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System Logic Description for High-Level Waste Facility - Radioactive Liquid Waste Disposal System

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Author(s): R Frink

Principal author signature: R. Frink

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Checker signature: Anthony L. Coulam

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Approver signature: S. E. Anderson

MARK A. FRIEDRICH
STATE OF WASHINGTON
32426
REGISTERED
PROFESSIONAL ENGINEER

Mark A. Friedrich 7-15-04

EXPIRES: 08/31/04

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River Protection Project
Waste Treatment Plant
2435 Stevens Center Place
Richland, WA 99352
United States of America
Tel: 509 371 2000

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History Sheet

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Contents

Tables

Figures

Acronyms and Abbreviations

Reference the *P&ID Symbols and Legend Sheets*, as listed in the Applicable Documents section, for acronyms and abbreviations employed on the attached figures.

AEA	*Atomic Energy Act of 1954*
AI	analog input
DOE	US Department of Energy
HLW	high-level waste
HCP	HLW concentrate receipt process system
HDH	HLW canister decontamination handling system
HFP	HLW melter feed process system
HOP	HLW melter offgas treatment process system
HSH	HLW melter cave support handling system
LAH	level alarm high
LAHH	level alarm high-high
LI	level indicator
LOL	lower operating limit
LSH	level switch high
LSHH	level switch high-high
LT	level transmitter
P&ID	piping and instrumentation diagram
RLD	radioactive liquid waste disposal system
SDS	safety design significant
UOL	upper operating limit
VSL	vessel
WAC	Washington Administrative Code
WTP	Hanford Tank Waste Treatment and Immobilization Plant

Glossary

Control system	This term refers to the electronic processors that perform regulatory and logic control functions necessary for normal operation of the plant.
High level	This term refers to a notification in the control system that is activated when the high level setpoint of the vessel has been reached.
High-high level	This term refers to a notification in the control system that is activated when the high-high level setpoint of the vessel has been reached.
Interlock	Predetermined system equipment connections so that action of one part of the system affects the action of another part of the system.
LOL	Lower operating limit - A low level set point used to stop a transfer-out batch operation from the vessel under normal plant operations.
Transfer-in	Coordinates the effluent transfer into vessel by setting the appropriate valve alignment and facility communication.
Transfer-out	Coordinates the effluent transfer out of a vessel by setting the appropriate valve alignment and facility communication.
UOL	Upper operating limit - A high-level set point used to stop a transfer-in batch operation to the vessel under normal plant operation.

1 Introduction

This document describes the instrument control logic for the ancillary equipment in the radioactive liquid waste disposal system (RLD) within the high-level waste (HLW) facility associated with dangerous waste permit.

2 Applicable Documents

24590-HLW-M6-RLD-P0001, *P&ID-HLW Radioactive Liquid Waste Disposal System Active Effluent Collection.*

24590-HLW-M6-RLD-P0002, *P&ID - HLW Radioactive Liquid Waste Disposal System Plant Wash & Drains Vessel.*

24590-HLW-M6-RLD-P0003, *P&ID - HLW Radioactive Liquid Waste Disposal System Decontamination Tank & Sumps.*

24590-HLW-M6-RLD-P0004, *P&ID - HLW Radioactive Liquid Waste Disposal System Miscellaneous Sumps.*

24590-HLW-M6-RLD-P0006, *P&ID - HLW Radioactive Liquid Waste Disposal System Fluidics Air Rack RLD-RK-00023.*

24590-HLW-M6-RLD-P0007, *P&ID - HLW Radioactive Liquid Waste Disposal System Fluidics Air Rack RLD-RK-00024.*

24590-HLW-M6-RLD-P0008, *P&ID - HLW Radioactive Liquid Waste Disposal System Miscellaneous Sumps.*

24590-HLW-M6-RLD-P0014, *P&I - HLW Radioactive Liquid Waste Disposal System Offgas Drains Collection Vessel .*

24590-HLW-M6-RLD-P0015, *P&ID - HLW Radioactive Liquid Waste Disposal System Miscellaneous Sumps.*

24590-HLW-M6-RLD-P0016, *P&ID - HLW Radioactive Liquid Waste Disposal System Miscellaneous Sumps.*

24590-HLW-M6-RLD-P0017, *P&ID - HLW Radioactive Liquid Waste Disposal System Miscellaneous Sumps.*

24590-HLW-M6-RLD-P20003, *P&ID - HLW Radioactive Liquid Waste Disposal System Decontamination Tank & Sumps - Melter 2.*

24590-HLW-M6-RLD-P20004, *P&ID - HLW Radioactive Liquid Waste Disposal System Miscellaneous Sumps Melter 2.*

