

ENGINEERING CHANGE NOTICE

KN

1. ECN **647701**

Page 1 of 2

Proj.
ECN

2. ECN Category (mark one) Supplemental <input type="checkbox"/> Direct Revision <input checked="" type="checkbox"/> Change ECN <input type="checkbox"/> Temporary <input type="checkbox"/> Standby <input type="checkbox"/> Supersedure <input type="checkbox"/> Cancel/Void <input type="checkbox"/>	3. Originator's Name, Organization, MSIN, and Telephone No. GA Barnes/Cogema/B4-51/6-2241	4. USQ Required? <i>KN</i> TF-96-690 <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	5. Date 8/25/98
	6. Project Title/No./Work Order No. HTI/LDUA Deployment/D25K2	7. Bldg./Sys./Fac.No. N/A	8. Approval Designator N/A <i>Job Q 8-25-98</i>
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) HNF-2300, Rev. 0	10. Related ECN No(s). N/A	11. Related PO No. N/A

12a. Modification Work <input type="checkbox"/> Yes (fill out B1k. 12b) <input checked="" type="checkbox"/> No (NA Blks. 12b, 12c, 12d)	12b. Work Package No. N/A	12c. Modification Work Complete N/A	12d. Restored to Original Condition (Temp. or Standby ECN only) N/A
Design Authority/Cog. Engineer Signature & Date		Design Authority/Cog. Engineer Signature & Date	

13a. Description of Change
ETN-96-0007

13b. Design Baseline Document? Yes No

The attached document replaces Rev. 0 of HNF-2300 in it entirety.

14a. Justification (mark one)

Criteria Change <input checked="" type="checkbox"/>	Design Improvement <input type="checkbox"/>	Environmental <input type="checkbox"/>	Facility Deactivation <input type="checkbox"/>
As-Found <input type="checkbox"/>	Facilitate Const. <input type="checkbox"/>	Const. Error/Omission <input type="checkbox"/>	Design Error/Omission <input type="checkbox"/>

14b. Justification Details
Rev. 1 of HNF-2300 is required to incorporate added scope. The USQ screening for this ECN is TF-96-690, rev. 2

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

G. A. Barnes	B4-51
C. A. Esvelt	S7-12
F. A. Schmorde	S7-01
D. H. Shuford	S7-03
W. J. Kennedy	S7-03
J. E. Corbett	S7-01

SEP 01 1998 RELEASE STAMP

DATE: _____
STA: **15**

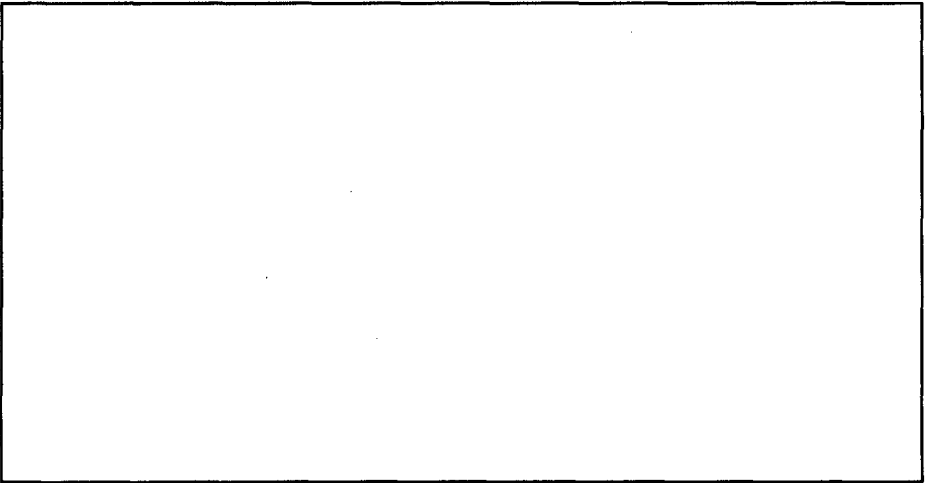
HANFORD RELEASE

ID: _____

(21)



