DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	AS, PM&I Planning & Integration	Date Oct 10, 1994
Project Title/Work Order		EDT No.
PROJECT W-087, RADIOACTIVE LIQUID WASTE LINE REPLACEMENT, FUNCTIONAL DESIGN CRITERIA		ECN No. 166040

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
M. L. Bell	T6-16		X		
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COMPLETE

ENGINEERING CHANGE NOTICE

Page 1 of 3

1. ECN 166040

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.		4. Date
Supplemental [] Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	C. B. McVey, AS, Planning and Integration, H4-19, 372-0926		July 11, 1994
	5. Project Title/No./Work Order No. W-087, Radioactive Liquid Waste Line Replacement	6. Bldg./Sys./Fac. No. 222-S	7. Impact Level ESQ
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-W087-FDC-001, Rev. 2	9. Related ECN No(s). N/A	10. Related PO No. N/A

11a. Modification Work	11b. Work Package No.	11c. Modification Work Complete	11d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 11b) [X] No (NA Blks. 11b, 11c, 11d)	N/A	N/A Cog. Engineer Signature & Date	N/A Cog. Engineer Signature & Date

12. Description of Change

This ECN incorporates changes and reissues the document as WHC-SD-W087-FDC-001, Revision 3. Changes are described below:

1) Page 4, Section 2.2, Operating Limitations, Pressure, Second Sentence: Change to read: "The transfer pipeline from 219-S to 244-S shall be designed to a pressure rating of the material selected, but no less than two times the dead-head discharge pressure of the transfer pump."

2) Page 7, Section 3.4, Piping, third paragraph, 219-S to 244-S, first sentence: Change to read: "The transfer piping size shall be designed to allow the best flow characteristics for the properties of the fluid in section 2.2."

13a. Justification (mark one)							
Criteria Change	[X]	Design Improvement	[]	Environmental	[]		
As-Found	[]	Facilitate Const.	[]	Const. Error/Omission	[]	Design Error/Omission	[]

13b. Justification Details

1). The criteria of using steam jets for transfers have been removed from the project and the design of the pipeline can be reduced to the design of the pump dead head pressure and that of the material selected.
2). Size for the pipeline are to restrictive. Calculations for best flow conditions recommends a 3" primary line for velocity, better pump efficiency, and better flow velocity after pump shutdown.

14. Distribution (include name, MSIN, and no. of copies)

See Distribution Sheet

RELEASE STAMP

OFFICIAL RELEASE BY WHC DATE OCT 13 1994 Sta #10

23

A-7900-013-2 (06/92) GEF095

DISCLAIMER

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1) 166040

15. Design Verification Required	16. Cost Impact				17. Schedule Impact (days)
	ENGINEERING		CONSTRUCTION		N/A
[] Yes	Additional	[X] $20K	Additional	[] $	Improvement []
[X] No	Savings	[] $	Savings	[X] $169K	Delay []

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

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

N/A

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

Document Number/Revision	Document Number/Revision	Document Number Revision
N/A		

20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog Engineer CB McVey	7/13/94	PE	
Cog. Mgr. SM Joyce	7/13/94	QA	
QA CE Norton	7-13-94	Safety	
Safety PA Moorman	7/14/94	Design	
Security		Environ.	
Environ. MJ Hall	7/14/94	Other	
Projects/Programs JR Kelly	7/14/94		
Tank Waste Remediation System			
Facilities Operations LD Goodwin	7/13/94	DEPARTMENT OF ENERGY	
Restoration & Remediation		Signature or Letter No.	
Operations & Support Services			
IRM		ADDITIONAL	
Other			
Projects JJ Beyer	7/13/94		
Tank Farms GJ Rust	7-13-94		

Item 12: Description of Change

3. Page 6, Section 3.3, "Waste Transfer Route" - Second paragraph, first sentence - Change the word "shall" to "may".

4. Page 6, Section 3.3, "Waste Transfer Route" - Second paragraph, second sentence - Change sentence to read: "If the existing encasement is used, the ..."

5. Page 7, Section 3.5 "Instrumentation" - Change last two sentences to read: "On liquid detection, the leak detection instruments shall activate an alarm in the local control room at 219-S. The leak detection for the waste transfer pipe encasement shall also activate alarms at 244-S and 242-S.

