 246-247	Radiation Protection - Air Emissions
WAC 246-272	On-Site Sewage Systems
WAC 246-290	Public Water Supplies
WAC 296-24	General Safety and Health Standards
WAC 296-45	Safety Standards, Electrical Workers
WAC 296-46	Safety Standards--Installing Electrical Wires and Equipment--Administrative Rules
WAC 296-62	Safety Standards for Carcinogens

Table 2-1. Applicable Constraint Documents. (4 sheets)

Document Identifier	Title
WSDOT Specs for Roads	
2.01	Clearing and Grubbing and Roadside Cleanup
2.03	Roadway Excavation and Embankment
2.04	Haul
2.06	Subgrade Preparation
2.07	Watering
2.09	Structural Excavation
4.02	Gravel Bases
4.04	Ballast and Crushed Surfacing
5.04	Asphalt Concrete Pavement
7.02	Culverts
8.01	Erosion Control
8.11	Guardrail
8.20	Illumination, Traffic Signals and Electrical
8.21	Permanent Signing
8.22	Pavement Markings
WSDOT M 21-01	Standard Plans for Road, Bridge and Municipal Construction
WSDOT M 41-10	Standard Specifications for Roads, Bridge and Municipal Construction
WSDOT M 22-01	Design Manual
WSDOT M 41-01	Construction Manual
WSDOT M 41-10	Road, Bridge, and Municipal Construction
WSDOT M 46-01	Materials Branch Laboratory Manual

CFR = Code of Federal Regulations
EPA = U.S. Environmental Protection Agency
NRC = U.S. Nuclear Regulatory Agency
WAC = Washington Administrative Code.
WSDOT = Washington State Department of Transportation

2.2 NON-GOVERNMENT DOCUMENTS

Table 2-2 lists nongovernment documents that contain requirements applicable to ILAW disposal.

Table 2-2. Company-Wide Controlled Manuals and Other Applicable Codes. (5 sheets)

Document identifier	Title
AASHTO	A Policy on Geometric Design of Highways and Streets
ACGIH	Ceiling Threshold Limits
ACI 318/rH	Building Code Requirements for Structural Concrete
AISC	Manual of Steel Construction

Table 2-2. Company-Wide Controlled Manuals and Other Applicable Codes. (5 sheets)

Document identifier	Title
ASME	Boiler and Pressure Vessel Code, Section VIII, American Society of Mechanical Engineers
ASME-NQA-1	Documentation/QA-Quality Assurance Program Requirements for Nuclear Facilities
ANSI C29.1 through 9	Insulators
ANSI C84.1	American National Standards for Voltage Ratings for Electrical Power Systems and Equipment
ANSI D6.1	Manual on Uniform Traffic Control Devices for Streets and Highways
ANSI O5-1	Wood Poles - Specifications and Dimensions
ANSI/ASHRAE Standard 55-1992	Thermal Environmental Conditions for Human Occupancy
ANSI/ASHRAE Standard 62-1989	Ventilation for Acceptable Indoor Air Quality
ASHRAE/IESNA Standard 90.1-1989	Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings
ANSI/ANS-3.2-88	Documentation
ANSI/IEEE C2	National Electrical Safety Code
ANSI/IEEE C62.11	Metal-Oxide Surge Arresters for Alternating Current Power Circuits
ANSI/IEEE C136 Series	Roadway Lighting Equipment
ANSI/ISA	Graphic Symbols for Process Displays
ANSI/ISA	Instrument Loop Diagrams
ANSI/ISA (R)	Binary Logic Diagrams for Process Operations
ANSI/ISA	Instrumentation Symbols and Identification
ANSI/ASME B30.2	Overhead and Gantry Cranes
ANSI B30.17	Overhead and Gantry Cranes
ANSI/NEMA TC 8	Extra-Strength PVC Plastic Utilities Duct for underground Installation
ASCE 7	Minimum Design Loads for Buildings and Other Structures
ASCE 52	Guide for Design of Steel Transmission Towers
ASCE 72	Design of Steel Transmission Pole Structures
ASTM B-232	Standard Specifications for Concentric-Lay-Stranded Aluminum Conductors, Coated Steel Reinforced
ASTM D-653	Standard Terminology Relating to Soil , Rock, and Contained Fluids
HNF-SD-SEMP-002 Rev. 1	Tank Waste Remediation Systems (TWRS) Systems Engineering Management Plan
HSRCM-1	Hanford Site Radiological Control Manual

Table 2-2. Company-Wide Controlled Manuals and Other Applicable Codes. (5 sheets)

Document identifier	Title
IEEE 751	Trial-Use Design Guide for Wood Transmission Structures
IEEE C135 Series	Pole Line Hardware Standards Collection
IEEE 32	Standard Requirements, Terminology, and Test Procedures for Neutral Grounding Devices
IEEE 485	Recommended Practice for Sizing Large Lead Storage Batteries for Generating Stations and Substations
IEEE C37.91	Guide for Protective Relay Applications to Power Transformers
IEEE 80	Guide for Safety in AC Substation Grounding
IEEE 242	Recommended Practice for Protection and Coordination for Industrial and Commercial Power Systems
IEEE 484	Recommended Practice for Installation Design and Installation of Large Lead Storage Batteries for Generating Stations and Substations
IEEE 1119	Guide for Fence Safety Clearances in Electric-Supply Substations
IEEE 837	Standard for Qualifying Permanent Connections Used in Substation Grounding
IEEE 399	Recommended Practice for Power Systems Analysis
IEEE 493	Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems
IEEE 1127	Guide for the Design, Construction, and Operation of Safe and Reliable Substation Environmental Acceptance
IEEE 751	Trial-Use Design Guide for Wood Transmission Structures
IEEE 1048	Guide for Protective Grounding for Power Lines
IEEE 142	Recommended Practice for Grounding of Industrial and Commercial Power Systems
IEEE 91-1984	IEEE Standard Graphic Symbols for Logic Functions
IEEE C12	Electricity Metering Standards Collection
IEEE 141	Recommended Practice for Electric Power Distribution for Industrial Power Systems
IEEE 1313	Standard For Power Systems, Insulation Coordination
IEEE 980	Guide for Containment and Control of Oil Spills in Substations
IEEE C37-series	Circuit Breakers, Switchgear, Substations, and Fuses Standards Collection
IEEE C57-series	Distribution, Power, and Regulating Transformers Standards Collection
IEEE C135-series	Pole Line Hardware Standards Collection
IEEE C62	Surge Protection Standards Collection

Table 2-2. Company-Wide Controlled Manuals and Other Applicable Codes. (5 sheets)

Document identifier	Title
IES HB-93	Lighting Handbook Application and Reference Volume
NEMA LA1	Surge Arresters
NEMA WC7-1988	Cross-Linked Thermosetting Polyethylene Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA WC8	Ethylene-Polyethylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA RN1	Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit
NEMA TC2	Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)
NEMA TC8	Extra Strength PVC Plastic Utilities Duct for Underground Applications
NEMA 250	Enclosures for Electrical Equipment (1,000V Maximum)
NEMA VE1	Metallic Cable Tray Systems
NEMA WC5	Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
NEMA ICS6	Industrial Controls and Systems: Enclosures
NFPA 72	National Fire Alarm Code
NFPA 780	Lightning Protection Code
NFPA 241	Standard for Safeguarding Construction, Alteration, and Demolition Operations
NFPA 101	Code for Safety of Life from Fire in Buildings and Structures
NFPA 24	Installation of Private Fire Service Mains and Their Appurtenances
NFPA 220	Types of Building Construction
NFPA 70	National Electrical Code
NFPA 13	Installation of Sprinkler Systems
UBC	Uniform Building Code Volume 1 (Administrative, Fire & Life Safety & Field Inspection Provisions), Volume 2 (Structural Engineering Design Provisions), and Volume 3 (Materials, Testing & Installation Standards)
UL	Standard for Safety, Medium Voltage Cables
HNF-MP-599	FDH Quality Assurance Program Description
HNF-PRO-097	Engineering Design and Evaluation
HNF-PRO-261	Quality Assurance Program Plans
HNF-PRO-451	Regulated Substance Management
HNF-PRO-506	Radiation Protection (Formerly IP-1043)

Table 2-2. Company-Wide Controlled Manuals and Other Applicable Codes. (5 sheets)

Document identifier	Title
HNF-PRO-704	Hazard and Accident Analysis Process
HNF-PRO-562	Conceptual Design Report
WHC-EP-0750	ALARA Design
WHC-EP-0063-4	Hanford Site Solid Waste Acceptance Criteria
WHC-SD-ETF-WAC-001	Acceptance of Feed Streams for Disposal and Treatment at the LERF/ETF Complex

AASHTO = American Association of State Highway and Transportation Officials
ACGIH = American Conference of Governmental Industrial Hygienists
ACI = American Concrete Institute
AISC = American Institute of Structural Concrete
ANSI = American National Standards Institute
ASHRAE = American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME = American Society of Mechanical Engineers
ASTM = American Society of Testing of Materials
ETF = Effluent Treatment Facility
HSRCM = Hanford Site Radiological Control Manual
IEEE = Institute of Electronic and Electrical Engineers
IES = Illumination Engineering Society of North America
ISA = Instrument Society of America
LERF = Liquid Effluent Retention Facility.
NEMA = National Electrical Manufacturers Association
NQA = Nuclear Quality Assurance
UL = Underwriters Laboratory

2.2.1 Hanford Site Documents/Other

Selected DOE orders and federal and Washington State regulations have been reviewed by the Project Hanford Management Contractor (PHMC) to provide a consistent interpretation of the constraints for application at the Hanford Site. These constraints are represented in site-wide procedures (HNF-PRO-xxx).

2.2.2 Information Documents

Table 2-3 lists other information documents.

Table 2-3. Information Documents. (2 sheets)

Document identifier	Title
FM 5-4/14-8	Loss Prevention Data Sheet on Transformers
FM 5-31/14-5	Loss Prevention Data Sheet on Cables and Busbars

Table 2-3. Information Documents. (2 sheets)

Document identifier	Title
WHC-SD-LL-ES-034	Electrical Utilities Distribution System Protective Relay Setting Guidelines
WHC-SD-WM-ICD-036	Interface Control Document for Electricity
WHC-SD-WM-ES-393	Engineering Study for the Phase 1 Privatization Facilities Electrical Power
WHC-SD-GN-DGS-3011	Radiological Design Guide
DOE/RL-92-36	Hanford Site Hoisting and Rigging Manual
CMAA-70	Electric Overhead Traveling Cranes

CMAA = Crane Manufacturer's Association of America

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3.0 PROJECT FUNCTIONS AND REQUIREMENTS

3.1 DEFINITIONS

This chapter covers the functions, requirements, and external interfaces for the ILAW disposal system.

3.1.1 Project Definition

The *Hanford Site Technical Database* (Treat, 1998) established Function tsd.5.4.2.4: Dispose Immobilized LAW On-Site. The activities of the Dispose ILAW function are to receive containers loaded with ILAW packages provided by the immobilization vendors from the LLW Immobilization Facility, place the waste packages in their designated disposal locations, monitor the disposal integrity, and close the facility. The LLW Immobilization Facility loads the shipping containers with packages of ILAW. The Transport ILAW function collects the loaded shipping containers and transports them to the disposal area or the storage area as required.