24590-HLW-M6-RLD-P20005, *P&ID - HLW Radioactive Liquid Waste Disposal System Miscellaneous Sumps Melter 2.*

24590-HLW-3YD-RLD-00001, *System Description for HLW Radioactive Liquid Waste Disposal (System RLD).*

WAC 173-303. "Dangerous Waste Characteristics", *Dangerous Waste Regulations. Washington Administration Code, as amended.*

3 Description

3.1 System Requirements

Radioactive liquid waste disposal (RLD) system sumps, in some cases, are not tagged with the RLD system. Sumps that are not tagged with the RLD system are tagged per the associated equipment within a facility room. Dangerous waste sump level measurement instruments that are all within the RLD system sumps are numbered with the RLD system designator. Vessels and the ancillary equipment associated with dangerous waste management that are within the HLW RLD system, but numbered per the facility room, are listed by tag number below.

HLW Sump PIN	HLW room number	Room Name	level measurement type
HCP-SUMP-00001	H-B014	wet process cell	radar
HDH-SUMP-00001	H-B039B	canister rinse tunnel	radar
HDH-SUMP-00002	H-B039A	canister rinse-bogie maintenance	radar
HDH-SUMP-00003	H-B035	canister decon cave	radar
HFP-SUMP-00002	H-0117	melter cave no. 1	radar
HFP-SUMP-00005	H-0106	melter cave no. 2	radar
HOP-SUMP-00003	H-B021	SBS drain collection cell no. 1	radar
HOP-SUMP-00008	H-B005	SBS drain collection cell no. 2	radar
HPH-SUMP-00001	H-0136	canister handling cave	radar
HPH-SUMP-00005	H-0136	canister handling cave	radar
HSH-SUMP-00003	H-0117	melter cave no. 1	bubbler
HSH-SUMP-00007	H-0106	melter cave no. 2	bubbler
HSH-SUMP-00008	H-0310A	melter no. 1 equipment decon pit	radar
HSH-SUMP-00009	H-0304A	melter no. 2 equipment decon pit	radar
RLD-SUMP-00001	H-B014	wet process cell	radar
HFP-SUMP-00001	H-0308	active services cell melter no. 1	none, drains to vessel RLD-VSL-00008
HFP-SUMP-00004	H-0302	active services cell melter no. 2	none, drains to vessel RLD-VSL-00008
RLD-VSL-00002	H-B014	wet process cell	radar
RLD-VSL-00007	H-B014	wet process cell	radar

HLW Sump PIN	HLW room number	Room Name	level measurement type
RLD-VSL-00008	H-B014	wet process cell	radar

3.2 Acidic Waste Vessel

The acidic waste vessel (RLD-VSL-00007) is used to store, process, and transfer acidic waste. For waste management reliability, transfers between vessels will be controlled by the control system for each vessel involved in the transfer. The acidic waste vessel (RLD-VSL-00007) is limited, by the control system, to one vessel volume transfer in or out at a time.

When the acidic waste vessel (RLD-VSL-00007) can receive effluent, the operator initiates the transfer-in sequence. The transfer-in sequence is monitored by the control system and stopped when the level in the acidic waste vessel (RLD-VSL-00007) reaches the upper operating limit (UOL), the specified transfer amount has been received, or the vessel transferring effluent to the acidic waste vessel (RLD-VSL-00007) reaches its lower operating limit (LOL). When the transfer is stopped by the control system, the operator is alerted. The effluent is sampled and tested, then the transfer-in sequence is completed. Based on the test results, the effluent is neutralized and prepared for transfer out.

When the effluent in the acidic waste vessel (RLD-VSL-00007) has been treated, the operator initiates the transfer-out sequence. The transfer-out sequence is stopped by the control system when the level in the acidic waste vessel (RLD-VSL-00007) reaches the LOL, the specified transfer amount has been transferred, or the receiving vessel reaches its UOL. When the transfer-out sequence is complete, the control system will alert the operator that the acidic waste vessel (RLD-VSL-00007) is ready to receive effluent.

Table 1 shows the level instruments associated with the acidic waste vessel (RLD-VSL-00007). Figure 1 shows the typical control system (UOL and LOL) for the level instruments associated with the acidic waste vessel (RLD-VSL-00007) level control. Two independent level signals can activate the control system to automatically stop transfer into or out of the acidic waste vessel (RLD-VSL-00007). The level limit, UOL, will alert the operator if level goes above the normal desired control range. If the vessel level is at level alarm high-high (LAHH) due to an abnormality, the vessel control system automatically stops transfer into the acidic waste vessel (RLD-VSL-00007) and alarms to alert the operator of the vessel level condition.