6. Page 8, Section 3.6 "Control Systems" - Add to end of 1st paragraph: "...with permissive controls at 242-S."

Item 13b: Justification

3. The word "shall" to restrictive. Change allows alternatives which may enhance design, schedule and/or budget.

4. Allows alternatives to be utilized.

5. Clarification

6. Tank Farm operational requirements.

RELEASE AUTHORIZATION

Document Number: WHC-SD-W087-FDC-001, REV.3

Document Title: Functional Design Criteria Radioactive Liquid Waste Line Replacement, Project W-087

Release Date: October 12, 1994

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

APPROVED FOR PUBLIC RELEASE

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WHC Information Release Administration Specialist:

M. L. Solis (Signature)

10/12/94 (Date)

SUPPORTING DOCUMENT

1. Total Pages 21

2. Title

FUNCTIONAL DESIGN CRITERIA RADIOACTIVE LIQUID WASTE LINE REPLACEMENT, PROJECT W-087

3. Number

WHC-SD-W087-FDC-001

4. Rev No.

3

5. Key Words

Criteria
Pipe
Encasement
Function
Design
222-S
219-S

6. Author

Name: C. B. McVey

C. B. McVey

Signature

Organization/Charge Code 8E210/YL118

7. Abstract

This document provides the functional design criteria for the 222-S Laboratory radioactive waste drain piping and transfer pipeline replacement. The project will replace the radioactive waste drain piping from the hot cells in 222-S to the 219-S Waste Handling Facility and provide a new waste transfer route from 219-S to the 244-S Catch Station in Tank Farms.

APPROVED FOR
PUBLIC RELEASE
10/12/94 D. Sklis

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9. Impact Level ESQ

10. RELEASE STAMP

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RECORD OF REVISION	(1) Document Number WHC-SD-W087-FDC-001	Page 1

(2) Title
FUNCTIONAL DESIGN CRITERIA RADIOACTIVE LIQUID WASTE LINE REPLACEMENT. PROJECT W-087

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Cog. Engr.	(6) Cog. Mgr. Date
0	(7) Releasing EDT#: 106574		
1	Incorporated ECN #114038	Signed: GD Campbell	Signed: RL Fiedler 1-9-91
2	Incorporates ECN #166027 replaces entire document with new revision 2	Signed: CB McVey	Signed: SM Joyce 2-15-94
RS 3	Incorporates ENC #166040, replaces entire document with revision 3	C.B. McVey	Steven M. Joyce for

TABLE OF CONTENTS

RADIOACTIVE LIQUID WASTE LINE REPLACEMENT PROJECT W-087

1.0 INTRODUCTION

1.1 BACKGROUND

The 222-S Laboratory was built in 1951 to support the 202-S REDOX Plant and the 200 Area Tank Farms. Analytical services are performed on radioactive samples. Decontamination of analytical processing and support equipment and disposal of non-archived radioactive samples results in generation of low-level mixed (Williamson, 1989) liquid radioactive waste. The liquid radioactive waste is discharged to the 219-S Waste Handling Facility where it is accumulated and sampled and hydroxide and nitrite concentrations are adjusted. When the waste meets Tank Farm acceptance criteria, it is transferred to Tank Farms for storage.

The engineering studies (McVey, 1989a and b) discuss two waste streams from the 222-S Laboratory: a "high-level" waste and an "intermediate-level" waste. Since all of the waste generated has been classified as "low-level" waste and to avoid confusion, the two waste streams will be called "high activity" and "intermediate activity" waste respectively.

1.2 SCOPE

Site Preparation. Evaluate tunnel access for decontamination and construction activities; improve tunnel access if necessary. Clean 222-S tunnels T-4, T-7 and T-8 to ALARA levels, remove existing radioactive waste drain piping (including tunnel sump pumps and out-of-service steam jets) and dispose. Remove and dispose existing asbestos insulation and steam piping no longer in service in the 222-S tunnels. Remove and dispose existing concrete encased piping in encasement 4-45 (between 222-S and 219-S). Remove and dispose the existing steam transfer jet and non-reusable associated jumpers in tank 219-S-102.

