

<h1>MODIFICATION TRAVELER</h1>			<b>Release Stamp</b>		
Prepared For the U.S. Department of Energy, Assistant Secretary for Environmental Management By Washington River Protection Solutions, LLC., PO Box 850, Richland, WA 99352 Contractor For U.S. Department of Energy, Office of River Protection, under Contract DE-AC27-08RV14800 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.			<div style="border: 2px solid red; padding: 10px; display: inline-block;"> <p style="color: red; font-weight: bold; font-size: 1.2em;">DATE:</p> <p style="color: red; font-weight: bold; font-size: 1.5em;">Mar 19, 2020</p> </div>		
1. <b>MT No:</b> MT-50400 <b>Rev.</b> 01					
2. <b>Title:</b> 242-A Evaporator Waste Transfer Line Replacement			<p><b>Clearance Review Restriction Type:</b> undefined</p>		
<b>SECTION I REQUEST FOR MODIFICATION</b>					
3. <b>Requested Completion Date (Optional):</b> 10/31/2018		4. <b>CACN (optional):</b>	<p><b>Workflow Approval Status:</b> Design Inputs Approved</p>		
5. <b>Project Number:</b> <input type="checkbox"/> N/A T1P207	6. <b>Design Type:</b> <input checked="" type="checkbox"/> I <input type="checkbox"/> II <input type="checkbox"/> III <input type="checkbox"/> IV <input type="checkbox"/> V <input type="checkbox"/> VI	7. <b>Project Type:</b> Project Category 2			
9. <b>Design Authority Designator:</b> PRJ - 242-A TRANSFER LINE REPLACEMENT PROJECT					
<b>10. Related Structures, Systems, and Components</b>					
a. <b>Related Building/Facilities</b> <input type="checkbox"/> N/A		b. <b>Related Systems</b> <input type="checkbox"/> N/A		c. <b>Related Equipment ID Nos. (EIN)</b> <input type="checkbox"/> N/A	
241-AW 241-AW-02A 241-AW-02E 241-AW-B 242-A		241-WT 242A 242A-SL 242A-SN		AW02A-WT-WTL-SL-170 AW02A-WT-WTL-SL-171 AW02E-WT-WTL-SN-269 AW02E-WT-WTL-SN-270 AW02E-WT-WTL-SN-275 AWVWPB-WT-WTL-SL-167 AWVWPB-WT-WTL-SL-172	
<b>11. Problem Description</b>					
Recent pneumatic testing on the encasement of SL-167 has determined that it cannot maintain pressure, and therefore cannot be used to compliantly transfer waste. Recent visual inspection of SL-168 (the back-up slurry line) and pneumatic testing have identified additional work to be performed in order to attempt to place the line back into service. Until transfer lines have been placed into service, the 242-A Evaporator cannot slurry out concentrated waste to tank farms to allow waste volume reduction. To ensure long-term success of the evaporator, a replacement feed line will also be installed.					
<b>12. Justification</b>					
The primary purpose of the feed and slurry lines is to support 242-A evaporator campaigns, specifically to create double-shell tank (DST) space through waste reduction, which supports the overall mission of the River Protection Project to store, treat, and immobilize highly radioactive waste stored in Hanford Site tanks in an environmentally safe, sound, and cost-effective manner.					
<b>SECTION II REQUIRED FOR DESIGN TYPE 1 PROJECTS</b>					
13. <b>Project Design Review Required (TFC-ENG-DESIGN-D-17.1)?</b> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		14. <b>Major Modification Evaluation Required (Use 1189 Checklist)?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A		15. <b>Safety In Design Strategy Required?</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> N/A	
<b>SECTION III PROPOSED SOLUTION</b>					
<b>16. Proposed Solution</b>					
Rev 1 of this MT includes the additional requirements to support the following tasks: Connecting spare conduits into the 242-A Evaporator and the AW-02E pits to support the new feed pump. Adjustable height gear actuators design enhancements. Shoring execution plan. Correction of ACI/AISC code of records years and other misc requirements.					
Complete the design within AW Tank Farm and 242-A, and all areas between, in accordance with the design requirements listed in this MT. The design includes:					
<ul style="list-style-type: none"> <li>• Four new permanent underground pipe-in-pipe transfer lines.</li> <li>• All required pit upgrades at AW-02A, AW-B, and AW-02E (i.e. structural modifications, cover blocks, jumpers, ancillary equipment, etc.).</li> <li>• All modifications to the 242-A evaporator facility.</li> <li>• All required electrical and instrumentation upgrades to allow for compliant operation and monitoring.</li> </ul>					
<b>SECTION IV DESIGN INPUT RECORD</b>					
<b>17. Design Inputs</b> <span style="float: right;"><input type="checkbox"/> N/A</span>					
<b>Type of Document</b>	<b>Document Number</b>	<b>Rev.</b>	<b>Title</b>		
FLOW DIAGRAM AND P&IDs	H-14-020802 SH 004	22	WASTE TRANSFER SYSTEM WT O&M SYSTEM P&ID		
FLOW DIAGRAM AND P&IDs	H-14-020802 SH 005	26	WASTE TRANSFER SYSTEM (WT) O&M SYSTEM P&ID		
FLOW DIAGRAM AND P&IDs	H-14-020802 SH 006	11	WASTE TRANSFER SYSTEM (WT) O&M SYSTEM P&ID		
MECHANICAL	H-14-104240 SH 001	05	JUMPER ARRANGEMENT VALVE PIT 241-AW-A		
MECHANICAL	H-14-104242 SH 001	05	JUMPER ARRANGEMENT VALVE PIT 241-AW-B		
MECHANICAL	H-2-69337 SH 001	04	PIPING ARRANGEMENT PUMP ROOM & HOT EQUIP. STORAGE PLAN		