3.3 The Plant Wash and Drains Vessel

The plant wash and drains vessel (RLD-VSL-00008) is used to store, process, and transfer plant wash and drains effluent. Waste transfers between vessels will be measured and verified by the control system for the vessels involved in the transfer. The control system limits fluid transfer to one vessel volume transfer at a time.

The plant wash and drains vessel (RLD-VSL-00008) receives effluent intermittently from various systems and transfers from the offgas drains collection vessel (RLD-VSL-00002). When the plant wash and drains vessel (RLD-VSL-00008) is ready to receive effluent, the operator will initiate the transfer-in sequence. The transfer is monitored by the control system and stopped when the level in the plant wash and drains vessel (RLD-VSL-00008) reaches its UOL, the specified transfer amount has been received, or

the transferring vessel has reached its LOL. When the transfer is stopped by the control system, the operator is alerted.

When the transfer is complete, the effluent will be sampled and tested. Based on the results of this testing, the effluent will be neutralized and prepared for transfer. The operator will initiate the transfer-out sequence. The control system will stop the transfer when the plant wash and drains vessel (RLD-VSL-00008) reaches its LOL, the specified amount of effluent has been transferred, or the receiving vessel reaches its UOL.

Table 1 shows the level instruments associated with the plant wash and drains vessel (RLD-VSL-00008). Figure 1 shows the typical control system (UOL and LOL) for the level instruments associated with the plant wash and drains vessel (RLD-VSL-00008). Two independent level signals can activate the control system to automatically stop transfer into or out of the plant wash and drains vessel (RLD-VSL-00008). The UOL will alert the operator if level goes above the normal desired control range. If the effluent level is at LAHH due to an abnormality, the vessel control system automatically stops transfer into the plant wash and drains vessel (RLD-VSL-00008) and alarms to alert the operator of the vessel level condition.

3.4 The Offgas Drains Collection Vessel

The offgas drains collection vessel (RLD-VSL-00002) receives condensate from the low points in the offgas ducts. Little to no effluent is received during normal operation. When the offgas drains collection vessel (RLD-VSL-00002) reaches its UOL, the control system will alert the operator through the plant control system interface.

When notified by the control system, the operator will initiate a transfer-out sequence. The transfer is stopped by the control system when the effluent level in the offgas drains collection vessel (RLD-VSL-00002) reaches its LOL, the effluent level in the plant wash and drains vessel (RLD-VSL-00008) reaches its UOL, or the specified transfer amount has been transferred. If the effluent level in the offgas drains collection vessel (RLD-VSL-00002) goes below the LOL, the control system will alert the operator to initiate a procedure to add the appropriate amount of water to put the fluid at the LOL.

If the effluent level rises above the normal operating range due to an abnormality, the LAHH interlock, along with alarms within the control system, will alert the operator of a possible overflow condition and stop the transfer of effluent into the offgas drains collection vessel (RLD-VSL-00002). Table 1 shows the level instruments associated with the offgas drains collection vessel (RLD-VSL-00002). Figure 2 shows the interlock and alarms system for the level instruments associated with the offgas drains collection vessel (RLD-VSL-00002). The control system will alarm at two high values. Each level signal can activate an interlock or alarm in the control system to alert the operator.

3.5 Sumps

All sumps for dangerous waste systems are designed for secondary containment during abnormal operating instances. Sump alarms may be caused by abnormal conditions, such as system leaks or overflows. Sump level transmitters will alarm when the sump fluid level reaches the high level to trigger operator investigation and action.

Table 2 shows the level instruments associated with the sumps. Figure 3 shows the alarm setting for the level instruments associated with each sump within the HLW facility.

Table 1 **Associated Instruments for HLW Acidic Waste Vessel (RLD-VSL-00007), Plant Wash and Drains Vessel (RLD-VSL-00008), and Offgas Drains Collection Vessel (RLD-VSL-00002)**

Instrument Tag Number	*Associated Vessel*	*Description*
RLD-LT-3153	RLD-VSL-00007	SDS level measurement sensor
RLD-LT-3154	RLD-VSL-00007	SDS level measurement sensor
RLD-LT-3241	RLD-VSL-00008	SDS level measurement sensor
RLD-LT-3242	RLD-VSL-00008	SDS level measurement sensor
RLD-LT-3024	RLD-VSL-00002	normal level measurement senor
RLD-LT-3027	RLD-VSL-00002	normal level measurement sensor