High Activity Drain Piping. Install pipe-in-pipe encased drain piping to collect high activity waste from floor drains in hot cells 1A, 1E-1, 1E-2 and 1F, hot sinks, slurping hood, condensate from exhaust ducts, flush water and two tunnel sump pumps. Replace the sump pumps. Route the high activity waste piping through the tunnels and underground to tank 219-S-103 (similar to existing routing). Install a spare encased pipeline in the underground portion of the pipe route.

Intermediate Activity Drain Piping. Install pipe-in-pipe encased drain piping to collect intermediate activity waste from the 2-B floor drain, room sink, acid sinks, T-4 tunnel sump and the inductively coupled plasma (ICP) spectrophotometer in rooms 1-J and 1-H. Replace the sump pump. Route the intermediate activity waste piping through the tunnels and underground to tank 219-S-101 (similar to existing routing). Install a spare encased pipeline in the underground portion of the pipe route.

219-S to 244-S Transfer Piping. Replace the existing steam transfer jet in tank 219-S-102 with a pump and associated pipe and electrical jumpers. The pipe jumper will include remote siphon breaking vent piping and valving and direct line flush capability with raw water piping, valving and metering. Determine a cost effective pipe route (about 3,000 feet) and install two pipe-in-pipe encased pipelines from 219-S to 244-S; one pipeline is set up to transfer waste and one is spare.

1.3 JUSTIFICATION

Most of the waste drain piping in the 222-S tunnels is about 40 years old and some of the pipes have developed leaks in the past that have increased radiation levels in the service tunnels. The drain piping is being replaced because of the age and the leaks and the tunnels need to be cleaned to reduce radiation exposure to construction, maintenance and operations personnel.

The existing transfer piping outside of the service tunnels is in concrete encasements which do not comply with double-containment requirements (40 CFR 265.193) nor with Safety Class 3 natural forces requirements (SDC 4.1). The new piping will be pipe-in-pipe encased and meet these requirements.

Failure or shutdown of these radioactive waste lines due to the present design inadequacies would result in a shutdown of the 222-S Laboratory. Schedules of programs important to Hanford and meeting the Hanford Federal Facility Agreement and Consent Order (or Tri-Party Agreement) would be affected by a failure of the transfer lines. Other laboratories on the site cannot handle the increase workload from this condition, resulting in increased operating costs for sending samples to off site analytical laboratories.

2.0 FUNCTIONS

2.1 CAPACITIES

The drainage and transfer piping systems provided by this project shall have the capacity to handle the estimated volume of waste transferred per year which is 28,000 gallons of intermediate activity waste, 10,000 gallons of high activity waste and up to 12,000 gallons of flush water. Under current practice, intermediate and high activity waste is combined in tank 219-S-102, neutralized and transferred to Tank Farms in nominally 3,000 gallon batches followed by a 1,000 gallon raw water flush.

2.2 OPERATING LIMITATIONS

Temperature. The piping systems shall be designed to withstand normal waste temperatures in the range of 50° F to 90° F. Flush water will be at ambient temperature. The transfer pump in tank 219-S-102 shall be designed to operate in the normal waste temperature range (not over 90° F). The use of live steam in the 219-S to 244-S transfer lines shall be prevented by removal or isolation of existing steam piping. Piping shall be protected from winter freezing. The design basis frost depth in soil is 36 inches.

Fluid Flow. The 219-S-102 transfer pump discharge head and flow rate shall be sized to transfer waste in the turbulent flow regime with a minimum Reynold's number of 30,000 in the new portion of the transfer piping.

Pressure. The waste drain piping between the sources in 222-S and 219-S shall have a design pressure rating of 20 psi. The transfer pipeline from 219-S to 244-S shall be designed to a pressure rating of the material selected, but no less than two times the dead-head discharge pressure of the transfer pump. Piping systems shall be designed for hydrostatic pressure testing at 150 per cent of the design pressure. Encasements shall be designed to the same design pressure rating as the primary piping.

