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Reason	Disp.								
1	1	Cog. Eng. T.W. Staehr	<i>T.W. Staehr</i>	5/1/96	H5-61				
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Decant Pump Assembly and Controls Qualification Testing - Test Report

T. W. Staehr

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Abstract: This report summarizes the results of the qualification testing of the supernate decant pump and controls system to be used for in-tank sludge washing in aging waste tank AZ-101. The test was successful and all components are qualified for installation and use in the tank.

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Release Approval

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DECANT PUMP ASSEMBLY AND CONTROLS
QUALIFICATION TESTING
TEST REPORT

April 1996

F. M. Hauck

T. W. Staehr

Westinghouse Hanford Company
Richland, Washington

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Abbreviations and Acronyms

ICF KH	Kaiser Engineers Hanford
QTP	Qualification Test Procedure
SBP	Sulzer Bingham Pumps
WHC	Westinghouse Hanford Company

Trademarks

Floway is a trademark of Sauk Valley System, Inc., Sterling, Illinois.
Sulzer Bingham is a trademark of Sulzer Bingham Pumps, Inc., Portland, Oregon.

**Decant Pump Assembly and Controls
Qualification Testing
Test Report**

1.0 INTRODUCTION

A full-scale demonstration of in-tank sludge washing, in conjunction with operational testing of mixer pumps provided by the W-151 Project, has been planned for tank AZ-101. Various equipment has been procured and fabricated to decant the existing supernate from the tank and monitor tank waste parameters during the mixing test. The primary pieces of equipment are:

1. A floating suction, supernate decant pump, with electric motor (*Dwg H-2-820774)
2. A retraction winch assembly, including a load sensor and cable length resolver (*Dwg H-2-820774)
3. A process jumper assembly including a motor-operated valve, flow meter, and turbidimeter (*Dwgs H-2-820776 and H-2-820777)
4. A programmable logic controller (*Dwg H-2-821433)
5. A suspended solids profiler (*Dwg H-2-822934)
6. An electrical power panel (*Dwg H-2-821438)

* See Appendix F

This test report documents the qualification testing and calibration of the supernate decant pump and associated instrumentation and control equipment listed above. Decant pump performance and run-in testing was conducted by Sulzer Bingham Pumps (SBP) at their test facility under the direction of ICF KH and WHC Retrieval Engineering. Testing of the control system and ancillary equipment was performed by ICF KH and WHC Retrieval Engineering after the pump testing. The testing began in December 1994, with the pump testing being completed in December, and the Control System Testing being completed on March 3, 1995. Additional follow-up testing of control system modifications was done at the Hanford Site during December 1995 and January 1996.

2.0 TEST DESCRIPTION AND METHOD

Initial testing and calibration of the decant pump and control system was performed and documented in revision 2 of the "TEST SPECIFICATION FOR DECANT PUMP AND WINCH ASSEMBLY", (see Appendix A). The test included three elements:

1. Decant Pump Performance Test

The decant pump was originally built by Floway and was modified onsite for decanting service. The performance test was done in a classical sense as outlined and explained in the SBP Test Report (see Appendix B).

2. Run-In Test

The run-in test involved continuous pump operation at a set head and flow for seven hours. Following the extended run, the pump head, flow, and power were compared with the original pump performance data to ensure that there was no degradation of the pump.

3. Control System Test

The control system test involved validation testing of all the control system equipment to ensure that it functioned as designed.

Follow up testing was performed and documented in Revision 4 of the "TEST SPECIFICATION FOR DECANT PUMP AND WINCH ASSEMBLY", (see Appendix D, additional test steps are shown as shaded areas). This follow up testing was performed to include testing of control system modifications and testing of the suspended solids profiler assembly .

3.0 TEST EQUIPMENT

It was the intent of the test procedure to test the equipment as it will be operated in the field. Initial testing was performed at the SBP test facility in Portland, Oregon, where a large test pit was available to observe the unrestricted movement of the pump float. In addition to the decant pump, the process jumper, programmable logic controller, and operator interface personnel computer were brought to Portland for testing. All other equipment required to perform the decant performance and run-in testing was provided by SBP.

The electrical rack to be permanently installed in the AZ tank farm was utilized during follow-up testing performed at the Hanford Site. Additionally, the operation of the suspended solids profiler was also included as part of the testing.

4.0 TEST OBJECTIVES

The test had four objectives as outlined below:

1. Verify the actual pump performance as defined by the original pump manufacturer's test curve.
2. Identify any effects on performance caused by the floating suction modifications.
3. Validate the design of the control system for the decant pump and ancillary instrumentation.
4. Verify the operation of hardware changes and modifications made to the pump control system logic as a result of the initial testing performed at SBP. All of these objectives were met, or exceeded, and are discussed in detail in Section 5.0.

5.0 TEST RESULTS

Results of the decant pump run-in and performance testing are documented in the "PUMP TEST REPORT", (see Appendix B).

1. Pump Performance Test

In general, the pump performance matched the original manufacturer's factory testing, indicating that several years of storage and handling had not caused the pump to degrade. In addition, the modifications made for decanting service made very minor performance changes as noted in the SBP report and will have no impact on plant pump operation.

2. Run-In Test

All specification requirements were met and the beginning and ending performance checks were identical, indicating that the pump operated for 7 hours without distress. The motor temperature and vibration remained constant throughout the test.

3. Control System Test

Testing of the control system, modifications to the control system, and suspended solids profiler were completed successfully. It was noted that the suction float generally stayed within a radius of 5 feet from the pump centerline during operation. The pump continued to operate to within approximately 6" of the tank bottom before automatically being turned off due to low flow and cavitation. Exceptions to the original test specification are identified and explained in Appendix C.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The testing performed on the decant pump at Sulzer Bingham in December 1994 and March 1995 and at the pump test facility at the Hanford 200 East Area in January 1996, was satisfactory, meeting all test objectives. Minor design modifications and changes to control system hardware and logic were made as a result of the initial testing and then retested successfully at the Hanford Site. Valuable information was gained regarding the operation of the control system equipment and mechanical design of the pump floating suction and hoist.

Based on the results of this testing, this equipment is qualified for use in decanting service for nuclear waste tanks at the Hanford Site. Should any additional programmatic changes be made prior to pump installation, a supplementary QTP shall be written to retest any features modified.

7.0 DISPOSITION OF PUMP

The pump and associated equipment shall be prepared for shipment in such a way that the pump is properly supported to avoid internal damage, and electronic equipment crated and protected from the elements during transit. Based on test results, the pump and control system are ready for tank installation.

In the event the pump is not transferred directly to a tank farm for installation, it should be prepared for long-term storage. This shall include wrapping and sealing the pump unit for outdoor storage to protect it from the elements, including rain and blowing sand. All of the control system components shall be wrapped and sealed and then stored indoors.

APPENDIX A: TEST SPECIFICATION, REV. 2

Ref WHC-SD-ER3297-TS-001, REV. 2

TEST SPECIFICATION FOR DECANT PUMP AND WINCH ASSEMBLY

WORKING COPY WITH SIGNED DATA SHEETS

32 Pages

ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN NO 616681

Proj.
ECN

2. ECN Category (mark one) Supplemental ☐ Direct Revision ☐ Change ECN ☐ Temporary ☐ Standby ☐ Supersedeure ☐ Cancel/Void ☐	3. Originator's Name, Organization, MSIN, and Telephone No. T. W. Staehr, 7F520, R3-27, 372-3013 5. Project Title/No./Work Order No. SLUDGE WASHING DECANT PUMP 8. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-ER3297-TS-001, Rev. 1	3a. USD Required? ☐ Yes ☒ No 6. Bldg./Sys./Fac. No. 241-AZ 9. Related ECN No(s). 611893	4. Date 2/14/95 7. Approval Designator Q 10. Related PO No. NA																																		
11a. Modification Work ☐ Yes (fill out Blk. 11b) ☒ No (NA Blks. 11b, 11c, 11d)	11b. Work Package No. NA	11c. Modification Work Complete NA Cog. Engineer Signature & Date	11d. Restored to Original Condition (Temp. or Standby ECN only) NA Cog. Engineer Signature & Date																																		
12. Description of Change This is a total revision of WHC-SD-ER3297-TS-001. Specific changes include the replacement of Section 4.4 "Control System Testing", and the addition of figure 3 "Exception Form".																																					
13a. Justification (mark one) Criteria Change ☐ Design Improvement ☒ Environmental ☐ Facility Deactivation ☐ As-Found ☐ Facilitate Const ☐ Const. Error/Omission ☐ Design Error/Omission ☐																																					
13b. Justification Details Section 4.4 has been replaced to incorporate changes made due to preliminary testing results and to facilitate final testing. Due to the large number of changes made to section 4.4, change bars were not used. An exception form was added to document resolution and approval of exceptions.																																					
<table border="1"> <tr> <td colspan="4">14. Distribution (include name, MSIN, and no. of copies)</td> <td>RELEASE STAMP</td> </tr> <tr> <td>A. Chu</td> <td>S3-08</td> <td>R.W. Ulbricht</td> <td>B4-40</td> <td rowspan="7"> OFFICIAL RELEASE BY WHC DATE FEB 22 1995 STA 4 </td> </tr> <tr> <td>R.E. Clayton</td> <td>R3-27</td> <td>C.M. Winkler</td> <td>S5-07</td> </tr> <tr> <td>T.K. Cordray</td> <td>G1-50</td> <td></td> <td></td> </tr> <tr> <td>F.M. Hauck</td> <td>B4-40</td> <td>Central Files (2)</td> <td>L8-04</td> </tr> <tr> <td>G.T. Maclean</td> <td>H5-49</td> <td>O.ST.I. (2)</td> <td>L8-07</td> </tr> <tr> <td>S.G. Romero</td> <td>S3-08</td> <td></td> <td></td> </tr> <tr> <td>T.W. Staehr</td> <td>R3-27</td> <td></td> <td></td> </tr> </table>				14. Distribution (include name, MSIN, and no. of copies)				RELEASE STAMP	A. Chu	S3-08	R.W. Ulbricht	B4-40	OFFICIAL RELEASE BY WHC DATE FEB 22 1995 STA 4	R.E. Clayton	R3-27	C.M. Winkler	S5-07	T.K. Cordray	G1-50			F.M. Hauck	B4-40	Central Files (2)	L8-04	G.T. Maclean	H5-49	O.ST.I. (2)	L8-07	S.G. Romero	S3-08			T.W. Staehr	R3-27		
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ENGINEERING CHANGE NOTICE

15. Design Verification Required ☒ Yes ☐ No	16. Cost Impact: ENGINEERING Additional ☐ \$ Savings ☐ \$	CONSTRUCTION Additional ☐ \$ Savings ☐ \$	17. Schedule Impact (days) Improvement ☐ Delay ☐
18. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 12. Enter the affected document number in Block 19.			
SDD/DD	☐	Seismic/Stress Analysis	☐
Functional Design Criteria	☐	Stress/Design Report	☐
Operating Specification	☐	Interface Control Drawing	☐
Criticality Specification	☐	Calibration Procedure	☐
Conceptual Design Report	☐	Installation Procedure	☐
Equipment Spec.	☐	Maintenance Procedure	☐
Const. Spec.	☐	Engineering Procedure	☐
Procurement Spec.	☐	Operating Instruction	☐
Vendor Information	☐	Operating Procedure	☐
OM Manual	☐	Operational Safety Requirement	☐
FSAR/SAR	☐	IEFD Drawing	☐
Safety Equipment List	☐	Cell Arrangement Drawing	☐
Radiation Work Permit	☐	Essential Material Specification	☐
Environmental Impact Statement	☐	Fac. Proc. Samp. Schedule	☐
Environmental Report	☐	Inspection Plan	☐
Environmental Permit	☐	Inventory Adjustment Request	☐
19. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECW.) 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			
20. Approvals Signature OPERATIONS AND ENGINEERING Cog. Eng. T. W. Staehr Cog. Mgr. J. E. Van Beek QA T. K. Cordray Safety Environ. Other Date 2/15/95 2/15/95 2/17/95 _____ _____ _____ _____ _____ _____ Signature ARCHITECT-ENGINEER PE QA Safety Design Environ. Other Date _____ _____ _____ _____ _____ _____ _____ DEPARTMENT OF ENERGY Signature or a Control Number that tracks the Approval Signature _____ ADDITIONAL _____ _____ _____ _____			

RELEASE AUTHORIZATION**Document Number:** *ref.* WHC-SD-ER3297-TS-001, REV 2**Document Title:** Test Specification for Decant Pump and Winch Assembly**Release Date:** 2/22/95

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

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:
Kara M. Broz

February 22, 1995

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SUPPORTING DOCUMENT		1. Total Pages 27
2. Title Test Specification for Decant Pump and Winch Assembly	3. Number WHC-SD-ER3297-TS-001	4. Rev No. 2
5. Key Words Decant, pump, winch, control, run-in, performance, test	6. Author Name: T. W. Staehr <i>TW Staehr</i> Signature Organization/Charge Code 7F520/D3024	
7. Abstract This specification provides the requirements for testing of the vertical turbine decant pump including the floating suction arm with load sensing winch control, instrumentation and the associated PLC/PC control system.		
8. RELEASE STAMP OFFICIAL RELEASE BY WHC DATE FEB 22 1995 <i>SA 4</i>		

TEST SPECIFICATION FOR DECANT PUMP AND WINCH ASSEMBLY

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4.0	TESTING REQUIREMENTS	5
5.0	QUALITY ASSURANCE	20
6.0	PREPARATION FOR DELIVERY	21
7.0	NOTES	21
FIGURE	DESCRIPTION	
1	PUMP TESTING ASSEMBLY SCHEMATIC	
2	ACCEPTANCE CRITERIA FOR PUMP EQUIPMENT FORM	
3	EXCEPTION FORM	

ref WHC-SD-ER3297-TS-001, Rev. 2

1.0 SCOPE

- 1.1 This specification provides the requirements for testing of the vertical turbine decant pump including the floating suction with load sensing winch control, instrumentation and the associated PLC/PC control system. All assembly necessary for testing including piping, temporary wiring, etc., shall be performed by the Seller. All referenced figures are at the back of this document.

1.2 Types of Tests

The testing consists of performance testing, winch testing and calibration, instrumentation verification testing and run-in testing of the pump. Testing shall be done in the presence and under the direction of the Buyer in accordance with this procedure.

2.0 APPLICABLE DOCUMENTS

- 2.1 The following documents of the exact issue shown, form a part of this specification to the extent specified herein. In the event of a conflict between the documents referenced herein and the contents of this specification, this specification shall take precedence.

2.1.1 HYDRAULIC INSTITUTE STANDARDS, 14TH Ed. (1983)

3.0 TEST PREPARATION

3.1 Equipment Required

3.1.1 Supplied by Seller:

- (a) Flexible Connectors (as needed)
- (b) Calibrated vibration meter
- (c) Throttling valve (drag or gate valve)
- (d) Calibrated deadweight tester for discharge pressure
- (e) Calibrated flow device (venturi w/ differential pressure gage or manometer)
- (f) Drop pipe, pump to test tank
- (g) Test tank
- (h) Calibrated wattmeter
- (i) Thermocouple or other temperature sensing devices
- (j) All wiring and miscellaneous electrical hardware

3.1.2 Supplied by Buyer:

- (a) Complete Pump Assembly with Winch and Cable
- (b) PLC/PC Control System
- (c) Fabricated Jumper with 3-Way MOV, Flowmeter and Turbidity meter
- (d) Adapter to Connect Jumper to Raised Face Flange

3.2 Instrumentation Calibration and Accuracy

Meters, gages and instrumentation used shall be calibrated and meet the following minimum accuracy requirements:

Pressure gages	2 percent minimum
Flow meters	2 percent minimum
Ammeters	1 percent minimum
Vibration	2 percent minimum

3.3 Pretest Operations

3.3.1 The Seller shall provide the following inspections of the pump motor:

- (a) Check the condition of the antifriction bearings and replace as necessary.
- (b) Megger the motor windings to verify the integrity of the windings and the insulation.
- (c) Provide a general clean-up of the motor, ie, remove dust, cobwebs, corrosion, etc.
- (d) Check the insulation of the electrical leads and replace as necessary.
- (e) Verify the satisfactory condition of the motor with a no-load run, as appropriate.

ref. WHC-SD-ER3297-TS-001, Rev. 2

3.3.2 The Seller shall assemble the modified pump with the suction arm and floating suction assembly, mounting adapter plate, winch assembly and jumper (all provided by the buyer)

3.4 Assembly of Test Equipment

Assembly of the test equipment shall include the following: (See Figure 1)

3.4.1 Discharge piping, of the same or larger size as the pump piping connections, shall be connected to the pump discharge. No sections of the flexible or rigid piping may be of smaller inner diameter than the pump discharge nozzle or flange.