The ILAW disposal project shall provide equipment and facilities for accomplishing the disposal (tsd.5.4.2.4). The scope of the ILAW Disposal Project includes the design and construction of a facility where ILAW packages are received, unloaded from transport containers, placed in the disposal area, and monitored after disposal. Monitoring consists of those requirements in DOE M 435.1 and applicable RCRA requirements from 40 CFR 264 and WAC-173-303. New infrastructure and upgrades to the existing infrastructure are part of this project. Disposal site closure, including placing cover systems, is also in the scope of this project.

Using systems engineering procedures, the Dispose ILAW functions have been further separated into the following subordinate functions essential for the performance of the system.

3.1.2 Disposal Functions

The following disposal functions and their associated numbers were taken from the Hanford Site Technical Database (Treat and Raymond, 1998).

- **tsd.5.4.2.2 Dispose ILAW On-Site**

  Receive ILAW. The disposal facility shall have the capability to receive and ship ILAW packages in shipping containers on a transport vehicle.

  Handle ILAW. The facility shall be capable of handling ILAW packages and placement within the disposal area.

Monitor ILAW. The facility shall be capable of initially visually inspecting the integrity of the ILAW packages destined for disposal, leak detection, leachate collection, and post-disposal facility monitoring.

Unload ILAW. The facility shall have the capability to load and unload a waste package into and out of the shipping container.

Provide ILAW Disposal Space. The facility shall provide space suitable for disposing of the ILAW packages safely.

- **tsd.1.2.4.3.5 Maintain Safe and Compliant ILAW Disposal Facilities**

  Monitor Disposal System. The facility shall provide post-operational monitoring of leak detection and leachate collection systems and other key indicators.

- **tsd.2.2.4.3.5 Transition ILAW Disposal Facility**

  ILAW Disposal Unit Closure. The facility shall be closed as a LLW Disposal Unit.

- **tsd.2.2.4.2.11 Transition ILAW Storage Facility**

  ILAW Storage Unit Closure. Project W-520 shall provide a design for the closure of the Project W-465 ILAW storage facility.

3.2 CHARACTERISTICS

Characteristics are the specific constraints and expected system performance requirements identified for the ILAW Disposal project. Where specific requirements have not been identified for a characteristic, the appropriate section notes that no requirements have been identified. If additional information must be developed to verify or derive a requirement, the appropriate section identifies the related issue and describes the analysis necessary to resolve it.

3.2.1 Disposal Function Performance Characteristics

This section provides the design criteria for the disposal functions of the ILAW disposal project. These criteria are based on the strategy identified in the analysis of alternatives report (Burbank 1997) for the ILAW disposal alternatives. A diagram representing a concept for ILAW disposal is shown in Figure 3-1. The design shall facilitate simultaneous operations and construction of new disposal vaults.

3.2.1.1 Receiving. The ILAW disposal facility shall be capable of receiving no fewer than 27 full transport containers per operating day. This is the peak rate for Phase 2, Phase 1 will not achieve that rate. Phase 1 will have a peak rate of 9 packages/day. However, the infrastructure shall be designed to allow for the Phase 2 rate of 27/day.

3.2.1.2 Package Handling. The ILAW disposal facility shall be capable of handling waste packages for placement and retrieval within the disposal area and the shipping/receiving area. Packages shall be handled by crane and/or forklift. Package handling equipment shall be remotely operated and/or shielded to minimize operator exposure to radiation. Package handling will require lifting packages weighing up to 10,000 kg to heights up to 10 meters and horizontal movement distances up to 35 meters.

3.2.1.3 Monitoring and Control. The ILAW facility shall be capable of monitoring and controlling the movement, placement, and disposal of waste packages into the disposal area. Information about the identity and location of waste packages shall be maintained in an electronic database. The ILAW facility shall be monitored for the presence of free liquids using leak collection and detection systems in accordance with RCRA and/or other applicable requirements. Post-closure monitoring shall comply with requirements in DOE M 435.1 and applicable RCRA requirements from 40 CFR 264 and WAC-173-303. Waste packages shall be remotely handled using a crane that is controlled and monitored from a central control room.

> **Issue**: The stored ILAW is assumed to have the status of a *Resource Conservation and Recovery Act of 1976* (RCRA)-listed waste. Pending changes in the U.S. Environmental Protection Agency (EPA) Hazardous Waste Identification and Listing Rules may allow the ILAW to be removed from the RCRA list.
>
> **Required Analysis**: The regulatory impacts these pending changes could have on the ILAW disposal project must be formally analyzed. The analysis should consider the potential for ILAW to be removed from RCRA jurisdiction, and the impacts on design, operating, maintenance, and monitoring requirements if the ILAW can be removed from the RCRA system.

3.2.1.4 Unloading. Each operating day the ILAW disposal facility shall be capable of unloading no fewer than 9 packages (during phase 1) and 27 packages (during phase 2) from transport containers.

> **Issue**: Loading and unloading waste packages out of the transport container will be a remote operation because of the expected radiation dose rate from the waste package. The configuration of the transport container and the design of the unloading area depends on the operating strategy for this operation.
>
> **Required Analysis**: An analysis to determine the operating strategy for moving waste packages from the transport container is required. The analysis will determine whether or not the transport container is to be removed from the transport vehicle during this operation.

Figure 3-1. Immobilized Low-Activity Waste Disposal Concept.

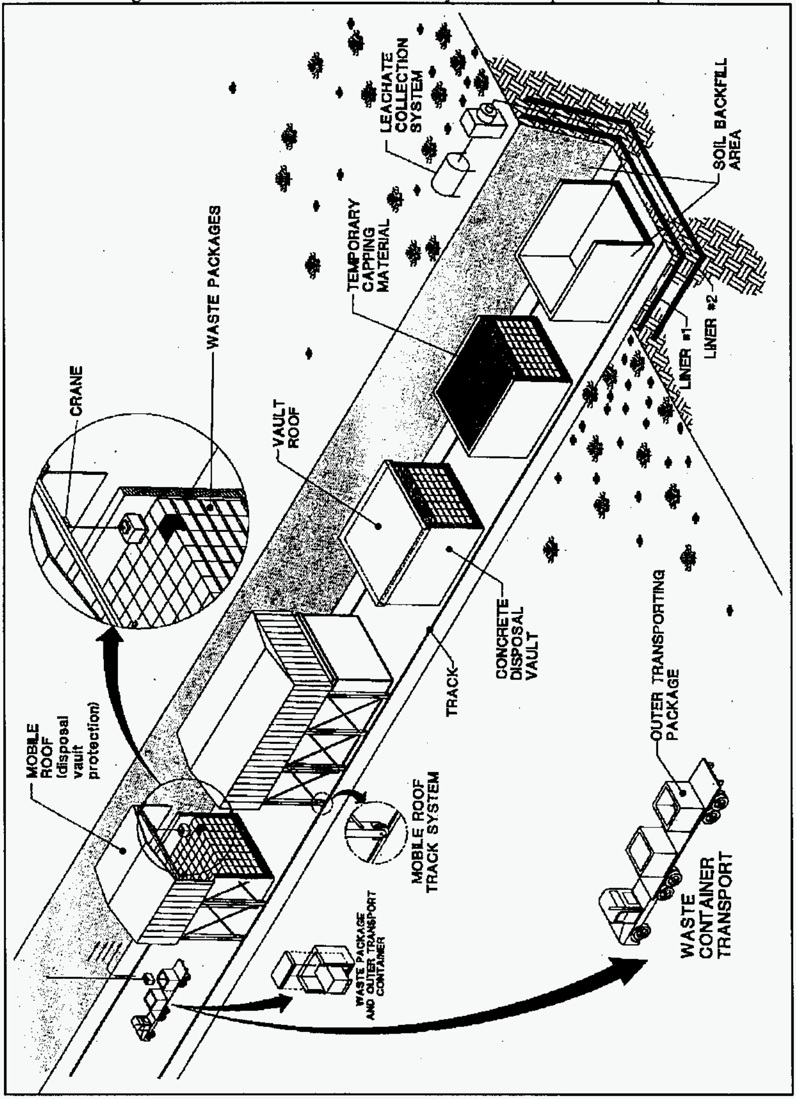
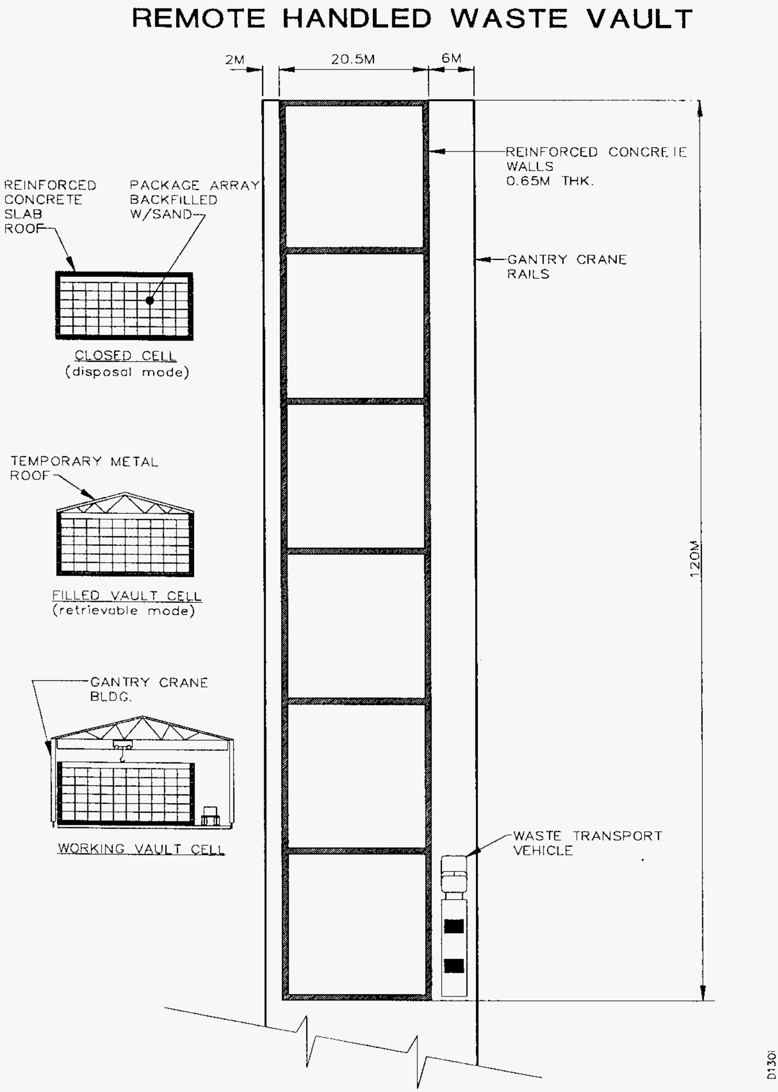


Figure 3-2. Remote Handled Waste Vault Concept.