2.2.1 Range of Operation

Piping, pipe encasements and all components in contact with waste solutions shall be designed to transfer liquid wastes with the following characteristics:

o All piping:

	Operating Range
Fluid Properties	
density	1.0 - 1.05 g/cc
viscosity	0.3 - 3.0 centipoise
solids content	0.0 - 2.0 vol. %
Radioactive Materials:	
Total Alpha	5.0E-06 Ci/l
Total Beta	2.0E-04 Ci/l
Strontium-89/90	3.0E-05 Ci/l
Cesium-137	5.0E-05 Ci/l
Uranium	1.0E-02 g/l

Plutonium . . . . . 4.0E-05 g/l

o Piping and components from 222-S tunnels to and including 219-S:

Chemicals in Aqueous Solution:

Hydrochloric Acid	0 - 0.5 Molar
Nitric Acid	0 - 12.0 Molar
Carbonate	0 - 2.0 Molar
Hydroxide	0 - 10.0 Molar
Fluoride	0 - 0.5 Molar
Nitrite	0 - 0.025 Molar
Phosphate	0 - 0.5 Molar
Sodium	0 - 10.0 Molar
Sulfate	0 - 0.5 Molar
Total Organic Carbon.	0 - 1.0 g/l

o Piping from 219-S to and including 244-S:

	Operating Range
Chemicals in Aqueous Solution:	
pH	> or = 12.14 (0.014 Molar OH^-)
Nitrite	> or = 0.015 Molar
Cl^-	< 0.035 Molar
Organic	No Separable Phase
Pu	< 0.01 gm/gal

2.3 INTENDED USEFUL LIFE

The piping shall be designed to have a service life of 30 years minimum. Mechanical equipment (pumps, valving) shall have a minimum design life of 10 years.

3.0 DESIGN CRITERIA

3.1 SITE LOCATION

The piping being replaced is located in the 222-S Laboratory tunnels, the 4-45 encasement between 222-S and 219-S, and in encasement 2-31 between 219-S and the 202-S (Redox) D cell, and in encasement 9-80 between 240-S-151 and 241-S-151. The new transfer piping will be routed from 219-S directly to 244-S. All of these facilities are located in the 200 West Area of the Hanford site.

3.2 SITE PREPARATION

The 222-S service tunnels shall be decontaminated (ALARA in accordance with WHC-CM-4-11) to reduce radiation exposure to construction and operating personnel and the existing hot cell drain piping shall be removed and disposed of prior to installation of the new drain piping. The project shall remove all contaminated out-of-service piping in the 222-S service tunnels including tunnel sump pumps and/or steam ejectors and associated asbestos insulated steam supply piping.

222-S service tunnel access shall be evaluated for ease of solid waste removal and installation of new drain piping. If existing access doors and stairs provide inadequate access for cost effective waste (old piping) removal or installation of new piping, improved access shall be provided.

The tank 219-S-102 steam transfer jet and associated steam supply and waste discharge piping shall be removed and disposed of. If the tank 219-S-102 agitator riser must be used for pump installation and the agitator cannot be reused, then agitator removal and disposal is included in the project scope.

The project shall provide the necessary containers for disposal of the solid waste generated during site preparation.

3.3 WASTE TRANSFER ROUTE

Radioactive waste drainage piping within the 222-S tunnels shall be routed to both existing tunnel exit points similar to existing routing. Intermediate and high activity wastes shall be routed to tanks 219-S-101 and -103 respectively for waste segregation prior to neutralization treatment.

Radioactive waste drainage piping from the 222-S tunnel exits to the entry point at the 219-S Waste Handling Facility may be routed in the existing concrete encasement, 4-45. If the existing encasement is used, the encasement shall be decontaminated prior to installation of new piping.

The route of the new pipeline for transferring waste from tank 219-S-102 to the 244-S Catch Station shall be optimized giving consideration to minimizing overall cost. Longer pipe routes are acceptable if they are more cost effective due to avoidance of hand excavation in radiation zones or areas with obstructions. The transfer pipeline (and spare) shall terminate at new nozzles in the south wall of the 244-S pump pit.