3.4.2 A piping jumper that includes a 3-way ball valve, flowmeter and turbidity probe, supplied by Buyer and a throttling valve (preferably a gate or drag valve) supplied by the Seller.

3.4.3 Calibrated discharge pressure measurement instrumentation. All lines or hoses between the connection point and the gage shall be vented and all air bled out before taking data.

3.4.4 A calibrated flow device.

3.4.5 A full size or larger drop-pipe back to the test tank.

3.4.6 Thermocouples or other approved temperature measuring devices shall be attached to the lower motor housing at the bearing location. Hand held temperature measuring devices are acceptable.

3.4.7 Vibration measuring pickups shall be attached on the pump mounting flange at two locations in the same plane, 90° apart. Hand held vibration meters are acceptable.

3.4.8 The pump, complete with ammeter or wattmeter, shall be wired to the specified voltage source. Hand-held ammeters are acceptable.

3.4.9 All devices controlled by the PLC shall be wired to the appropriate I/O module:

- (a) pump motor starter (Size 3)
- (b) winch reversing motor starter (Size 0)
- (c) flowmeter signal (4-20mA 24VDC)
- (d) 3-way MOV (120 VAC - 3 inputs and 3 outputs)
- (e) winch controls (resolver, 24 VDC rotary limit switch, and 24 VDC weight transmitter)
- (f) turbidity analyzer

24VDC signals shall be routed separately from 120 VAC signals.

4.0 TESTING REQUIREMENTS

4.1 Testing Sequence

Testing shall be performed in the following sequence unless a change is authorized by the Buyers Representative.

- (a) Performance Testing
- (b) Control System Testing
- (c) Run-in Testing

4.2 Pump Testing Parameters

4.2.1 The following steps shall be performed before taking readings:

- (a) Place MOV in recirc position and the throttling valve in the full-open position allowing the pump to operate at maximum flow. (Operation with a full open discharge line is an acceptable alternative)
- (b) After placing the pump in Manual/Remote control, start the pump from the PC using the Start button and let it run a minimum of 10 minutes after all air is purged from the system and then stop the pump using the Stop button.
- (c) If any unusual characteristics are observed in start-up or running, shut down the pump to determine and correct the cause, then proceed as in (a) and (b) above.

4.2.2 Acceptance Criteria

Acceptance Criteria will be provided on the Acceptance Criteria for Pump Equipment form, Figure 2.

- (a) The pump flow at rated head shall not be more than 10% above the rated flow. Flow cannot be below the rated flow.
- (b) The pump head at rated flow shall not be more than 5% above the rated head. Head cannot be below the rated head.

NOTE: Conformity with only one of the above tolerances is required.

- (c) The average amps of all phases at rated flow shall not exceed that shown on Acceptance Criteria. Notify the Buyer's Representative if there is more than 2 amps difference between the highest and lowest phase.
- (d) The Buyer's Representative may define other deviations or special test requirements in the applicable section of the Acceptance Criteria Form.

4.3 Performance Testing

- 4.3.1 Performance testing shall be accomplished to determine if the pump meets the specified performance criteria. Testing will be done at the Seller's facility and will precede the run-in testing in order to establish baseline performance.
- 4.3.2 Performance testing shall be done with the winch and floating suction in the manual mode (because the performance test precedes the winch test). The floating suction shall be manually lowered to a point where it has a satisfactory suction.
- 4.3.3 Figure 1, (attached) is a schematic diagram of the vertical turbine decant pump test assembly.
- 4.3.4 Pump Test Readings

The following five sets of readings shall be taken and recorded.

- (a) At 100% flow: record gpm, discharge pressure, amps, watts, vibration and RPM.
- (b) At 75% flow: record gpm, discharge pressure, amps, watts, vibration and RPM.
- (c) At 50% flow: record gpm, discharge pressure, amps, watts, vibration and RPM.
- (d) At 25% flow: record gpm, discharge pressure, amps, watts, vibration and RPM.
- (e) At shut-off: record discharge pressure, amps, watts, vibration, and RPM. (NOTE: Minimize run time at shutoff.)

4.3.5 Test Data Corrections

The following corrections shall be added to the head readings obtained above:

- (a) The vertical distance between the center-line of the test pressure gage and the free water surface.
- (b) Other correction factors as defined in the HYDRAULIC INSTITUTE STANDARDS may be applied at the discretion of and by the Buyer's Representative. This will be noted on the Acceptance Criteria Form when required.

4.4 Control System Testing

4.4.1 General

After test installation is completely set up, and after visually inspecting all wiring for correctness, perform the following tests. Each test consists of several steps. Test director or designee shall initial the blank for the step after successfully completing the step. In the event there are exception(s) to the required test results, these exceptions shall be sequentially numbered and documented on an individual exception form (see figure 3). This enables case by case resolution and approval of each exception.

A. Turbidity Analyzer OIT-01 Signal

DELETE
WAS TKE

1. With Decant Pump Discharge Turbidity transmitter and probe installed in test loop, record the turbidity with probe not in water. Turbidity = ____ ppm.
2. Record the turbidity with probe in water. Turbidity = 0 ppm. (Perform this step at the first convenient opportunity after water has been introduced to the piping).

B. Remote/Local Modes (Using Personal Computer (PC))

1. Place the overall controls in Remote Mode at the PC by clicking on the REMOTE button with mouse. REMOTE button should be highlighted in light blue.
2. Repeat test A1 for Local Mode. LOCAL button should be highlighted in light blue.
3. Repeat test A1 using keyboard controls.
4. Repeat test A2 using keyboard controls.

C. Remote/Local Modes (Using Operator Interface Panel (OIP))

1. Place the overall controls in Local Mode at the OIP by pushing F1, the LOC/REM button. (2nd line message should display LOCAL or REMOTE Mode).
2. Repeat test A1 for Remote Mode.

4.4.2 Decant Pump Tests in Remote Mode (Using Personal Computer (PC))

A. Auto/Manual Modes

1. Place pump in manual by clicking on MAN button with mouse. MAN button should be highlighted in light blue.
2. Repeat test A1 with AUTO button. AUTO button should be highlighted in light blue.
3. Repeat test A1 with keyboard controls.
4. Repeat test A2 with keyboard controls.

B. On/Off (Start/Stop) Controls

CAUTION! Ensure that pump is ready for operation. The discharge valve should be in Manual/Transfer or Manual/Recirc mode and the throttle valve full open.

1. With pump in Remote/Manual mode click on ON button. Pump should start and ON button should be highlighted in light blue. Ensure PLC program uses M.S. aux contacts for On/Off indicator.
2. Click on OFF button. Pump should stop and OFF button should be highlighted in light blue.
3. Repeat Step B1 with keyboard controls.
4. Repeat Step B2 with keyboard controls.
5. Repeat Step B1 in Remote/Auto Mode.
6. Repeat Step B2 in Remote/Auto Mode.
7. Repeat Step B3 in Remote/Auto Mode.
8. Repeat Step B4 in Remote/Auto Mode.

C. Flow Transmitter FT-01 Signal

1. Refer to the flow transmitter user manual and verify (or set) the range for the flow transmitter at 0-200 GPM.

ref. WHC-SD-ER3297-TS-001, Rev. 2

2. With the Decant Pump flow transmitter powered and flowtube installed in test loop, and the pump not running, record the flow reading. Flow per magmeter = 0 GPM. Compare venturi flow reading with magmeter. Flow per venturi = 0 GPM.
3. Start the pump and record the flow with throttle valve full open. Flow = 195.1 GPM. (VENTURI = 193.7)
4. With pump running in Remote/Auto Mode, lower flow to 70 GPM (low flow cutout) using throttle valve. Pump should stop immediately and the "Auto Low Flow Cutout" alarm should annunciate. 90 ~~70~~
5. Without changing throttle valve position or pump mode, start pump. Pump should stop after a delay of approximately 10 seconds and the "Auto Low Flow Cutout" alarm should annunciate. 15 ~~10~~ THE ALARM MUST BE ACKNOWLEDGED TO PROCEED.
6. Repeat test C4 in Remote/Manual mode. Pump should continue to run. Verify 'Auto Low Flow Cutout' not active in Manual mode. "Pump Flow Rate Low" alarm should annunciate. Stop pump.
7. Repeat test C5 in Remote/Manual mode. "Pump Flow Rate Low" alarm should annunciate after approx. 10 seconds and the pump should continue to run. 15 ~~10~~ THE
- * 2 B — 8. While pump is running push Pump E-Stop (PLC input X55 off). Pump should immediately stop running and appropriate alarm should annunciate.
- * 2 B — 9. Release Pump E-Stop. Pump should remain off.

4.4.3 Decant Pump Tests in Local Mode (Using Operator Interface Panel (OIP))

A. Select Pump Controls

1. Switch to Local mode, then use F2, the SELECT button, to cycle through the equipment choices and select the Decant Pump. When the message "DEC PUMP IS [ON/OFF] FLOW = [XXXXX] GPM" (1st line) / "REMOTE OFF LOCAL ON AUTO [ON/OFF] MAN [ON/OFF]" is displayed, the Decant Pump has been selected for control.

B. Auto/Manual Modes

1. Place pump in Local/Manual mode by pushing F3, the MAN/AUTO button. Pump is in Local/Manual mode when the 2nd line message is "REMOTE OFF LOCAL ON AUTO OFF MAN ON".

- 2. Repeat test B1 for Auto mode. Pump is in Local/Auto mode when the 2nd line message is "REMOTE OFF LOCAL ON AUTO ON MAN OFF".

C. Start/Stop (On/Off) Controls

- 1. With pump not running and while in Local/Manual mode, push F4, the START button. Pump should start and "DEC PUMP IS ON FLOW = [XXXXXX] GPM" message should be displayed on 1st line.
- 2. Start pump and while in Local/Manual mode, push F7, the STOP button. Pump should stop and "DEC PUMP IS OFF FLOW = [XXXXXX] GPM" message should be displayed on 1st line.
- 3. Repeat test C1 in Local/Auto Mode.
- 4. Repeat test C2 in Local/Auto Mode.
- 5. Start pump in Local/Auto Mode and lower flow to or below low flow cutout of 90 GPM. Pump should stop immediately.
- 6. Message displayed should read: "PUMP STOPPED ON LOW FLOW CUTOUT". (#31)
- 7. Repeat test C5 in Local/Manual mode. Pump should continue to run.
- 8. Message displayed should read: "LOW FLOW ALARM STOP PUMP MANUALLY" (#41)

4.4.4 Winch Tests In Remote Mode (Using PC)

A. Empirical Determination of Winch Cable Length Setpoints

NOTE: The cable length tests are performed with the tank dry.

Due to the lack of a camera in the tank, a method has been devised to remotely recalibrate the cable length setpoints relying on the instantaneous cable length value at the moment when the Upper Safety Limit (USL) rotary limit switch is tripped. This allows the operator to recalibrate the cable length setpoints, if at any time, it becomes obvious that the cable length is incorrect. The operator places the winch in Setup mode and recalibrates all of the cable length setpoints at one time. In order to accomplish automatic recalibration, the cable length setpoints are stored as calculated values in the PLC in "V" registers. Each cable length setpoint has an empirically derived offset associated with it. Each offset is either added or subtracted from the USL value when recalibration is triggered by pushing the UP button in Setup mode. Once established by these series of tests, these offsets should not change and therefore are stored in the PLC memory for constants or the "K" registers. The USL does

not require calibration since it is the instantaneous reading from the cable length transmitter whenever the USL rotary limit switch is tripped to close. The USL offset is therefore 0" and is stored in K102. (SEE ATTACHED DOCUMENTATION)

- *3B ~~3A~~ 1. Connect winch controls via the winch terminal box to the PLC control panel per the interconnection diagrams provided. (Ref. dwg. H-2-821432)
- *3B ~~3A~~ 2. After verifying correct wire connections have been made, apply power to PLC panel and verify cable length signal from winch is giving a reasonable reading. Record initial value for cable length signal = ____ inches.
- *3B ~~3A~~ 3. Manually reel in cable until floating intake and hose are pulled up to a safe maximum and positioned reasonably tight next to the pump column. Record this as the initial Upper Damage Limit (UDL). Initial UDL = ____ inches.
- *3B ~~3A~~ 4. Lower the winch 3" and set the Upper Safety Limit (USL) rotary limit switch to open at this cable length. Initial USL = ____ inches.
- *3B ~~3A~~ 5. Lower floating intake until approximately level with bottom of pump column and cable just begins to slacken. Set the Lower Safety Limit (LSL) limit switch to open at this point. Record the difference in cable length between the USL and the LSL. This is the usable cable length and it is stored as the LSL offset. The offset for LSL = ____ " and is stored in K _____. This step may be done at any convenient time when test pit is almost empty.

The cable length setpoints and their offsets are stored in the following registers. Use TISOFT software to enter offsets.

Setpoint	Setpoint Calc	S.P. Register	Offset	Offset Register
UDL	V2 ¹ - K101	V31	<u>3"</u>	K101
USL	V2 + K102	V32	0	K102
UL	V2 + K103	V33	<u>3"</u>	K103
LL	V2 + K104	V34	<u>261"</u>	K104
LSL	V2 + K105	V35	<u>267"</u>	K105
LML	V2 + K106	V36	<u>273"</u>	K106

¹Instantaneous reading from cable length transmitter when USL rotary limit switch trips during Winch Setup Mode.

ref. WHC-SD-ER3297-TS-001, Rev. 2

* 3 B. Empirical Determination of Winch Cable Weight Setpoints

NOTE: Cable weight tests are performed with water in the tank.

- 1. After verifying correct wire connections have been made, apply power to PLC panel and verify cable weight signal from winch is giving a reasonable reading. Record initial value for cable weight signal.
Initial cable weight = ____ LBS.
- 2. Lower Safety Weight (LSW) - Manually lower the floating intake until cable is fully slack and Cable Weight = 0 LBS. Then raise winch until cable slack begins to disappear. Record this as the LSW = ____ LBS.
- 3. Operating Weight (OW) - Manually raise the winch until floating intake is about 6-12" above floating level. Start pump and record this as the OW = ____ LBS.
- 4. Operate Down Weight (ODW) - With pump running, raise floating intake with winch until intake opening is about 6-12" below surface of water. Stop raising winch and record weight as ODW = ____ LBS.
- 5. Unsubmerged Weight (UW) - With pump off, raise winch until floating intake is completely unsubmerged with most of the hose still submerged. Record this as the UW = ____ LBS.
- 6. Upper Safety Weight (USW) - Raise winch until floating intake and all of the hose, with residue water, are completely unsubmerged. Stop winch and observe weight reading. Add 10 lbs. and record this as the USW = ____ LBS.
- 7. With TISOFT software, enter USW, UW, ODW, OW & LSW in appropriate K registers of PLC. Add 20 lbs. to USW for Upper Damage Weight (UDW).

UDW = ____ in K112.

USW = ____ in K114.

UW = ____ in K116.

ODW = ____ in K118.

OW = ____ in K120.

LSW = ____ in K122.

C. Auto/Manual/Setup Mode Selection

CAUTION: Make sure Decant Pump is turned off.

1. Click on AUTO button. The AUTO button should be only one of three (AUTO, MAN, and SETUP) highlighted in light blue.
2. Click on MAN button. The MAN button should be only one highlighted in light blue.
3. Click on SETUP button. The SETUP button should be only one highlighted in light blue.
4. With Winch in Setup mode, attempt to start the Decant Pump. Pump should not respond and the following message should be displayed: "Pump cannot be started when winch is in SETUP mode."
5. Conversely with pump running, attempt to place winch in Setup mode. Winch controls should not respond and the following message should be displayed: "Winch can not be put in SETUP mode when pump is ON."
6. Repeat Step C1 using keyboard controls (F5).
7. Repeat Step C2 using keyboard controls (F6).
8. Repeat Step C3 using keyboard controls (F9).

D. Up/Down Controls

CAUTION: Make sure Decant Pump is turned off.