Document Separator



Document Separator



ENGINEERING CHANGE NOTICE

KN

1. ECN **647701** ⁵¹

Page 1 of 2

Proj.
ECN

2. ECN Category (mark one) Supplemental <input type="checkbox"/> Direct Revision <input checked="" type="checkbox"/> Change ECN <input type="checkbox"/> Temporary <input type="checkbox"/> Standby <input type="checkbox"/> Supersedure <input type="checkbox"/> Cancel/Void <input type="checkbox"/>	3. Originator's Name, Organization, MSIN, and Telephone No. GA Barnes/Cogema/B4-51/6-2241	4. USQ Required? <i>KN</i> TF-96-690 <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	5. Date 8/25/98
	6. Project Title/No./Work Order No. HTI/LDUA Deployment/D25K2	7. Bldg./Sys./Fac.No. N/A	8. Approval Designer N/A ^{Bob} Q ₈₋₂₅₋₉₈
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) HNF-2300, Rev. 0	10. Related ECN No(s). N/A	11. Related PO No. N/A

12a. Modification Work <input type="checkbox"/> Yes (fill out B1k. 12b) <input checked="" type="checkbox"/> No (NA B1ks. 12b, 12c, 12d)	12b. Work Package No. N/A	12c. Modification Work Complete N/A	12d. Restored to Original Condition (Temp. or Standby ECN only) N/A
		Design Authority/Cog. Engineer Signature & Date	Design Authority/Cog. Engineer Signature & Date

13a. Description of Change
ETN-96-0007

13b. Design Baseline Document? Yes No

The attached document replaces Rev. 0 of HNF-2300 in it entirety.

14a. Justification (mark one)

Criteria Change <input checked="" type="checkbox"/>	Design Improvement <input type="checkbox"/>	Environmental <input type="checkbox"/>	Facility Deactivation <input type="checkbox"/>
As-Found <input type="checkbox"/>	Facilitate Const. <input type="checkbox"/>	Const. Error/Omission <input type="checkbox"/>	Design Error/Omission <input type="checkbox"/>

14b. Justification Details

Rev. 1 of HNF-2300 is required to incorporate added scope. The USQ screening for this ECN is TF-96-690, rev. 2

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

G.A. Barnes	B4-51
C.A. Esvelt	S7-12
F.A. Schmorde	S7-01
D.H. Shuford	S7-03
W.J. Kennedy	S7-03
J.E. Corbett	S7-01

SEP 01 1998 RELEASE STAMP

DATE: _____ STA: **15** ID: _____

HANFORD RELEASE

21

ENGINEERING CHANGE NOTICE

Page 2 of 2

1. ECN (use no. from pg. 1)
64771 647701

16. Design Verification Required <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	17. Cost Impact <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;">ENGINEERING</th> <th style="width: 50%;">CONSTRUCTION</th> </tr> <tr> <td>Additional <input type="checkbox"/> \$</td> <td>Additional <input type="checkbox"/> \$</td> </tr> <tr> <td>Savings <input type="checkbox"/> \$</td> <td>Savings <input type="checkbox"/> \$</td> </tr> </table>	ENGINEERING	CONSTRUCTION	Additional <input type="checkbox"/> \$	Additional <input type="checkbox"/> \$	Savings <input type="checkbox"/> \$	Savings <input type="checkbox"/> \$	18. Schedule Impact (days) Improvement <input type="checkbox"/> Delay <input type="checkbox"/>
ENGINEERING	CONSTRUCTION							
Additional <input type="checkbox"/> \$	Additional <input type="checkbox"/> \$							
Savings <input type="checkbox"/> \$	Savings <input type="checkbox"/> \$							

19. 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 13. Enter the affected document number in Block 20.

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

20. 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
--------------------------	--------------------------	--------------------------

21. Approvals

Signature	Date	Signature	Date
Design Authority		Design Agent	
Cog. Eng. C.A. Esvelt	<u>8-25-98</u>	PE	
Cog. Mgr. J.S. Schofield	<u>8-25-98</u>	QA	
QA	<u>8-25-98</u>	Safety	
Safety		Design	
Environ.		Environ.	
Other F.A. Schmorde	<u>25 Aug 98</u>	Other	
		DEPARTMENT OF ENERGY	
		Signature or a Control Number that tracks the Approval Signature	
		ADDITIONAL	

LIGHT DUTY UTILITY ARM STARTUP PLAN

GA Barnes

COGEMA Engineering Corporation, Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

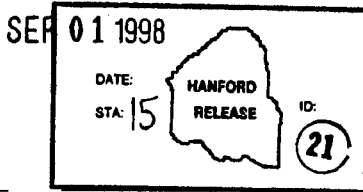
EDT/ECN: 647701 UC: 2070
Org Code: 08 E00 Charge Code: LME010 DZSKZ / SGNP0010
B&R Code: EW3120674 Total Pages: 14 KN KN

Key Words: Light Duty Utility Arm, LDUA, startup plan, system, testing

Abstract: This plan details the methods and procedures necessary to ensure a safe transition in the operation of the Light Duty Utility Arm (LDUA) System. The steps identified outline the work scope and identify responsibilities to complete startup, and turnover of the LDUA to Characterization Project Operations (CPO).