<b>MODIFICATION TRAVELER</b>				MT No.: MT-50400 Rev. 01
<b>17. Design Inputs</b>				<input type="checkbox"/> N/A
Type of Document	Document Number	Rev.	Title	
MECHANICAL	H-2-69338 SH 001	04	PIPING ARRANGEMENT PUMP ROOM & HOT EQUIP. STORAGE SECTIONS	
CIVIL, STRUCTURAL, ARCHITECTURAL	H-2-70398 SH 002	02	PIPING PLAN	
CIVIL, STRUCTURAL, ARCHITECTURAL	H-2-70399 SH 001	14	PIPING PLAN 241-AW TANK FARM	
CIVIL, STRUCTURAL, ARCHITECTURAL	H-2-70401 SH 001	08	PIPING PLAN VALVE PITS 241-AW-A&B	
FLOW DIAGRAM AND P&IDs	H-2-98989 SH 001	28	P&ID SLURRY SYSTEM	
MECHANICAL	H-2-99009 SH 001	05	PIPING JUMPER ARRANGEMENT PUMP ROOM	
MECHANICAL	H-2-99009 SH 002	00	PIPING JUMPER ARRANGEMENT PUMP ROOM	
<b>18. Other Design Input Requirements:</b>				
See continuation pages.				
<b>19. Other Design Input Considerations:</b>				
See continuation pages.				
<b>20. Preliminary Safety Classification:</b> <input type="checkbox"/> SC <input checked="" type="checkbox"/> SS <input type="checkbox"/> GS <input type="checkbox"/> N/A		<b>21. Environmental Risk:</b> (TFC-ENG-DESIGN-C-52 Att. D) <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		<b>22. Radiological Risk:</b> (TFC-ENG-DESIGN-C-52 Att. D) <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
<b>23. Hazard Category</b> 2		<b>24. Approval Designators</b> E, R, EDL-CS, PE, HR, WE, NS, S, EDL-M, EDL-E		
SECTION V IMPACTS				
<b>25. Impacted Documents</b>				<input type="checkbox"/> N/A
Type of Document	Document Number	Rev.	Title	
<b>26. Other Impacts</b>				
SECTION VI DESIGN OUTPUT RECORD				
<b>27. Design Outputs</b>				<input type="checkbox"/> N/A
Type of Document	Document Number	Rev.	Title	
<b>28. Work Package Numbers:</b>				<input type="checkbox"/> N/A
<b>29. Other Outputs</b>				
SECTION VII DESIGN INPUT AND CLOSURE APPROVALS				
<b>30. Approvals</b>				
Title	Name	Signature	Date	
Design Authority Design Input Approval	Engeman, Jason K	<i>Engeman, Jason K</i>	02/26/2020	
Design Authority Manager	Huntington, Matthew R	<i>Huntington, Matthew R</i>	03/19/2020	
Design Engineering	Sijgers, Frederik O	<i>Sijgers, Frederik O</i>	03/12/2020	
Document Control Approval	Scales, Anthony	<i>Scales, Anthony</i>	03/19/2020	
Environmental Protection	Klages, Deanna L	<i>Klages, Deanna L</i>	02/26/2020	
Engineering Discipline Lead-Civil/Structural	Langevin, Ann	<i>Langevin, Ann</i>	02/27/2020	
Engineering Discipline Lead-Electrical	Rambo, Charles L	<i>Rambo, Charles L</i>	02/26/2020	
Engineering Discipline Lead-Mechanical	Goessmann, Glen E	<i>Goessmann, Glen E</i>	03/16/2020	
Engineering Hoisting and Rigging SME	McShane, Michael P	<i>McShane, Michael P</i>	02/26/2020	
Nuclear Safety	Kozlowski, Stephen D	<i>Kozlowski, Stephen D</i>	03/16/2020	
Originator	Engeman, Jason K	<i>Engeman, Jason K</i>	02/26/2020	
Process Engineer	Conner, John M	<i>Conner, John M</i>	03/13/2020	
Radiological Control	Franz, James A	<i>Franz, James A</i>	12/02/2019	
Industrial Safety	Ladwig, Cevin J	<i>Ladwig, Cevin J</i>	11/26/2019	
Welding Engineer	Berkey, James	<i>Berkey, James</i>	03/16/2020	

## CODE OF RECORD DOCUMENTS

**Table 1-1. Government Documents**

Document Number	Title
<b>Code of Federal Regulations (CFR); Washington, D.C.</b>	
10 CFR 830	<i>Nuclear Safety Management</i>
10 CFR 835	<i>Occupational Radiation Protection</i>
10 CFR 851	<i>Worker Safety and Health Program</i>
29 CFR 1910	<i>Occupational Safety and Health Standards</i>
40 CFR 264	<i>Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities</i>
40 CFR 265	<i>Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities</i>
<b>U.S. Department of Energy (DOE); Washington, D. C.</b>	
DOE O 414.1D	<i>Quality Assurance</i>
DOE O 420.1C	<i>Facility Safety</i>
DOE/RL-92-36,	<i>Hanford Site Hoisting and Rigging Manual</i>
DOE-0344	<i>Hanford Site Excavating, Trenching and Shoring Procedure (HSETSP)</i>
DOE-0359	<i>Hanford Site Electrical Safety Program (HSESP)</i>
DOE-0360	<i>Hanford Site Confined Space Procedure (HSCSP)</i>
DOE-STD-1020 (2016)	<i>Natural Phenomena Hazards Analysis and Design Criteria for DOE Facilities</i>
DOE-STD-1189 (2008)	<i>Integration of Safety into the Design Process</i>
<b>Washington Administrative Code (WAC); Olympia, Washington</b>	
WAC 296-46B-010	<i>Electrical Safety Standards, Administration, Inspections, and Installation – General – Adopted Standards</i>
WAC 173-303-280	<i>General Requirements for Dangerous Waste Management Facilities</i>
WAC 173-303-640	<i>Tank System</i>

**CODE OF RECORD NON-GOVERNMENT DOCUMENTS**

**Table 1-2. Non-Government Documents (2 Sheets)**

<b>Document Number</b>	<b>Title</b>
<b>American Concrete Institute (ACI), Farmington Hills, Michigan</b>	
ACI 301 (2010)	<i>Specification for Structural Concrete</i>
ACI 318 (2014)	<i>Building Code Requirements for Structural Concrete and Commentary</i>
<b>American Institute of Steel Construction and Commentary (AISC), Chicago, Illinois</b>	
AISC 325 (2011)	<i>Steel Construction Manual</i>
AISC 360 (2010)	<i>Specification for Structural Steel Buildings</i>
<b>American Society of Civil Engineers (ASCE), Reston, Virginia</b>	
ASCE 7 (2010)	<i>Minimum Design Loads for Buildings and Other Structures</i>
<b>American Society of Mechanical Engineers (ASME); New York, New York</b>	
ASME Boiler & Pressure Vessel Code (B&PVC) (2017)	<i>B&amp;PVC – Rules for Construction of Pressure Vessels</i>
ASME B31.3 (2016)	<i>Process Piping</i>
ASME B30.20 (2018)	<i>Below-the-Hook Lifting Devices,” American Society of Mechanical Engineers</i>
ASME BTH-1 (2017)	<i>Design of Below-the-Hook Lifting Devices</i>
ASME NQA-1 (2008/2009 Addenda)	<i>Quality Assurance Requirements for Nuclear Facility Applications.</i>
<b>American Welding Society (AWS); Miami, Florida</b>	
AWS D1.1/D1.1M (2015)	<i>Structural Welding Code-Steel</i>
AWS D1.6/D1.6M (2017)	<i>Structural Welding Code – Stainless Steel</i>
<b>Instrumentation, Systems, and Automation Society (ISA), Research Triangle Park, North Carolina</b>	
ISA-84.00.01 (2004)	<i>Functional Safety: Safety Instrumented Systems for the Process Industry Sector</i>
<b>International Code Council, Washington D.C.</b>	
IBC (2015)	<i>International Building Code<sup>®1</sup></i>
<b>National Association of Corrosion Engineers (NACE); Houston, Texas</b>	
SPO169 (2013)	<i>Control of External Corrosion on Underground or Submerged Metallic Piping Systems</i>
<b>National Fire Protection Association (NFPA); Quincy, Massachusetts</b>	
NFPA 101 (2018)	<i>Life Safety Code<sup>®2</sup></i>
<b>Underwriters Laboratories (UL), Inc., Northbrook, Illinois</b>	
UL508A (2013)	<i>Standard for Industrial Control Panels</i>

<sup>1</sup> International Building Code<sup>®</sup> is a registered trademark of the International Code Council of Washington D.C.

<sup>2</sup> Life Safety Code<sup>®</sup>; registered trademark of the National Fire Protection Association of Quincy. MA.