3.4 PIPING

222-S to 219-S. The drain piping, including the two in-service steam jets, shall be pipe-in-pipe encased in all physically accessible locations within the service tunnels to the point inside the 219-S concrete confinement. The steam supply piping to the in-service jets need not be encased though accessibility to the jets should be maintained. The drain piping shall be sloped and sized to gravity drain to the tanks in 219-S. Since the encasement piping will tend to require more space than existing primary drain piping, some size reduction or encasement omission may be acceptable in the service tunnels on a case by case basis with approval from 222-S Laboratory Operations. The drain piping shall be designed for hydrotesting the annular space between the inner pipe and the encasement. Due to multiple entry points from hot cells and tunnel sump pumps, encasement piping shall have fittings for water filling and draining and air venting at all high and low points. Encasement drain and leak detector piping shall have a seal loop configuration (similar to line V560 at 244-S) except that encasement drainage shall be directed to one of the 219-S tanks (not the floor), if applicable.

219-S. Tank 219-S-102 shall be configured with a pump and agitator for waste transfer to 244-S. If the existing agitator is removed due to space requirements for the pump, then the replacement agitator shall provide equivalent agitation. New piping within the 219-S confinement structure shall be consistent with the existing piping configuration, fittings and materials. All valving within the 219-S confinement shall be remotely actuated with position indication.

219-S to 244-S. The transfer piping size shall be designed to allow the best flow characteristics for the properties of the fluid in section 2.2. The transfer piping shall be sloped to gravity drain to the tank in 244-S. The transfer piping shall be designed for hydrotesting the annular space between the inner pipe and the encasement. Encasement drain and leak detector piping shall be configured similar to Line V560 at 244-S, if applicable.

244-S. A waste transfer jumper from the new wall nozzle (same type as existing nozzle design shown on H-2-71053) to a spare 244-S tank port and a nozzle blank connector on the spare line shall be provided. Manual valve operators for encasement drain valving are acceptable.

3.5 INSTRUMENTATION

Leak detectors in the high activity and intermediate activity drain line encasements at 219-S and in the waste transfer pipe encasement at 244-S shall be provided. The spare piping encasements shall have leak detection capability. On liquid detection, the leak detection instruments shall activate an alarm in the local control room at 219-S. The leak detection for the waste transfer pipe encasement shall also activate alarms at 244-S and 242-S.

3.6 CONTROL SYSTEMS

The tank 219-S-102 transfer pump start/stop controls shall be located in the 219-S control room with permissive controls at 242-S.

Siphon breaking valving shall be automatically activated on tank 219-S-102 transfer pump shut down.

3.7 ELECTRICAL

The tank 219-S-102 pneumatic transfer pump shall have lock out capability.

3.8 SHIELDING

Shielding for buried piping shall restrict radiation dose rates to 0.2 mrem/hour maximum. Refer to the radiological source term in section 2.3.

3.9 CORROSION PROTECTION

The design shall consider cost effective means to achieve the design life by minimizing corrosion of system components. Depending on material selection, components in potentially corrosive environments (such as: dissimilar metals, encasement piping in contact with soil, inner piping in contact with hydrotest water and chemicals listed in Section 2.3 or piping within the area of influence of existing cathodic protection systems, etc.) shall be protected. Refer to NACE Std. RPO 169-92 and WAC 173-303-640 for regulatory requirements for corrosion protection.

3.10 MISSION FLEXIBILITY

The 222-S laboratory is essential to achieving environmental clean up at Hanford and will continue to support defense waste management and chemical processing missions for the next 30 years.

3.11 FACILITY DESIGNATION AND HAZARD CLASSIFICATION

The 222-S Laboratory, which includes the 219-S Waste Handling Facility and transfer piping, is designated as a low hazard, nuclear facility (Refer to Appendix A). This project will not affect the 222-S facility designation nor the hazard classification.

3.12 NATURAL FORCES

The waste transfer piping and control systems shall be designed to Safety Class 3 design loads as specified by the Hanford Standard Design Criteria, SDC-4.1 Revision 11.

3.13 UTILITIES

Electrical power is required for the new equipment, control systems and instruments. Emergency power is not required.

3.14 COMMUNICATION AND AUTOMATIC DATA PROCESSING (ADP) SYSTEMS

No communication or ADP systems are required by the project.