Table 2 Associated Instruments for HLW Facility Sumps

Instrument Tag Number	Sump	Description
RLD-LT-3014	HCP-SUMP-00001	level measurement sensor
RLD-LT-3215	RLD-SUMP-00001	level measurement sensor
RLD-LT-3413	HDH-SUMP-00003	level measurement sensor
RLD-LT-3102	HOP-SUMP-00003	level measurement sensor
RLD-LT-3416	HDH-SUMP-00001	level measurement sensor
RLD-LT-3172	HOP-SUMP-00008	level measurement sensor
RLD-LT-3411	HPH-SUMP-00001	level measurement sensor
RLD-LT-3403	HPH-SUMP-00005	level measurement sensor
RLD-LT-3803	HFP-SUMP-00002	level measurement sensor
RLD-LT-3805	HSH-SUMP-00003	level measurement sensor
RLD-LT-3853	HFP-SUMP-00005	level measurement sensor
RLD-LT-3333	HSH-SUMP-00008	level measurement sensor
RLD-LT-3855	HSH-SUMP-00007	level measurement sensor
RLD-LT-3383	HSH-SUMP-00009	level measurement sensor
RLD-LT-3418	HDH-SUMP-00002	level measurement sensor

Figure 1 Typical Level Measurement for the HLW Acidic Waste Vessel (RLD-VSL-00007) and the Plant Wash and Drains Vessel (RLD-VSL-00008)

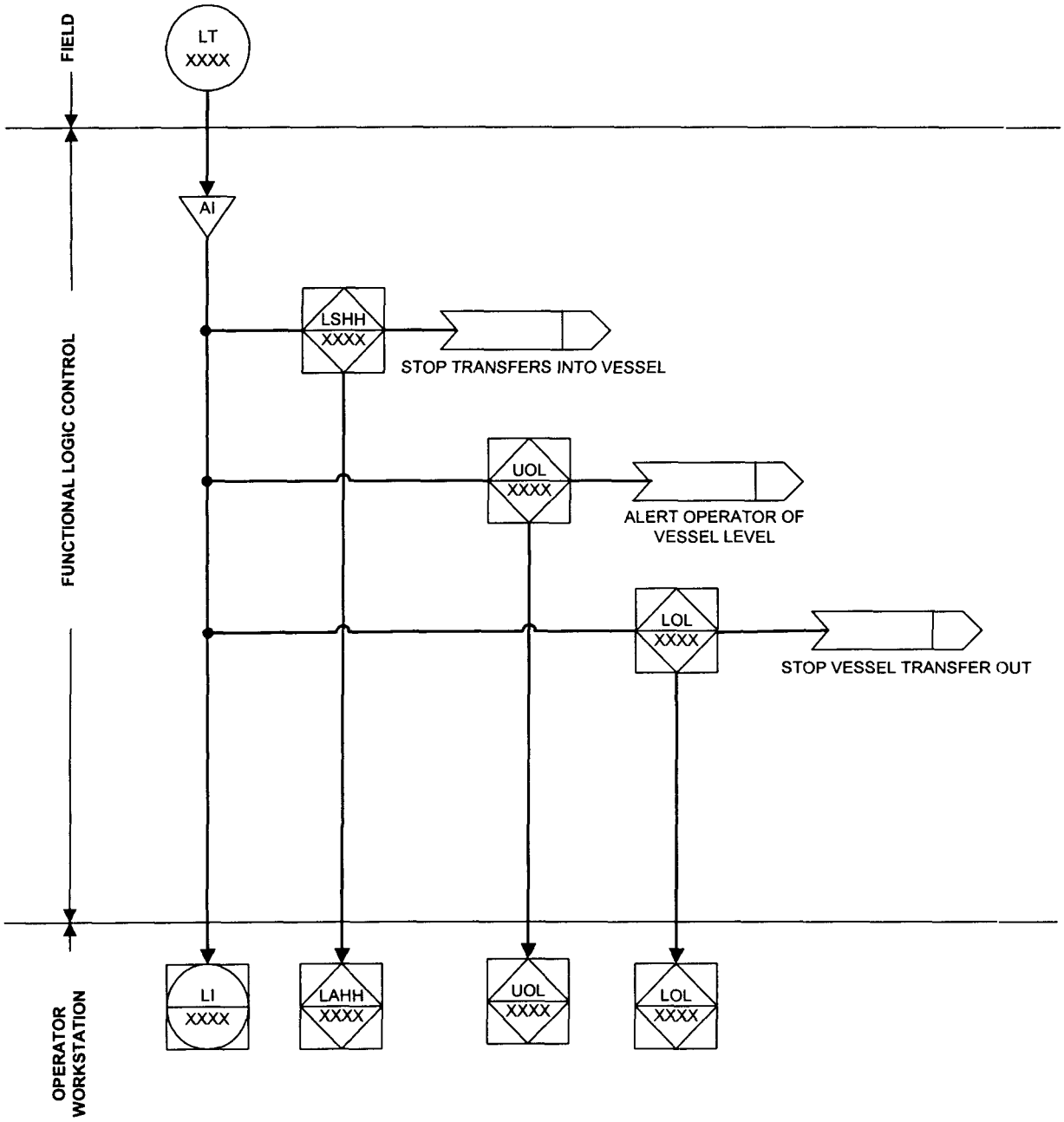

Figure 2 Typical Level Measurement for Offgas Drains Collection Vessel (RLD-VSL-00002)