3.2.1.5 Provide Disposal Space. The disposal area shall consist of vaults provided by this project. Waste packages shall be stacked no more than 7.2 m (nominally, six packages high based on current packages size) with allowance for freeboard (DOE 1998). Horizontal package spacing shall allow backfill penetration of spaces while accommodating floor space. All required disposal systems shall be designed in accordance with the requirements specified in documents in Table 2-1. The facility hazardous classification developed by the preliminary safety evaluation (PSE) will dictate the design criteria for the disposal vaults.

Vaults (containment systems) trenches and liners shall be provided. A liner system including a leachate collection and leak detection system shall be provided, depending on the waste type, as discussed in previous studies (Burbank 1997). The total capacity of the disposal system shall be 259,000 m^3 of waste. Project W-520 shall provide 26,000 m^3 of this capacity. The site layout based on the current performance assessment (DOE 1998) shall be oriented such that the cumulative width of the disposal units is greater than 150 m (i.e., the North-South longitudinal coordinate perpendicular to groundwater flow > 150 m). The layout was determined in the analysis of alternatives (Burbank 1997) based on the performance assessment (DOE 1998).

3.2.1.6 Closure of the Facility. Facility closure will include this facility and the grout vaults covered under Project W-465. The current design baseline for interim grout vault storage (Project W-465) is for all waste packages to be retrieved for transport to the ILAW disposal facility once it is operating. Package handling equipment would be removed and the interim storage facility would be backfilled to prevent subsidence. In this case, the W-465 facility will be suitable for clean closure after all waste and handling equipment is removed. An alternative strategy that will be evaluated is to leave the waste stored in the grout vaults under Project W-465 in place and close the storage facility as a disposal unit. In this case, the space around and above the packages would be backfilled with porous media that could include absorbents to reduce the long-term release rate from the waste.

The closure function shall include designing a barrier/cover system over the disposal site to reduce infiltration of water and intrusion by man, animals and plants. The modified RCRA subtitle C surface barrier shall be used for sites containing dangerous waste, Category 3 LLW and/or Category 3 mixed LLW, and Category 1 mixed LLW (DOE 1993). This barrier is designed to provide long-term containment and hydrologic protection for 500 years. The 500-year performance period is based on radionuclide concentration and activity limits for Category 3 LLW. The Modified RCRA Subtitle C Barrier is composed of 8 layers of durable material with a combined minimum thickness of 1.7 m (5.5 ft). One major change is the elimination of the clay layer, which may desiccate and crack over time in an arid environment. The geomembrane component also has been eliminated because of its uncertain long-term durability. The design incorporates provisions to control biointrusion and human intrusion.

Closure activities shall be performed under RCRA (40 *Code of Federal Regulations* [CFR] 264, 268, and 270 and *Washington Administrative Code* [WAC] 173-303 and -304) and DOE orders (5400 series and 5820.2A).

The closure function shall provide appropriate equipment for back-filling spaces within the containment structures. This includes the design or procurement of a system to accommodate backfilling on a layer-by-layer basis and filling of the disposal system after the packages have been placed in position.

3.2.2 Infrastructure Characteristics

This section describes the characteristics of the infrastructure portion of the ILAW disposal facility.

3.2.2.1 Site Clear and Grub. Sagebrush, roots, and other objects resting on or protruding through the surface where foundations are to be placed for disposal units, transmission line, conduit, piping, and structures shall be completely removed and disposed of. Trees that can grow beyond the minimum prescribed distance to underground utilities shall be completely removed. Activities shall meet the requirements of 36 CFR 800, "Protection of Historic and Cultural Properties," 50 CFR 402, "Endangered Species Act," and DOE Order 6430.1A. The ash pile at the northwest corner of the site shall be relocated or disposed in accordance with appropriate requirements from Tables 2-1 and 2-2.

3.2.2.2 Cut and Fill to Rough Grade. The site shall be graded and sloped to provide surface drainage, level areas for equipment, erosion control, elimination of standing water, and diversion of water from the site to the natural drainage area in accordance with DOE Order 6430.1A. All earthmoving activities shall meet the requirements of 36 CFR 800 and 50 CFR 402.

3.2.2.3 Perimeter Fencing and Signs. Perimeter fencing and signs shall be posted in accordance with DOE Order 6430.1A requirements for property protection areas. The facility shall be enclosed by fences to prevent the entrance of animals and unauthorized persons who might, willfully or through negligence, damage equipment or injure themselves. Fences shall be provided to enclose individual pieces of outdoor electrical apparatus having exposed live parts less than the minimum prescribed distance above ground. Perimeter fencing and specific equipment isolation fencing shall be designed following the guidance of Section 0280 of DOE Order 6430.1A and shall comply with IEEE 1119, *Guide for Fence Safety Clearances in Electric-Supply Substations*.

3.2.2.4 Site Drainage Storm Water Control. The site shall be graded and sloped to provide surface drainage, level areas for equipment, erosion control, elimination of standing water, and diversion of water from the site to the natural drainage area. Storm water and site drainage systems shall be designed in accordance with DOE Order 6430.1A.

3.2.2.5 Site Lighting. The lighting level shall conform to the requirements of the IES Lighting Handbook as required by DOE Order 6430.1A. Protective lighting shall be provided for security purposes, as required, in accordance with DOE Order 6430.1A. The lighting power budget shall be determined in conformance with ASHRAE/IESNA Standard 90.1. Exit and emergency lighting systems shall comply with National Fire Protection Association (NFPA) Code 101.

3.2.2.6 Roadways. New and upgraded roadways shall be provided according to specifications in Table 2-1 and as determined by the site development plan. Section 0250-3 of DOE Order 6430.1A specifies geometry and gradients be designed in accordance with American Association of State Highway and Transportation Officials (AASHTO) GDHS-84, which has been superseded by *A Policy on Geometric Design of Highways and Streets* (AASHTO). Pavements design shall conform with Washington State Department of Transportation (WSDOT), *Standard Specifications for Road, Bridge and Municipal Construction*, M 41-10-94, and WSDOT *Design Manual*, M 22-01. Signing, pavement markings and channelization shall comply with the *Manual on Uniform Traffic Control Devices for Streets and Highways*, ANSI 6.1 (ANSI) and DOE Order 6430.1A. Roadway lighting shall comply with IES Lighting Handbook HB-93 and ANSI C 136 series (ANSI). Electrical installation related to traffic control devices and roadway lighting shall be in accordance with National Electrical Code, NFPA-70 (NFPA).

For roads and miscellaneous site grading, materials shall consist of native and imported materials meeting the following WSDOT specifications:

9-02, *Bituminous Materials*
9-05, *Drainage Structures, Culverts and Conduits*
9-14, *Erosion Control and Roadside Planting*
9-16, *Fence and Guardrail*
9-28, *Signing, Materials and Fabrication*
9-29, *Illumination, Signing, Electrical.*

3.2.2.7 Utilities. The Infrastructure portion of the system shall provide utilities within the disposal facility site and connection to existing onsite utility infrastructure, as well as relocation or removal of the existing above-grade steam line along the north boundary and the buried 24" water main that crosses the site.

3.2.2.7.1 Electrical. The TWRS privatization contracts (DOE 1996b and 1996c) state that the DOE will provide and maintain an electrical distribution system capable of delivering up to 20 megawatts (MW) of electrical power, 13.8 kilovolts (kV), 60 hertz (Hz), three-phase alternating current (AC), to the privatization contractor's site electrical distribution system. Details of this are provided in the *Design Requirements Document For The Phase 1 Privatization Electrical Power System*, HNF-SD-WM-DRD-011 (Singh 1997).

A single substation shall be located at the ILAW Disposal Facility to transform the 13.8 kV feed to end-usable 110/230/460 V, 60 Hz, AC power. The feed will be the existing 13.8 kV distribution line that runs south and east of the PUREX facility. Power requirements include building, indoor and outdoor lighting systems, crane systems, HVAC power, and other services necessary for normal occupancy, site requirements, safety and security, and operations.

Issue: It is not known if the 13.8 kV feed will meet the facility's power requirements.

Required Analysis: The power required must be determined for the facility.

All electrical devices shall conform to National Electrical Code and NFPA 70, IEEE, and NEMA standards. Electrical power systems shall be designed in accordance with appropriate codes and standards as provided in Table 2-2.

3.2.2.7.2 Potable Water. Potable water shall be provided for the work force (Table 3-1) in accordance with WAC 246-290, "Public Water Supplies." Sanitary (potable) water systems shall be shared with the other TWRS processing functions and provided via a shared water pumphouse allocated to the TWRS treatment and disposal projects. Sanitary water shall be separated from raw (nonpotable) water and fire water in accordance with the design criteria as stated in DOE Order 6430.1A. Sanitary water shall be used to supply water to the disposal facilities.

Table 3-1. Estimated Occupancy Requirements.

Classification	Maximum single shift	Total personnel
Manager	5	13
Engineer	6	9
Professional	6	14
Technician	4	17
Craftsman	13	59
Operator	10	50
General Office	3	5
Total	47	167

3.2.2.7.3 Fire Water. A dedicated fire water system shall be provided to the ILAW Disposal facility. Fire water system design, installation, flushing, and testing shall comply with the requirements of DOE Order 6430.1A (DOE 1989), Section 0266, NFPA 24 (NFPA 1995), and WAC 246-290. Raw water shall be used for fire protection The Disposal Facility Fire Water System requirements will be determined as part of the preliminary and final fire hazards analysis.

3.2.2.7.4 Sanitary Sewer. The system shall be designed and constructed to comply with the requirements of WAC 248-96 and the Benton-Franklin District Board of Health. The sanitary waste water collection system shall comply with the requirements of DOE Order 6430.1A, Section 0270-1. Excavations, trenching, and shoring shall comply with 29 CFR 1926, Subpart P. The sanitary sewer shall be connected to on-site systems near the disposal site. The portion of the sanitary sewer system within the ILAW Disposal Facility shall be designed for 7-day, 24-hour, 3-work-shift operation, and shall be sized for the maximum number of people on the most populous shift.

3.2.2.7.5 Telecommunications. Telecommunication services shall be secured from the Hanford Site Telecommunications group. Telecommunication services will include circuits for voice communications, data collection, supervisory control of components, etc. The telecommunications system is a dedicated system and shall be provided by the ILAW Disposal Project. The system shall consists of all equipment required to provide internal and external communications functions. The external telecommunications system will provide for telephone, emergency response, and data transfer into and out of the facility, including multiple connections to the Hanford Site local area network system (HLAN), while the internal telecommunications system will provide for communication within the facility. This system includes voice, video, spectrum-dependent communications and data communications required to support facility operations, maintenance, management, and emergency response.

Land-based trunk lines shall enter the disposal facility at a single location and be routed to the telecommunications room in the central control building. Distribution equipment will then route both hard-wired and wireless communications to the various areas of the facility.

3.2.2.8 Buildings/Architecture. All required support buildings, subsystems, and components, including utilities, fire protection, lightning protection and grounding, and heating, ventilation, and air conditioning (HVAC), shall be designed in accordance with the requirements specified in appropriate documents in Table 2-1 and 2-2. Buildings/architecture should include accessibility for the handicapped.

Issue: Buildings are assumed to be non-safety class, UBC zone 2B, category 3.
Required Analysis: Completion of the facility safety analysis.