1. In Remote/Auto mode, click on UP button and hold. Winch should not respond.
2. Message displayed should read: "Manual control of winch not allowed in AUTO mode."
3. In Remote/Auto mode, click on DOWN button and hold. Winch should not respond.
4. Message displayed should read: "Manual control of winch not allowed in AUTO mode."
5. In Remote/Manual mode click on UP button and hold. Winch should raise until the button is released.

ref WHC-SD-ER3297-TS-001, Rev. 2

- WJ 6. In Remote/Manual mode click on DOWN button and hold. Winch should lower until the button is released.
- WJ 7. Repeat Step D5 with keyboard controls.
- WJ 8. Repeat Step D6 with keyboard controls.
- WJ 9. Force UDL (PLC coil C42 on), USL (PLC coil C15 off) and UL (PLC coil C41 C42 on) to permissive state with TISOFTE software. In Remote/Manual mode, ^{2nd} click on UP button and hold. Winch should raise the floating intake until ^{7th} USW (PLC coil C43 on) is reached. Appropriate alarm should annunciate.
- WJ 10. Repeat D9 for UDL with USW (PLC coil C43 on), USL and UL forced to permissive state. Appropriate alarm should annunciate.
- WJ 11. Repeat D9 for USL with USW, UDL and UL forced to permissive state. Appropriate alarm should annunciate.
- WJ 12. Repeat D9 for UL with USW, UDL and USL forced to permissive state. Appropriate alarm should annunciate.
- *2B — 13. While winch is raising floating intake push Winch E-Stop (PLC input X56 off). Winch should stop in place. Appropriate alarm should annunciate.
- WJ 14. Verify the PLC "Winch Down Control Relay" (Y34) and "Winch Up Control Relay" (Y35) have been released and indication at the PC is that the winch is stopped.
- *2B — 15. Release Winch E-Stop. Winch should remain stopped.
- WJ 16. Force LSL (PLC coil C16 off) and LL (PLC coil C37 on) to permissive state with TISOFTE software. In Remote/Manual mode, click on DOWN button and hold. Winch should lower floating intake until LSW (PLC coil C40 on) is reached. Appropriate alarm should annunciate.
- WJ 17. Repeat D16 for LSL with LSW and LL forced to permissive state. Appropriate alarm should annunciate. ^{5th}
- WJ 18. Repeat D16 for LL with LSW and LSL forced to permissive state. Appropriate alarm should annunciate. ^{5th}
- *2B — 19. While winch is lowering floating intake push Winch E-Stop (PLC input X56 off). Winch should stop in place. Appropriate alarm message should annunciate.

ref. WHC-SD-ER3297-TS-001, Rev. 2

- 20. In Remote/Auto mode, lower tank level until floating intake is partially suspended out of the liquid. When ODW of 45 LBS. is reached, winch should lower intake until OW of 30 LBS. is reached.

- 21. Remove all forces with TISOFT software.

E. Setup Mode at PC

- 1. Reset values in V31 to V36 to 0 using TISOFT.
- 2. With the pump off, the winch in SETUP mode, and the floating intake in a lowered position, click on the UP button. Winch should begin raising and continue even after the UP button is released.
- 3. Click on the STOP button while the winch is being raised. Winch should stop immediately.
- 4. Click on the UP button to raise the winch again. It should continue to raise until the USL is reached and then stop. "Winch Length Calibration Successful" message should be displayed.
- 5. Verify that new cable length setpoints have been placed in registers V31 thru V36.

4.4.5 Winch Tests in Local Mode (Using OIP)

A. Select Winch Controls

- 1. Use F2, the SELECT button, to cycle through the equipment choices and select the Winch. When "WINCH UP [ON/OFF] DN [ON/OFF] CL=[XXXXXX]" WT=[XXXXXX]# (1st line) / "LOCAL [ON/OFF] AUTO [ON/OFF] MAN [ON/OFF] SETUP [ON/OFF]" (2nd line) message is displayed, the Winch has been selected for control.

B. Auto/Manual/Setup Mode Selection

- 1. Push F3, the MAN/AUTO button. The 2nd line of the display should read "LOCAL ON AUTO ON MAN OFF SETUP OFF" message.
- 2. Push MAN/AUTO button. The display should read "LOCAL ON AUTO OFF MAN ON SETUP OFF" message.
- 3. Push F9, the WINCH SETUP MODE button. Display should read "LOCAL ON AUTO OFF MAN OFF SETUP ON" message.

C. Up /Down Controls

1. In Local/Auto Mode, push F5, the UP button. Winch should not respond.
2. Message displayed should read "WINCH MUST BE IN LOCAL/MANUAL MODE TO" (OIP message #22 on 1st line) "USE THIS CONTROL (USE ~~SELECT~~ TO RETURN)" (OIP message #32 on 2nd line).
~~ACK~~ ~~WA~~
3. In Local/Auto Mode, push F8, the DOWN button. Winch should not respond.
4. Message displayed should read "WINCH MUST BE IN LOCAL/MANUAL MODE TO" (#22 on 1st line) "USE THIS CONTROL (USE ~~SELECT~~ TO RETURN)" (#32 on 2nd line).
~~ACK~~
5. In Local/Manual Mode, push F5, the UP button, message displayed should read "WINCH UP ON DN OFF CL= 3 LB" WT= 8 lb # (1st line) / "LOCAL ON AUTO OFF MAN ON SETUP OFF" (2nd line)
6. With UP button continuously pushed in, winch should pull floating intake up until USW or UL is reached or UP button is released.
7. In Local/Manual Mode, push F8, the DOWN button, message displayed should read "WINCH UP OFF DN ON CL=   " WT=   # (1st line) / "LOCAL ON AUTO OFF MAN ON SETUP OFF" (2nd line)
8. With DOWN button continuously pushed in, winch should lower floating intake down until LSW or LL is reached or DOWN button is released.
- *2 B — 9. Repeat steps C5 and C6 and while winch is raising intake, push Winch E-Stop button on front of panel. Winch should stop in place.
- *2 B — 10. Repeat steps C7 and C8 and while winch is lowering intake, push Winch E-Stop button on front of panel. Winch should stop in place.

D. Setup Mode at OIP

1. Reset values in V31 to V36 to 0 using TISOFT.
2. With the pump off, the winch selected and in SETUP mode, and the pump intake float in a lowered position, push the UP button. Winch should begin raising the intake and continue even after the UP button is released.
3. Click on the STOP button while the winch is being raised. Winch should stop immediately.

ref. WHC-SD-ER3297-TS-001, Rev. 2

4. Click on the UP button to raise the intake again. It should continue to raise until the USL is reached and then stop. "WINCH LENGTH CAL OK" message should be displayed. SUCCESSFULLY
5. Verify that new cable length setpoints have been placed in registers V31 thru V36.

4.4.6 Decant Pump Discharge Valve Tests in Remote Mode (Using PC)

CAUTION: Make sure Decant Pump is turned off.

A. Auto/Manual Mode Selection

1. Click on AUTO button. AUTO button should be highlighted in light blue.
2. Click on MAN button. MAN button should be highlighted in light blue.
3. Repeat Step A1 using keyboard controls (Shift-F5).
4. Repeat Step A2 using keyboard controls (Shift-F6).

B. Transfer, Recirc, Backflush Selection Controls

1. With valve in Remote/Manual mode, click on XFER button. Valve should go to Transfer position and XFER button should be highlighted in light blue.
2. With Transfer limit switch inputs forced off (PLC inputs X50 and X57 off), push the XFER button again. The "Transfer Position Failure" alarm should annunciate and the valve should continue to rotate until the inputs are released from the forced off state or the RECIRC or BACKFL button is pushed.
3. With valve in Remote/Manual mode, click on RECIRC button. Valve should go to Recirc position and RECIRC button should be highlighted in light blue.
4. With Recirc limit switch input forced off (PLC input X49 off), push the RECIRC button again. The "Recirc Position Failure" alarm should annunciate and the valve should continue to rotate until the input is released from its force or the TRANSFER or BACKFL button is pushed.
5. With valve in Remote/Manual mode, click on BACKFL button. Valve should go to Recirc Backflush position and BACKFL button should be highlighted in blue.

ref. WHC-SD-ER3297-TS-001, Rev. 2

- 204 6. With Recirc/Backflush limit switch input forced off (PLC input X51 off), push the BACKFL button again. The "Backflush Position Failure" alarm should annunciate and the valve should continue to rotate until the input is released from its force or the TRANSFER or RECIRC button is pushed..
- 204 7. With valve in Recirc Backflush position, attempt to start Decant Pump in Remote/Manual mode. Pump should not respond. Message should read "Pump can not be started when valve is in BACKFL position."
- 204 8. Repeat Step B1 with keyboard controls (Shift-F7). *204 204*
- 204 9. Repeat Step B3 with keyboard controls (Shift-F8). *204 204*
- 204 10. Repeat Step B5 with keyboard controls (Shift-F9).
- 204 11. With valve in either RECIRC or TRANSFER position, start pump and click on BACKFL button. Valve should not respond. Message should read "Valve can not be put in BACKFL position when pump is ON".
- 204 12. With pump running repeat tests B1 and B3. With valve in Recirc position, record the flow 113 GPM. Verify that orifice plate is limiting flow between 100-120 GPM.
- 204 13. With valve in Remote/Auto mode, click on BACKFL button. Valve should not change position. Message should read "Valve position can not be manually changed in AUTO mode."
- 204 14. *above 100 ppm*
With pump running and valve in Remote/Auto mode, ~~lower high discharge turbidity setpoint below reading recorded earlier for probe in water.~~ *raise reading temporarily by using zero check switch on turb. analyzer* New setpoint =   ppm. Valve should change to Recirc position. *204 204*
- 204 15. With valve in Remote/Auto mode, click on XFER button. Valve should not change position. Message should read "Valve position can not be manually changed in AUTO mode."
- ~~204~~ 204 16. *REMOVED PER #14 204 204*
With pump running and valve in Remote/Auto mode, raise high discharge turbidity setpoint above reading recorded earlier for probe in water. New setpoint =   ppm. Valve should change to Transfer position.
- 204 17. With valve in Remote/Auto mode, click on RECIRC button. Valve should not change position. Message should read "Valve position can not be manually changed in AUTO mode."
- DELETE 204 18. Reenter 100 ppm for high discharge turbidity setpoint. *204*

4.4.7 Decant Pump Discharge Valve Tests in Local Mode (Using OIP)

A. Select Valve Controls

- 1. Use F2, the SELECT button, to cycle through the equipment choices and select the Valve. When "VLV XFER [ON/OFF] REC [ON/OFF] REC/BACKFLUSH [ON/OFF]" (1st line) / "REMOTE [ON/OFF] LOCAL [ON/OFF] AUTO [ON/OFF] MAN [ON/OFF]" (2nd line) message is displayed, the Valve has been selected for control.

B. Auto/Manual Mode Selection

- 1. Push MAN/AUTO button until 2nd line of display shows "REMOTE OFF LOCAL ON AUTO OFF MAN ON" message. Valve is now in Local/Manual mode.
- 2. Push MAN/AUTO button once so that display shows "REMOTE OFF LOCAL ON AUTO ON MAN OFF" message. Valve is now in Local/Auto mode.

C. Transfer, Recirc, Backflush Selection Controls

- 1. With valve in Local/Manual mode, push F6, the XFER/RECIRC/BACKFL button, until 1st line of display shows "VLV XFER ON REC OFF REC/BACKFLUSH OFF".
- 2. Valve should go to Transfer position.
- 3. With valve in Local/Manual mode, push F6, the XFER/RECIRC/BACKFL button, until 1st line of display shows "VLV XFER OFF REC ON REC/BACKFLUSH OFF".
- 4. Valve should go to Recirc position.
- 5. With valve in Local/Manual mode, push F6, the XFER/RECIRC/BACKFL button, until 1st line of display shows "VLV XFER OFF REC OFF REC/BACKFLUSH ON".
- 6. Valve should go to Recirc Backflush position.
- 7. With valve in Recirc Backflush position, attempt to start Decant Pump in Remote/Manual mode. Pump should not respond.
- 8. With pump running, repeat test C5. Valve should not respond.

9. With valve in Local/Auto mode, attempt to reposition valve. Valve should not change position.

4.5 Run-in Pump Testing

4.5.1 Test Time Requirements

Run-in test time shall be as specified on the Acceptance Criteria form. Testing of the instrumentation and which may be done during the run-in test period providing the testing does not require flow changes. (See NOTE 7.3)

4.5.2 Pump Run-In Test Requirements

- (a) The pump shall be run at the rated flow for the time specified on the Acceptance Criteria Form. The following data shall be recorded.
  - Pump discharge pressure
  - Flow
  - Amps
  - Watts
  - Speed
  - Vibration
  - Motor Bearing Temperatures
  - Ambient Air Temperatures
- (b) At the end of the run-in test, the watts and vibration shall be no higher than after the first hour of run-in; if they are, notify the Buyer's Representative. The pressure and flow shall not have decreased more than 2%. The bearing temperature shall not exceed that specified on the Acceptance Criteria Form.
- (c) Variations due to change in input voltage or other normal causes shall be acceptable as long as they can be corrected back to the original conditions.
- (d) Anomalies noted during the test shall be referred to the Buyer's Rep for resolution.

5.0 QUALITY ASSURANCE

The Seller shall have a Quality Assurance Program in place meeting the requirements, as a minimum, of Sections 5.1 through 5.3 shown below.

5.1 Testing or Recorded Data

The Seller's Quality Assurance representative or their designee shall provide surveillance of testing or recorded data.

5.2 Approval of Testing

The Seller's Quality assurance representative or their designee will indicate approval of the testing and the records by signing, and dating the test records after the testing is complete and the other required signatures have been applied.

5.3 Quality Assurance Records

Records that furnish documentary evidence of quality shall be specified, prepared and maintained. Records shall be legible, identifiable, and retrievable. Records shall be protected against damage, deterioration, distribution, retention, maintenance, and disposition shall be established and documented.

6.0 PREPARATION FOR DELIVERY

- 6.1 Following the testing prescribed, the pump shall be drained of water and dried, the test equipment removed.
- 6.2 If the pump is scheduled for service, moisture shall be removed by flowing dry air or other media for sufficient period to assure adequate dryness.
- 6.3 All pump openings and flange surfaces shall be protected during handling operations with manufactured flange covers or 6 mil thickness plastic coverings taped securely in place. Tape shall not be attached to parent metal of the pump assembly, unless specifically authorized by the Buyer's Representative.
- 6.4 Hoisting and Rigging procedures shall be in evidence during the installation and removal of the pump from the test facility.

7.0 NOTES

- 7.1 Vertical turbine pumps shall be tested in full length to ensure that they will perform to the requirements for the intended service, as well as to the suppliers data. The purpose for assembly is to ensure that the configuration will conform to the specified drawings before being placed in service.
- 7.2 Request for changes to the test requirements or criteria shall be addressed to the Buyer's Representative for consideration and approval.
- 7.3 Flow control valve adjustment after a Run-in test has begun shall not be permitted. Any drop in flow rate during the test provides valuable insight into the soundness of the pump and would be lost if the valve is adjusted.

FIGURES

<u>FIGURE</u>	<u>DESCRIPTION</u>
1	PUMP TESTING ASSEMBLY SCHEMATIC
2	ACCEPTANCE CRITERIA FOR PUMP EQUIPMENT

FIGURE 1 - DECANT PUMP TEST CONFIGURATION

*PROVIDED BY SELLER
**PROVIDED BY BUYER

- NOTES: 1. ALL INTERCONNECTING PIPING & WIRING SHALL BE FURNISHED AND INSTALLED BY SELLER
2. SELLER SHALL PROVIDE FOR FILLING THE TANK AS MANY TIMES AS NECESSARY. (THE TANK LEVEL MUST BE LOWERED IN ORDER TO TEST THE WINCH AUTOMATIC OPERATION.)

Figure 1

ACCEPTANCE CRITERIA FOR PUMP EQUIPMENT

Work Order No. _____	Manufacturer <u>PEABODY FLOWAY</u>
Pump Identification No. <u>6411-2225-1P-TX1-XCC-3</u>	No of Stages <u>7</u>
Motor Full Load Rated AMPS <u>35.5</u>	Motor Service Factor <u>1.15</u>
Motor Rated Horsepower <u>30</u>	Service S G <u>1.2</u>
Raised RPM <u>3505</u>	Purchased Order No. <u>MBL-XBB-419574</u>

Performance Test Requirements

1. Test Fluid	Water SG=1 <u>X</u>	Other _____
2. Shut Off Head	<u>360</u>	Feet (min)
3. Total Head (rated)	<u>300</u>	Feet (min)
4. Flow Capacity (at rated head)	<u>100</u>	GPM (min)
5. Test AMPS shall not exceed	<u>35.5</u>	AMPS (max)
6. Rated Voltage	<u>460</u>	Volts
7. Vibration	<u>2.0</u>	MILS Max @ Rated RPM
8. Impeller Clearance	<u>0.030" NOMINAL</u>	Min (IN) _____ Max (IN) _____

Run-In Requirements

1. Flow <u>100</u> GPM for <u>7</u> Hrs Continuous <u>X</u>
2. Flow _____ GPM for _____ Hrs Not Continuous _____
3. Motor Bearing temperature <u>180</u> °F (maximum)

Special Test Requirements

Winch testing and calibration - See procedure paragraph #4.4

DeviationsApprovals

Plant Engineering _____	Date _____
Fabrication Control _____	Date _____
Deviation Approvals _____	Date _____

NOTE: Deviations from this Acceptance Criteria can only be approved by Plant Engineering
Note any deviations in the space above

Quality Control Representative

Stamp

Date

OCRN, JCS, or Equal

Figure 2

APPENDIX B: PUMP TEST REPORT

SULZER BINGHAM PUMPS, INC.

DECEMBER 20, 1995

40 Pages

SULZER BINGHAM PUMPS, INC.