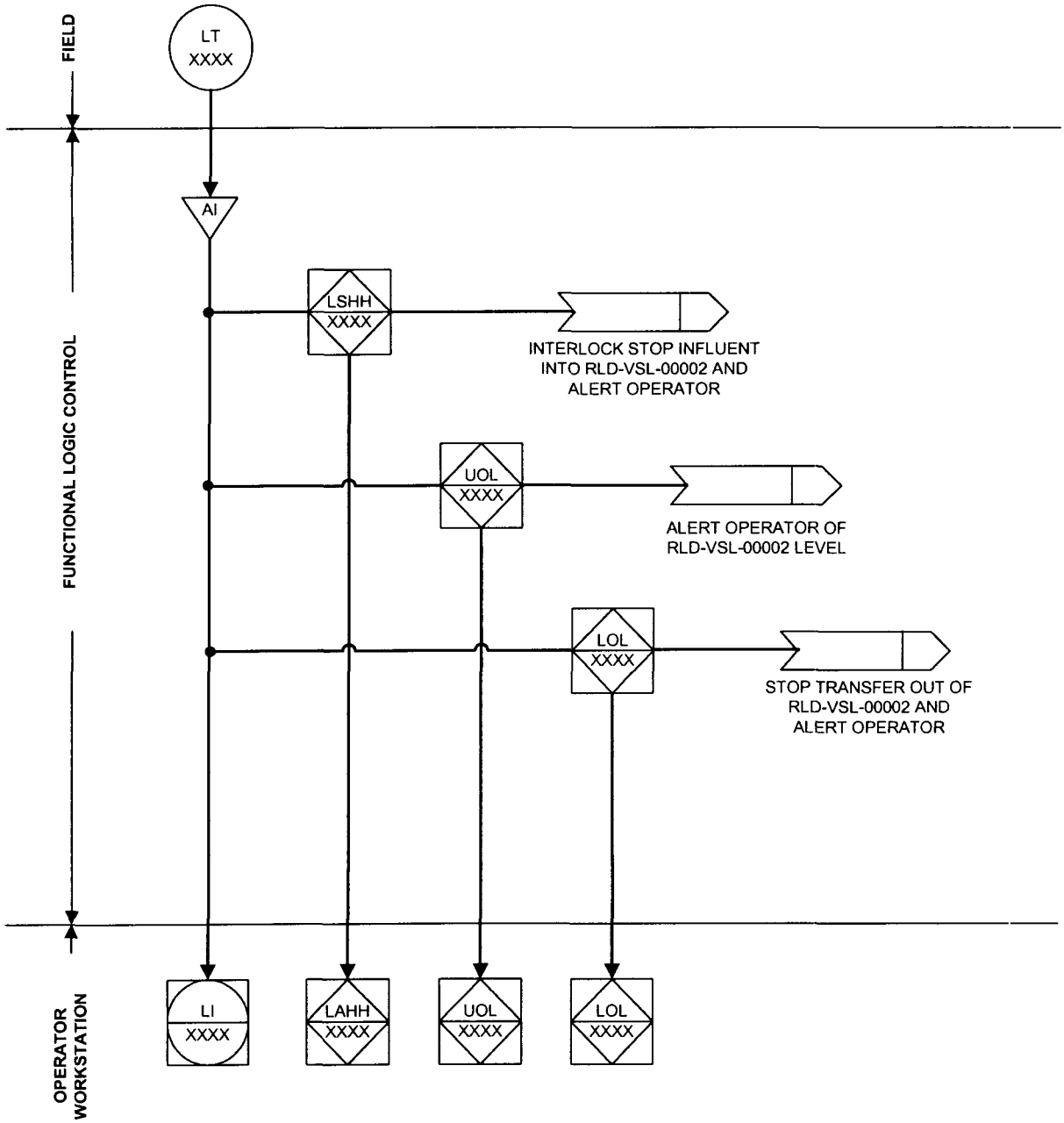

Figure 3 Typical Level Measurement for HLW Facility Sumps