**Table 1-2. Non-Government Documents (2 Sheets)**

<b>Other Publications; Washington River Protection Solutions (WRPS), LLC, Richland, Washington</b>	
TFC-ENG-STD-01, Rev. A-7	“Human Factors in Design”
TFC-ENG-STD-02, Rev. A-12	“Environmental/Seasonal Requirements for TFC Systems, Structures, and Components”
TFC-ENG-STD-03, Rev. A-8	“Waste Transfer Confinement Configuration”
TFC-ENG-STD-06, Rev. D-1	“Design Loads for Tank Farm Facilities”
TFC-ENG-STD-08, Rev. B-5	“Post Maintenance Testing”
TFC-ENG-STD-10, Rev. A-16	“Drawing Standard”
TFC-ENG-STD-12, Rev. E-3	“Tank Farm Equipment Identification Numbering and Labeling Standard”
TFC-ENG-STD-13, Rev. G-4	“Ignition Controls for Work Controls in Potentially Flammable Atmospheres”
TFC-ENG-STD-14, Rev. C-3	“Setpoint Standard”
TFC-ENG-STD-15, Rev. C-6	“Standard for Raceway Systems and Flexible Cords& Cables”
TFC-ENG-STD-22, Rev. G-2	“Piping, Jumpers and Valves”
TFC-ENG-STD-26, Rev. C-6	“Waste Transfer, Dilution, and Flushing Requirements”
TFC-ENG-STD-31, Rev. A-4	“Electrical Distribution Studies”
TFC-ENG-STD-34, Rev. A-1	“Standard for the Selection of Non-Metallic Materials in Contact with Tank Waste”
TFC-ENG-STD-39, Rev. A-3	“Civil Survey for Tank Farm Facilities”
TFC-ENG-STD-41, Rev. A-9	“Electrical Installations”
TFC-ENG-STD-42, Rev. A-1	“Tank Farms Waste Transfer System Fitness-for-Service Evaluation”
TFC-ENG-STD-45, Rev. B-2	“Installations for Potentially Flammable Atmospheres”,
TFC-ENG-STD-47, Rev. A-1	“Piping Data Specification Standard”
TFC-ENG-STD-51, Rev. A-0	“Vendor Calculation Standard”
TFC-ENG-FAC SUP-C-25, REV E-0	“Hoisting, Rigging, Load Handling, and Transport”

**NON-GOVERNMENT NON-CODE OF RECORD DOCUMENTS**

**Table 1-3. Non-Code of Record Documents (3 Sheets)**

<b>Document Number</b>	<b>Title</b>
<b>U.S. Department of Energy (DOE); Washington, D. C.</b>	
DOE-0336, Rev. 2A	<i>Hanford Site Lockout/Tagout Procedure</i>
DOE-0344, Rev. 4-3	<i>Hanford Site Excavating, Trenching and Shoring</i>
<b>Hanford Site, Richland, Washington</b>	
HNF-SD-GN-ER-501, Rev. 3	<i>Natural Phenomena Hazards, Hanford Site, Washington;</i>
MSC-POL-EU-60619, Rev. 0	“Electrical Utilities Right of Way”
<b>Tank Farms, Washington River Protection Solutions, LLC, Richland, Washington</b>	
HNF-4160, Rev. 4	<i>Double-Shell Tank Transfer Valving Subsystem Specification</i>
HNF-4161, Rev. 6	<i>Double-Shell Tank Transfer Piping Subsystem Specification</i>
HNF-5183, Rev. 05N	<i>Tank Farms Radiological Control Manual (TFRCM)</i>
HNF-IP-1266	<i>Tank Farms Operations Administrative Controls</i>
HNF-SD-WM-HC-017, Rev. 10	<i>NFPA Flammable Vapor &amp; Gas Hazard Classification for Tank Farms</i>
RPP-RPT-58290, Rev. 1	<i>NFPA Flammable Vapor and Gas Hazard Classification for the 242-A Evaporator</i>
OSD-T-151-00007, Rev. 20	<i>Tank Farms Waste Transfer Compatibility Program</i>
OSD-T-151-00010, Rev. 3	<i>Operating Specifications for Pressure Testing and Leak Detection for Tank Farm Transfer System</i>
RPP-8360, Rev. 6	<i>Lifting Attachment and Lifted Item Evaluation, A Hanford Tank Operating Contractor Process</i>
RPP-13033, Rev. 7K	<i>Tank Farm Documented Safety Analysis</i>
HNF-14755, Rev. 6E	<i>242-A Evaporator Documented Safety Analysis</i>
HNF-SD-WM-TSR-006, Rev. 8F	<i>Tank Farms Technical Safety Requirements</i>
HNF-15279, Rev. 02C	<i>242-A Evaporator Technical Safety Requirements</i>
RPP-13909, Rev. 0R	<i>Transfer Leak Detection Alarm Activation Percent Volume Increase</i>
RPP-14541, Rev. 8	<i>Jumper Design, Fabrication, and Testing Specification for Tank Farms</i>
RPP-25153, Rev, 1	<i>Volume 3: IQRPE DST System Integrity Assessment – Waste Compatibility</i>
RPP-CALC-41527, Rev. 1	<i>Bridge Plate Design for Tank Farms</i>
RPP-PLAN-34886, Rev. 5	<i>Investigation and Work Plan for the Resolution of Double-Shell Tank Valve Positioning Problems</i>
RPP-RPT-41859, Rev. 12	<i>Safety-Significant Isolation Valves for Double Valve Isolation – Functions and Requirements Evaluation Document</i>
RPP-RPT-42297, Rev. 19	<i>Safety-Significant Waste Transfer Primary Piping – Functions and Requirements Evaluation Document</i>

**Table 1-3. Non-Code of Record Documents (3 Sheets)**

<b>Document Number</b>	<b>Title</b>
RPP-RPT-52823, Rev. 6	<i>Tank Farm Waste Transfer Buried Piping Freeze Protection Methodology</i>
RPP-RPT-58773, Rev. 2	<i>Assessment of Safety Significant Piping Jumpers to Assure Excess Load Capacity for Potential Water Hammer (Leak Check and Flush) Events - Supplemental Operation and Design Rules for Water Hammer Evaluation</i>

The use of words “shall,” “must,” “should,” “may,” and “will” within this specification express the following meanings:

- Shall – Denotes a requirement.
- Must – Denotes a requirement.
- Should – Denotes a recommendation. If a “should” recommendation cannot be satisfied, justification of an alternative design shall be submitted to the Project Design Review Team for approval.
- May – Denotes a “permissive” for a stated action, or denotes a possible outcome, depending on the context of the verbiage.
- Will – Denotes a statement of fact.