3.2.2.8.1 Control Room. A control room shall be provided to house distributed process control systems, including up to four crane control consoles, inventory control and tracking systems, area alarms, monitoring instrumentation and surveillance systems. The control room shall be designed to accommodate the operating personnel listed in Table 3-1 as they perform package handling operations, monitoring and control activities.

3.2.2.8.2 Change/Locker Room. Locker and change rooms shall be sized to accommodate the total occupancy for craft workers, operators, and technicians as described in Table 3-1.

3.2.2.8.3 Administrative Space. The Disposal Complex Management System is a dedicated system provided by the ILAW Disposal Project. This system provides facilities for the management and support of the ILAW disposal operations. This system provides office space for operations and support personnel, as well as facilities for postal service, plant records retention, reprographics, training, and public outreach displays. Administrative office space is required for the administrative and management workers shown in Table 3-1.

3.2.2.8.4 Electrical Substation/Motor Control Center. An electrical substation or control center is required to house electrical equipment necessary to power the entire disposal facility including peripheral functions. This structure shall be designed in accordance with codes and standards listed in Tables 2-1 through 2-3.

3.2.2.9 Equipment Maintenance. The maintenance and repair system for non-radioactive and non-contaminated parts shall be shared with the 200 East fleet support operations. The system shall consist of repair areas, tools and equipment necessary to remove, maintain, and repair failed product handling equipment, transportation equipment, and other equipment required to operate the ILAW disposal facility and maintain peripheral support systems.

3.2.2.9.1 Truck and Forklift Maintenance. The 200 East fleet support facility shall provide routine maintenance and repairs for trucks and forklifts. Parking space for the entire truck fleet shall be provided at the ILAW disposal facility.

3.2.2.9.2 Crane Maintenance. The ILAW disposal facility shall provide specialized equipment and systems as needed for routine on-site maintenance and repair of cranes.

3.2.2.10 Security Access Control. Security access control shall be provided to meet the requirements of DOE Order 6430.1A, WAC 173-303-310, Security, and WAC-173-303-335, CQA program.

3.2.2.11 Transport Vehicles. A trucking fleet large enough to transport 9 packages per day for Phase 1 and 27 packages per day for Phase 2 shall be provided. The design shall be the same as used for Project W-465 with more trucks required for the additional throughput during Phase 2. The maximum gross weight of a fully loaded transport vehicle shall be no more than 45,000 kg.

3.2.2.12 Support Structure(s) and Systems. Support services in the form of uninterruptible power supply (UPS), solid waste handling, and radioactive and nonradioactive liquid waste collection and handling shall be provided as part of the facility. All support functions and infrastructure identified in Table 3-2 are included in the project scope. The ILAW Disposal Project shall include the support services indicated as "dedicated" in Table 3-2.

Table 3-2. Support and Infrastructure Function Definition. (2 sheets)

Function description	Location/provider	Shared versus dedicated
Collect and handle potentially radioactive liquid waste	Leachate Collection/ILAW Disposal	Dedicated
Disposal facility fire water system	Water pumphouse/Site Infrastructure	Shared
Disposal facility ventilation system	ILAW Disposal	Not required
Supply air treatment system	ILAW Disposal	Not required
Exhaust air treatment system	ILAW Disposal	Not required

Table 3-2. Support and Infrastructure Function Definition. (2 sheets)

Function description	Location/provider	Shared versus dedicated
Collection and handling of solid wastes	ILAW Disposal	Dedicated
Backup power system	Switchgear building/ILAW Disposal	Dedicated
Uninterrupted power system	Telecommunications room/ILAW Disposal	Dedicated
Personnel Protection System	ILAW Disposal	Dedicated
Maintenance and repair	Maintenance shop	Shared
Sanitary and raw water system	Water pumphouse/Site Infrastructure	Shared
Sanitary sewer system	Control building/ILAW Disposal	Shared
Tank Waste Remediation System treatment complex site fire water system	Water pumphouse/Site Infrastructure	Shared
Heating, ventilation and air conditioning system	Control Building/ILAW Disposal	Dedicated
Compressed air system	ILAW Disposal	Dedicated
Normal AC power system	Switchgear building/ILAW Disposal	Dedicated
Disposal process facility operations control system	Control building/ILAW Disposal	Dedicated
Major equipment assembly	ILAW Disposal	Dedicated
Spare parts fabrication	Offsite	Shared
Telecommunications system	Telecommunications room/ILAW Disposal	Dedicated
Treatment Complex Management System	Control building/ILAW Disposal	Dedicated
Employee Support System	Control building/ILAW Disposal	Dedicated
Shipping and receiving system, warehousing and disposal system, service yard	ILAW Disposal	Dedicated

ILAW = Immobilized Low Activity Waste.

Basis: *TWRS Process Support and Infrastructure Definition* (Leach 1995). Letter 95-RTI-034, G. Sanders, DOE, to President, WHC, *Common Support and Infrastructure for Tank Waste Remediation System (TWRS)* (Sanders 1995).

3.2.2.12.1 Collection and Handling of Potentially Radioactive Liquid Waste. No Requirements.

3.2.2.12.2 Disposal Facility Ventilation System. The ILAW product specifications require the waste packages to be contamination free and sealed, therefore no ventilation or confinement is required inside the disposal vaults.

3.2.2.12.3 Supply Air Treatment System. No requirements.

3.2.2.12.4 Exhaust Air Treatment System. No requirements.

3.2.2.12.5 Collect and Handle Solid Waste. This system will be a dedicated system provided by the ILAW Disposal Project. The requirements for solid waste management are found in Section 3.2.3.5.

3.2.2.12.6 Backup Power System. If required by the safety analysis, any backup power system shall be provided by the ILAW Disposal Project and meet the applicable requirements of DOE Order 6430.1A. The backup power system shall provide power to those functions required to maintain operation and bring the ILAW disposal facility into a safe shutdown condition in the event of a loss of normal AC power.

3.2.2.12.7 Uninterruptible Power Supply System. The ILAW Disposal Project shall provide a UPS system close to the equipment items requiring UPS support. The UPS system provides continuous power to equipment requiring continuous power during short-duration power outages.

3.2.2.12.8 Personnel Protection System. No requirements.

3.2.2.12.9 Heating, Ventilation, and Air Conditioning System. A dedicated HVAC system shall be provided by the ILAW Disposal Project. The HVAC system shall be designed to maintain the comfort of personnel in the control room, change rooms, locker rooms and other normally occupied indoor areas. The HVAC system shall meet applicable requirements in DOE Orders 6430.1A and other applicable federal, state, and local regulations.

3.2.2.12.10 Compressed Air System. If necessary, the compressed air system shall be a dedicated system that provides instrument air for pneumatically controlled or actuated package handling components and instrumantation.

3.2.2.12.11 Disposal Facility Operating Control System. The ILAW Disposal Project shall provide a distributed control system (DCS) to interface with disposal facility equipment and the central control room. The centralized control system monitors and controls remote operations, closed-circuit television (CCTV) systems, and inventory control systems.

The DCS shall be a special-purpose, functionally distributed, microprocessor-based system with hierarchical functions supervised or handled by the host computer in the central control room. The interface requirements to the central control system shall be defined as part of the ILAW Disposal Project design. The design of the DCS shall comply with these interface requirements.

The DCS shall monitor and control the disposal facility operations, and support services; provide product inventory control; physical parameters required by DOE M 435.1; and process manual requests and data input. Standard vendor-supplied software shall be used and shall be able to call up real-time displays and historical data. The distributed microprocessors shall have execution speeds, scan rates, transmission rates, and loadings appropriate to ensure control of the facility or process.

The installed spare capacity of system hardware such as input, output, memory, peripheral, and additional DCS devices shall be at least 25 percent.

3.2.2.12.12 Major Equipment Assembly. Major equipment assembly will be a dedicated system provided by the ILAW Disposal Project. This system provides for the assembly of new, in-vault equipment before installation in the disposal facilities. Sufficient space and parts to expand the number of cranes needed and to replace or relocate cranes shall be provided.

3.2.2.12.13 Spare Parts Fabrication. The spare parts fabrication function is a shared (not distance-constrained) function provided by the project. The spare parts fabrication function shall provide for the manufacture and assembly of small equipment items and spare parts required for the operation and maintenance of the ILAW disposal facilities and transport equipment.

3.2.2.12.14 ILAW Disposal Management System. No requirements.

3.2.2.12.15 Employee Support System. This is a dedicated system provided by the ILAW Disposal Project. The employee support system provides for amenities required to enhance worker comfort and morale. This system shall consist of lunch rooms, vending machine areas, toilet facilities, parking lots, and items aimed at enhancing the work environment.

3.2.2.12.16 Shipping and Receiving System, Warehousing, and Disposal System, and Service Yard. This is a dedicated system provided by the ILAW Disposal Project. The shipping and receiving system shall provide for the receipt, inspection, and inventory control of waste packages, equipment, spare parts, and miscellaneous goods delivered to the ILAW disposal facilities. The system also provides for packaging and distributing these items to the process and process support facilities within the ILAW disposal facilities.

3.2.2.13 Electromagnetic Radiation. No requirements.

3.2.3 External Interface Requirements

The interfaces to the ILAW Disposal Project consist of programmatic and administrative interfaces, physical interfaces, and functional interfaces. The ILAW Disposal Project shall interface with the existing TWRS infrastructure, new and existing facilities, and other DOE and privatized projects. External interfaces for the ILAW Disposal Project are shown in Figure 3-3.

The primary physical interfaces for the ILAW Disposal Project are those necessary for the following: receipt of waste packages, transfer of waste packages to the ILAW disposal area, and transfer of empty shipping containers to interfacing Hanford Site programs.

3.2.3.1 ILAW Disposal Site Location. The ILAW disposal facilities shall be located on 90 acres of uncontaminated land in the 200 East Area, south of 4th Street, east of Baltimore Avenue, and southwest of the PUREX facility. The control and operations buildings shall be in the vicinity of the disposal site.

Basis: Analysis of Alternatives for Immobilized Low-Activity Waste Disposal (Burbank 1997).

3.2.3.2 ILAW Waste Package. The ILAW disposal facilities shall interface with the waste package described in the privatization contracts (DOE 1996b). The details of the package specification that affect the ILAW disposal project interface are described in Sections 3.2.3.2.1 through 3.2.3.2.17. Additional requirements apply to the waste package for the private vendor, however they do not affect the project interfaces or the design requirements of the ILAW Disposal Project.

3.2.3.2.1 Package Description. The ILAW products will be in the form of a package. The constituent parts of each package are a sealed metal container enclosing a waste form, in which the ILAW product is emplaced; an optional matrix material, which may be used to encapsulate the waste form; and an optional filler material, which may be used to fill void spaces in the container before it is closed.