4.0 GENERAL CRITERIA

4.1 DISUCSSION OF RISKS

During the construction phase all applicable Occupational Safety and Health (OSHA) and Department of Energy (DOE) standards shall be complied with to minimize safety risks. Removal of contaminated materials (piping, concrete, soil) associated with this project will be accomplished according to the applicable Westinghouse Hanford Company procedures and standards to promote safety and minimize the potential for personnel injury or contamination spread. Safety precautions shall be provided for, but not limited to, the following items:

1. Routine construction hazards will exist during site preparation and construction activities. Field operations shall be conducted in compliance with recognized safety codes and practices to ensure a safe working environment.

2. During elements of construction, personnel may be exposed to radiation from existing sources. The Operating Contractor will provide on-site radiation monitoring and surveying services, and will prescribe requirements for the use of protective apparel and exposure monitoring as appropriate.

3. Where construction is to be performed around lifting devices, adequate safety measures such as roped off areas, hardhats, signs, guardrails, shall be employed to protect personnel from injury.

4. Appropriate safety standards and procedures for working in a radiation area and for segregating, removing, packaging, transporting, and disposing of radioactively contaminated materials shall be followed.

The project design shall have the objective that no single credible project component failure shall result in unacceptable safety consequences. Unacceptable safety consequences are:

- Fire (other than localized minor fire, such as might be caused by shorting of electrical equipment).
- Explosion.
- Instantaneous release of radioactivity from the facility in excess of 5000 times DOE Order 5480.11 Table II values at the point of discharge.
- Exposure of personnel to ionizing radiation in excess of annual personnel exposure limits given in DOE Order 5480.11.
- Exposure of personnel to toxic chemical agents in excess of the ceiling Threshold Limit Values (TLV-C) established by the American Conference. of Governmental Hygienists

4.2 ENVIRONMENTAL

Project activities shall be performed in compliance with the Environmental Compliance Manual, WHC-CM-7-5, Section 7 for dealing with solid waste generated during site preparation and construction activities and Section 9 for design of laboratory waste handling facility modifications.

4.3 OPERATIONS AND MAINTENANCE

Site preparation and construction activities shall be coordinated with laboratory operations to minimize operation down time.

Number of Personnel. No additional operating or maintenance personnel are required during operations.

Extent of Services Provided. No new change rooms or maintenance shops will be provided.

Maintenance. The design shall accommodate maintenance in accordance with current practice. Current practice at 219-S allows some contact maintenance and does not use Purex-style piping connectors. Current practice at 244-S is all remote access, low maintenance and does use Purex-style piping connectors.

4.4 SECURITY AND SAFEGUARDS

Existing safeguards and security measures will not be impacted by this project. No new measures beyond the current practices for entry into the area will be required (refer to WHC-CM-4-33, Security Manual and DOE Order 6430.1A, Section 0110-13, Physical Protection).

4.5 DESIGN VERIFICATION

Since this project provides an interface between the 222-S Laboratory and Tank Farms, review and approval by representatives of both organizations is required. The design verification shall include the following design review items:

- An informal design review of all definitive design media at about 30% completion. At a minimum 222-S Laboratory and Tank Farm representatives shall review the design media; no formal documentation is required.

- A design review, in accordance with WHC-CM-6-1, of all design media when issued for approval. Closed review comment records are required prior to Westinghouse approval of design media. All review comment records shall be compiled in a design review completion report.

4.6 EXISTING DRAWING UPDATE

If existing 219-S and 222-S facility drawings are not adequate to provide required design input, then the project shall provide for the necessary revisions via Engineering Change Notice.

4.7 DRAWING TRACEABILITY

Existing drawings that are modified by the project shall be listed on project drawings and the project shall provide the Engineering Change Notice to add drawing traceability notes to the existing drawings at construction completion.

4.8 QUALITY ASSURANCE

Quality Assurance (QA) activities for all contractors involved in design, construction, and testing of the project shall be formulated and executed in accordance with a project specific QA Plan. Program requirements established in the specific QA Plan shall be consistent with DOE Order 5700.6C "Quality Assurance."

4.9 DECONTAMINATION AND DECOMMISSIONING

Solid waste will be generated during site preparation, from equipment failures and during facility decommissioning. The use of construction materials that would be considered hazardous waste (per WHC-CM-5-16) when disposal is necessary shall be avoided. Examples include:

- Lead shielding during site preparation activities that cannot be decontaminated and re-used.
- Lead counter-weights in jumpers when not retrievable in clean condition.
- Asbestos insulation material.