## **Waste Transfer System Requirements**

- 1.) Design of the transfer lines shall include one new feed transfer line from the 242-A Evaporator pump room to the AW-02E feed pump pit.
- 2.) Design of the transfer lines shall include two new slurry transfer lines from the 242-A Evaporator pump room to the AW-02A central pump pit.
- 3.) Design of the transfer lines shall include one new slurry transfer line from the AW-02A central pump pit to the AW-B valve pit.
- 4.) The equipment identification numbers (EINs) for the transfer lines should follow the designations identified in Table 1. All nozzle designations are to be new nozzles with no existing tank farm nozzles to be reused:

**Table 1 – Transfer Line EINs**

Transfer Line (EINs)	From	To
AW02A-WT-WTL-SL-170	242-A, Nozzle 41	AW-02A, Nozzle F
AW02A-WT-WTL-SL-171	242-A, Nozzle 42	AW-02A, Nozzle E
AW02E-WT-WTL-SN-275	AW-02E, Nozzle F	242-A, Nozzle 43
AWVPB-WT-WTL-SL-172	AW-02A, Nozzle W	AW-B, Nozzle R-6

- 5.) Design of new tank systems or components shall meet the applicable requirements in WAC-173-303-640.
- 6.) Transfer piping analyses shall be performed in accordance with TFC-ENG-DESIGN-C-60, "Preparation of Piping Analysis for Waste Transfer Systems" and TFC-ENG-STD-22, "Piping, Jumpers, and Valves."
- 7.) Waste transfer system design shall minimize inaccessible pockets, crevice, blind holes, socket welds, rough surfaces, or other features and conditions that could trap contamination.
- 8.) Cover blocks/plates, jumpers, and other components which require the use of a crane for installation shall be provided with lifting attachment points. Design shall be in accordance with DOE/RL-92-36, Hanford Site Hoisting and Rigging Manual and RPP-8360, Lifting Attachment and Lifted Item Evaluation.
- 9.) Waste transfer system (piping, valves, instruments, etc.) should be welded construction.
- 10.) The pressure boundary piping that makes up the transfer system route used to support the slurry out transfers shall be a 2-inch Schedule 40 stainless steel. Use of piping of any size and/or material that differs from this requires approval from the WRPS project Design Authority.
- 11.) The pressure boundary piping that makes up the transfer system route used to primarily support the feed transfers shall be 3-inch Schedule 40 stainless steel. Use of piping of any size and/or material that differs from this requires approval from the WRPS project Design Authority.



- 12.) Waste transfer system components shall be designed to protect workers from occupational radiation exposures and maintain radiation exposure As Low As Reasonable Achievable (ALARA), including equipment and component disposal, in accordance with the requirements in 10 CFR 835.1001, Occupational Radiation Protection - Design and Control; 10 CFR 835.1002, Occupational Radiation Protection – Facility Design and Modification; HNF-5183, Tank Farms Radiological Control Manual (TFRCM), Table 2-0; and TFC-ESHQ-RP\_STD-03, “ALARA Decision Making Methods.”
- 13.) Equipment containing hazardous energy sources (e.g. valves/actuators) shall have locking features to support compliance with 29 CFR 1910.147, Occupational Safety Health Standards – The Control of Hazardous Energy (Lockout/Tagout) and DOE-0336, Hanford Site Lockout/Tagout Program.
- 14.) Design of tank farms waste transfer system equipment shall utilize the classification of potentially flammable atmospheres as identified HNF-SD-WM-HC-017, NFPA Flammable Vapor and Gas Hazard Classification for the Tank Farms.
- 15.) Waste transfer lines (primary pressure boundary) shall be classified as a Class 1, Division 1, Group B location. A Design Requirements Compliance Matrix (DRCM) shall demonstrate how the following will be verified:
  - Class 1, Division 1, Group B locations shall be identified on a Hazard Area Classification (HAC) plan drawing or on existing drawings in accordance with TFC-ENG-STD-45, Section 3.2.2.
  - Equipment suitable for Class I, Division 1, Group B shall be specified in applicable design documents.
  - For non-electrical equipment that cannot be specified with ATEX certification, a technical evaluation shall be identified or created to approve equivalent safety of the equipment specified.
- 16.) Design of 242-A Evaporator waste transfer system equipment shall utilize the classification of potentially flammable atmospheres as identified RPP-RPT-58290, NFPA Flammable Vapor and Gas Hazard Classification for the 242-A Evaporator.
- 17.) Waste transfer pits shall contain Safety Significant freeze protection (i.e. temperature monitoring and heating) whose design conforms to active systems utilized within the DST WTS unless a technical basis exists which documents why freeze protection is not required.
- 18.) Waste transfer system component design shall consider winterization requirements. The system shall be designed to sufficiently drain, within the time requirements specified in the DSA so that when the system is shut down there are no low spots that pose a freezing hazard requiring special precautions
- 19.) New tank systems and addition or modification of existing tank systems shall meet the requirements set forth in 40 CFR 264.192, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities – Design and installation of new tank systems or components and 40 CFR 265.192, Interim Status Standards for

Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities – Design and installation of new tank systems or components.

- 20.) The waste transfer piping and jumper shall be designed utilizing the following waste composition properties for the radioactive slurry which will be pumped through the system:

**Table 2 – Waste Properties**

<b>Waste Property</b>	<b>Range</b>
Specific Gravity	1.0-1.6
Viscosity, cP	1-20
Temperature (flushes/transfers)	40°F – 200°F
Particle Size (micron)	15-1000
Hardness (MOHS Scale)	3-5
Abrasiveness, Miller Number (ASTM G75-	<100
Solids Loading (vol%)	0-30% by vol
Sodium Hydroxide	0-8.0M
Sodium Aluminate	0-3.0M
Sodium Nitrate (NaNO <sub>3</sub> )	0-5.0M
Sodium Nitrite (NaNO <sub>2</sub> )	0-4.43M
Sodium Carbonate	0-2.0M
Sodium Phosphate	0-0.21M
Total Organic Constituents	0-80 gm/L
Cs <sup>137</sup> Concentration	0.8 Ci/L

- 21.) Design structural welds in accordance with AWS D1.1 or AWS D1.6 statically loaded criteria for carbon steel or stainless steel, respectively.
- 22.) The waste transfer system design shall ensure that MSA Electrical Utilities right-of-way boundaries are maintained in accordance with MSC-POL-EU-60619, “Electrical Utilities Right of Way.”
- 23.) Waste transfer system component design shall adhere to the component performance parameter requirements as listed in Table 3 and in accordance with TFC-ENG-STD-06, “Design Loads for Tank Farm Facilities”.

**Table 3 - Component Performance Parameter Requirements**

<b>Item</b>	<b>Safety Function</b>	<b>Safety</b>	<b>Quality</b>	<b>Natural Phenomena Design Category (NDC)</b>	<b>Seismic Design Category</b>	<b>Limit State</b>	<b>Design Code</b>
Buried Piping – Primary	Pressure Containment	SS	QL-2	NDC-2	SDC-2	C	TFC-ENG-STD-22
Buried Piping - Encasement	Pressure Containment	GS	QL-3	NDC-2/1	SDC 2/1	C	TFC-ENG-STD-22
Jumpers	Pressure Containment	SS	QL-2	NDC-2	SDC-2	C	TFC-ENG-STD-22
Cover blocks/ plates	Secondary Containment <sup>3</sup>	GS	QL-3	NDC-2/1	SDC 2/1	C	ACI 318/ AISC 360
Evaporator Walls	Secondary Containment	SS	QL-2	NDC-2	SDC-2	C	ACI 318/ AISC 360
Transfer System Pit Walls	Secondary Containment	GS	QL-3	NDC-2/1	SDC 2/1	C	ACI 318/ AISC 360

<sup>3</sup> These SSCs are designed for higher NDC loads to address system interaction effects (two-over-one phenomena).