W-520 ILAW DISPOSAL EXTERNAL INTERFACES

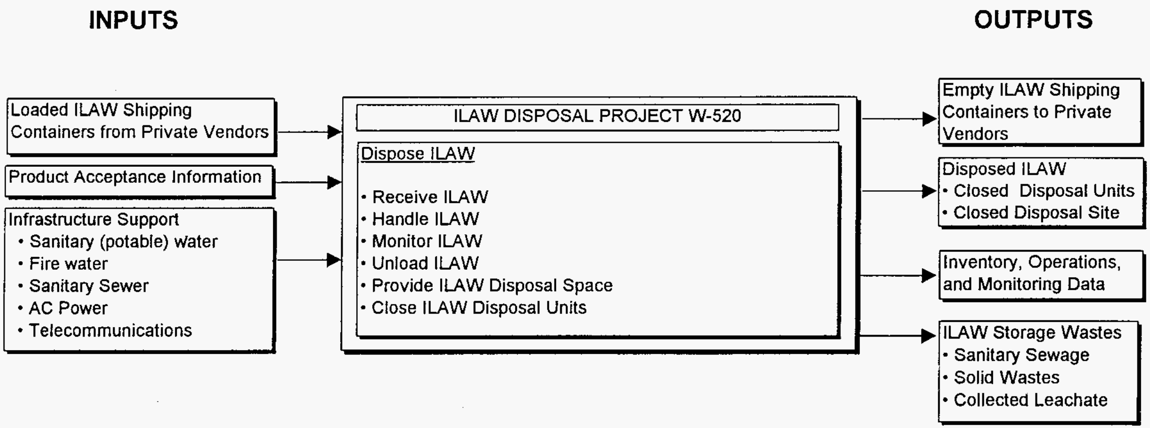


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Figure 3-3. External Interfaces.

3.2.3.2.2 Size and Configuration. The package will be a rectangular metal container and will have an external dimension, including all appurtenances, of 1.8 m (length) x 1.2 m (width) x 1.2 m (height), $\pm$ 0.2 m. Once a package size is selected, the dimension of all packages will be constant and have a dimensional tolerance of $\pm$ 0.01 m.

Issue: All privatization vendors are not required to use the same package design.

Required Analysis: The design of vendor waste packages shall be analyzed for compatibility with disposal project package handling equipment and integrated with the transport container and transport vehicle design.

3.2.3.2.3 Mass. The mass of each package will not exceed 10,000 kg.

3.2.3.2.4 Radiological Composition Documentation. The Contractor will identify the individual package inventory of radionuclides that *Products and Secondary Wastes Plan* as significant as defined in NUREG/BR-0204 and 49 CFR 172.101 (Table 2). Technetium-99 will be considered significant at concentrations greater than 0.003 Ci/m^3 in the ILAW form. The inventories will be indexed to the year 2000. The documentation will be consistent with the radiological description format described in NUREG/BR-0204.

3.2.3.2.5 Radionuclide Concentration Limitations. The radionuclide concentration of the ILAW form will be less than Class C limits as defined in 10 CFR 61.55 and as described in *Branch Technical Position on Concentration Averaging and Encapsulation*. In addition, the average concentrations of ^{137}Cs, ^{90}Sr, and ^{99}Tc will be limited as follows: ^{137}Cs <3 Ci/m^3, ^{90}Sr <20 Ci/m^3 and ^{99}Tc <0.3 Ci/m^3. The average concentrations will be calculated by adding the inventories of these radionuclides in the packages that have been presented to date for acceptance and dividing by the total volume of waste in these packages.

3.2.3.2.6 Surface Dose Rate Limitations. The dose rate at any point on the external surface of the package will not exceed 1,000 mRem/h.

3.2.3.2.7 Surface Contamination Limitations. Removable contamination on the external surfaces of the package will not exceed 367 Bq/m^2 for alpha and 3670 Bq/m^2 for beta-gamma contamination when measured using the method described in 49 CFR 173.443(a).

3.2.3.2.8 Labeling and Manifesting. Each package will have a label attached or stamped on the outer surfaces of at least two sides of the container in a readily accessible location. The label will contain a unique identification (e.g., serial number) that will be assigned to each package and the corresponding documentation. Labels and markings will have a predicted service life of 50 years assuming that the packages are stored in a ventilated enclosure at ambient temperatures.

The contractor will prepare a shipping manifest for delivery with each shipment of ILAW product. Information on the manifest will satisfy the requirements in DOE Order 5820.2A, Chapter III, Section 3.d, and NUREG/BR–0204. Any package containing dangerous waste will be labeled and manifested in accordance with WAC 173-303-370 and the *Dangerous Waste Portion of the Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Wastes* (Permit No. WA 7890008967).

3.2.3.2.9 Closure and Sealing. The fully loaded package will be closed, sealed, and labeled with a tamper-indicating device. The closure system will be leak tight as defined by ANSI Standard N14.5. The closure system will be designed to ensure that the seal remains intact for a storage period of 50 years in an ambient-temperature, ventilated enclosure.

3.2.3.2.10 External Temperature. The temperature of the accessible external surfaces of the package will not exceed 50 C when returned to DOE. This temperature constraint will assume a shaded, still-air environment at an ambient temperature of 38 C.

3.2.3.2.11 Free Liquids. The package will contain no detectable free liquids as prescribed in ANSI/ANS-55.1 or SW-846 Method 9095.

3.2.3.2.12 Pyrophoricity or Explosivity. The package contents will not be pyrophoric, readily capable of detonation, or readily capable of explosive decomposition or reaction (including reaction with water) at normal pressure and temperature. The waste form and any optional matrix and filler materials will not be ignitable or reactive as defined in WAC 173-303-090(5) and WAC 173-303-090(7).

3.2.3.2.13 Explosive or Toxic Gases. The package will not contain or be capable of generating quantities of explosive (e.g., hydrogen) or toxic gases, vapors, or fumes harmful to persons handling the waste.

3.2.3.2.14 Compressive Strength. The contractor will determine the mean compressive strength of the waste form (and any optional matrix and filler materials) by testing representative nonradioactive samples. The compressive strength will be at least 3.45E6 Pa when tested in accordance with ASTM C39-94 or an equivalent testing method.

3.2.3.2.15 Compression Testing. Each fully loaded package will be able to withstand a compression load of 50,000 kg of force. Compliance with this specification will be established by using the compression test described in 49 CFR 173.465(d). The contractor will demonstrate the integrity of the package by showing that the dimensions of the tested packages are within the tolerance range and by showing that the seal remains intact in accordance with Section 3.2.3.2.9.

3.2.3.2.16 Package Material Degradation. The package will be resistant to degradation by microbial action, moisture, radiation effects, or chemical reactions with its contents under the expected storage conditions that may reasonably occur during storage (in an ambient-temperature, ventilated enclosure) and handling and disposal operations. The package and handling appurtenances will be designed to allow safe lifting and movement in accordance with Section 3.2.3.2.17 after a storage period of 50 years. The integrity of the package will not be jeopardized by wind, blowing sand, precipitation, sunlight, or extreme temperatures (+60 C, -40 C).

3.2.3.2.17 Package Handling. The package will be compatible with forklift and crane lifting and movement. The package will be equipped with lifting and other handling appurtenances designed to allow the packages to be safely lifted, moved, and stacked when fully loaded. The package will maintain its integrity during handling, transportation, and stacking. The package will allow for vertical stacking of six packages.

3.2.3.3 Nonradioactive Airborne Emissions. A Notice of Construction (NOC) for the emission of toxic air pollutants and/or criteria pollutants shall be produced by the operations contractor as required by the Washington State Department of Ecology (Ecology) (WAC 173-400, "General Regulations for Air Pollution Sources," and WAC 173-460, "Controls for New Sources of Toxic Air Pollutants"). Nonradioactive airborne emission monitoring requirements are located in Section 3.2.1.15.3.

In addition to the NOC requirements, the Air Operating Permit required by WAC 173-401 shall be modified to include the ILAW disposal emissions. The ILAW disposal NOC process shall occur before the Air Operating Permit is modified.

3.2.3.3.1 The best available control technology (BACT) and best available control technology for air toxins (T-BACT) shall be used for the construction, installation, or establishment of a new source of nonradioactive emissions subject to those requirements. Air emission calculations shall be performed to support the BACT/T-BACT analysis (WAC 173-400-113 and 173-460-060). BACT for criteria pollutants shall be applied for emissions that exceed the significance levels called out in 40 CFR 52.21.

3.2.3.3.2 The national primary and/or secondary ambient air quality standards, found in 40 CFR 50.4 through 50.9, shall be met by the ILAW Disposal Project.

3.2.3.3.3 The constraints associated with organic emissions, controls, and other nonradioactive airborne emissions, found in 40 CFR 264.1032 and 40 CFR 264.1033 (a, b, c, g, h, and k) shall be met by the ILAW Disposal Project.

3.2.3.4 Liquid Effluents. Liquid effluents and leachate generated by the ILAW Disposal system shall be transferred to the Liquid Effluent Retention Facility (LERF) and/or the Effluent Treatment Facility (ETF) and shall meet the waste acceptance criteria for these facilities (McDonald 1994).

> **Issue:** The extent of effluent treatment required before discharging the effluents to LERF/ETF needs to be determined by the project.
>
> **Required Analysis:** Evaluate the expected facility effluent composition and compare it with the LERF/ETF waste acceptance criteria.

3.2.3.4.1 The ILAW disposal liquid effluent waste stream, if any, shall be characterized to the degree established in RCRA Part B Permit for the ETF. Analytical procedures shall be consistent with RCRA waste analysis plans. Only the waste codes listed in the delisting petition and the RCRA permit will be accepted for treatment at the ETF, unless the permit and the delisting petition are modified.

Basis: *Hanford Dangerous Waste Permit Application, 200 Area Effluent Treatment Facility*, DOE/RL-93-02 (DOE-RL 1993) and the *200 Area Effluent Treatment Facility Delisting Petition*, DOE/RL-92-72, Rev. 1 (DOE-RL 1992). The ETF is limited by RCRA regulations to treat only those waste streams containing constituents that have been demonstrated to be treatable. The delisting petition to the EPA is the primary document controlling what is considered treatable. The delisting petition, if granted, will exclude treated waste generated from the ETF from RCRA regulation under 40 CFR Parts 262-268 and the permitting standards of Part 270. These documents can be updated to reflect an expansion of the treatment envelope.

3.2.3.5 Solid Waste Management. Solid waste generated by the ILAW disposal system shall be controlled, reduced, segregated, and minimized in accordance with DOE Order 5820.2A, Chapter III, 3.c.E. Transfer of solid radioactive waste to the Hanford Site Solid Waste program for dispositioning shall be in accordance with criteria specified in the *Hanford Site Solid Waste Acceptance Criteria*, WHC-EP-0063-4 (Willis 1993) and *Nonradioactive Hazardous Material/Waste Shipments,* HNF-PRO-156. The exterior of all waste packages shall not be smearable above 3.67 Bg/100 cm^2 (220 dpm/100 cm^2) for alpha and 36.7 Bg/100 cm^2 (2,200 dpm/100 cm^2) for beta-gamma in accordance with *Hanford Site Solid Waste Acceptance Criteria*, WHC-EP-0063-4 (Willis 1993).

3.2.3.6 Radioactive and Mixed Waste Management. A waste management plan, provided by the PHMC, shall be developed for facilities that produce radioactive waste and mixed waste (DOE Order 5820.2A). Hazardous waste shall be regulated in accordance with RCRA and WAC 173-303, "Dangerous Waste Regulations."