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

Printed in the United States of America. To obtain copies of this document, contact: Document Control Services, P.O. Box 950, Mailstop H6-08, Richland WA 99352, Phone (509) 372-2420; Fax (509) 376-4989.



Karen A. Noland 9/1/98
Release Approval Date

Approved for Public Release

**LIGHT DUTY UTILITY ARM
STARTUP PLAN**

**HNF-2300
Rev. 1**

**G. A. Barnes
COGEMA Engineering Corporation**

August, 1998

Table of Contents

1.0 Purpose	3
2.0 Scope	3
3.0 Background	3
3.1 System Description	3
4.0 Responsibilities	4
5.0 Start-Up of The LDUA	5
5.1 Overview of Startup Sequence	5
5.2 Startup Prerequisites	7
6.0 System Testing	10
6.1 Operational Testing	10
6.2 Acceptance Testing	10
7.0 References	12

LIGHT DUTY UTILITY ARM STARTUP PLAN

1.0 PURPOSE

This plan details the methods and procedures necessary to ensure a safe transition in the operation of the Light Duty Utility Arm (LDUA) System. The steps identified below outline the work scope and identify responsibilities to complete startup, and turnover of the LDUA to Characterization Project Operations (CPO).

2.0 SCOPE

This Startup Plan encompasses activities necessary to perform startup and operation of the LDUA in Facility Group 3 tanks and complete turnover to CPO. The activities discussed in this plan will occur prior to, and following the U.S. Department of Energy, Richland Operations Office (RL) Operational Readiness Review (ORR).

This startup plan does not authorize or direct any specific field activities or authorize a change of configuration. As such, this startup plan was Unresolved Safety Question (USQ) screened as a categorical exclusion (TF-96-690, Rev. 2).

3.0 BACKGROUND

3.1 SYSTEM DESCRIPTION

The LDUA is a mobile, multi-axis positioning system capable of accessing tanks through existing 12-inch diameter and larger tank dome risers. This system provides a flexible robotic platform designed to exercise tools called end effectors for accomplishing activities such as in situ inspection, waste assessment, equipment deployment, and sampling. The end effectors are mounted on the end of the LDUA by attachment to a tool interface plate (TIP) with mating service connectors.

The various end effectors are deployed into tanks to facilitate requirements such as surveillance, inspection, waste characterization, and movement of in-tank equipment. The end effectors may be locally waste disturbing near the waste surface (up to 12 inches deep) by probing, scraping, grabbing or sampling tank waste at various locations within the tank. In addition, the end effectors may be used to place monitoring equipment onto or into tank waste.

Major components of the LDUA system are as follows:

- **End Effectors:** end effectors are the tools that perform the specific in-tank tasks of the LDUA system;

- **Light Duty Utility Arm:** the light duty utility arm is a robotic manipulator (having seven degrees of freedom) that provides dexterity to reach around obstructions in the tank while orienting and positioning end effectors to any surface within its operating envelope;
- **Tank Riser Interface and Confinement (TRIC) System:** the TRIC system provides an interface between the LDUA system and the waste tank riser, and is used for change-out of end effectors, minor maintenance tasks, and containment of the tank atmosphere;
- **Vertical Positioning Mast:** the vertical positioning mast provides the gross vertical positioning of the LDUA above the waste;
- **Mobile Deployment System:** the mobile deployment system is used to transport the LDUA between and within tank farms;
- **Operations Control System:** the operations control system includes most of the control and data acquisition equipment for the LDUA system, consisting of the operations control trailer, the at-tank instrument enclosure, the supervisory control and data acquisition system, and the control network;
- **Operations Control Trailer:** the operations control trailer is a standard semi-trailer that is towed to the tank farm and parked outside the perimeter fence. It provides two separate work areas - the operating area, containing the control panels and workstations which control the LDUA system; and the visitor area, containing desks, shelves, data access workstations, and other staff amenities;
- **Utilities:** electrical systems, compressed gas systems, and decontamination wash water supply system.