**242-A Evaporator Waste Transfer System Jumper Design Inputs/Requirements:**

- 1.) The new jumper designs for the 242-A Evaporator shall allow the following operational capability:
  - Allow pumping to the new slurry transfer line, SL-170, by connecting pump room Nozzle 5 to the to be installed new slurry transfer line, SL-170, wall nozzle.
  - Allow the receipt of supernatant through a new transfer line by connecting pump room Nozzle 13A to the to be installed new supernatant feed nozzle.
- 2.) The arrangement of the jumper shall be such to allow the tightening and loosening of connector heads remotely via the 242-A Evaporator process crane impact wrench. Exterior dimensions of the impact wrench are available upon request.
- 3.) The jumper shall conform to the requirements listed in TFC-ENG-STD-22, Piping, Jumpers, and Valves.
- 4.) Material for the pressure boundary piping that make up the jumpers shall be ASTM A312, Type 304L stainless steel.
- 5.) The piping analysis for the jumpers shall be prepared in accordance with TFC-ENG-DESIGN-C-60, Preparation of Piping Analyses for Waste Transfer Systems.
- 6.) RPP-RPT-58773, Assessment of Safety Significant Piping Jumpers to Assure Excess Load Capacity for Potential Water Hammer (Leak Check and Flush) Events shall be used to demonstrate compliance for withstanding pressure transients. Specific design features listed in RPP-RPT-58773 Appendix D shall be incorporated into the jumper design media. A compliance table shall be included in the analysis identifying how each requirement has been met.
- 7.) The jumpers shall be designed to accommodate the fabrication specification requirements listed in RPP-14541, Jumper Fabrication and Testing Specification for Tank Farms.
- 8.) Jumpers connected to the replacement slurry waste transfer lines and supernatant feed line are designated as high transfer volume jumpers and their design shall comply with the requirements in TFC-ENG-STD-42, Section 3.2.1.3, "Tank Farms Waste Transfer System Fitness-for-Service Evaluation – Erosion/Corrosion In-Line Monitoring" and TFC-ENG-STD-42, Section 3.3.1.1, "Tank Farms Waste Transfer System Fitness-for-Service Evaluation – Future Erosion/Corrosion Allowance."
- 9.) Jumpers shall be designed and fabricated to exclude dead legs.
- 10.) Nozzle, manifold, and jumper assembly connections installed shall be the Plutonium-Uranium Extraction (PUREX) type designed in accordance with drawings H-2-32420, "Assembly Horiz. & Vert. Conn. 2" Connector," Sheet 1 – 2 and H-2-32430, "Assembly Horiz. & Vert. Conn. 3" Connector".

**DST Waste Transfer System Jumper Design Inputs/Requirements:**

- 1.) The new safety significant jumper design for the DST waste transfer system (AW-02A, AW-B, and AW-02E pits) shall allow the following operational capabilities.

**AW-02A Central Pump Pit:**

- Allow the routing of waste transfers between the following transfer lines: New transfer line SL-170 to new transfer line SL-172 via jumpers in AW-02A. Jumper shall include a low point drain valve in AW-02A to drain into the headspace of AW-102.
- Allow the routing of waste transfer between the following transfer lines: SN-609, SN-610, SN-267, SN-268, and SN-272 via jumpers in AW-02A with DVI to isolate each route.
- Allow the receipt of waste into the AW-102 headspace via a drop leg from waste being transferred from SN-609, SN-610, SN-267, SN-268, or SN-272.
- Valve placement shall be such that transfers from SN-272 can enter the headspace of AW-102 via a drop leg in AW-02A while being physically disconnected via DVI from transfers occurring through AW-02A via SN-609, SN-610, SN-267, and SN-268.
- Jumper elevation/hydraulics shall be such that transfers into AW-02A via SN-609, SN-610, SN-267, SN-268, or SN-272 are free draining back to the originating waste transfer pit (e.g. AP valve pit, AW-B valve pit, AW-A valve pit, etc.).
- Design process jumpers to allow installation of encasement process blanks for use during encasement pressure tests.

**AW-B Valve Pit:**

- Allow the routing of waste transfers between the following transfer lines: SN-268, SL-509, SL-166, SN-264, SN-266, and the new transfer line SL-172 with DVI to isolate each route.
- Jumper elevation/hydraulics shall be such that transfers into AW-B via SN-268, SL-509, SL-166, SN-264, SN-266, and the new transfer line SL-172 are free draining back to the originating waste transfer pit (e.g. AP valve pit, AW-02A pump pit, etc.).
- Isolate existing failed transfer lines SL-167 and SL-164 from the waste transfer system within AW-B.

**AW-02E Feed Pump Pit:**

- Allow the routing of waste transfers between the following transfer lines/components: new transfer line SN-275, SN-272, and the waste transfer pump installed in the AW-02E 12-inch riser.
- Jumper elevation/hydraulics shall be such that transfers associated with SN-275, SN-272, and the AW-02E feed pump free drain back into AW-102 via the pump column.

- 2.) Waste transfer jumpers should be designed to allow the installation of blanks to support periodic pneumatic encasement pressure tests at the DST waste transfer line low point encasement drain PUREX nozzles. Blanks shall be installed using a remote impact wrench without the removal of waste transfer system jumpers. If this is not practical, design encasement drain valve jumpers to allow waste transfer system jumpers to remain in place during encasement pressure tests.
- 3.) The arrangement of the jumpers shall be such to allow the tightening and loosening of connector heads remotely via an electric impact wrench (Part #C-HEFIG-002). Exterior dimensions of the impact wrench are available upon request.
- 4.) Material for the pressure boundary piping that make up the jumpers shall be ASTM A312, Type 304L stainless steel.
- 5.) The available valve make/model numbers and flow patterns available for use to support this jumper design may be provided to the Subcontractor upon request. Selection of different valve and/or flow pattern shall require justification by the Subcontractor with concurrence by WRPS engineering prior to proceeding with the design due to the procurement duration required to obtain additional valves.
- 6.) The new valves shall utilize valve funnels identified on H-14-107471, Valve Funnel Receiver Assemblies, to allow engagement between the valve stem and the gear actuator drive shaft.
- 7.) Valves which are to be used for DVI valve criteria shall utilize valve body indicator plates identified on H-14-107606, "Valve Indicator Plate Details" to allow remote valve positioning and in-service inspections.
- 8.) The jumper shall conform to the requirements listed in TFC-ENG-STD-22, Piping, Jumpers, and Valves.
- 9.) The piping analysis for the jumpers shall be prepared in accordance with TFC-ENG-DESIGN-C-60, Preparation of Piping Analyses for Waste Transfer Systems.
- 10.) RPP-RPT-58773, Assessment of Safety Significant Piping Jumpers to Assure Excess Load Capacity for Potential Water Hammer (Leak Check and Flush) Events shall be used to demonstrate compliance for withstanding pressure transients. Specific design features listed in RPP-RPT-58773 Appendix D shall be incorporated into the jumper design media. A compliance table shall be included in the analysis identifying how each requirement has been met.
- 11.) The jumpers shall be designed to accommodate the fabrication specification requirements listed in RPP-14541, Jumper Fabrication and Testing Specification for Tank Farms.
- 12.) Jumpers connected to the replacement slurry waste transfer line are designated as high transfer volume jumpers and their design shall comply with the requirements in TFC-ENG-STD-42, Section 3.2.1.3, "Tank Farms Waste Transfer System Fitness-for-Service Evaluation – Erosion/Corrosion In-Line Monitoring" and TFC-ENG-STD-42, Section 3.3.1.1, "Tank Farms Waste Transfer System Fitness-for-Service Evaluation – Future Erosion/Corrosion Allowance."