3.2.3.6.1 Radioactive Material Packaging. The ILAW Disposal Project shall comply with the radioactive waste packaging, shipping, and transportation requirements found in DOE Order 1540.2. Radioactive materials properly packaged for transportation from facilities comprising the ILAW Disposal Project shall comply with DOE Order 5480.3. Dose rate limits for radioactive material packaged for onsite transportation are identified in *Hanford Radioactive Solid Waste Packaging, Disposal, and Disposal Requirements* (Stickney 1988) and will be used for shipment activities.

3.2.3.6.2 Toxic Products and Materials. The design shall include provisions required for handling hazardous materials as identified in DOE Order 5480.3 and HNF-PRO-451 (FDH 1997b).

3.2.3.7 Waste Compatibility. The requirements for waste compatibility are located in "Use and Management of Containers," WAC 173-303-630, (4) Compatibility.

3.2.4 Physical Characteristics

Not applicable.

3.2.4.1 Protective Coatings. No requirements

3.2.5 Project Quality Factors

Each system for the ILAW Disposal Project shall meet the reliability, maintainability, and availability requirements consistent with DOE Order 430.1.

3.2.5.1 Reliability. The ILAW disposal facility shall be designed to provide features to enhance equipment reliability. An evaluation of equipment system failures shall be provided to fully define equipment reliability.

Issue: Develop applicable reliability requirements.

Required Analysis: An approved reliability, availability, and maintainability (RAM) analysis will be performed for the ILAW Disposal Project during definitive design.

3.2.5.1.1 Facility Design Life. The facility design life for the disposal facility shall be determined by the project and shall support Tri-Party Agreement (Ecology et al. 1996) milestone M-90-06, "Initiate hot operations of the ILAW interim disposal facility" (December 2002). The facility shall be designed to enable retrieval of stored packages for 50 years from receipt of the first package. The ILAW waste retrievability concept is based on principles and values described in Appendix F of the Tank Waste Task Force Final Report (September, 1993, M.E. Drummond, Chair). These include the following points: 1) It is accepted that the Hanford 200 Area will be the ultimate disposal site for ILAW, 2) A "safe" ILAW waste form must be disposed in a manner that protects the environment, worker, and public health, 3) There is a need to minimize irretrieval/irreversible disposal. At the present time, there are no plans for ILAW retrieval, although the disposal site will be monitored during institutional control. Disposal system design features, however, will allow access to the ILAW packages in the unforeseen event of a future safety concern or technological improvement that warrants retrieval.

Issue: Selection of the plant design life has implications on the choice of maintenance and operations category. A facility design life must be determined taking into consideration economic factors and required Tri-Party Agreement schedules. Individual equipment components must be evaluated separately.

Required Analysis: The Project shall provide and validate a documented basis for design life selection during definitive design.

3.2.5.2 Maintainability. The ILAW disposal facility design shall provide for routine maintenance, repair, or replacement of equipment subject to failure. Remote maintenance, inspection, and testing capabilities shall be incorporated where required in the design of the facilities and equipment (DOE Order 6430.1A, Section 1300-3.5).

Issue: Develop applicable maintainability requirements.

Required Analysis: A maintainability plan will be developed during definitive design.

3.2.5.3 Availability. The ILAW disposal facility's overall availability (e.g., operational availability) shall be sufficient to produce the required total throughput over the designated life of the plant. Reliability and maintainability analyses shall be conducted for each major equipment item to determine overall system availability.

Issue 1: Availability requirements need to be prepared for each equipment system, subsystem, or component.

Required Analysis: An approved RAM analysis will be performed for the ILAW Disposal Project during definitive design.

Issue 2: A total operating efficiency of 60 percent was used to arrive at a throughput and must be evaluated for application to the actual plant availability.

Required Analysis: An operational availability analysis will be provided during the ILAW disposal facility definitive design activities. This anlysis will be used to demonstrate compliance with the required 60 percent TOE.

3.2.5.4 Operations and Maintenance Considerations. The ILAW disposal facility design approach shall enhance operations and maintenance to the greatest extent practicable while fulfilling all other design requirements. Operations and maintenance (O&M) design requirements relate specifically to the personnel-to-physical plant interface. O&M qualities of design pertain to the ability of personnel to safely and efficiently interface with the physical plant to perform the intended function. A particular design solution or approach can enhance, be neutral to, or degrade O&M compared to another solution or approach. This section defines and quantifies, as well as possible, O&M considerations to be used for design of the ILAW disposal facility and is based on a philosophy of "good operating practices."

Factors such as life-cycle cost, radioactive waste minimization, and number of personnel and time required to perform plant functions shall be considered in the design. The basic operations plan and its associated maintenance plan will be derived during an evaluation of the O&M concept and the use of RAM analysis. Operation and maintenance can be further enhanced by incorporation of design features and considerations such as those listed in Sections 3.2.5.4.1 and 3.2.5.4.2.

3.2.5.4.1 Operations Considerations. The plant shall be designed with operations considerations taken into account. The O&M concept and RAM analysis shall be used to elaborate on and optimize the operational mission requirements during the design phase. This analysis will be used to determine anticipated equipment utilization rates, staffing requirements, personnel skills and training requirements, operating characteristics, and critical system performance parameters. Examples include, but are not limited to, the following:

- All normally occupied operating stations will be in Radiation Zone 1 (as defined in Section 3.3.1.1) or lower areas, and in Ventilation Zone 3 (as defined in Section 3.3.6.8) or cleaner areas. Other operations may occur in other areas of the facility less frequently.

- Routine operations will generate as little solid radioactive waste as practical. In particular, the design should be such that little or no manufacturers' packaging material has to be taken into regulated areas of the facility.

- Special precautions (e.g., wearing of respirators) will not normally be required for routine operations, except for repair of contaminated equipment or removal and decontamination of equipment for repair or disposal.

- The overall design philosophy will include minimizing the potential to spread contamination.

- Design shall include strategy for operating simultaneously with on-going construction.

3.2.5.4.2 Maintenance Considerations. The plant shall be designed with maintenance considerations such as accessibility, visibility, testability, complexity, and interchangeability taken into account. The O&M concept and RAM analysis will be used to establish the maintenance plan, evaluate preventive and corrective maintenance requirements, forecast material and spare parts inventories, and serve as the basis for establishing maintenance organizational responsibilities and policies. Examples include, but are not limited to, the following:

- Personnel performing scheduled routine maintenance will be in Radiation Zone 2 or lower and in Ventilation Zone 3 or cleaner areas.

- The facility design will permit scheduled maintenance to be performed without unnecessary disruption of the systems. For example, all routine calibrations and testing of instruments will be accomplished without disconnecting wiring or piping to the extent practical.

- Routinely used spare parts and materials will be stored readily at hand to assist in maintaining continuous operations.

- Equipment will be standardized to the maximum extent practical to reduce spare parts inventories and training requirements.

- All required inspections within radiation Zone 3 or higher, or in Ventilation Zone 1 will be performed remotely, unless the area is designed to be readily decontaminated.

- Where scheduled inspections of large equipment are required, built-in features for inspection will be provided so that special equipment, such as cranes, does not have to be brought in from off site.

3.2.5.4.3 Occupancy Requirements. The estimated facility occupancy is shown in Table 3-1. The facility shall be designed to comfortably accommodate the single-shift population based on a 5-shift rotation. Locker and change rooms shall be sized to accommodate the total occupancy for craft workers, operators, and technicians.

3.2.6 Environmental Conditions

The ILAW disposal structures, systems, and components shall be designed to withstand temperature, pressure, and humidity based on the most severe postulated accident affecting the particular item. The postulated environment shall reflect an environment that considers both radiological composition (e.g., elements, isotopes, total radioactivity) and chemical composition (e.g., abrasives, acids, smoke, caustic vapors) of all material physical forms likely to affect the equipment (DOE 6430.1A Div. 1300-3.4.2).

Each system for the ILAW disposal facility shall be designed to meet the requirements for exposure to the following natural and induced environmental conditions.

3.2.6.1 Natural Environments. The following meteorological parameters shall be used, as necessary, during the ILAW disposal facility conceptual design activities.

3.2.6.1.1 Temperature. The temperatures and conditions at the Hanford Site Meteorological Station (HMS) are expected to be similar to the conditions at the project site in the 200 East Area. The systems for this ILAW Disposal Project shall be designed to operate at or near the temperatures and conditions provided by the HMS.

The mean surface air temperature averages approximately 12 C (53 F) at the HMS. July tends to be the warmest month of the year with temperatures averaging 25 C (76 F). The average daily minimum and maximum temperatures for July are 16 C and 33 C (61 and 92 F) respectively. The highest temperature ever recorded on the Site was 46 C (115 F). January is the coolest month of the year with an average temperature of -2 C (29 F). The lowest temperature ever recorded on the Site was -33 C (-27 F).

The Hanford Site and vicinity are known for severe and abrupt temperature changes. During winter the Site frequently experiences rapid rises in temperature accompanied by moderate west winds. This phenomenon, known as a chinook wind, has produced variations of up to 6 C (11 F) in 0.5 hour.

During much of the year, a well-defined nocturnal temperature inversion occurs over the Site. The inversion is strongest in early fall and spring when the minimum nighttime temperature at the top of the inversion may be 5 to 8 C (9 to 14 F) warmer at the basin floor.

3.2.6.1.2 Relative Humidity. The systems for this project shall be designed to operate in a humidity range as recorded at the HMS. Relative humidity at the HMS is expected to be representative of that in the 200 East Area.

The annual mean relative humidity recorded at the HMS is approximately 54 percent with the highest monthly relative humidity (80 percent) occurring in December and the lowest average monthly relative humidity (32 percent) occurring in July. Daily relative humidity can change 20 to 30 percent between early morning and late afternoon, except in the winter months when the changes are less pronounced.

3.2.6.1.3 Precipitation. The ILAW disposal systems shall use the precipitation conditions recorded by the HMS for design calculations, as necessary. The mean annual precipitation at the HMS is approximately 16 cm (6.3 in.). Historical data indicate that over roughly 80 years, the annual precipitation varied from a low of 8 cm (3.1 in.) to a high of 30 cm (11.8 in.). Precipitation of 4 cm (1.56 in.) in 24 hours can be expected to occur once every 25 years. Total annual snowfall has varied from 0.8 cm to 110 cm (0.31 to 43.3 in.), with an average annual snowfall of 34 cm (13.4 in.). The largest depth of snow on the ground at one time was 62 cm (24.4 in.) Small hail, with diameters from 5 to 10 mm (0.2 to 0.4 in.), has been recorded at the HMS, with 2 days of hail being the most in any 1 year.

3.2.6.2 Induced Environments

3.2.6.2.1 Radiation. ILAW disposal structures, systems, and components shall be capable of performing their intended function for the duration of their intended useful life with no adverse effects from the radiological and chemical environment in the systems that they operate.

3.2.7 Transportability

Material handling systems, such as overhead bridge cranes, shall be designed for ease of removal and replacement in the vaults. Cranes shall be transportable from one vault to another. The design shall provide for removal and reinstallation of the bridge crane and trolleys using temporary cranes and trucks for transporting the equipment. Crane rails and power systems internal to the vault do not need to be transportable.