5.0 REGULATIONS, CODES AND STANDARDS

Engineering and construction shall be in accordance with applicable regulations, codes and standards (including DOE Orders) referenced in the following documents. The latest editions in effect at the start of design shall be used; and applicable Richland Operations (RL) supplements to referenced DOE Orders shall be included.

- DOE Order 6430.1A, "General Design Criteria" (Division 1 provides an extensive list of regulations, DOE Orders, and "National Consensus" codes and standards to be applied as necessary. In division 13 only sections 1300, 1323 and 1325 and in general sections with the "-99" suffix only the sections with the -99.0 and -99.1 suffix may be applicable.)

- Hanford Plant Standards:

  - SDC 1.3 "Preparation and Control of Engineering and Architectural Drawings"

  - SDC 4.1 "Design Loads for Facilities", Revision 11.

6.0 REFERENCES

McVey, C. B., 1989a, Project W-057, 222-S High Level Drain System Upgrade, WHC-SD-W057-ES-001, Westinghouse Hanford Company, Richland, Washington, November 8, 1989

McVey, C. B., 1989b, 219-S Radioactive Liquid Waste Transfer Line, WHC-SD-W087-ES-001, Westinghouse Hanford Company, Richland, Washington, June 26, 1989

WHC-CM-4-33, Security Manual, Westinghouse Hanford Company, Richland Washington.

WHC-CM-7-5, Environmental Compliance, Westinghouse Hanford Company, Richland Washington.

WHC-CM-6-1, Standard Engineering Practices, Westinghouse Hanford Company, Richland Washington.

WHC-CM-4-11, ALARA Program Manual, Westinghouse Hanford Company, Richland Washington.

WHC-CM-5-16, Hazardous Waste Management, Westinghouse Hanford Company, Richland Washington.

Williamson, L. A., 1989, 222-S Laboratory Facilities Hazards Identification and Evaluation, SD-CP-HIE-001, Westinghouse Hanford Company, Richland, Washington, June 10, 1989

NACE Standard RPO 169-92, *National Association of Corrosion Engineers*

WAC 173-303, 1991, "Dangerous Waste Regulations," *Washington Administrative Code*

APPENDIX A

222-S LABORATORY FACILITY HAZARD CLASSIFICATION

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THIS APPENDIX IS FOR A/E INFORMATION ONLY.

222-S LABORATORY FACILITY HAZARD CLASSIFICATION

1.0 INTRODUCTION

This document reports the facility hazard classification determination for the 222-S Laboratory Facilities and evaluates the modifications proposed by Project W-087, Radioactive Liquid Waste Line Replacement in accordance with the requirements in WHC, 1990. The facility hazard classification is based on results of a hazards identification and evaluation of the 222-S Facility which has been documented in Williamson, 1989. Facility equipment, operations and waste management are also described in the referenced documents.

The 222-S Laboratory provides analytical chemical analysis and support services for Hanford programs. Low level radioactive liquid wastes resulting from 222-S Laboratory operations are routed to an auxiliary facility, the 219-S Waste Handling Facility, and periodically transferred to the Tank Farms.

Project W-087 will modify the facility by replacing the aged piping for the drain systems (McVey, 1989a) and the waste transfer line (McVey, 1989b). The referenced engineering studies describe the proposed modifications and also recommend that they be combined and installed together. It is significant from a hazards classification standpoint that the design capacity of the waste handling system will not be changed.

2.0 SUMMARY

The results of this analysis conclude that the 222-S Laboratory Facility is classified as a low hazard, nuclear facility and that the modifications proposed by Project W-087 will not change the facility hazard classification.

3.0 HAZARDS ANALYSIS

Assignment of hazard classification is based on determination of potential radiological and toxicological dose consequences and environmental impacts of worst case, credible accidents.