- 13.) Jumpers shall be designed and fabricated to exclude dead legs.
- 14.) Nozzle, manifold, and jumper assembly connections installed shall be the Plutonium-Uranium Extraction (PUREX) type designed in accordance with drawings H-2-32420, "Assembly Horiz. & Vert. Conn. 2" Connector," Sheet 1 – 2 and H-2-32430, "Assembly Horiz. & Vert. Conn. 3" Connector".
- 15.) Jumper support legs that contact with the flooring or walls as part of installation and/or operation shall use materials at the contact surface that minimize risk of damage to floor and wall protective coatings.
- 16.) Manual valves in safety-significant jumpers shall meet the Double Valve Isolation (DVI) criteria in TFC-ENG-STD-22, "Piping, Jumpers, and Valves."

### **Air lift Circulator (ALC) Jumper Design Inputs/Requirements:**

- 1.) New General Service jumpers designed for the ALC system shall allow the following operational capabilities.
  - Allow the routing of air from Nozzle P to R and Nozzle S to T
- 2.) The arrangement of the jumpers shall be such to allow the tightening and loosening of connector heads remotely via an electric impact wrench (Part #C-HEFIG-002). Exterior dimensions of the impact wrench are available upon request.
- 3.) Material for the pressure boundary piping that make up the jumpers shall be ASTM A312, Type 304L stainless steel.
- 4.) The jumper shall conform to the requirements listed in TFC-ENG-STD-22, Piping, Jumpers, and Valves where possible as a best practice. This jumper is not a waste transfer jumper as it supports the process air system to connect to the airlift circulator. B31.3 load cases shall be used to include dead weight, thermal, and occasional loads. Inputs to the analysis shall be utilized from TFC-ENG-DESIGN-C-60 where practical to aid in the analysis.
- 5.) The jumper shall have a design pressure of 125 psig at a design temperature of 100 deg F per the M-7 pipe code specification of Project B-120-C7.
- 6.) The jumpers shall be designed to accommodate the fabrication specification requirements listed in RPP-14541, Jumper Fabrication and Testing Specification for Tank Farms.
- 7.) Jumpers shall be designed and fabricated to exclude dead legs.
- 8.) Nozzle, manifold, and jumper assembly connections installed shall be the Plutonium-Uranium Extraction (PUREX) type designed in accordance with drawings H-2-32410, "Assembly Horiz. & Vert. Conn. 1" Connector,"
- 9.) Jumper support legs that contact with the flooring or walls as part of installation and/or operation shall use materials at the contact surface that minimize risk of damage to floor and wall protective coatings.

**AW-02A Encasement Flanged Spool Design Inputs/Requirements:**

- 1.) Two new General Service encasement drain valve spools shall have a design pressure of 60 psig at a design temperature of 200 deg F.
- 2.) The encasement drain valves shall interface with the existing 1-1/2 inch encasement flanged end for SN-267 and SN-268 located in the AW-02A central pump pit.
- 3.) Installation configuration shall be in accordance with H-2-70411 Sht 2 Detail 3, with the exception that the valve shall be stainless steel and the valve funnel shall utilize valve funnels identified on H-14-107471, Valve Funnel Receiver Assemblies, to allow engagement between the valve stem and the gear actuator drive shaft.
- 4.) The encasement spools shall be designed to accommodate the fabrication specification requirements listed in RPP-14541, Jumper Fabrication and Testing Specification for Tank Farms, as practical.

**DST Waste Transfer Pit Cover Block Design Inputs/Requirements:**

- 1.) New cover blocks/plates shall be designed as required to support new jumper arrangements where utilizing the existing cover blocks is not practical. It is anticipated that existing equipment which was previously installed through the cover block will require replacement due to changes in cover block design (i.e. new equipment lengths) to meet current requirements. The cover blocks shall be designed with penetrations to allow installation and operation of the following equipment:
  - One Leak Detection Assembly (Reference H-14-100981). To be located adjacent to the drain seal assembly port.
  - One Pit Thermocouple Tree (Reference H-14-109814).
  - One Pit Drain Seal Assembly (Reference H-14-107249). To be located in the same location as the existing drain seal assembly.
  - Valve Gear Actuator(s) Assembly (Reference H-14-110327). To align above each jumper valve centerline.
  - Multiple Remote Cameras (Viewport penetrations with minimum inside diameter of 4 inches). Sufficient view ports shall be selected to ensure remote cameras have line of sight to all installed equipment including valves, Purex connectors, leak detector probes, drain, etc.
  - One In-Pit Heater (Reference H-14-110254)
  - A minimum of one spare gear actuator assembly mating flanges (to support future jumper replacement activities).
- 2.) Penetrations which will not have equipment installed as part of normal operation (viewport penetrations, spare gear actuator assembly, etc.) will require shield port covers to be listed as details on the applicable cover block design media.



- 3.) Shield port covers shall utilize gaskets and a drip ledge to prevent water and foreign material intrusion into the applicable pit.
- 4.) New cover blocks shall be sloped and extend over the outside of the pit walls to allow water to drain off the top of the cover and away from the pit. If utilizing steel plate for the top surface, water intrusion mitigation features (e.g. drip ledges, raised surface, etc.) may be implemented instead of slope as an acceptable means. Minimizing intrusions shall be a consideration to limit shutdowns due to artificial leak detector alarms.
- 5.) Cover block/plate penetrations shall be sealed adequately to stop rain/snow water intrusion.
- 6.) Cover blocks/plate configuration shall minimize radiation streaming.
- 7.) Cover blocks/plate shall be provided with lifting bails positioned to be suitable for balanced lifting by crane.
- 8.) Cover blocks/plate and process pits shall have a special protective coating to prevent waste absorption from a spray leak.
- 9.) New cover blocks/plates shall be designed in accordance with TFC-ENG-STD-06, "Design Loads for Tank Farm Facilities" with the natural phenomena design category of NDC-2. The cover blocks are NDC-2/1 (2 over 1), which means their failure could affect NDC-2 equipment (piping inside the pump pits) and they are subjected to the same seismic loads as NDC-2 equipment. Utilize Limit State C for analysis.
- 10.) Cover block/plate design shall be in accordance with DOE/RL-92-36, Hanford Site Hoisting and Rigging Manual and RPP-8360, Lifting Attachment and Lifted Item Evaluation.