PORTLAND SERVICE CENTER

(503) 226-5203 - FAX (503) 226-5598
2800 N.W. FRONT AVE.
PORTLAND OR 97210

**IMPORTANT DOCUMENTATION ENCLOSED
TEST DATA**

WESTINGHOUSE HANFORD COMPANY

TEST SPECIFICATION ^{ref} WHC-SD-ER3297-TS-001, REV 2

SULZER BINGHAM REFERENCE NOS. F-94-5908, and 101T243

P/N H-9-1105-037 TXI-6

ITEM NO. 6411-2225-IP-TXI-XCC-3

S/N 86-02651

If you have any questions or comments regarding the enclosed information, please contact us at the above number.

Sincerely,

BRIEN JONES
SHOP SUPERINTENDENT

MIKE WHITE
REPAIR COORDINATOR

PUMP TEST REPORT

DECANT PUMP AND WINCH ASSEMBLY
for
WESTINGHOUSE HANFORD COMPANY

TEST SPECIFICATION ^{ref.} WHC-SD-ER3297-TS-001, REV 2

SULZER BINGHAM REFERENCE NOS. F-94-5908, and 101T243

PUMP IDENTIFICATION
P/N H-9-1105-037 TXI-6
ITEM NO. 6411-2225-IP-TXI-XCC-3
S/N 86-02651

PUMP TEST CONDUCTED AT SULZER BINGHAM PUMP TEST FACILITY
PORTLAND, OREGON
DECEMBER 19/20, 1994

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DECANT PUMP TEST REPORT

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I. TEST REPORT

TEST REPORT
WESTINGHOUSE HANFORD COMPANY
DECANT PUMP

TEST PER TEST SPECIFICATION WHC-SD-ER3297-TS, Rev. 2
 (Note the paragraph numbers below refer to this test specification)

- 1.0 SCOPE
- 1.1 This report is applicable to the performance and run-in testing of the subject pump.
- 3.0 TEST PREPARATION
- 3.1 Test equipment for performance testing.
  - (A) Flexible connector was supplied by Hanford.
  - (B) Vibration measured with CSI, Model 2110-3D.
  - (C) Throttle valve, 2" 150# gate valve.
  - (D) Calibrated deadweight tester
  - (E) 2" x 7/8" venturi (control no. E791648) with 25 PSI Barton differential gauge.
  - (F) Test pipe utilized from the adapter flange to the return to the sump.
  - (G) No tank is used in the test system. Suction is from an open sump.
  - (H) Weston wattmeter used to measure power. Amps measured with an A. W. Perry ammeter, model SPR-1030.
  - (I) Temperatures measured with Raytek Raynger, model RAYPRM3LS Infrared Temperature Probe.
- 3.2 INSTRUMENTATION CALIBRATION and ACCURACY
 Calibration of test equipment attached in report.
- 3.3 PRETEST OPERATIONS
- 3.3.1 Motor inspections performed by Reliance Electric. Report under separate cover.
- 3.3.2 The pump, complete with suction arm and floating assembly, mounting adapter, winch assembly and jumper piping, mounted on 26 ft. tower over test sump as per test set-up description, attached.
- 3.4 ASSEMBLY OF TEST EQUIPMENT
- 3.4.1 The discharge pipe, attached to the adapter, 3" pipe, standard schedule, 3.068" ID.
- 3.4.2 The jumper piping was installed. The discharge pipe was mounted after the jumper piping. The discharge valve was mounted at the floor level, after the venturi.
- 3.4.3 The discharge pressure measurement is from the discharge pipe to the deadweight tester via high pressure hose. The instrumentation is vented and bled off before taking data.
- 3.4.4 A portable 2 x 7/8" venturi is used to measure the flow.

- 3.4.5 The test piping system returns water back to the sump after measuring the flow rate.
- 3.4.6 Temperatures measured with hand held device.
- 3.4.7 Vibration measured at the motor stand, 90 degrees apart, in the horizontal plane. The vibration was measured in inches/second velocity, at all pass and the discreet frequencies of; rotative, 3 and 5 times rotative frequency. The measurements were made at each flow taken except shutoff.
- 3.4.8 Power is measured with both wattmeter and hand held ammeter. The wattmeter is used for the performance testing.
- 4.0 TESTING REQUIREMENTS
- 4.1 Testing sequence alteration was authorized by witness to facilitate scheduling of the run-in test prior to the Control System Testing due to the unavailability of the control system from the customer.
- 4.2 PUMP TESTING PARAMETERS
- 4.2.1 The pump was started in the wide open mode of the 3-way valve to verify mechanical operation of the sump and system. The pump was subsequently started through the discharge piping, at a reduced flow setting, prior to the performance test. The PC control system was not available at the time of the performance test.
- 4.3 PERFORMANCE TEST
- 4.3.1 The performance testing was run prior to the run-in testing to establish a baseline performance.
- 4.3.2 The floating suction was utilized in an unsupported mode. The device floated with undo movement. No evidence of vortices or other anomalies were noted during the performance or run-in testing.
- 4.3.4 The pump was run at the described flow points and additional higher flows to establish curve shape characteristics.
- 4.3.5 Test Data Corrections.
  - (A) The vertical distance between the free water surface and the discharge gauge centerline is 10.9 feet.
  - (B) The performance data was corrected for speed to 3570 RPM, from the actual operating speed at the rated flow of 100 GPM.
  - (C) The BHP shown is actual total BHP and does not include motor efficiency. The pump efficiency shown is overall efficiency of the system and includes motor and pump losses.
  - (D) The deviation of the performance curve from the original pump manufacturer performance curve is related to the losses incurred in the pump system. The suction now includes the suction hose and floating collection device, which adds friction and velocity losses. The discharge side of the pump system includes the jumper piping and the associated devices in that system, prior to the discharge pressure measurement, which adds to the losses in performance. The piping size is reduced from 4" to 2" prior to 3" at the adapter. The losses in the suction and discharge systems are not isolated and no

adjustments are made in the test data to account for the losses incurred.

4.5 RUN-IN TESTING

- 4.5.1 The run-in testing was performed in the same test system as the performance test.
- 4.5.2 (A) The required test data was measured and recorded for the specified 7 hour period. The data is included on pages 3 & 4 of the Test Data sheets.
(B/C/D) The performance deviations are reported on the Test Data sheets, and are within specification. No adjustments were required during the run-in testing.

Conclusion;

The performance and run-in testing, performed by Sulzer Bingham Pump, was done in accordance of the specifications and accepted variations. The pump performance is within the acceptance criteria of the specification.

Test Report prepared by;

Ron Low
Sulzer Bingham Test Department
Dec. 20, 1994

David Patterson
Sulzer Bingham
Quality Manager

TEST SETUP TA-100 DESCRIPTION

FOR WESTINGHOUSE HANFORD COMPANY, DECANT PUMP AND WINCH ASSEMBLY TESTING.

The pump is to be set up in the 'ice house' test area, on the vertical pump tower over the test sump. The 47' 6" long pump will require to be elevated an additional 3' 2" to allow a minimum of 6" clearance of the suction elbow on the sump floor. Set the liquid level at approximately 5 feet below the main floor level, for full flotation of the suction float.

The test piping is to consist of the following:

- test pipe 3P-3.1 @ the pump adapter flange
- 3" flange with pipe (to clear the support structure) to the 3" x 2" bushing and elbow to 2" standard schedule pipe, down to the main floor.
- 2" 300# screwed flange with 2 ft. long pipe, minimum, at the floor level to bolt to the portable 2" x 7/8" venturi. Pipe from the venturi to a 2" 150 # motor operated gate valve and a 2" pipe, to return the water to the sump.

Instrumentation:

- Measure pump discharge pressure at pipe 3P-3.1, at the pump and use hose to the deadweight tester in the control room.
- Measure differential pressure of the venturi with a 25 LB. Barton differential pressure gage, located in the control room.
- Power is to be measured with a wattmeter, in the control room.
- The water level to the centerline of the deadweight tester will be measured with a tape measure.

SECTION VIEW - PUMP TEST PIT

II. TEST CURVES

WESTINGHOUSE HANFORD CO.		SLUDGE TRANSFER DECANT PUMP		PUMP #: 1011243	
SULZER BINGHAM		PUMPS INC		TW 12/20/94	
IMPELLER		MAX DIA		EYE AREA SQ IN	
4x12 6JOLL		3.80"		DIA IMPELLER	
7-STG.		NAT'L. PAT'T.		CURVE NO. 49848	
3570 RPM		REV			

49848

III. TEST DATA

SULZER BINGHAM PUMPS INC

TEST DEPARTMENT - TEST DATA SHEET

PAGE 1 OF 4

CURVE NO. 48844

PUMP SIZE & TYPE 4 x 12 6 JOLL	STAGES 7	CUSTOMER Westinghouse Hanford Company	PUMP TESTED 101T243-1

PURCHASE ORDER NO.:										CUSTOMER ITEM NO: Decant Pump									
CONDITION	RPM	T.D.H.	GPM	EFF	SP GR	EYE DIA	AREA	DISCH	SUCT ID	TEST BY	DATE	START	STOP						
FIELD	3570	300.0	100	88	1.700			3.07	100.00	TW / RL	12/19/94	1430	1530						
TEST MOTOR: Job 30 HP																			
STG	IMP PATTERN				VANES	IMP MAX DIA		IMP TEST DIA											
1-7	6 JOLL							3.80											

RUN NO	SPEED RPM	CAPACITY		Hv PER 1000	GAGE TO GAGE	DISCH PSIG	SUCT PSIG	TDH (FT H2O)	POWER		PUMP EFF	AT FIELD SPEED/SP. GR.					
		P 2" VENTURI							FLOW IN GPM	T.D.H. IN FEET		POWER IN BHP					
		F = 39.53 PSI	GPM														
1	3577	0.00	0.0	0.00	10.90	151.00	0.00	359.7	172	11.5	0.0%	0.0	358.3	19.4			
2	3577	0.40	25.0	0.02	10.90	149.00	0.00	355.1	181	12.1	18.5%	25.0	353.7	20.4			
3	3578	1.75	52.3	0.08	10.90	145.50	0.00	347.1	200	13.4	34.2%	52.2	345.9	22.7			
4	3572	3.70	76.0	0.17	10.90	139.75	0.00	333.9	217	14.5	44.2%	76.0	333.5	24.6			
5	3570	6.40	100.0	0.29	10.90	128.25	0.00	307.5	235	15.8	49.3%	100.0	307.5	26.8			
6	3568	11.55	134.3	0.53	10.90	106.00	0.00	258.3	255	17.1	60.8%	134.4	256.6	29.1			
7	3587	20.10	177.2	0.92	10.90	61.75	0.00	154.5	255	17.1	40.4%	177.4	154.7	29.1			
8																	
9																	
10																	
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12																	
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22																	
23																	
24																	

Bob Faulkner
Q.E. 12/21/94

Ranford 12/21/94

CERTIFIED TEST PERFORMANCE
SULZER-BINGHAM PUMPS
PORTLAND OREGON
DATED: 12/20/94

CERTIFIED BY: *Jim Danaher* 12/21/94

B-14

REC-SD-2003297-IRP-001, REV 0

SULZER BINGHAM PUMPS INC

PAGE 3 OF 4

TEST DEPARTMENT - TEST DATA SHEET

PUMP SIZE & TYPE 4x12 6JOLL		STAGES 7	CUSTOMER WESTINGHOUSE HANFORD COMPANY					PUMP TESTED 101T243					
PROJECT: SLUDGE TRANSFER DECANT PUMP													
CONDITION FIELD	RPM	T.D.H.	GPM	EFF	SP GR	EYE DIA	AREA	DISCH 3.07	SUCT ID	TEST BY TW	DATE 12/20/94	START 6:15	STOP 13:15
TEST MOTOR: JOB-30-3800													
STG	IMP PATTERN				VANES	IMP MAX DIA		IMP TEST DIA					
RUN-IN TEST													
* TOTAL POWER CONSUMPTION													

		CAPACITY		Hv	DISCHARGE		SUCT	TDH	POWER		TIME	AMPS			TEMP. DEGREES F.	
RUN NO	SPEED RPM	P 2" VENTURI		29.28 PER 1000		FEET OF WATER	FEET OF H2O	(FT H2O)	WATT	B.H.P. *		PHASE 1	PHASE 2	PHASE 3	AMB- IENT	LOWER MOTOR BRG.
		PSI	GPM													
1	3572	6.40	100.0	0.29	126.50	292.2	-10.90	303.4	233	15.6	6:15	18.0	16.0	18.0		
2	3571	6.40	100.0	0.29	126.75	292.8	-10.90	304.0	232	15.5	7:15	18.0	16.0	18.0	61	118
3	3570	6.40	100.0	0.29	127.25	293.9	-10.90	305.1	232	15.5	8:15	18.0	16.0	18.0	60	117
4	3570	6.40	100.0	0.29	127.50	294.5	-10.90	305.7	231	15.5	9:15	18.0	16.0	18.0	60	117
5	3571	6.40	100.0	0.29	127.50	294.5	-10.90	305.7	232	15.5	10:15	18.0	16.0	18.0	60	117
6	3570	6.40	100.0	0.29	127.50	294.5	-10.90	305.7	232	15.5	11:15	18.0	16.0	18.0	60	117
7	3570	6.40	100.0	0.29	127.25	293.9	-10.90	305.1	231	15.5	12:15	18.0	16.0	18.0	60	117
8	3570	6.40	100.0	0.29	127.25	293.9	-10.90	305.1	231	15.5	13:15	18.0	16.0	18.0	60	117
9																
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CERTIFIED TEST PERFORMANCE
SULZER-BINGHAM PUMPS
PORTLAND OREGON
DATED: 12/20/94

CERTIFIED BY: _____

VIBRATION DATA

PAGE 4 OF 4

CUSTOMER:	WESTINGHOUSE HANFORD CO.	SERIAL NO.: 101T243	RUN-IN TEST
PROJECT:	SLUDGE TRANSFER DECANT PUMP	DATE: 12/20/94	BY: TW
		START: 6:15	STOP: 13:15
		INSTRUMENT: CSI-2110	
		TEST SPEED: 3600	

VIBRATION MEASURED ON DRIVER STAND

	FLOW (GPM)	LOCATION	VELOCITY-IN/SEC				TIME
			ALL PASS	1X	3X	5X	
H	100	X	0.10	0.07	0.06	0.04	8:15
V	100	Y	0.05	0.02	0.03	0.02	8:15
A							
H	100	X	0.10	0.07	0.05	0.04	7:15
V	100	Y	0.05	0.02	0.03	0.02	7:15
A							
H	100	X	0.10	0.07	0.05	0.04	8:15
V	100	Y	0.05	0.01	0.03	0.02	8:15
A							
H	100	X	0.10	0.07	0.04	0.03	9:15
V	100	Y	0.05	0.01	0.03	0.01	9:15
A							
H	100	X	0.09	0.07	0.04	0.05	10:15
V	100	Y	0.05	0.01	0.03	0.02	10:15
A							
H	100	X	0.09	0.07	0.03	0.03	11:15
V	100	Y	0.06	0.01	0.04	0.01	11:15
A							
H	100	X	0.09	0.07	0.03	0.02	12:15
V	100	Y	0.06	0.01	0.04	0.02	12:15
A							
H	100	X	0.08	0.07	0.03	0.02	13:15
V	100	Y	0.06	0.01	0.03	0.02	13:15
A							
FORMULA FOR CONVERSION FROM VELOCITY TO DISPLACEMENT: 19100V/CPM = D							
H			V = VELOCITY IN IN/SEC.				
V			CPM = ACTUAL RUNNING SPEED OF 3571 RPM				
A			D = DISPLACEMENT IN MILS				
H							
V							
A							
H			.07 IN/SEC = .37 MILS				
V			.02 IN/SEC = .11 MILS				
A			.01 IN/SEC = .05 MILS				
H							
V							
A							
H							
V							
A							
H							
V							
A							

IV. INSTRUMENTATION CALIBRATION

$$Q_a = C K_M \sqrt{h}$$

Q_a = actual flow rate in cubic feet per second

C = discharge coefficient - dimensionless

h = pressure differential in feet of water at run temperature

$$K_M = \text{meter constant} = \frac{a \sqrt{2g}}{\sqrt{1 - \beta^4}} = 0.03418$$

a = throat area in square feet = 0.004172

g = local acceleration of gravity = 32.163 feet per second squared

β = dimensionless ratio of throat to pipe diameter = 0.4513

DIMENSIONS FURNISHED BY B.W. Co.

CALIBRATION OF
2" X 7/8" VENTURI METER
BINGHAM - WILLAMETTE COMPANY
P.O. No. 54079
CONTROL No. E791648
6 AUGUST 1970

ALDEN RESEARCH LABORATORIES
WORCESTER POLYTECHNIC INSTITUTE
WORCESTER, MASSACHUSETTS

2" x 7/8" Venturi Meter

BINGHAM-WILLAMETTE COMPANY

DATE: 6 August 1970

SER. NO.