4.0 RESPONSIBILITIES

The LDUA Startup Team has been formed with key personnel from the Hanford Tanks Initiative (HTI) and Characterization Project. Cognizant Engineering and Design Authority support is provided by Characterization Equipment Engineering.

CPO will specifically train a selected group who will work with the LDUA Startup Team to provide operations support for startup of the LDUA. This selected group consists of two Persons In Charge (PIC), seven Nuclear Process Operators (NPO) and various other maintenance and radiological control personnel. The Operations Shift Manager will release work activities in this startup sequence and direct the startup team to proceed. When appropriate, a senior supervisory watch will observe the activity.

5.0 START-UP OF THE LDUA

5.1 OVERVIEW OF STARTUP SEQUENCE

Startup of the LDUA (deployment in tank AX-104) will consist of the following activities:

- **Install Utilities** – This activity will provide appropriate utilities to AX-farm to power the LDUA system. It is anticipated that this activity will be completed prior to the completion of the RL ORR.
- **Move LDUA to AX-farm** – This activity will consist of moving the LDUA equipment from the Cold Test Facility (CTF) in the 400 area to AX-Farm.
- **Setup equipment at AX-farm** – The LDUA system will be setup for deployment into AX-104, as depicted in Figure 1.



Figure 1

- **Deploy LDUA in AX-104/Complete Campaign** – The LDUA system will be deployed into tank AX-104 and sampling will be conducted with the Extended Reach End Effector (EREE). Approximately 15 samples will be retrieved from the bottom, side-walls and dome (Tank 241-AX-104 Light Duty Utility Arm Sampling and Analysis Plan, HNF-2071). Video inspection of the interior of AX-104 will also be conducted during deployment with the High Resolution Stereo Video System (HRSVS) end effector.
- **Ship Samples to 222S** – The samples obtained during the LDUA deployment will be shipped to the 222S laboratory for analysis.
- **Remove Equipment** – At the completion of the deployment, the LDUA will be removed from the tank and all associated equipment will be placed in storage.
- **Remove Boot** – During this activity, the LDUA will be moved to TX farm where it will be deployed into an empty caisson. As the LDUA is lowered into the TX
-

farm caisson, the protective rubber boots will be removed. The LDUA will also be decontaminated at this time, if required.

- **Transport to Storage** – Upon successful decontamination of the LDUA, the LDUA system and all subsystems will be transported to storage.

5.2 STARTUP PREREQUISITES

Prior to commencing the Startup activities, it must be confirmed that the Department of Energy, Richland Operations Office (RL), Operational Readiness Review (ORR) has been completed and RL has issued authorization to startup.

Prior to the RL ORR, the following items must be completed:

- RL must release the hold on LDUA field activities. The hold on LDUA field activities occurred in February of 1997 and it will not be lifted until RL is satisfied that there is adequate authorization basis for the LDUA system.
- All ORR prerequisites are completed. The following is a list of ORR prerequisites:
 - **Preparation and approval of LDUA system Preventive Maintenance (PM) and calibration procedures.** The basis for the scope of the PM procedures is detailed in PNNL document, PNNL-LDUA-PMR-97211701, (VI # 22803). The scope of the calibration program is based on the LDUA safety equipment list (HNF-2147) and the Flammable Gas Equipment Advisory Board (FGEAB) letter (FGEAB-97-019, Rev 2, September 9, 1997.) A total of 6 PM and calibration procedures are required.
 - **Revision and approval of the LDUA Plant Operating Procedures (POP).** The LDUA POPs were first prepared in FY-96 for the initial deployment of the LDUA in tank T-106 and must be revised to include controls from the BIO, TSRs and FGEAB requirements. A total of 7 POPs are required.
 - **Reconcile POPs to the Authorization Basis.** Preparation of the POPs was largely performed prior to finalization of the AB. CPO personnel will verify that the POPs have incorporated all controls from the authorization basis documents.
 - **Prepare and approve work package.** The work package is the first line work authorization document. It includes instructions, permits, dome load calculations and other documentation required for the operating crew to safely deploy the LDUA. This activity cannot be completed until the POPs are approved.