**DST Waste Transfer Lines Design Inputs/Requirements:**

- 1.) Locations for the new transfer line nozzle connections into the DST waste transfer system shall occur within AW-Farm. Pit tie-in locations are AW-02A, AW-02E, and AW-B valve pits.
- 2.) 242-A Evaporator wall nozzles are to be designed for remote installation from the inside of the pump room via the process crane. Support personnel will be located on the outside of the pump room wall to facilitate the final placement/anchorage.
- 3.) Transfer piping design shall comply with the requirements in TFC-ENG-STD-22, "Piping, Jumpers, and Valves."
- 4.) New slurry transfer piping shall be comprised of a 2 inch Schedule 40 stainless steel primary pipe and a 4 inch Schedule 40 carbon steel secondary encasement pipe.
- 5.) New supernatant transfer piping shall be comprised of a 3 inch Schedule 40 stainless steel primary pipe and a 6 inch Schedule 40 carbon steel encasement pipe.
- 6.) Material for the primary piping within the transfer line shall be seamless grade 316L stainless steel.
- 7.) Material for the encasement piping of the transfer line shall be seamless carbon steel ASTM A106 or ASTM A53.
- 8.) The encasement pipe shall extend through the concrete wall of the applicable structure (i.e. pit walls, pump room wall, etc.) to maintain secondary containment.
- 9.) Waste transfer piping design (primary confinement piping and secondary containment piping) shall have the capability to be pressure tested in accordance with the requirements of ASME B31.3, *Process piping* for normal fluid service.
- 10.) Underground transfer piping shall be covered by the equivalent of  $\geq 3$  foot (ft.) of soil to the top of the pipe [RPP-13033, *Tank Farms Documented Safety Analysis*, Section 2.4.2.1 "Transfer Lines"]. The definition of "equivalent" is outlined in RPP-RPT-52823, *Tank Farm Waste Transfer Buried Piping Freeze Protection Methodology*; this design shall comply with the requirements outlined therein.
- 11.) Underground transfer piping located outside of an RBA shall be covered with appropriate backfill/shielding to ensure that the contact dose rate during a transfer (simultaneous feed and slurry transfers) does not exceed 0.5 mr/hr as measured at grade utilizing the source term cited in Table 1.
- 12.) Buried piping must be provided with a backfill material that is noncorrosive, porous, and homogeneous substance that is carefully installed so that the backfill is placed completely around the piping and compacted to ensure that the piping is fully and uniformly supported. Controlled density fill (CDF) will be used under and up to at least the horizontal centerline of transfer pipe system.
- 13.) Buried pipe bends with a minimum of five pipe diameters are preferred to butt-welding elbow and shall be used where possible

- 14.) The transfer line encasements shall have connection points (i.e., test risers) at or near grade to allow the performance of encasement pneumatic pressure testing and encasement flushing near each low point and high point.
- 15.) The transfer line encasement connection point shall be configured to aid in the installation of a boroscope into the transfer line encasement (minimum inner diameter of ½-inch test riser required with angled approach into the encasement).
- 16.) Design of new pipe system to connect to existing piping shall be compatible with the material of construction, nominal pipe size and pipe schedule with interfacing existing piping
- 17.) New transfer piping shall be designed with a corrosion protection system that complies with the NACE SP0169, which shall include a fusion bonded epoxy layer and cathodic protection.
- 18.) Waste transfer lines shall be sloped continuously from high point to low point with a minimum slope of 0.5%. If shown that 0.5% is not practical, then the pipe slope shall utilize no less than the absolute minimum of slope of 0.25 %.
- 19.) Low point encasement drains into the applicable pit shall utilize the pit leak detector as the low point leak detection.
- 20.) The transfer line encasement low point at the applicable pit structure shall be designed with a 2-inch PUREX nozzle to support periodic pneumatic encasement pressure tests. These 2-inch nozzles should be accessible for the installation of a process blank and isolation blank without the removal of process jumpers. If this is not practical, design encasement drain valve jumpers to allow process jumpers to remain in place during encasement pressure tests.
- 21.) The transfer lines and associated jumpers shall be designed to the following design pressure/design temperature parameters:

**Table 4 – Pressure and Temperature Design Requirements**

Transfer Line Type	Primary Piping		Encasement Piping	
	Design Pressure	Design Temperature	Design Pressure	Design Temperature
Supernatant	620 psig	200°F	60 psig	200°F
Slurry	620 psig	200°F	60 psig	200°F

**Table 5 – Jumper Pressure and Temperature Design Requirements**

Jumper Piping	
Design Pressure	Design Temperature
400 psig	200°F

**Waste Transfer System Material Design Inputs/Requirements:**

- 1.) Equipment, components, and assemblies that may contact waste or waste treatment materials shall be compatible with their physical, chemical, and radioactive properties.
- 2.) Waste transfer component selection shall use the guidance in TFC-ENG-STD-34, "Standard for the Selection of Non-Metallic Materials in Contact with Tank Waste," for selection of Non-Metallic materials. Material selection is to be based on normal, bounding conditions for DSTs, with the exception of Tank 241-AZ-101. Tank 241-AZ-101 waste characteristics are not part of the normal bounding conditions and shall not be used in the selection of non-metallic materials.
- 3.) Metallic surfaces which will routinely contact tank waste shall be fabricated from stainless steel.
- 4.) Materials of construction shall be selected to minimize all forms of corrosion.
- 5.) Waste transfer system components shall be designed for the 250 Rad/hour radiation environment for direct contact with tank waste utilizing the source term methodology defined in TFC-ENG-STD-34, "Standard for the Selection of Non-Metallic Materials in Contact with Tank Waste", Attachment D, "Derivation of Radiation Source Term" for a non-AZ Tank Farm tank.
- 6.) Non-metallic materials shall conform to the requirements of TFC-ENG-STD-34, "Standard for the Selection of Non-Metallic Materials in Contact with Tank Waste.

**System Design Life Design Inputs/Requirements:**

- 1.) Pit cover blocks/plates shall have a design life of 35 years.
- 2.) Removable components beneath cover blocks/plates, including valves and jumpers, should have a design life of 25 years without maintenance, where practical.
- 3.) Buried waste transfer line piping shall have a design life of 50 years.

**Electrical Requirements Design Inputs/Requirements:**

- 1.) Electrical systems shall be designed in compliance with the requirements of the NFPA 70, National Electrical Code®, NFPA 101, Life Safety Code® and TFC-ENG-STD-41, "Electrical Installations."
- 2.) Electrical installations in potentially flammable atmospheres shall meet the requirements of TFC-ENG-STD-45, "Installations for Potentially Flammable Atmospheres."
- 3.) Outdoor electrical equipment enclosures shall be rated for protection from windblown dust, per NEMA ICS 6, Industrial Control and Systems: Enclosures.

**Hand-hole and Buried Conduit Design Input/Requirements:**

- 1.) Hand-holes shall be sized to allow for the installation of a minimum of three 3 inch PVC conduits (for both electrical distribution and instrumentation).
- 2.) Buried conduit shall be Ocal style PVC-coated rigid conduit and fittings.
- 3.) Hand-holes shall be selected and load rated for the applicable traffic conditions based upon their location. It is anticipated that all hand-holes shall be rated for higher than light duty (pedestrian traffic only).
- 4.) Electrical distribution hand-holes shall be separate from instrumentation hand-holes.
- 5.) Hand-hole locations shall allow for ease of future upgrades to tie into new conduit runs. This includes structures such as the 271-AW building, new electrical distribution building (location to be provided by WRPS Engineering), AW-102 pit structures, nearby hand-holes, and conduit runs on the north side of the 242-A Evaporator to enter the building.
- 6.) All hand-holes and conduit shall comply to the requirements is TFC-ENG-STD-15 and TFC-ENG-STD-41.
- 7.) Conduit shall be run to two new terminal boxes to be installed on the south side of the evaporator to allow routing of electrical and instrumentation from the evaporator to the new conduit hand holes.
- 8.) Core drilling near the southeast corner of the Evaporator into the AMU room shall be performed to allow passage of conduit. Spare cores and pass thru' s shall be in place for future expansion.
- 9.) Conduit shall be routed along the south face of the evaporator wall to the southeast corner region joining the new TBX to the pass-thru's into the AMU room.
- 10.) Conduit shall be continued to be routed into the AMU room in the evaporator to join into MCC-001.
- 11.) Conduit shall be run from the new hand-holes to the AW-02E feed pump pit to allow conductors to tie into the P-102-1 TBX located on the south side of the AW-02E pit.