P.O. NO. 54079

CALIBRATED BY: W.M.S.-H.W.D.

RAW DATA								CALCULATED DATA							
Run No.	Line Press. Psig.	TEMPERATURE F		WEIGHT W lbs.	TIME t sec.	DIFFERENTIAL		FLOW Q cfs.	FLOW Q gpm	RD $\times 10^{-5}$	C				MARK
		Line	Monometer Hg H ₂ O			Reading	Feet Line Fluid								
1		73.0	77.0	3550	223.571	56.028	58.672	0.2552	114.54	1.961	0.9748				⊗
2		"	"	3451	254.525	40.812	42.738	0.2179	97.80	1.675	0.9753				⊗
3		72.0	73.0	2150	175.936	33.227	34.805	0.1964	88.15	1.490	0.9740				⊗
4		"	"	2616	235.893	27.746	29.064	0.1782	79.98	1.352	0.9672				○
5		"	"	2790	294.529	20.383	21.351	0.1522	68.31	1.155	0.9639				○
6		"	"	2578	305.364	16.220	16.990	0.1357	60.91	1.030	0.9630				○
7		"	"	2548	420.655	8.494	8.897	0.0974	43.72	0.7387	0.9548				○
8		"	73.0	2257	483.558	5.362	5.353	0.0750	33.66	0.5692	0.9486				○
9		"	73.0	2524	346.630	12.091	12.665	0.1170	52.51	0.8880	0.9620				○
10		"	"	3590	334.062	26.017	27.253	0.1727	77.51	1.311	0.9679				○
11		"	"	3543	193.352	74.875	78.432	0.2945	132.18	2.235	0.9729				⊗
12		"	"	3539	250.261	44.646	46.767	0.2273	102.02	1.724	0.9773				⊗
13		"	"	2955	227.871	37.492	39.273	0.2084	93.54	1.581	0.9730				⊗
14		"	"	3607	315.950	29.108	30.491	0.1835	82.36	1.392	0.9721				⊗
15		"	"	3565	208.571	65.128	68.222	0.2747	123.29	2.084	0.9730				⊗
16		"	"	3609	237.628	51.418	53.860	0.2441	109.56	1.852	0.9730				⊗
17		"	"	3544	243.665	47.144	49.384	0.2337	104.89	1.774	0.9732				⊗
18															○
19															○
20															○
21															○

MARK: ⊗ Points included in the mean C
 ○ Points not included in the mean C

CERTIFIED BY:

Lawrence C. Neale

ENTERED NOV 28 1994

SULZER BINGHAM PUMPS INC.

2800 N.W. FRONT AVE. PORTLAND, OR 97210

INSTRUMENT LAB**CERTIFICATE OF CONFORMANCE/CALIBRATION**

940450

CERTIFICATION NO.

DATE: 10-21-94

This is to certify that: Make ITT Barton, Model 200,
 Serial No. DP-B12, was inspected and tested by SBPI instrument laboratory
 personnel and upon receipt was found in the following condition: Good.

CALIBRATION TABLE

STANDARD units=	IUT units=	STANDARD units=	IUT units=
1 2.46	2.5	1	
2 4.98	5	2	
3 7.45	7.5	3	
4 9.99	10	4	
5 12.47	12.5	5	
6 14.98	15	6	
7 17.47	17.5	7	
8 20.01	20	8	
9 22.45	22.5	9	
10 25.05	25	10	

Instrument primary location:

W-18

Calibration location:

Onsight ☐ Laboratory ☒

Note's & Adj:

N.A.R

The following instruments were used to establish N.I.S.T. traceability:

MAKE	MODEL	SERIAL#	DUE DATE
1 FLECTOSYN	B500	1650	2-9-95
2			
3			
4			

Date due for next calibration:

Date: 10/21/95 Week #: 9542

This instrument is hereby certified, based on a transfer of standards from the U.S. National Institute of Standards and Technology. The tests were conducted in a clean environment and comply with ANSI N45.2, Mil-Std-45662, Mil-Q-9858A, and one of the following procedures:
 SBPI procedure D92. 6 Rev. 5 Mfg   Date   Volume

Certified by:

Instrument Technician

Form No. 681-6

SULZER BINGHAM PUMPS INC.

2800 N.W. FRONT AVE. PORTLAND, OR 97210

INSTRUMENT LAB**CERTIFICATE OF CONFORMANCE/CALIBRATION**

ENTERED DEC 07 1994

940517

CERTIFICATION NO.

DATE: 12-6-94

This is to certify that: Make Bingham, Model Dwt C,
 Serial No. 0-1978(C), was inspected and tested by SBPI Instrument laboratory
 personnel and upon receipt was found in the following condition: Good

CALIBRATION TABLE

STANDARD units=	IUT units=	STANDARD units=	IUT units=
1 99.75	100	1	
2 199.5 ~~200~~	200	2	
3 299.25	300	3	
4 399.25	400	4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	

Instrument primary location:

Lag

Calibration location:

Onsight ☐ Laboratory ☒

Note's & Adj:

N.A.R

The following instruments were used to establish N.I.S.T. traceability:

MAKE	MODEL	SERIAL#	DUE DATE
1 Hcizer	CM77	29874	4-25-95
2 Hcizer	CM77	23807	2-9-95
3 Sander	RC-1631	029844	3-10-95
4			

Date due for next calibration:

Date: 12-6-95 Week #: 9549

This instrument is hereby certified, based on a transfer of standards from the U.S. National Institute of Standards and Technology. The tests were conducted in a clean environment and comply with ANSI N45.2, Mil-Std-45662, Mil-Q-9858A, and one of the following procedures:
 SBPI procedure D92.12 Rev. 2 Mfg   Date   Volume

Certified by: Joseph R. C. C. C.

Instrument Technician

Form No. 681-6

SULZER BINGHAM PUMPS INC.

2800 N.W. FRONT AVE. PORTLAND, OR 97210

INSTRUMENT LAB**CERTIFICATE OF CONFORMANCE/CALIBRATION**

940384

CERTIFICATION NO.

ENTERED OCT 05 1994

DATE: 9-8-94

This is to certify that: Make Raytek, Model Raynger PM,
 Serial No. 1A55JJ, was inspected and tested by SBPI instrument laboratory
 personnel and upon receipt was found in the following condition: Good

CALIBRATION TABLE

STANDARD units= °F	IUT units= °F	STANDARD units=	IUT units=
1 70	70	1	
2 259	260	2	
3 414.4	416	3	
4 503.8	544	4	
5		5	
6		6	
7		7	
8		8	
9		9	
10		10	

Instrument primary location:

Main

Calibration location:

Onsight ☐ Laboratory ☒

Note's & Adj:

N.A. - R

The following instruments were used to establish N.I.S.T. traceability:

MAKE	MODEL	SERIAL#	DUE DATE
1 <u>OMEGA</u>	<u>omnicol</u>	<u>1898</u>	<u>10-25-94</u>
2			
3			
4			

Date due for next calibration:

Date: 3-8-95 Week #: 9516

This instrument is hereby certified, based on a transfer of standards from the U.S. National Institute of Standards and Technology. The tests were conducted in a clean environment and comply with ANSI N45.2, Mil-Std-45662, Mil-Q-9858A, and one of the following procedures:
 SBPI procedure D92.17 Rev. 3 Mfg   Date   Volume

Certified by: Joseph R. Cillo

Instrument Technician

Form No. 681-6

SULZER BINGHAM PUMPS INC.

2800 N.W. FRONT AVE. PORTLAND, OR 97210

INSTRUMENT LAB**CERTIFICATE OF CONFORMANCE/CALIBRATION**

940525

CERTIFICATION NO.

DATE: 12-21-94This is to certify that: Make Specy, Model SPR-1030,Serial No. AKE 8887, was inspected and tested by SBPI instrument laboratorypersonnel and upon receipt was found in the following condition: Good**CALIBRATION TABLE**

STANDARD units=	IUT units=	STANDARD units=	IUT units=
1		1	
3.17	3	198.9	200
2		2	
6.12	6	247.3	250
3		3	
9.08	9	294	300
4		4	
9.09	9	594	600
5		5	
18.16	18		
6		6	
26.5	27		
7		7	
30.06	30		
8		8	
58.76	60		
9		9	
96.9	98		
10		10	
101.2	100		

Instrument primary location:

Block house

Calibration location:

Onsight ☐ Laboratory ☒

Note's & Adj:

AC Amps cal'd only

 $\pm 3\%$ MFC spec

N.A.R.

The following instruments were used to establish N.I.S.T. traceability:

MAKE	MODEL	SERIAL#	DUE DATE
1 HP	3466 A	1716A12411	2-11-95
2 RFL	828	562	2-9-95
3 Fluke	803-10	1012	2-28-95
4			

Date due for next calibration:

Date: 6-21-95 Week #: 95

This instrument is hereby certified, based on a transfer of standards from the U.S. National Institute of Standards and Technology. The tests were conducted in a clean environment and comply with ANSI N45.2, Mil-Std-45662, Mil-Q-9858A, and one of the following procedures:

SBPI procedure D92. ☒ Rev. ☒ Mfg A.W. Spec Date 9-1-94 Volume ☒Certified by: Joseph E. Cullen Jr

Instrument Technician

Form No. 681-6

SULZER BINGHAM PUMPS INC.

2800 N.W. FRONT AVE. PORTLAND, OR 97210

INSTRUMENT LAB**CERTIFICATE OF CONFORMANCE/CALIBRATION**

940401

CERTIFICATION NO.

ENTERED OCT 06 1994

DATE: 9-15-94This is to certify that: Make Weston, Model 329Serial No. 4457, was inspected and tested by SBPI instrument laboratory personnel and upon receipt was found in the following condition: Good**CALIBRATION TABLE**

STANDARD units=	IUT units=	STANDARD units=	IUT units=
1	.099	1	
2	.201	2	
3	.301	3	
4	.401	4	
5	.501	5	
6	.601	6	
7	.701	7	
8	.802	8	
9	.902	9	
10	1.082	10	

Instrument primary location:

AG / Pump test

Calibration location:

Onsight ☐ Laboratory ☒

Note's & Adj:

N.A.R

The following instruments were used to establish N.I.S.T. traceability:

MAKE	MODEL	SERIAL#	DUE DATE
1 <u>Weston</u>	<u>Pen</u>	<u>001</u>	<u>1-27-95</u>
2			
3			
4			

Date due for next calibration:

Date: 3-15-95 Week #: 9511

This instrument is hereby certified, based on a transfer of standards from the U.S. National Institute of Standards and Technology. The tests were conducted in a clean environment and comply with ANSI N45.2, Mil-Std-45662, Mil-Q-9858A, and one of the following procedures:
 SBPI procedure D92. 2 Rev. 4 Mfg   Date   Volume

Certified by: Joseph R. Cindler

Instrument Technician

Form No. 681-6

ENTERED AUG 03 1994

SULZER BINGHAM

2800 N.W. Front Ave. • P.O. Box 10247 • Portland, Oregon 97210 USA • (503) 226-5200 • FAX (503) 226-5286 • ITT 4742014

CERTIFICATE OF CONFORMANCE/CALIBRATION

Certification Number: 940298Date of Calibration: 7-25-94This is to certify that: Make CSIModel# 3110-30 Serial# 3354was inspected and tested by SBP instrument Laboratory personnel
and upon receipt was found in the following condition:PHYSICAL: NEW ☐ GOOD ☒ FAIR ☐ POOR ☐ BROKEN ☐ NEED OF
REPAIR ☐PERFORMANCE: SEE BELOW ☒ MFG SPEC ☐ OTHER ☐Initial
Units= G's

CALIBRATION TABLE

After Adj.
Units=

ϕ_H	STD	IUT	%ERROR		STD	IUT	%ERROR
1 20	1	1.001		1			
2 60	1	.9999		2			
3 100	1	1.0		3			
4 500	1	.9968		4			
5 850	1	.9412		5			
6				6			
7				7			
8				8			
9				9			
10				10			
11				11			
12				12			
13				13			
14				14			
15				15			
16				16			

Form 681-5

See Reverse

Additional Remarks: N/A

Adjustments: N.A.R

This instrument is hereby certified, based on a transfer of standards from the U.S. National Institute of Standards and Technology. The tests were conducted in a clean environment and comply with ANSI N45.2, Mil-STD-45662, Mil-Q-9858A, and SBP Procedure D92. Rev. _____

The following instruments were used to establish N.I.S.T. Traceability:

Make	Model#	Serial#	Due Date
1 SRS	DS345	18440	2-14-95
2			
3			
4			
5			
6			

Instrument Primary Location: AG

Notes: _____

Calibration location: Onsite ☐ Laboratory ☒

Date due for next calibration: 1-29-95

Certified by: James R. C. [Signature]

Title: Inst Tech

Form 681-5

ENTERED JUN 0 2 1994

SULZER BINGHAM

2800 N.W. Front Ave. • P.O. Box 10247 • Portland, OR 97210 USA • (503) 226-5200 • FAX 226-5286 • (ITT 474-2014

CERTIFICATE OF CONFORMANCE/CALIBRATION

Certification Number: 940236Date of Calibration: 6-2-94This is to certify that: Make SPBModel# Weights Serial# weights

was inspected and tested by SPB instrument Laboratory personnel and upon receipt was found in the following condition:

PHYSICAL: NEW ☐ GOOD ☒ FAIR ☐ POOR ☐ BROKEN ☐ NEED OF REPAIR ☐PERFORMANCE: SEE BELOW ☐ MFG SPEC ☐ OTHER ☒ see AttachedInitial
Units=

CALIBRATION TABLE

After Adj.
Units=

	STD	IUT	%ERROR		STD	IUT	%ERROR
1				1			
2				2			
3				3			
4				4			
5				5			
6				6			
7				7			
8				8			
9				9			
10				10			
11				11			
12				12			
13				13			
14				14			
15				15			
16				16			

Form 681-5

See Reverse

Pa 1 of 2

Additional Remarks: N/AAdjustments: N.A.R

This instrument is hereby certified, based on a transfer of standards from the U.S. National Institute of Standards and Technology. The tests were conducted in a clean environment and comply with ANSI N45.2, Mil-STD-45662, Mil-Q-9858A, and SBP Procedure D92.16 Rev. 4

The following instruments were used to establish N.I.S.T. Traceability:

Make	Model#	Serial#	Due Date
1 <u>Sauter</u>	<u>RC-1631</u>	<u>628844</u>	<u>3-10-95</u>
2 <u>Troemner</u>	<u>Master Weights</u>	<u>7841.16</u>	<u>1-10-96</u>
3			
4			
5			
6			

Instrument Primary Location: AG / CAP / W18Notes: N/ACalibration location: Onsite ☐ Laboratory ☒Date due for next calibration: 6-2-95Certified by: Joseph L. CilleTitle: Inst Tech

Form 681-5

Pg 2 of 2

SBPI DEADWEIGHT
CALIBRATION
CHART
9:10 AM6/2/94

SERIAL	STAMPED	GRAMWE	IUT	ERROR	LOCATION
W-40-4	1OZ	28.3495	28.3425	-0.0247	C
W-30-2	2OZ	56.6991	56.6518	-0.08349	C
W-20-6	4OZ	113.398	113.2694	-0.11353	C
W-20-5	4OZ	113.398	113.2638	-0.11848	A
W-20-7	4OZ	113.398	113.262	-0.12008	A
W-20-4	4OZ	113.398	113.292	-0.09356	A
W-30-7	4OZ	113.398	113.4282	0.026625	C
W-10-6	4OZ	113.398	113.3371	-0.05373	C
W-20-8	8OZ	226.796	226.9	0.045835	A
W-10-10	8OZ	226.796	226.7	-0.04235	A
W-30-11	8OZ	226.796	226.6	-0.0865	A
W-30-10	8OZ	226.796	226.6	-0.0865	C
W-30-9	8OZ	226.796	226.6	-0.0865	C
W-30-13	1.25#	566.991	566.8	-0.0337	C
W-10-15	1.25#	566.991	566.9	-0.01605	C
W-30-12	1.25#	566.991	566.8	-0.0337	C
W-30-14	1.25#	566.991	566.8	-0.0337	C
W-10-13	1.25#	566.991	566.9	-0.01605	A
W-10-12	1.25#	566.991	566.7	-0.05135	A
W-20-15	1.25#	566.991	567	0.001587	A
W-30-15	1.25#	566.991	566.6	-0.06901	A
W-20-12	1.25#	566.991	567	0.001587	A
W-10-17	2.5#	1133.98	1134.2	0.019397	C
W-30-16	2.5#	1133.98	1133.8	-0.01588	A
W-30-17	2.5#	1133.98	1133.8	-0.01588	A
W-30-21	5.0#	2267.96	2267.7	-0.01147	C
W-10-25	5.0#	2267.96	2267.8	-0.00706	C
W-30-19	5.0#	2267.96	2267.8	-0.00706	A
W-30-22	5.0#	2267.96	2267.7	-0.01147	A
W-30-23	5.0#	2267.96	2267.7	-0.01147	A
W-30-24	5.0#	2267.96	2267.6	-0.01588	A
W-40-28	10.0#	4535.92	4536	0.001764	C
W-10-34	10.0#	4535.92	4535.6	-0.00706	C
W-10-35	10.0#	4535.92	4535.8	-0.00265	C
W-30-34	10.0#	4535.92	4535.8	-0.00265	C
W-10-30	10.0#	4535.92	4535.5	-0.00926	C
W-10-29	10.0#	4535.92	4535.6	-0.00706	A
W-30-36	10.0#	4535.92	4535.9	-0.00044	A
W-30-33	10.0#	4535.92	4535.6	-0.00706	A
W-20-28	10.0#	4535.92	4536.3	0.008377	A
W-30-28	10.0#	4535.92	4535.5	-0.00926	A
W-10-31	10.0#	4535.92	4535.9	-0.00044	A
W-30-32	10.0#	4535.92	4535.3	-0.01367	A
W-10-27	10.0#	4535.92	4535.8	-0.00265	A
W-20-35	10.0#	4535.92	4536.3	0.008377	A
W-10-33	10.0#	4535.92	4535.7	-0.00485	A
W-20-30	10.0#	4535.92	4536.2	0.006173	A