3.2.8 Flexibility and Expansion

The process and facility design shall accommodate changes in the flowsheet throughout the operating life of the facility by a built-in capability to change process equipment (e.g., process flexibility). Design solutions shall demonstrate methods for modification, expansion, additional capacities (unless otherwise restricted in other requirement sections), and other techniques when justified by life cycle cost. The degree of flexibility will be determined during conceptual design. Typically, the following flexibility features are provided:

- Remote equipment installation and removal and the decontamination and decommissioning (D&D) capabilities for remotely maintained equipment and facilities

- Design features of the disposal configuration will be based on performance assessment criteria.

Basis: DOE Order 6430.1A, Section 0110-3 states: "Flexibility is a major design requirement for all facilities except those with highly specialized functions. Even in those special facilities, however, the design shall, to the maximum extent practicable, provide sufficient flexibility to accommodate for programmatic changes or operational modifications."

3.2.9 Portability

Equipment shall be portable where applicable and appropriate (e.g., portable instrument skids, pump skids, etc.).

3.3 DESIGN AND CONSTRUCTION

DOE Order 6430.1A provides general design criteria for the acquisition of the DOE facilities. The general design criteria specified in DOE Order 6430.1A (primarily applicable Division 13 and applicable parts of Section 99) shall be used for the design and construction of the ILAW disposal facility, Project W-520. Design life of the facility shall be 30 years. Additional specific requirements are identified in Sections 3.3.1 through 3.3.11.

3.3.1 Materials (i.e., Structure, Shielding)

The structure and layouts of the facility shall conform to DOE Order 6430.1A, National Fire Protection Association codes, and the Uniform Building Code (UBC for structural only).

3.3.1.1 Facility Design and Shielding Criteria. The design shall conform to the guidelines for radiological design provided in *Radiological Design Guide*, WHC-SD-GN-DGS-30011 (WHC 1994b). The shielding design criteria listed in Table 3-3 are summarized from *Radiological Design Guide*, Section 7.0, and shall be used to determine the preliminary shielding requirements of different areas in the facility. Final shielding design shall limit the total effective whole body dose equivalent of the maximally exposed individual to less than 5 mSv per year.

3.3.1.2 Transportation Shielding Criteria. The transport container system shall provide sufficient shielding comply with U.S. Department of Transportation (DOT) radiological protection guidelines in addition to the guidelines shown in Table 3-3. A loaded transport container shall not exceed the criteria for contact handling. Transportation system shielding criteria are summarized in Table 3-4.

Table 3-3. Disposal Facility Shield Design Criteria.

Zone category	Access time allowed	Maximum[1] (μSv/h)	Maximum[1] (mrem/h)
Uncontrolled area	Full time[2]	0.5	0.05
Controlled Area			
1	Full time[2]	2.5	0.25
2	Less than 1 h/day	20	2.0
3	Less than 1 h/week	100	10.0
4	Less than 10 h/year	500	50.0
5	No normal access permitted	>500	>50

Notes: 1) For design purposes the dose caused by neutrons should be calculated by doubling the neutron quality factors (DOE Order 5480.11).
2) Full time occupancy limit is based on 2000 hours of exposure per year.

Table 3-4. Transportation Shielding Criteria.

Basis for limit	Maximum dose rate (μSv/h)	Maximum dose rate (mrem/h)
Contact Handling	2000 at container surface	200 at container surface
DOT Cargo	100 at 2 meters	10 at 2 meters
DOT Driver	20 at truck cab	2 at truck cab

DOT = U.S. Department of Transportation

3.3.2 Electromagnetic Radiation

No requirements.

3.3.3 Nameplates and Product Marking

Hanford Site standards developed for identification of nameplates and product markings shall be followed and are specified in *Data Standards Administration*, WHC-CM-2-6.

3.3.3.1 Equipment and Piping Labelling. Equipment and piping labeling shall be in accordance with DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, Chapter XVIII, DOE Standard 1044-93, "Guide to Good Practices for Equipment and Piping Labeling;" and DOE Order 6430.1A, Section 1300-12.4.11, "Labels." Labeling of electrical raceways and circuits shall be in accordance with ANSI-Y14.15.

3.3.4 Workmanship

See Section 4.0.

3.3.5 Interchangeability

The ILAW Disposal Project shall include interchangeability factors. Interchangeability (or interoperability) factors shall be applied to minimize downtime using an optimized response approach in which lower-priority equipment may be temporarily used in a higher-priority operation. These requirements shall be determined by evaluation of the O&M concept and RAM analyses. Interchangeability is necessary to allow, as much as practical, for temporary use of different parts or equipment until a replacement is procured, e.g., use of a pipe fitting or electrical fitting that may suffice until its replacement is obtained.

3.3.6 Safety

Requirements and guidance on safety documentation are located in DOE Orders 6430.1A, 5480.7A, 5480.22, and 5480.23. Safety documentation shall include a facility hazards classification, preliminary and final safety analysis reports, fire hazards analysis, and technical safety requirements. These reports shall be prepared by the PHMC according to guidance found in DOE-Std 3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*. The requirements for developing a safety equipment list are located in HNF-PRO-704, Hazard and Accident Analysis Process. Requirements and guidance on industrial safety and hygiene are located in the HNF-PRO-series.

3.3.6.1 Design-Basis Accidents. The project shall be designed to withstand the effects of design-basis accidents (DBA), as defined in DOE Order 6430.1A, *General Design Criteria*, without loss of containment and with confinement of radioactive and toxic materials within allowable limits. Simultaneous occurrences of more than one DBA shall be considered when a joint occurrence (i.e., common-mode failure) is possible. The DBAs shall include but not be limited to fire, power failure, earthquake, tornado, flood, and ash fall. The specifications for this ILAW product preclude criticality from being a credible accident scenario.

3.3.6.1.1 Design-Basis Fire. The disposal facility shall be designed to withstand a design-basis fire in accordance with DOE Order 6430.1A, DOE Order 5480.7A, *Fire Protection*, and applicable NFPA standards. The design-basis fire shall be considered to be that fire that results from the burning of all combustible materials in a fire zone as defined in DOE 5480.7A.

3.3.6.1.2 Design-Basis Power Failure. No requirements.

3.3.6.1.3 Design-Basis Earthquake. The disposal facility shall be designed to withstand a design-basis earthquake in accordance with DOE Order 6430.1A, HNF-PRO-097 Engineering Design and Evaluation, and Uniform Building Code earthquake regulations as determined by the facility safety analysis.

3.3.6.1.4 Design-Basis Tornado. The disposal facility shall be designed to withstand a design-basis tornado in accordance with HNF-PRO-097 Engineering Design and Evaluation.

3.3.6.1.5 Design-Basis Flood. The elevation of the disposal facility site has been determined to be outside the maximum extent of the Hanford Site design-basis flood. Therefore no flood analysis is required.

3.3.6.1.6 Design-Basis Ash Fall. The disposal facility shall be designed to withstand a design-basis ash fall in accordance with HNF-PRO-097, Engineering Design and Evaluation. Designs shall be analyzed to determine the effects on the HVAC systems, mechanical and electrical equipment, structures, and personnel operations that could result from the abrasive or chemical properties of volcanic ash.

3.3.6.2 Nuclear Safety and Criticality. The ILAW product specification precludes the possibility of a criticality occurring. Criticality safety requirements are found in HNF-PRO-334.

3.3.6.3 Classification of Structures, Systems, and Components. The project design shall comply with HNF-PRO-704, "Hazard and Accident Analysis Process," the HNF-PRO-series, and *Non-Reactor Facility Safety Analysis*.

3.3.6.4 Component Failure Analysis. The design shall be such that no single credible component failure or loss of normal power will result in unacceptable safety consequences. Unacceptable safety consequences include the following:

- Fire (other than localized minor fire such as caused by shorting of electrical equipment)

- Explosion

- Instantaneous release of radioactivity from the facility in excess of 5,000 times the derived concentration guide (DCG) values specified in HNF-PRO-466.

- Exposure of personnel to ionizing radiation in excess of DOE Order 5480.11, *Radiation Protection for Occupational Workers*.

- Exposure of personnel to toxic chemical agents in excess of ceiling threshold limit (CTL) value of the American Conference of Governmental Industrial Hygienists.

The effects of component failure, including control and monitoring, and utilities failure (such as power sources, and air and vacuum supplies) shall be evaluated for unacceptable consequences.

3.3.6.5 Abnormal Operations. The facility design shall include provisions to monitor and alarm on detection of abnormal conditions such as radioactive particulate release, liquid intrusion, gaseous release, abnormal radiation levels, fires, and overheating or pressurization in accordance with DOE M 435.1. Process and facility systems shall be designed to ensure safe channeling of energy and material flows (e.g., rupture discs, fault-to-ground electrical circuitry, etc.).

3.3.6.6 Personnel Radiation Exposure. Personnel radiation exposure shall be in accordance with as low as reasonably achievable (ALARA) principles, cost-benefit analysis, and DOE Orders 5400.5 Chapter II (item 2), and 5820.2A, Chapter 1, 3.C (2)(s).

3.3.6.7 Ventilation Systems. This system shall be designed in accordance with DOE Order 6430.1A, DOE Order 5480.11, DOE Order 5400.5, ANSI/ASHRAE Standard 55-1992 Thermal Environmental Conditions for Human Occupancy, ANSI/ASHRAE Standard 62-1989 Ventilation for Acceptable Indoor Air Quality, and the *Radiological Design Guide* (WHC 1994b). Sufficient redundancy and/or spare capacity shall be provided as necessary to ensure adequate ventilation during normal operations and DBA conditions.

3.3.6.8 Ventilation Zones. The ILAW packages will be free from external contamination, as described in Section 3.2.4.2.7. Therefore, confinement ventilation is not required for the ILAW disposal facility. The requirements for the facility's ventilation zones, shown in Table 3-5, will be based on the results of the preliminary safety analysis.

Final airborne particulate treatment on all airborne effluents that have the potential to exceed 10 percent of the derived concentration guide-public value on an annual average basis as cited in HNF-PRO-466, shall use a high-efficiency particulate air (HEPA) or equivalent filter.

The adequacy of the filtration system (the number of filtration stages required) shall be determined by analysis to ensure that the contamination in the effluents are ALARA and do not exceed the emission limits given in Table 3-5.

Design shall provide for measurement of supply and exhaust airflows. Final HEPA filter systems, if required, shall include the necessary fire protection provisions to comply with DOE Orders 6430.1A and 5480.7.

Table 3-5. Ventilation Zones.

Zone	Minimum DP (in. WG)	Description of typical areas
I - Process Zone	- 1.0	High and potentially high contamination areas.
II - Control Zone	- 0.5	Areas providing access or penetrations to Zone I. Not normally contaminated areas with moderate contamination potential. May be normally or frequently occupied areas.
III - Operating Zone	- 0.25	Not normally contaminated areas with low contamination potential. Normally or frequently occupied areas.
IIIA - Operating Zone	- 0.1	Less contamination potential than Zone III. Minimum DP may not be maintained with outer doors open.
IV - Uncontrolled Access Zone	+ 0.125	Clean areas. Areas where contamination is unacceptable.
Neutral Zone	N/A	Areas not requiring confinement ventilation.