3.1 RADIOLOGICAL CONSEQUENCES

In the approved safety analysis documentation for 222-S (Williamson, 1989) release consequences for several accident scenarios have been calculated. The most serious release consequences are those projected due to an extrinsic event, a seismic induced failure of the main laboratory building, failure of piping systems and ignition of flammable materials which disperses the maximum allowed inventory of radiological materials (Williamson, 1989, Section 2.1.4.1.). The calculated effective dose equivalents (EDE) for the accident scenarios are:

DOSE CONSEQUENCES, SAFETY ANALYSIS

Organ	Onsite (rem)	Offsite (rem)
Whole body EDE	5.0E-02	5.9E-03
Bone	5.1E-01	4.7E-02
Lung	1.8E-01	6.5E-03

From Williamson, 1989, Table 2-3.

The potential consequences were calculated assuming a building removal factor of 0.05. If the building removal factor were increased to unity, assuming total collapse of the building, i.e. removal of all engineered barriers, the projected dose consequences would be:

DOSE CONSEQUENCES, NO BARRIERS

Organ	Onsite (rem)	Offsite (rem)
Whole body EDE	1E+00	1.18E-01
Bone	1.02E+01	9.4E-01
Lung	3.6E+00	1.3E-01

3.2 TOXICOLOGICAL CONSEQUENCES

A toxic source term of 45.6 pounds of Carbon Tetrachloride was taken from 222-S Hazardous Material Inventory Information (Williamson, 1989, Appendix A). This material was chosen for analysis because of its volatility, toxicity and the relatively large quantities allowed in maximum inventory. Using Shell Spills Model for the IBM-PC, Version 3.0, the maximum concentrations following a spill and evaporation of the Carbon Tetrachloride were:

- o 2.5 PPM at 200 m
- o 1 PPM at 300 m
- o Negligible at distances greater than 1000 m.

The permissible exposure limits were determined for the guidelines (WHC, 1990) by reference to NIOSH/OSHA Pocket Guide to Chemical Hazards, September 1985, for Carbon Tetrachloride:

- o Immediately Dangerous to Life and Health (IDLH) is 300 PPM
- o PAG (onsite) Protective Action Guideline is 150 PPM (half of IDLH)
- o TLV-TWA (offsite) is 10 PPM.

3.3 ENVIRONMENTAL IMPACTS

The potential for contamination to land or surface water is less than or equal to the levels which would require implementation of the Environmental Protection Agency (EPA) preventive protection action guide (PPAG) set at 0.5 rem EDE and corresponding organ dose equivalents from ingestion pathways. Therefore, environmental impacts are negligible.

4.0 HAZARD CLASSIFICATION

The 222-S Laboratory Facility hazard classification is "LOW" as indicated in the following table.

ONSITE CONSEQUENCES	DOSE EQUIVALENTS CALCULATED	CRITERIA*
Radiological (rem)		
EDE	1	≤5
Bone	10.2	≤50
Lung	3.6	≤50
Toxicological (PPM)		
Carbon Tetrachloride	2.5	≤150
OFFSITE CONSEQUENCES		
Radiological (rem)		
EDE	0.118	≤0.5
Bone	0.94	≤5
Lung	0.13	≤5
Toxicological (PPM)		
Carbon Tetrachloride	negligible	≤10
Environmental Impact (rem)	0.118	≤0.5

* Criteria for Low classification per WHC-CM-4-46, Section 2.0.

Inasmuch as the Project W-087 modifications planned for the liquid waste piping systems will not change the capacities or inventories, or introduce more serious accident scenarios, the hazard classification of the 222-S Laboratory will not be increased.

5.0 REFERENCES

McVey, C. B., 1989a, Engineering Study, 222-S High-Level Drain System Upgrade, Project W-057, SD-W057-ES-001, Rev. 0, Westinghouse Hanford Company, November 6, 1989.

McVey, C. B., 1989b, Engineering Study, 219-S Radioactive Liquid Waste Transfer Line, Project W-087, SD-W087-ES-001, Rev. 0, Westinghouse Hanford Company, June 26, 1989.

WHC, 1990, Nonreactor Facility Safety Analysis Manual, Facility Hazard Classification, WHC-CM-4-46, Section 2.0, Rev. 1, Westinghouse Hanford Company, March 31, 1990.

Williamson, L. A., 1989, 222-S Laboratory Facilities Hazards Identification and Evaluation, SD-CP-HIE-001, Rev. 0, Westinghouse Hanford Company, June 10, 1989.