SBPI DEADWEIGHT

CALIBRATION

CHART

9:10 AM6/2/94

W-10-28	10.0#	4535.92	4535.6	-0.00706	A	
W-40-2	1OZ	28.3495	28.3137	-0.12644	C	
W-40-5	1OZ	28.3495	28.4112	0.217168	A	
W-40-3	1OZ	28.3495	28.3631	0.04795	A	
W-40-9	2OZ	56.6991	56.6497	-0.0872	A	
W-40-7	2OZ	56.6991	56.7217	0.039844	A	
W-40-10	2OZ	56.6991	56.6732	-0.0457	A	
W-40-6	2OZ	56.6991	56.69625	-0.00503	A	
W-40-8	2OZ	56.6991	56.7894	0.159009	A	
W-40-11	4OZ	113.398	113.373	-0.02205	A	
W-40-12	4OZ	113.398	113.3698	-0.02487	A	
W-40-15	4OZ	113.398	113.458	0.052883	A	

V. PROCEDURE VARIATIONS

DECANT PUMP TESTING - INITIAL SEQUENCE
DECEMBER 19 - 20, 1994

I. PROCEDURE VARIATIONS

The following variations to the testing procedure have been reviewed and accepted by the project lead engineer (Buyer's Representative) and the WHC project engineer.

PARAGRAPH

- 4.1 The test sequence shown in the procedure was changed so that the Run-in testing will precede the Control System testing. This is the result of the unavailability of the control system equipment.

This change allows the pump equipment to be completely checked out prior to testing the Control System.

- 3.4.6 The motor temperature is being measured with a hand-held device at the lower bearing location during the Run-in test sequence. Because of the location of the motor, temperature readings during the performance test were not taken. Typical motor loads were at approximately 1/2 of the rated HP and temperatures have remained constant throughout the Run-in test.

- 3.4.7 Vibration was measured in velocity (in/sec) and converted to displacement (mils) as stated in the procedure acceptance criteria.

- 4.2.2 The Performance Test acceptance criteria shall be applicable at the best efficiency point (BEP). This is not specifically stated in the procedure, however, it becomes important because the performance of the modified pump varies from the original manufacturer's test as you approach run-out conditions as a result of the modifications to the pump suction.

- 4.3.4 For the purpose of this test, recording of either watts or amps and line voltage is acceptable. The amps for each phase will be measured during the Run-in testing for comparison but will not be required during the Performance test.

The Performance test is not limited to the 5 points listed in the procedure. This represents the minimum. If possible, measuring of run-out conditions is desirable.

F. Marshall Hauck
Project Lead Engineer

ATTACHMENTS TO SBP TEST REPORT

**RELIANCE
ELECTRIC**

INDUSTRIAL SERVICE CENTER
2315 N.W. 21st Place
Portland, OR 97210-2116
FAX: 503-226-7340
503-226-4951
1-800-368-4951

December 20, 1994

Sulzer Bingham Pumps, Inc.
P. O. Box 10247
Portland, OR 97210

Attention: Tom Richfield

Subject: P.O. #76478, 30 HP U.S. Vertical Motor,
Our Job #77471

Dear Sir:

In reference to the above, we are pleased to confirm to you that the above motor has been reconditioned in accordance with accepted industry practices. The recondition included replacement of D.B. and O.D.B. bearings and shaft nut & washer.

Thank you for the opportunity to be of service. If there are any further questions, please do not hesitate to call.

Respectfully,

RELIANCE ELECTRIC
Industrial Service Center

Donn H. Rudy
Donn H. Rudy
Customer Service Manager

DHR:ks

SULZER BINGHAM PUMPS INC.

MEMORANDUM

DATE: March 1, 1995
TO: Ron Low
FROM: Tom Davis
SUBJECT: Test Stand Safety

Ron,

My apologies for the delay in getting this information to you.

As promised I had an audit done by a consultant from OR-OSHA. His findings were consistent with mine. He made the following recommendations that I believe we have complied with;

Label secondary containers of lacquer wash being used to clean parts. Remove the damaged safety can from service.

Upgrade the access ladder to the elevated platform, secure it to the supports, and improve the hand rails around the platform.

Remove the damaged ladder laying on top of the platform.

Circuit breaker was exposed. Replace these items.

Lockout tag on east end of building was not properly labeled. These panels are all disconnected at this time and should not present a problem. I will conduct annual refresher training for the electricians and all maintenance personnel as part of my annual training.

It is also critical to our customers that we inform them of the hazards of the facility prior to their starting work. In the future I would like the opportunity to conduct training with our customers as is our policy.

id:/qfy/rhanforddocument file name (optional)

JOB SAFETY ANALYSIS										Page 1 of 2	
Project No. <u>DECANT PUMP - A2161</u>				Work Order No. <u>ER3297</u>				Area <u>VENDOR'S</u>		Bldg.	
Prepared by <u>M.W. MANDERSACH</u>				Date <u>11/30/95</u>				KEH No. <u>DECANT - REV. 0</u>			
Scope/Description: <u>PERFORM TESTING ON THE DECANT PUMP AT VENDOR'S SHOP</u>											
Emergency Contact Person(s): Primary: <u>TOM DAVIS, 5BP</u> Secondary:											
Emergency Radio/Phone No.: <u>(303) 226-5591</u>											
Specific Work Location(s): <u>SULZER BINGHAM PUMPS, PORTLAND, OREGON</u>											
KNOWN OR POTENTIAL HAZARDS											
		Yes	No	Reference				Yes	No	Reference	
				KEH	Contractor					KEH	Contractor
1. Radiation Area Work	✓		✓	RAD 1		10. Respiratory Hazards	✓		✓	RH 10	
2. Hazardous Waste Operation	✓		✓	CFV1.2		11. Electrical Hazards		✓		IS 10L	
3. Confined Space	✓		✓	IS 10C		12. Lock and Tag	✓		✓	IS 10S	
4. Welding/Burning			✓	IS 10K		13. Scaffolding			✓	IS 10A	
5. Roof Work			✓	IS 10V		14. Aerial Lifts			✓	IS 10B	
6. Fall Hazards (> = 10')		✓		IS 10E		15. Asbestos Removal	✓		✓	CFV1.3	
7. Excavation/Trenching			✓	IS 100		✓ = Formal training required * = Items that require a permit/form/report					
8. Asbestos Inspection Report			✓	IS 3							
9. Hazardous Materials	✓		✓	IS 10D							
Other Hazards		Yes	No	Control Measures							
1. Temperature Extremes			✓								
2. Noise			✓								
3. Poor Lighting			✓								
4. Animals/Insects			✓								
5. Process Chemicals/Steam			✓								
6. Dust			✓								
7. Flammable/Combustible Materials			✓								
8. Ladders	✓			<u>READ KEH PROCEDURE IS10 A</u> <u>WEAR NON-SLIP SOLID FOOTWEAR</u>							
9. Wet/Slippery Floors	✓										
10. Uneven Terrain			✓								
11. Open Excavations/Trenches			✓								
12. Adjacent Water Hazard			✓								
13. Vehicle Traffic			✓								
14. Heavy Equipment			✓								
15. Rigging Operation			✓								
16. Manual Lifting			✓								
17. Power Tools			✓								
18. Pinch Points			✓								
19. Falling Objects	✓										
20. Sharp Objects	✓										
21. Overhead Obstructions	✓										
22. Site Control (Signs/Barricades)			✓								
23. Remote Work Area			✓								
24. Other:											
MINIMUM DRESS REQUIREMENTS: Hard Hat, Safety Glasses, Proper Footwear, Full Length Pants, Shirt with Sleeves											
APPROVALS											
Does further evaluation of the job steps, associated hazards, or safety measures need to be performed? Yes ☐ No ☐											
If Yes, continue job safety analysis on the following pages:											
<u>M.W. Mandersach</u> KEH Supervision				<u>READ KEH REL TOLSON 11/29/95</u> Industrial Safety Representative				<u>N/A</u> Industrial Hygiene, if required			

JOB SAFETY ANALYSIS (Continued)		Page 2 of 2
Work Activity	Hazards Present	Required Safety Measures/PPE
1. REPLACEMENT OF LOAD CELL ON WINCH	FALLING FALLING OBJECTS	PROPER RAILINGS/SUPPORTS ON PLATFORM WORN HARD HATS + SAFETY GLASSES (ABOVE + BELOW)
2. WORK INSIDE INSTRUMENT CABINET	ELECTROCUTION/ELECTRICAL	USE PROPER TOOLS + CAUTION AROUND ENERGIZED EQUIPMENT.

KEH 0898.02 (05/93) KEF047

KAISER ENGINEERS HANFORD		
Title	Number <i>DECONT</i>	Revision <i>0</i>
Approved By <i>[Signature]</i> <i>1/30/95</i> Date 1 of 1	Effective Date <i>1/30/95</i>	Page <i>3</i>

KEH-0305.00 (08/91) (EP) REF039

APPENDIX C: TEST SPECIFICATION EXCEPTIONS

8 Pages

Ref

EXCEPTION NO. 01	Project No. U-101, Decant Pump	QTP. No. WHC-SD-ER3297-TS-001	Rev. 2
Recorded by FM Hauck	Organization ICF KH	Date 12-19-94	QTP Page No. 4
Step No. 3.4.6	Requirement Temperature Readings of Motor		
Description of Problem			
The motor temperature is being measured with a hand-held device at the lower bearing location during the Run-in test sequence.			
Because of the location of the motor, temperature readings during the performance test were not taken.			
Planned Action			
See Above			
Action Taken			
See Above			
RETEST - APPROVAL AND ACCEPTANCE			
☐ Retest Approved and Accepted ☒ Exception Accepted-as-is* ☐ Other*			
*Explanation			
Typical motor loads were at approximately 1/2 of the rated HP and temperatures have remained constant throughout the Run-in test.			
Test Director (name/Org) J.M. Anderson ICF KH			
Date 4/17/96		Cog Engineer RW Stecher	Date 4/17/96
QA Engineer W.S.K. Cardray		Date 4/26/96	Other

EXCEPTION NO. 02	Project No. U-101, Decant Pump	QTP. No. WHC-SD-ER3297-TS-001	Rev. 2
Recorded by FM Hauck	Organization ICF KH	Date 12-19-94	QTP Page No. 4
Step No. 3.4.7	Requirement Vibration To Be Read in Mils		
Description of Problem			
Vibration was measured in velocity (in/sec) and converted to displacement (mils) as stated in the procedure acceptance criteria.			
Planned Action			
See Above			
Action Taken			
See Above			
RETEST - APPROVAL AND ACCEPTANCE			
☐ Retest Approved and Accepted ☒ Exception Accepted-as-is* ☐ Other*			
*Explanation			
Velocity readings are more meaningful and are generally preferred for monitoring pump and motor vibration.			
Test Director (name/Org) J.M. Dand 1CF KH	Date 4/17/96	Cog Engineer PW Steinh 4/17/96	Date 4/17/96
QA Engineer J.K. Gendray	Date 4/26/96	Other	Date

EXCEPTION NO. 03	Project No. U-101, Decant Pump	QTP. No. WHC-SD-ER3297-TS-001	Rev. 2
Recorded by FM Hauck	Organization ICF KH	Date 12-19-94	QTP Page No. 5
Step No. 4-1	Requirement Testing Sequence		
Description of Problem			
The test sequence shown in the procedure was changed so that the Run-in testing will precede the Control System testing. This is the result of the unavailability of the control system equipment.			
Planned Action			
See Above			
Action Taken			
See Above			
RETEST - APPROVAL AND ACCEPTANCE			
☐ Retest Approved and Accepted ☒ Exception Accepted-as-is* ☐ Other*			
*Explanation			
This change allows the pump equipment to be completely checked out prior to testing the Control System.			
Test Director (name/Org) FM Hauck ICF KH			
Date 4/17/96		Cog Engineer RW Stach	Date 4/17/96
QA Engineer J.K. Goodroy		Date 4/26/96	Other Date

EXCEPTION NO. 04	Project No. V-101, Decant Pump	QTP. No. WHC-SD-ER3297-TS-001	Rev. 2
Recorded by FM Hauck	Organization ICF KH	Date 12-19-94	QTP Page No. 6
Step No. 4.3.4	Requirement Power to be read in watts & amps x voltage		
Description of Problem			
For the purpose of this test, recording of either watts or amps and line voltage is acceptable. The amps for each phase will be measured during the Run-in testing for comparison but will not be required during the Performance test.			
Planned Action			
See Above			
Action Taken			
See Above			
RETEST - APPROVAL AND ACCEPTANCE			
☐ Retest Approved and Accepted ☒ Exception Accepted-as-is* ☐ Other*			
*Explanation			
Either measurement is satisfactory for determining the electrical power consumed.			
Test Director (name/Org) FM Hauck ICF KH	Date 4/17/96	Cog Engineer RW Staehle	Date 4/17/96
QA Engineer J.K. Carding	Date 4/26/96	Other	Date

EXCEPTION NO. 1B	Project No. U-101, Decant Pump	QTP. No. WHC-SD-ER3297-TS-001	Rev. 2
Recorded by Chris Winkler	Organization WHC OPS	Date 3-1-95	QTP Page No. 8
Step No. 4.4.2.B-1	Requirement Ensure PLC Program Uses M.S. Aux Contacts		
Description of Problem			
Motor start aux contacts can not be tested at Bingham, because we do not have M.S. that will be used in the field.			
Planned Action			
Test this step following pump installation and held connection from pump to motor starter.			
Action Taken			
Final field equipment tested at Hanford (see App D)			
RETEST - APPROVAL AND ACCEPTANCE			
☒ Retest Approved and Accepted		☐ Exception Accepted-as-is* ☐ Other*	
*Explanation			
Test Director (name/Org) J.M. Branch, EF 14H	Date 4/17/96	Cog Engineer DW Stach	Date 4/17/96
QA Engineer J.K. Gerday	Date 4/26/96	Other	Date

EXCEPTION NO. 2B	Project No. U-101, Decant Pump	QTP. No. WHC-SD-ER3297-TS-001	Rev. 2
Recorded by Chris Winkler	Organization WHC OPS	Date 3-1-95	QTP Page No. 9, 14, 16
Step No. 4.4.2.C-8&9 4.4.4.D13,15 & 19 4.4.5.C-9 & 10	Requirement Test Emergency Stops		
Description of Problem			
Emergency stop buttons currently installed immediately reset after being pushed - design is for buttons that need to be pulled out (reset) after pushed in.			
Planned Action			
New E-Stop buttons have been ordered, but have not yet arrived. Will need to be tested following installation of new E-Stop buttons.			
Action Taken			
New E-Stop buttons installed and tested at Hanford (See App D)			
RETEST - APPROVAL AND ACCEPTANCE			
☒ Retest Approved and Accepted		☐ Exception Accepted-as-is*	
☐ Other*			
*Explanation			
Test Director (name/Org) J.M. Bunch ICF KH	Date 4/17/96	Cog Engineer TW Stecher	Date 4/17/96
QA Engineer S.K. Easley	Date 4/26/96	Other	Date