- **Setup operator training program.** This task will include preparation of all operator training documentation. The training documentation will be adequate to qualify the operations personnel to operate the LDUA. The documentation will include training handouts, OJT cards, examinations and training plan.
- **Operator Training.** Operator training will occur in the Cold Test Facility (CTF) in the 400 area. Operator training will begin before the training program is complete, however the operators will not be qualified until they attend the classes and pass the exam. In addition, the POPs will be validated during the initial phase of operator training.
- **Setup maintenance training program.** The CPO maintenance personnel will be maintaining the LDUA after the system is turned over. This activity will prepare the training program for CPO maintenance personnel. The maintenance training program will focus on orientations to the LDUA systems and LDUA PM and calibration procedures, rather than component-specific training.
- **Maintenance training.** Maintenance training of CPO personnel will occur after the maintenance training program is setup. Maintenance training cannot occur until after the PM and calibration procedures are completed.
- **Safety documentation for the Extended Reach End Effector (EREE).** Safety documentation for the EREE must be completed. The safety documentation for the EREE includes preparation of a Hazards Identification and Evaluation (HIE) and preparation of a USQ screening/determination. The information in the HIE will feed into the POPs and other documentation, as required.
- **Review procedures for conduct of operations.** The scope of this activity is to review the operations procedures to verify that all aspects of the conduct of operations program are considered.
- **Review calibration, testing and PMs.** A separate review of the PM and calibration procedures will be conducted to verify adequacy.
- **Place PMs and calibrations on recall.** This activity will place all PM and calibration items identified during the preparation of the PM and calibration procedures in the CPO preventive maintenance and calibration recall system. This task will also review the current status of the LDUA PMs and calibrations.
- **Calibrate LDUA instruments and perform PMs.** This activity will consist of preparation of the work packages and performing the calibrations and maintenance on the LDUA system. This activity cannot start until the

calibration and PM procedures are approved and maintenance personnel are adequately trained.

- **Review HATS and DTS.** This activity will review the various tracking systems associated with CPO and TWRS to verify there are no issues that could affect the LDUA deployment
- **Identify changes to S/RIDS.** The scope of this activity is to review the current S/RIDS program to verify that the startup of the LDUA does not change any of the requirements within the S/RIDS.
- **Prepare SEL.** A LDUA system Safety Equipment List (SEL) will be prepared. The SEL will provide requirements for calibration and dedication of Commercial Grade Items (CGI)
- **Prepare CGI.** CGI data sheets will be prepared during this activity. The CGI data sheets will be based on the SEL. Completion of the CGI forms will document the dedication of commercial grade items to the appropriate Safety Class, Safety Significant or GS-DID level.
- **Prepare storage plan.** A storage plan will be prepared that identifies the storage location for the LDUA after deployment in AX-104. The selected storage location must allow storage of radioactive material and must provide adequate electrical utilities for operating the HVAC systems and maintaining climate control of the various LDUA systems
- **Complete ABU Punchlist.** In addition to the previously listed activities, the following tasks must be finished to complete the Acceptance for Beneficial Use (ABU) punchlist:
 - **Issue Documents to CVI.** Prior to turnover of the LDUA system to Operations, all design and vendor documentation will be transmitted to the Vendor Information (VI) file.
 - **Issue ATP.** The LDUA Phase 2 qualification test report (HNF-SD-WM-ATR-196) must be issued. Phase 2 qualification testing verified that the LDUA met the flammable gas control imposed by the FGEAB (FGEAB-97-019, Rev 2, September 9, 1997)
 - **Issue Test Report.** The vendor, (PNNL), will issue the EREE test report. The EREE test report will then be transmitted to the VI file.
 - **Issue O&M Manuals.** The Operations and Maintenance manuals that were prepared by the vendors of the LDUA system will be issued.