**Evaporator Feed Pump Electrical Design Input/Requirements:**

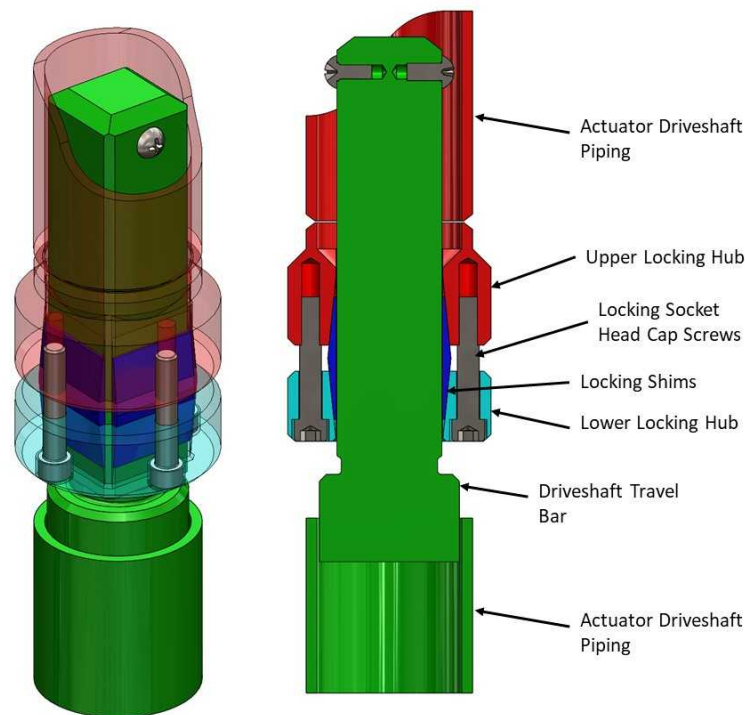
- 1.) New conductors shall routed from the P-102-1 TBX located by the AW-02E pit to the MCC-001 located in the 242-A Evaporator AMU room to allow the operation of the AW-02E feed pump.
- 2.) Conductors shall be sized for a minimum of a 20HP motor. Larger conductors are preferred for future pump replacements which may require additional HP requirements.
- 3.) Existing overload protection and motor contactor shall be replaced in the motor starter compartment if not appropriately sized for the new replacement feed pump.

**Hoisting and Rigging Design Inputs/Requirements:**

- 1.) All hoisting and rigging equipment shall comply with the requirements of DOE/RL 92-36, *Hanford Site Hoisting and Rigging Manual*; TFC-ENG-FAC SUP-C-25, "Hoisting and Rigging;" RPP-8360, *Lifting Attachment and Lifted Item Evaluation*.
- 2.) The lifting attachment(s) on the equipment (lifting eyes, lugs, ears, etc.) and the lifted items shall be designed in accordance with site procedures, an exception is that ASME BTH-1, *Design of Below-the-Hook Lifting Devices* should be used to verify lifting lugs hole diameter compared to the shackle pin diameter (the D to d ratio). The design shall consider equipment orientation, i.e., horizontal to vertical.
- 3.) Lift points for packages and individual components shall be clearly identified.
- 4.) Design Agent provided structural and mechanical lifting devices, as defined by ASME B30.20, *Below-the-Hook Lifting Devices* and shall conform to the requirements of ASME B30.20.
- 5.) The design of below-the-hook lifting (BTH) devices shall conform to the requirements of ASME BTH-1, *Design of Below-the-Hook Lifting Devices*.
- 6.) The Design Agent shall submit calculations required for the design of all BTH devices and associated lifting points. BTH devices shall be load tested to 125% of the rated capacity +0%/-5%.
- 7.) All lifting devices shall be rated for outdoor service. Lifting devices shall be designed to a minimum temperature of 10 °F.

### Actuator Design Enhancements Inputs/Requirements:

- 1.) The actuator design change shall allow for setting the overall length in the field prior to installation without the requiring welding.
- 2.) Features shall be included to allow approximately 8-inches of travel adjustment. This distance is based on the uncertainty of where the as-built location of the applicable valve funnel is in elevation.
- 3.) The preferred design solution involves two hubs that are drawn together using socket head cap screws which squeezes four locking shims onto the face of the driveshaft travel bar. This compression and mating surfaces prevents any torsional deflection/slop to occur.
- 4.) The design should include a feature to where in the event the compression of the shims fail, the driveshaft travel bar does not fall out of the actuator drive shaft assembly. For example this could be accomplished by two button head screws put in place prior to welding the upper locking hub to the actuator driveshaft piping.
- 5.) The torsional load this joint needs to withstand are the same as the remaining driveshaft assembly as documented in RPP-CALC-60314, *Manual Valve Gear Operator Supporting Analysis* of 750 ft-lbs.



**Driveshaft Enhancement Concept**

### **Shoring Plan Design Inputs/Requirements**

- 1.) The shoring system and methods of deployment will comply with the requirements of DOE-0344, Hanford Site Excavating, Trenching and Shoring Procedure (HSETSP).
- 2.) The shoring system will be required to be compatible with Type C-60 soil.
- 3.) The shoring system will be required to be in place for 3-6 months at a time.
- 4.) Excavations will be performed via hand digging (i.e. shovels). The shoring system installation shall be compatible with this type of excavation.
- 5.) Fall protection will need to be a feature that is that included with the shoring system.
- 6.) Trench ingress and egress shall be included with the shoring system
- 7.) The shoring system needs to allow long sections of piping (40-50ft) to be placed in the trench via a crane without cross supports preventing installation.
- 8.) The shoring system needs to allow 90 degree turns of the excavated trench.
- 9.) The shoring system needs to account for surcharge loads from nearby facilities.
- 10.) The shoring system needs to allow for existing infrastructure in unknown locations to cross the excavation.

### **Interface Points:**

- 1.) The new slurry jumper to be designed/installed in the 242-A Evaporator shall connect to Nozzle 5 which is located on an existing jumper 4 to 5 / 40 to 21 (Reference H-2-836350) in the pump room.
- 2.) The new supernatant jumper to be designed/installed in the 242-A Evaporator shall connect to Nozzle 13A which is located on the existing jumper D to 13A (Reference H-14-107263) in the pump room.
- 3.) The new jumpers to be designed/installed in the AW-B Valve Pit shall connect to Nozzle R4 to allow transfer to the AP Valve Pit via SL-509.