EXCEPTION NO. 3B	Project No. U-101, Decant Pump	QTP. No. WHC-SD-ER3297-TS-001	Rev. 2
Recorded by Chris Winkler	Organization WHC OPS	Date 3-1-95	QTP Page No. 11,12
Step No. 4.4.4.A1-5, B1-7	Requirement Setting Cable Length Limits and Load Cell Limits		
Description of Problem			
These steps are not part of the test. They are actually part of the initial set-up of the control system (i.e. length and load limit set points)			
Planned Action			
Control System Engineer will attach calibration procedure to QTP which will document the initial set-up, the system set point and how the resolver and load cell were calibrated.			
Action Taken			
Calibration procedure included as appendix E to this report.			
RETEST - APPROVAL AND ACCEPTANCE			
☐ Retest Approved and Accepted		☐ Exception Accepted-as-is*	
☒ Other*			
*Explanation			
Software change. No retest required			
Test Director (name/Org) J. M. H. 1 LFKH	Date 4/17/96	Cog Engineer W. Stuehn	Date 4/17/96
QA Engineer D. K. Corderoy	Date 4/26/96	Other	Date

APPENDIX D: TEST SPECIFICATION, REV. 4

SUBSEQUENT HANFORD TESTING

INCLUDING

Ref. WHC-SD-ER3297-TS-001, REV. 4

TEST SPECIFICATION FOR DECANT PUMP AND WINCH ASSEMBLY

WORKING COPY WITH SIGNED DATA SHEETS

38 Pages

COMPLETE

ENGINEERING CHANGE NOTICE

Page 1 of 2

1. ECN 626155
Proj. ECN

2. ECN Category (mark one) Supplemental ☐ Direct Revision ☒ Change ECN ☐ Temporary ☐ Standby ☐ Supersedeure ☐ Cancel/Void ☐	3. Originator's Name, Organization, MSIN, and Telephone No. T.W. Staehr, 73530, H5-61, 372-3013 5. Project Title/No./Work Order No. SLUDGE WASHING DECANT PUMP 8. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-ER3297-TS-001, Rev. 3	3a. USQ Required? ☐ Yes ☒ No 6. Bldg./Sys./Fac. No. 241-AZ 9. Related ECN No(s). 197434	4. Date 11/8/95 7. Approval Designator Q 10. Related PO No. NA
11a. Modification Work ☐ Yes (fill out Blk. 11b) ☒ No (NA Blks. 11b, 11c, 11d)	11b. Work Package No.	11c. Modification Work Complete Cog. Engineer Signature & Date	11d. Restored to Original Condition (Temp. or Standby ECN only) Cog. Engineer Signature & Date
12. Description of Change This is a total revision of WHC-SD-ER3297-TS-001, Rev. 3. Specific changes include the replacement of Section 4.4 "Control System Testing".			
13a. Justification (mark one) Criteria Change ☐ Design Improvement ☒ Environmental ☐ Facility Deactivation ☐ As-Found ☐ Facilitate Const ☐ Const. Error/Omission ☐ Design Error/Omission ☐			
13b. Justification Details This revision is being issued to include testing of decant control system alarms and testing of the suspended solids profiler. This revision incorporates changes made per revision 3, which was issued to add testing of modifications of the control system that were made based on the results of the original testing at Sulzer Bingham Pumps in Portland. Actual testing was not performed under specification revision 3.			
14. Distribution (include name, MSIN, and no. of copies) R.E. Clayton S2-48 T.K. Cordray G1-50 F.M. Hauck S2-47 G.T. Maclean H5-49 M.W. Manderbach S2-47 M.J. Ramos S2-47 S.G. Romero H5-61 T.W. Staehr H5-61 G.R. Tardiff S5-05			RELEASE STAMP OFFICIAL RELEASE 58 BY WHC DATE NOV 10 1995 Sta. #

A-7900-013-2 (11/94) GEF095

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NOV 1 - 1995

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RELEASE AUTHORIZATION**Document Number:** WHC-SD-ER3297-TS-001, REV *04***Document Title:** Test Specification for Decant Pump and Winch Assembly**Release Date:** 11/10/95

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

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Kara Broz
Kara Broz

11/10/95

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SUPPORTING DOCUMENT		1. Total Pages 34
2. Title Test Specification for Decant Pump and Winch Assembly	3. Number WHC-SD-ER3297-TS-001	4. Rev No. 4
5. Key Words Decant, pump, winch, control, run-in, performance, test	6. Author Name: T. W. Staehr <i>TW Staehr</i> Signature Organization/Charge Code 73530/D2094	
7. Abstract This specification provides the requirements for testing of the vertical turbine decant pump assembly including the floating suction arm with load sensing winch control, instrumentation, and the PLC/PC control system.		
D-5		8. RELEASE STAMP OFFICIAL RELEASE 58 BY WHC DATE NOV 10 1995 <i>Sta. 4</i>

TEST SPECIFICATION FOR DECANT PUMP AND WINCH ASSEMBLY

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FIGURE	DESCRIPTION
1	PUMP TESTING ASSEMBLY SCHEMATIC
2	ACCEPTANCE CRITERIA FOR PUMP EQUIPMENT FORM
3	EXCEPTION FORM

1.0 SCOPE

- 1.1 This specification provides the requirements for testing of the vertical turbine decant pump including the floating suction with load sensing winch control, instrumentation and the associated PLC/PC control system. This revision (Rev. 4) addresses only the testing of new or revised Control System functionality, added since Revision 2 tests (see section 1.2 below). As a result, certain sections will not be addressed. These sections have already been performed under a previous revision of this test procedure. Only the testing listed in the following sections will be performed.

<u>Section No.</u>	<u>Description</u>
4.4.2 / B / 9	Decant Pump Tests in Remote Mode (Using Personal Computer (PC))
4.4.2 / C / 10-17	Decant Pump Tests in Remote Mode (Using Personal Computer (PC))
4.4.3 / C / 9-16	Decant Pump Tests in Local Mode (Using Operator Interface Panel (OIP))
4.4.4 / F / All	Winch Tests in Remote Mode (Using PC)
4.4.6 / B / 19-22	Decant Pump Discharge Valve Tests in Remote Mode (Using PC)
4.4.8 / All	Suspended Solids Monitor (SSM) Test Preparation
4.4.9 / All	SSM Tests in Remote Mode (Using Personal Computer (PC))
4.4.10 / All	SSM Tests in Local Mode (Using Operator Interface Panel (OIP))
4.4.11 / All	Decant Pump Power Transmitter AZ101-JT-01 Tests
4.4.12 / All	Winch Bypass Interlocks Tests

All referenced figures are at the back of this document.

1.2 Types of Tests

The testing consists of performance testing, winch testing and calibration, instrumentation verification testing and run-in testing of the pump. Testing shall be done in the presence and under the direction of the Buyer in accordance with this procedure.

Revision 2 Tests: Those items with a   have been verified and validated in the test completed at Sulzer-Bingham in Portland, OR on March 3, 1995, per Rev. 2 of this procedure. Those items marked with an X, followed by a number, were handled as exceptions. Those items which were tested successfully but will now be superseded by changes in logic due to operational changes, etc., are shown in *ITALICS*. Certain items have been deleted such as the calibration procedures which will be documented in the Test Report.

Revision 3 Tests: Procedure issued but testing was not performed. All remaining tests will be performed under Revision 4. A separate ATP and OTP will be performed after installation is complete.

Revision 4 Tests: This revision will complete the tests on the active exceptions from Rev. 2 and the new tests in Rev. 3, and add tests for the Suspended Solids Monitor (SSM) (also termed the Turbidity Profiler - see sections 4.4.8 through 4.4.10), the Decant Pump Power Transmitter and the Winch Bypass Interlocks. In preparation for testing the following steps must be taken:

1. Temporarily setup the power rack, including transformer, for the Decant Pump in a convenient location for connection of 460-480VAC power to the pump and winch motors, 110-120VAC power to the PLC panel (2 circuits) and 220-240VAC power to the air conditioning unit mounted on the side of the PLC panel. Test for correct line voltages at all breakers and MCP's mentioned below. For reference, see electrical drawings (revision D and latest ECN).

WMC-SD-ER3297-TS-001, Rev. 4

H-2-821436, H-2-821437, H-2-821438 (sheets 1-3) and H-2-821439, as well as instrument drawing (revision 1, latest ECN), H-2-821432 (sheets 1-4).

2 Open the following disconnect terminal blocks (TB's) in the PLC panel prior to connecting temporary power from the power rack:

- ____ TB-AC-1, TB's 4, 7, 10, 16, and 25
- ____ TB-AC-2, TB's 108, 117, 120, 123, and 126
- ____ TB-DC-1, TB 16
- ____ TB-DC-2, TB's 125 and 131

3 Open breaker #2 of mini-power center on power rack. Connect this 110-120VAC 15A circuit to PLC panel at TB-AC-1, TB's: 1 (H), 2 (N) and 3 (G). Open and close breaker as needed during testing.

4 Open breaker #4 of mini-power center on power rack. Connect this 110-120VAC 15A circuit to PLC panel at TB-AC-1, TB's: 28 (H), 29 (N) and 30 (G). Open and close breaker as needed during testing.

5 Open double pole breaker #1-3 of mini-power center on power rack. Connect this 220-240VAC 15A circuit to PLC panel air conditioning unit power terminals. Open and close breaker as needed during testing.

6 Open Motor Circuit Protector (MCP) for which on power rack. Connect 460-480VAC 3A circuit from size 0 reversing starter on power rack to which motor. Open and close MCP as needed during testing.

7 Open MCP for decant pump on power rack. Connect 460-480VAC 70A circuit from size 3 starter on power rack to pump motor. Open and close MCP as needed during testing.

8 Energize and deenergized temporary 460-480VAC power to power rack as needed during testing.

At the conclusion of Revision 4 testing, a Test Report for Decant Pump Assembly and Controls Qualification Testing, WMC-SD-ER3297-TRF-001, Rev. 0, will be issued.

2.0 APPLICABLE DOCUMENTS

- 2.1 The following documents of the exact issue shown, form a part of this specification to the extent specified herein. In the event of a conflict between the documents referenced herein and the contents of this specification, this specification shall take precedence.
- 2.1.1 HYDRAULIC INSTITUTE STANDARDS, 14TH Ed. (1983)

3.0 TEST PREPARATION

3.1 Equipment Required

- 3.1.1 Supplied by Seller:
- (a) Flexible Connectors (as needed)
  - (b) Calibrated vibration meter

ref. WHC-SD-ER3297-TS-001, Rev. 4

- (c) Throttling valve (drag or gate valve)
- (d) Calibrated deadweight tester for discharge pressure
- (e) Calibrated flow device (venturi w/ differential pressure gage or manometer)
- (f) Drop pipe, pump to test tank
- (g) Test tank
- (h) Calibrated wattmeter
- (i) Thermocouple or other temperature sensing devices
- (j) All wiring and miscellaneous electrical hardware

3.1.2 Supplied by Buyer:

- (a) Complete Pump Assembly with Winch and Cable
- (b) PLC/PC Control System
- (c) Fabricated Jumper with 3-Way MOV, Flowmeter and Turbidity meter
- (d) Adapter to Connect Jumper to Raised Face Flange

3.2 Instrumentation Calibration and Accuracy

Meters, gages and instrumentation used shall be calibrated and meet the following minimum accuracy requirements:

Pressure gages	2 percent minimum
Flow meters	2 percent minimum
Ammeters	1 percent minimum
Vibration	2 percent minimum

3.3 Pretest Operations

3.3.1 The Seller shall provide the following inspections of the pump motor:

- (a) Check the condition of the antifriction bearings and replace as necessary.
- (b) Megger the motor windings to verify the integrity of the windings and the insulation.
- (c) Provide a general clean-up of the motor, ie, remove dust, cobwebs, corrosion, etc.
- (d) Check the insulation of the electrical leads and replace as necessary.
- (e) Verify the satisfactory condition of the motor with a no-load run, as appropriate.

3.3.2 The Seller shall assemble the modified pump with the suction arm and floating suction assembly, mounting adapter plate, winch assembly and jumper (all provided by the buyer)

3.4 Assembly of Test Equipment

Assembly of the test equipment shall include the following: (See Figure 1)

3.4.1 Discharge piping, of the same or larger size as the pump piping connections, shall be connected to the pump discharge. No sections of the flexible or rigid piping may be of smaller inner diameter than the pump discharge nozzle or flange.

- 3.4.2 A piping jumper that includes a 3-way ball valve, flowmeter and turbidity probe, supplied by Buyer and a throttling valve (preferably a gate or drag valve) supplied by the Seller.
- 3.4.3 Calibrated discharge pressure measurement instrumentation. All lines or hoses between the connection point and the gage shall be vented and all air bled out before taking data.
- 3.4.4 A calibrated flow device.
- 3.4.5 A full size or larger drop-pipe back to the test tank.
- 3.4.6 Thermocouples or other approved temperature measuring devices shall be attached to the lower motor housing at the bearing location. Hand held temperature measuring devices are acceptable.
- 3.4.7 Vibration measuring pickups shall be attached on the pump mounting flange at two locations in the same plane, 90° apart. Hand held vibration meters are acceptable.
- 3.4.8 The pump, complete with ammeter or wattmeter, shall be wired to the specified voltage source. Hand-held ammeters are acceptable.
- 3.4.9 All devices controlled by the PLC shall be wired to the appropriate I/O module:
  - (a) pump motor starter (Size 3)
  - (b) winch reversing motor starter (Size 0)
  - (c) flowmeter signal (4-20mA 24VDC)
  - (d) 3-way MOV (120 VAC - 3 inputs and 3 outputs)
  - (e) winch controls (resolver, 24 VDC rotary limit switch, and 24 VDC weight transmitter)
  - (f) turbidity analyzer

24VDC signals shall be routed separately from 120 VAC signals.

4.0 TESTING REQUIREMENTS

4.1 Testing Sequence

Testing shall be performed in the following sequence unless a change is authorized by the Buyers Representative.

- (a) Performance Testing
- (b) Control System Testing
- (c) Run-in Testing

4.2 Pump Testing Parameters

4.2.1 The following steps shall be performed before taking readings:

- (a) Place MOV in recirc position and the throttling valve in the full-open position allowing the pump to operate at maximum flow. (Operation with a full open discharge line is an acceptable alternative)

ref. WHC-SD-ER3297-TS-001, Rev. 4

- (b) After placing the pump in Manual/Remote control, start the pump from the PC using the Start button and let it run a minimum of 10 minutes after all air is purged from the system and then stop the pump using the Stop button.
- (c) If any unusual characteristics are observed in start-up or running, shut down the pump to determine and correct the cause, then proceed as in (a) and (b) above.

4.2.2 Acceptance Criteria

Acceptance Criteria will be provided on the Acceptance Criteria for Pump Equipment form, Figure 2.

- (a) The pump flow at rated head shall not be more than 10% above the rated flow. Flow cannot be below the rated flow.
- (b) The pump head at rated flow shall not be more than 5% above the rated head. Head cannot be below the rated head.

NOTE: Conformity with only one of the above tolerances is required.

- (c) The average amps of all phases at rated flow shall not exceed that shown on Acceptance Criteria. Notify the Buyer's Representative if there is more than 2 amps difference between the highest and lowest phase.
- (d) The Buyer's Representative may define other deviations or special test requirements in the applicable section of the Acceptance Criteria Form.

4.3 Performance Testing

- 4.3.1 Performance testing shall be accomplished to determine if the pump meets the specified performance criteria. Testing will be done at the Seller's facility and will precede the run-in testing in order to establish baseline performance.
- 4.3.2 Performance testing shall be done with the winch and floating suction in the manual mode (because the performance test precedes the winch test). The floating suction shall be manually lowered to a point where it has a satisfactory suction.
- 4.3.3 Figure 1, (attached) is a schematic diagram of the vertical turbine decant pump test assembly.
- 4.3.4 Pump Test Readings

The following five sets of readings shall be taken and recorded.

- (a) At 100% flow: record gpm, discharge pressure, amps, watts, vibration and RPM.
- (b) At 75% flow: record gpm, discharge pressure, amps, watts, vibration and RPM.
- (c) At 50% flow: record gpm, discharge pressure, amps, watts, vibration and RPM.
- (d) At 25% flow: record gpm, discharge pressure, amps, watts, vibration and RPM.

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- (e) At shut-off: record discharge pressure, amps, watts, vibration, and RPM. (NOTE: Minimize run time at shutoff.)

4.3.5 Test Data Corrections

The following corrections shall be added to the head readings obtained above:

- (a) The vertical distance between the center-line of the test pressure gage and the free water surface.
- (b) Other correction factors as defined in the HYDRAULIC INSTITUTE STANDARDS may be applied at the discretion of and by the Buyer's Representative. This will be noted on the Acceptance Criteria Form when required.

4.4 Control System Testing

4.4.1 General

After test installation is completely set up, and after visually inspecting all wiring for correctness, perform the following tests. Each test consists of several steps. Test director or designee shall initial the blank for the step after successfully completing the step. In the event there are exception(s) to the required test results, these exceptions shall be sequentially numbered and documented on an individual exception form (see figure 3). This enables case by case resolution and approval of each exception.