DP = differential pressure with respect to atmospheric pressure
N/A = not applicable
WG = water gauge.

3.3.6.9 Remote Maintenance. The facility shall utilize remote maintenance features and other appropriate techniques to minimize and maintain personnel radiation exposure as low as reasonably achievable in accordance with DOE 5481.1B. (also see Section 3.2.5).

3.3.6.10 Fire Protection. The requirements for fire protection shall be in accordance with DOE Orders 5480.4, 5480.7A, RL directives RLID 5480.7, the HNF-PRO-series, the NFPA National Fire Codes (including NFPA 101 and 241), and the Uniform Fire Code to the extent that is implemented by WAC 173-303.

The design for the fire protection and detection system shall comply with the requirements of DOE Order 6430.1A, Sections 1530-3,-4,-5,-6,-7,-8,-9, and -99, Sections 1670-1, -2, -3, and Section 1671-2.

The facility shall comply with 29 CFR 1926 and 29 CFR 1910 and NFPA 101. Conformance with NFPA shall be considered to satisfy the site requirements of 29 CFR 1910. (DOE Order 6430.1A, Section 0110-6.1)

3.3.6.11 Occupational Health and Safety. DOE Order 5483.1A, 29 CFR 1910, and 29 CFR 1926 contain health and safety requirements that shall be used for this project. Engineering controls shall be used where feasible to prevent or minimize exposure to hazards.

3.3.7 Human Engineering

The system shall be designed to be comfortable and natural for humans to operate and maintain. Design considerations shall be given to the guidelines in MIL-STD-1472E, *Human Engineering Design Criteria for Military Systems, Equipment, and Facilities* (DOD 1989) and DOE Order 6430.1A, Section 1300-12, *Human Factor Engineering*.

3.3.8 Nuclear Control

Not applicable.

3.3.9 Security

Exterior telecommunications and alarm systems shall be designed in accordance with DOE Order 6430.1A. Physical security shall be in accordance with DOE 6430.1A and RCRA (40 CFR series and WAC-173-303-310 and -335).

3.3.10 Government Furnished Property Use

Not applicable.

3.3.11 Computer Resource Reserve Capacity

Computer requirements are provided in Section 3.3.1.3.17.

3.4 INFORMATION AND PROJECT DOCUMENTATION

Records, documents, and document control pertinent to design functions shall be in accordance with ASME-NQA-1-1994-1A, DOE 5500.7b, DOE-4700.1, and ANSI/ANS-3.2-88.

3.4.1 Drawings

Architect-engineer and construction management drawings and other design media (e.g., specification) prepared for the system shall comply with the HNF-PRO-097, -227, -241, -244, -317, -440, -448, -709, -710, -711, -712, and -713, when released to PHMC at completion of Title III (construction inspection).

3.4.2 Technical Manual

Manuals describing the technical operations and maintenance aspects of equipment provided by the ILAW Disposal Project shall be prepared and provided to the operating and maintenance contractor. Vendor-supplied equipment manuals are acceptable as technical manuals.

3.5 LOGISTICS

Logistics can be viewed as the composite of all considerations necessary to ensure the effective and economical support of a system throughout its life cycle. Logistic elements shall be developed on an integrated basis with other segments of the system.

Logistic elements to be considered include the following:

- Maintenance. Operation and maintenance plans, equipment documentation, repair manuals, etc.

- Supply System requirements. Requirements for supply lines, specialized parts and equipment needed to support this mission. A key logistical requirement for this design is that it must be able to accommodate simultaneous operation and on-going construction activities.

3.5.1 Site Development Plan

Site development planning shall be prepared in accordance with DOE 4320.1B. The site development plan shall consider:

- Future Land Uses. Identify planned dedicated uses for the ILAW disposal site lands.

- Future Functional Locations. Identify the major operating support uses, planned interactions, and where applicable, material and/or process flow for the entire site.

- Future Facility Locations and Uses. Identify the use and general location of new construction showing proposed building sites and designate future development zones for ILAW disposal facilities and support functions.

- Utilities. Identify future loads, load configuration (e.g.pulse steady, time of day peak), types of service (interruptible, firm, high reliability), and planned utility sources (e.g., on-site generation/process or purchase). Using maps and narrative, show future distribution systems, on-site plants, significant modifications to present systems, and new utilities construction.

- Future Circulation. Show transportation systems, including existing and new roads, parking, and pathways and significant changes or additions.

- Future Security. Identify existing and proposed security zones, fences, lighting, barriers, portals, and other improvements for security, commensurate with the security classification of the facility.

- Future Safety. Identify hazardous areas, arcs, buffer zones, fire protection, and other safety-related areas. Solutions to operational or industrial safety issues identified in other steps of the planning process relating to land use and siting of facilities should be addressed.

- Future Environmental Issues. Identify areas planned to be set aside for waste disposal. Address the impact on siting of other facilities and construction activities.

3.6 PERSONNEL AND TRAINING

The system shall be designed for operation by personnel possessing qualifications in accordance with DOE Order 5480.20, Chapter IV, who are trained in accordance with Chapter I.

3.7 CHARACTERISTICS AT SUBORDINATE ELEMENTS

No requirements identified at this time.

3.8 PRECEDENCE

The hierarchical relationship among requirements specified in Chapter 3 is as follows, excepting those instances where Washington State has been granted regulatory authority by the U.S. Government:

- Federal laws (e.g., *Code of Federal Regulations*)

- *Revised Code of Washington* (RCW) as specified in the WAC

- Local ordinances

- DOE orders

- National consensus codes and standards.

3.9 QUALIFICATION

The ILAW disposal facility design shall include provisions for periodic testing of monitoring, surveillance, and alarm systems. In addition, the design shall provide the capability to test periodically, under simulated conditions, safety class items that are required to function under emergency conditions. Safety class items shall be designed to be tested on a regular schedule (DOE Order 6430.1A, Section 1300-3.6).

3.10 STANDARD SAMPLE

Not applicable.

3.11 PREPRODUCTION SAMPLE, PERIODIC PRODUCTION SAMPLE, PILOT OR PILOT LOT

Not applicable.

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4.0 QUALITY ASSURANCE PROVISIONS

The ILAW Disposal Project shall adhere to the requirements of HNF-MP-599, Fluor Daniel Hanford Quality Assurance Program Description, Part 2, Sections 1 through 9. The project shall develop a project-specific quality assurance program plan (QAPP) that will include the following elements, as applicable:

- Program
- Personnel training and qualifications
- Quality improvement
- Documents and records
- Work processes
- Design
- Procurement
- Inspection and acceptance testing
- Management assessment.

All subcontractors providing services for the ILAW Disposal Project, (i.e., architect-engineer services, construction management services, and testing services in support of technology development) shall have or shall be required to develop a QA program that complies with the requirements of the project QAPP for the subcontractor's area of responsibility. Nationally recognized consensus standards (i.e., NQA-1, ISO 9000, 10 CFR 50, Appendix B) may be used as guidance in developing a QA program, although no single standard fully meets all the requirements of 10 CFR 830.120. However, HNF-MP-599, FDH Quality Assurance Program Description, should encompass requirements. All subcontractor QA programs shall be submitted to the PHMC ILAW Disposal Project for review and concurrence.

4.1 RESPONSIBILITY FOR INSPECTION

Not applicable.

4.2 SPECIAL TESTS AND EXAMINATIONS

Tanks and vessels shall be designed using ASME, Section VIII.

4.3 REQUIREMENTS CROSS REFERENCE

Not applicable.

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5.0 PREPARATION FOR DELIVERY

Not applicable.

6.0 NOTES AND REFERENCES

6.1 INTENDED USE

Not applicable.

6.1.1 Missions

Not applicable.

6.1.2 Hazards

Not applicable.

6.2 DEFINITIONS

Availability. Availability is a measure of the degree to which an item is in an operable and committable state at any point in time. Mathematically, availability can be calculated several ways, depending on the desired use. Conceptually, availability is Up Time divided by Total Time (Total Time = Up Time + Down Time). As with reliability, there are different types of availability, such as inherent availability, operational availability, and achieved availability.

Critical Facility. Facilities such as those for radioactive material handling, processing, or storage and those facilities having high replacement value or vital importance to DOE programs (DOE 6430.1A).

Design Requirements Document (DRD). The design requirements baseline is documented by project-level DRDs, associated interface control documents, and functions and requirements. This documentation captures all of the functions, interfaces, and requirements allocated to a specific architectural solution, and will provide a basis for design by an A-E. (The design basis includes all results of formal decision analysis, technical analyses, studies, and other products of systems engineering that are used to provide a rationale for baseline requirements.)

Functions and Requirements (F&R). The functions are statements of purpose, defining what the system must do; requirements indicate how well the function must be accomplished. The Tank Waste Remediation System F&Rs are detailed to the fourth level of the architecture in DOE/RL-92-60, *Tank Waste Remediation System Functions and Requirements* (RL 1994).

Hazardous Waste. At the Hanford Site, this term usually means nonradioactive chemical toxins or otherwise potentially dangerous materials such as sodium, heavy metals, beryllium, or some organic materials.

High-Level Waste. The highly radioactive waste material that results from reprocessing spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation (DOE Order 5820.2A, *Radioactive Waste Management*).

Immobilization. A process (e.g., grouting or vitrification) used to stabilize waste. Stabilizing the waste inhibits the release of waste to the environment.

Leachate. Any liquid, including suspended components, that has percolated through or drained from hazardous or solid waste. Also refers to liquid that percolates out of a solution.

Low-Activity Waste. The waste remaining after separating as much radioactivity as is practicable from high-level waste that when solidified may be disposed of as low-level waste in a near-surface facility in accordance with U.S. Nuclear Regulatory Commission regulations. In its final form, it would meet Class C radioisotope limits.

Logistics Reliability. This is the measure selected to account for or address all incidents that require a response from the logistics system.

Low-Level Waste. Any gaseous, liquid, or solid waste that contains radioactivity and is not classified as high-level waste, transuranic waste, or spent nuclear fuel or byproduct material as defined by DOE Order 5820.2A, *Radioactive Waste Management* (DOE 1988). Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic constituents is <100 nCi/g.

Maintainability. Maintainability is a characteristic of design and installation expressed as the probability that an item will be retained in, or restored to, a specific condition within a given period of time, when maintenance is performed in accordance with prescribed procedures and resources.

Maintenance. Maintenance is all actions required to retain or restore the system to a specified condition. This may include diagnosis, repair, or inspection.

Mission Reliability. Mission reliability is the probability that a system will perform mission-essential functions for a period of time under the conditions stated in the mission profile. Reliability measures are concerned with the expected frequency of failure.

Operating Life. The operating life is the time span from hot startup through processing of the final feed.

Operational Availability. Operational availability is operating time divided by total calendar time.

Reliability. Reliability is the probability that an item will perform its intended function for a specified interval under stated conditions. This definition does not specifically consider the effect of the age of the system. Reliability can be further subdivided into mission reliability and logistics reliability. Reliability measures are concerned with the expected frequency of failure.

Vital Activity. Relating to integrity of a national security program or a public health and safety function.

Vital Facility. A facility where vital activities occur.

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