- **Complete Spare Parts Inventory.** This task will include preparation of the recommended spare parts list by the vendor (PNNL) and verification that recommended spare parts are available for LDUA startup.
- **Release vendor drawings to CVI.** This task will update all LDUA vendor drawings to include red line changes identified after delivery of the system. The updated vendor drawings will be released by the vendor (PNNL) with vendor QA review. The updated vendor drawings will then be transmitted to the VI file.
- **LDUA drawing update.** This task will review and select LDUA drawings that will be walked down and as-built. The criteria used for selecting the drawings that will be as built are those drawings that identify design features required by the Authorization Basis, required for personnel safety and required for maintenance.
- **Procedure Review.** After the LDUA drawing update, the LDUA POPs, PMs and Calibration procedures will be reviewed to verify that they are not changed due to the drawing updates.
- **Training Review.** After the LDUA drawing update, the LDUA training program will be updated to verify that it does not need to be change. Any additional training to operation personnel due to drawing updates will be covered under this task.
- **Verification Test.** The LDUA design features that are required in the AB will be identified and verified or tested during this task.
- **Software Control.** The LDUA software documentation will be updated during this task to include any changes to the software that that took place. A software configuration management plan will also be prepared and released during this task.
- **Issue ABU.** Once the above tasks are completed, a final ABU checklist will be issued. Issuance of the ABU will be tied to completion of the management self-assessment.
- **Review Environmental Permits.** A review of environmental permits associated with the LDUA system will be performed to verify that all environmental permits associated with LDUA startup are current and approved.
- **Prepare drill Scenarios.** Various drill scenarios will be prepared to verify that the operations team is adequately trained for typical emergency responses.
-

- **Management observe drills.** Once the drill scenarios are prepared, management will observe and evaluate the team's performance while conducting these drills.
- **Develop design compliance matrix.** The design compliance matrix will identify all design criteria that was used to develop the LDUA system and it will also detail how the design criteria has been met.

6.0 SYSTEM STARTUP TESTING

6.1 OPERATIONAL TESTING

Operational testing of the LDUA has been completed. The scope of the operational testing is detailed in WHC-SD-WM-OTP-213, Rev. 0. The results of the operational testing are detailed in HNF-SD-WM-OTR-213, Rev. 0. **No additional operational testing is anticipated at this time.**

6.2 ACCEPTANCE TESTING

Acceptance testing was performed in two parts: Phase 1 qualification (acceptance) testing was performed in fiscal year, 1996, per ATP-WHC-SD-TD-ATP-005 and the results are detailed in WHC-SD-TD-ATR-005. Phase 2 qualification (acceptance) testing was performed in fiscal year 1997 per WHC-SD-WM-ATP-196 and the results are detailed in WHC-SD-WM-ATR-196. **No additional acceptance testing is anticipated at this time.**

7.0 REFERENCES

1. FGEAB-97-019, Rev 2, "*Flammable Gas Equipment Advisory Board Interpretation/ Recommendation Report*," dated September 9, 1997.
2. HNF-2071, Rev. 0, "*Tank 241-AX-104 Light Duty Utility Arm Sampling and Analysis Plan*", dated February, 1998.
3. HNF-2147, Rev 0, "*Safety Equipment List for the Light Duty Utility Arm System*," dated February, 1998.
4. HNF-SD-WM-ATP-196, Rev 0, "*Light Duty Utility Arm Equipment Qualification Test Procedure*", 1997.
5. HNF-SD-WM-ATR-196, Rev 0, "*Light Duty Utility Arm Equipment Qualification Test Report*", 1997.
6. HNF-SD-TD-ER-005, Rev. 1, "*Light Duty Utility Arm Baseline System Description*", dated December, 16, 1996.
7. HNF-SD-WM-OTR-213, REV 0, "*Light Duty Utility Arm (LDUA) Operability Test Report*, dated October, 1996.
8. Letter, J.K. McClusky, RL to H.J. Hatch, FDH, "*contract Number DE-AC06-96RL13200, Directed Hold on Tank Intrusive Activities With the Light Duty Utility Arm (LDUA) and Push Mode Sampling*," 9751787, dated February 27, 1997.
9. PNNL-LDUA-PMR-97211701, (contained inf VI file # 22803), "*Integrated LDUA System Preventive Maintenance Requirements*, dated December 30, 1997.
10. WHC-SD-WM-OTP-213, Rev 0, "*Operability Test Procedure for the Light Duty Utility Arm in Tank T-106*", dated 1996
11. WHC-SD-WM-TD-ATP-004, Rev 0, "*Light Duty Utility Arm Qualification Test Procedure*," 1996.
12. WHC-SD-WM-TD-ATR-004, Rev 0, "*Light Duty Utility Arm Qualification Test Report*," 1996.
13. LMHC-97-61734, "*Light Duty Utility Arm Plan of Action*" , dated December 18, 1998.