A. Turbidity Analyzer OIT-01 Signal

- ✓ 1. *With Decant Pump Discharge Turbidity transmitter and probe installed in test loop, record the turbidity with probe not in water. Turbidity = ____ ppm.*
- ✓ 2. Record the turbidity with probe in water. Turbidity = 0 ppm. (Perform this step at the first convenient opportunity after water has been introduced to the piping).

B. Remote/Local Modes (Using Personal Computer (PC))

- ✓ 1. Place the overall controls in Remote Mode at the PC by clicking on the REMOTE button with mouse. REMOTE button should be highlighted in light blue.
- ✓ 2. Repeat test B1 for Local Mode. LOCAL button should be highlighted in light blue.
- ✓ 3. Repeat test B1 using keyboard controls.
- ✓ 4. Repeat test B2 using keyboard controls.

C. Remote/Local Modes (Using Operator Interface Panel (OIP))

- ✓ 1. Place the overall controls in Local Mode at the OIP by pushing F1, the LOC/REM button. (2nd line message should display LOCAL or REMOTE Mode).
- ✓ 2. Repeat test B1 for Remote Mode.

Def. WHC-SD-ER3297-TS-001, Rev. 4

4.4.2 Decant Pump Tests in Remote Mode (Using Personal Computer (PC))

NOTE: The turbidity should remain below the Hi-Hi (pump off) setpoint for these tests.

A. Auto/Manual Modes

- ✓ 1. Place pump in manual by clicking on MAN button with mouse. MAN button should be highlighted in light blue.
- ✓ 2. Repeat test A1 with AUTO button. AUTO button should be highlighted in light blue.
- ✓ 3. Repeat test A1 with keyboard controls.
- ✓ 4. Repeat test A2 with keyboard controls.

B. On/Off (Start/Stop) Controls

CAUTION! Ensure that pump is ready for operation. The discharge valve should be in Manual/Transfer or Manual/Recirc mode and the throttle valve full open.

- 1/10/96 Jke
- ✓ 1. With pump in Remote/Manual mode click on ON button. Pump should start and ON button should be highlighted in light blue. Ensure PLC program uses M.S. aux contacts for On/Off indicator.
  - ✓ 2. Click on OFF button. Pump should stop and OFF button should be highlighted in light blue.
  - ✓ 3. Repeat Step B1 with keyboard controls.
  - ✓ 4. Repeat Step B2 with keyboard controls.
  - ✓ 5. Repeat Step B1 in Remote/Auto Mode.
  - ✓ 6. Repeat Step B2 in Remote/Auto Mode.
  - ✓ 7. Repeat Step B3 in Remote/Auto Mode.
  - ✓ 8. Repeat Step B4 in Remote/Auto Mode.
  - 1/10/96 Jke
✓ 9. With the pump off, turn the Unsubmerged Weight (UW) alarm on by raising the float out of the water with the winch. Press the Pump On button. Pump should not turn on and a warning message should be displayed: "Float Intake Unsubmerged - Do Not Attempt To Start Pump".

C. Flow Transmitter FT-01 Signal

- ✓ 1. Refer to the flow transmitter user manual and verify (or set) the range for the flow transmitter at 0-200 GPM.

ref. WHC-SD-ER3297-TS-001, Rev. 4

- ✓ 2. With the Decant Pump flow transmitter powered and flowtube installed in test loop, and the pump not running, record the flow reading. Flow per magmeter = 0 GPM. Compare venturi flow reading with magmeter. Flow per venturi = 0 GPM.
- ✓ 3. Start the pump with valve in Transfer position and record the flow with throttle valve full open. Flow = 195.1 GPM. Flow per venturi = 195.7 GPM.
- ✓ 4. With pump running in Remote/Auto Mode, lower flow to 90 GPM (low flow cutout) using throttle valve. Pump should stop immediately and the "Auto Low Flow Cutout" alarm should annunciate.
- ✓ 5. Without changing throttle valve position or pump mode, start pump. Pump should stop after a delay of approximately 15 seconds and the "Auto Low Flow Cutout" alarm should annunciate. Alarm must be acknowledged to proceed.
- ✓ 6. Repeat test C4 in Remote/Manual mode. Pump should continue to run. Verify 'Auto Low Flow Cutout' not active in Manual mode. "Pump Flow Rate Low" alarm should annunciate. Stop pump.
- ✓ 7. Repeat test C5 in Remote/Manual mode. "Pump Flow Rate Low" alarm should annunciate after approx. 15 seconds and the pump should continue to run.

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JKE

- 8. While pump is running push Pump E-Stop (PLC input X55 off). Pump should immediately stop running and appropriate alarm should annunciate.

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JKE

- 9. Release Pump E-Stop. Pump should remain off.

- 10. Start pump in Remote/Manual mode and lower flow to between 40 GPM (Pump Flow Rate Lo-Lo alarm setpoint) and 60 GPM (Pump Flow Rate Lo alarm setpoint). The Pump Flow Rate Lo alarm should annunciate and pump continues to run.

1/10/96

WJ
JKE

- 11. Turn pump off. Without changing the flow signal level, start pump. After a delay of approximately 15 seconds, the Pump Flow Rate Lo alarm should annunciate and pump continues to run.

1/10/96

WJ
JKE

- 12. Lower flow to below 40 GPM (Pump Flow Rate Lo-Lo alarm setpoint). Pump should stop immediately and the Pump Flow Rate Lo-Lo alarm should annunciate.

1/10/96

WJ
JKE

- 13. Without changing the flow signal level, start pump. After a delay of approximately 15 seconds, the pump should stop and the Pump Flow Rate Lo-Lo alarm should annunciate.

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- 14. Repeat Step C10 in Remote/Auto Mode

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- 15. Repeat Step C11 in Remote/Auto Mode.

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JKE

- 16. Repeat Step C12 in Remote/Auto Mode.

1/10/96

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JKE

- 17. Repeat Step C13 in Remote/Auto Mode.

4.4.3 Decant Pump Tests in Local Mode (Using Operator Interface Panel (OIP))

A. Select Pump Controls

- ✓ 1. Switch to Local mode, then use F2, the SELECT button, to cycle through the equipment choices and select the Decant Pump. When the message "DEC PUMP IS [ON/OFF] FLOW = [XXXXX] GPM" (1st line) / "REMOTE OFF LOCAL ON AUTO [ON/OFF] MAN [ON/OFF]" is displayed, the Decant Pump has been selected for control.

B. Auto/Manual Modes

- ✓ 1. Place pump in Local/Manual mode by pushing F3, the MAN/AUTO button. Pump is in Local/Manual mode when the 2nd line message is "REMOTE OFF LOCAL ON AUTO OFF MAN ON".
- ✓ 2. Repeat test B1 for Auto mode. Pump is in Local/Auto mode when the 2nd line message is "REMOTE OFF LOCAL ON AUTO ON MAN OFF".

C. Start/Stop (On/Off) Controls

- ✓ 1. With pump not running and while in Local/Manual mode, push F4, the START button. Pump should start and "DEC PUMP IS ON FLOW = [XXXXX] GPM" message should be displayed on 1st line.
- ✓ 2. Start pump and while in Local/Manual mode, push F7, the STOP button. Pump should stop and "DEC PUMP IS OFF FLOW = [XXXXX] GPM" message should be displayed on 1st line.
- ✓ 3. Repeat test C1 in Local/Auto Mode.
- ✓ 4. Repeat test C2 in Local/Auto Mode.
- ✓ 5. Start pump in Local/Auto Mode and lower flow to or below low flow cutout of 90 GPM. Pump should stop immediately.
- ✓ 6. Message displayed should read: "PUMP STOPPED ON LOW FLOW CUTOUT". (#31)
- ✓ 7. Repeat test C5 in Local/Manual mode. Pump should continue to run.
- ✓ 8. Message displayed should read: "LOW FLOW ALARM STOP PUMP MANUALLY" (#41)
- 1/10/96 *JA* ✓ 9. Start pump in Local/Manual mode and lower flow with throttling valve to between 40 GPM (Pump Flow Rate Lo-Lo alarm setpoint) and 60 GPM (Pump Flow Rate Lo alarm setpoint). The "LOW FLOW ALARM - STOP PUMP MANUALLY" alarm message should be displayed, the alarm annunciated and the pump continues to run.
- 1/10/96 *JA* ✓ 10. Turn pump off. Without changing the flow setting, start pump. After a delay of approximately 15 seconds, the "LOW FLOW ALARM - STOP PUMP MANUALLY" alarm message should be displayed, the alarm annunciated and the pump continues to run.

11	Lower flow to below 40 GPM (Pump flow rate Lo-to alarm setpoint). Pump should stop immediately and the "PUMP STOPPED ON LOW FLOW CUTOFF" alarm message should be displayed and the alarm annunciated.	1/10/96	OK
12	Without changing the flow setting, start pump. After a delay of approximately 15 seconds, the pump should stop and the "PUMP STOPPED ON LOW FLOW CUTOFF" alarm message should be displayed and the alarm annunciated.	1/10/96	OK
13	Repeat Step C9 in Local/Auto Mode.	1/10/96	OK
14	Repeat Step C10 in Local/Auto Mode.	1/10/96	OK
15	Repeat Step C11 in Local/Auto Mode.	1/10/96	OK
16	Repeat Step C12 in Local/Auto Mode.	1/10/96	OK
4.4.4	Winch Tests in Remote Mode (Using PC)		
X3	A. Empirical Determination of Winch Cable Length Setpoints		
	This section deleted and moved to WHC-SD-ER3297-TRP-001, Rev. 0.		
X3	B. Empirical Determination of Winch Cable Weight Setpoints		
	This section deleted and moved to WHC-SD-ER3297-TRP-001, Rev. 0.		

C. Auto/Manual/Setup Mode Selection
Make sure Decant Pump is turned off.

1. Click on AUTO button. The AUTO button should be only one of three (AUTO, MAN, and SETUP) highlighted in light blue.

2. Click on MAN button. The MAN button should be only one highlighted in light blue.

3. Click on SETUP button. The SETUP button should be only one highlighted in light blue.

4. With Winch in Setup mode, attempt to start the Decant Pump. Pump should not respond and the following message should be displayed: "Pump cannot be started when winch is in SETUP mode."

5. Conversely with pump running, attempt to place winch in Setup mode. Winch controls should not respond and the following message should be displayed: "Winch can not be put in SETUP mode when pump is ON."

6. Repeat Step C1 using keyboard controls (F5).

7. Repeat Step C2 using keyboard controls (F6).

8. Repeat Step C3 using keyboard controls (F9).

D. Up/Down Controls

CAUTION: Make sure Decant Pump is turned off.

- ✓ 1. In Remote/Auto mode, click on UP button and hold. Winch should not respond.
- ✓ 2. Message displayed should read: "Manual control of winch not allowed in AUTO mode."
- ✓ 3. In Remote/Auto mode, click on DOWN button and hold. Winch should not respond.
- ✓ 4. Message displayed should read: "Manual control of winch not allowed in AUTO mode."
- ✓ 5. In Remote/Manual mode click on UP button and hold. Winch should raise until the button is released.
- ✓ 6. In Remote/Manual mode click on DOWN button and hold. Winch should lower until the button is released.
- ✓ 7. Repeat Step D5 with keyboard controls.
- ✓ 8. Repeat Step D6 with keyboard controls.
- ✓ 9. Force UDL (PLC coil C42 on), USL (PLC coil C15 off) and UL (PLC coil C41 on) to permissive state with TISOFT software. In Remote/Manual mode, click on UP button and hold. Winch should raise the floating intake until USW (PLC coil C43 on) is reached. Appropriate alarm should annunciate.
- ✓ 10. Repeat D9 for UDL with USW (PLC coil C43 on), USL and UL forced to permissive state. Appropriate alarm should annunciate.
- ✓ 11. Repeat D9 for USL with USW, UDL and UL forced to permissive state. Appropriate alarm should annunciate.
- ✓ 12. Repeat D9 for UL with USW, UDL and USL forced to permissive state. Appropriate alarm should annunciate.
- 1/10/96 ✓ 13. While winch is raising floating intake push Winch E-Stop (PLC input X56 off). Winch should stop in place. Appropriate alarm should annunciate.
Jrc
- 1/10/96 ✓ 14. Verify the PLC "Winch Down Control Relay" (Y34) and "Winch Up Control Relay" (Y35) have been released and indication at the PC is that the winch is stopped.
Jrc
- ✓ 15. Release Winch E-Stop. Winch should remain stopped.
- ✓ 16. Force LSL (PLC coil C16 off) and LL (PLC coil C37 on) to permissive state with TISOFT software. In Remote/Manual mode, click on DOWN button and hold. Winch should lower floating intake until LSW (PLC coil C40 on) is reached. Appropriate alarm should annunciate.

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- 1/12/96
- ✓ 17. Repeat D16 for LSL with LSW and LL forced to permissive state. Appropriate alarm should annunciate.
  - ✓ 18. Repeat D16 for LL with LSW and LSL forced to permissive state. Appropriate alarm should annunciate.
  - 1/12/96 ~~WAF~~ ~~JRC~~ 19. While winch is lowering floating intake push Winch E-Stop (PLC input X56 off). Winch should stop in place. Appropriate alarm message should annunciate.
  - ✓ 20. In Remote/Auto mode, lower tank level until floating intake is partially suspended out of the liquid. When ODW of 45 LBS. is reached, winch should lower intake until OW of 30 LBS. is reached.
  - ✓ 21. Remove all forces with TISOFT software.

E. Setup Mode at PC

- ✓ 1. Reset values in V31 to V36 to 0 using TISOFT.
- ✓ 2. With the pump off, the winch in SETUP mode, and the floating intake in a lowered position, click on the UP button. Winch should begin raising and continue even after the UP button is released.
- ✓ 3. Click on the STOP button while the winch is being raised. Winch should stop immediately.
- ✓ 4. Click on the UP button to raise the winch again. It should continue to raise until the USL is reached and then stop. "Winch Length Calibration Successful" message should be displayed.
- ✓ 5. Verify that new cable length setpoints have been placed in registers V31 thru V36.

F. Level Transmitter LT-01 Signal

The system is designed to detect a loose winch cable by taking the real-time sum of the cable length and liquid level and comparing it to a calculated maximum. The loose cable detection logic is not enabled until the tank level is down to the level of the float. This is because the float is at its maximum height in the tank, which is well below the initial level of the tank supernate, when the Decant Pump is first installed. Once the tank level is down to the float, the real-time sum should remain relatively constant during the remainder of decanting. The winch Auto mode will be disabled if a loose cable is detected to protect against inadvertent lowering of the winch cable into the liquid in case of cable tension measurement failure. There will also be an alarm which must be acknowledged.

- 1/10/96 ~~WAF~~ ~~JRC~~ 1. Place system in Remote mode and simulate the liquid level to a value greater than the maximum float height of 285" (PLCK).
- 1/10/96 ~~WAF~~ ~~JRC~~ 2. The winch Auto mode should be disabled and the text grayed out. Click on the winch Auto button. Message should appear "LIQUID LEVEL ABOVE FLOAT - WINCH AUTO MODE DISABLED".

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- 11/01/94 ~~SKC~~ 3. Lower the value of the liquid level to the maximum float height, at which point the Loose Cable Alarm is enabled but not tripped.
- 11/01/94 ~~SKC~~ 4. The winch Auto mode button should become active and the text black. Click on the Auto button to put the winch into Auto mode. Auto button becomes light blue to show that Auto mode is on.
- 11/01/94 ~~SKC~~ 5. Simulate an increase in the cable length (while keeping the liquid level signal constant) until the sum of the cable length and liquid level is greater than the setpoint of 800" (PLCV).
- 11/01/94 ~~SKC~~ 6. The Loose Cable Alarm should annunciate and the winch should go to Manual mode. Acknowledge alarm. The winch UP and DOWN buttons should now be enabled to control the winch.
- 11/01/94 ~~SKC~~ 7. Repeat Step F5 in Manual mode.
- 11/01/94 ~~SKC~~ 8. The Loose Cable Alarm should annunciate. Test the winch UP and DOWN buttons.
- 11/01/94 ~~SKC~~ 9. Put the pump in Auto mode. Lower the tank level signal to less than 60". Message should appear to ask the operator to "Shut down the annular vent system if running. Press Confirm button when action completed otherwise pump will stop in 60 (TCP14) minutes."
- 11/01/94 ~~SKC~~ 10. Lower "Ann Vent S/D Unconfirmed" alarm delay to 1 minute (TCP14). Push Confirm button. Message should disappear. Wait for 1 minute to verify that pump continues to run.
- 11/01/94 ~~SKC~~ 11. Repeat Step F9 but DO NOT provide confirmation as in Step F10. Pump should continue to run for 1 minute and then shut off. "Ann Vent S/D Unconfirmed" alarm should annunciate and the following message should also be displayed: "Pump Shutdown Interlock Activated". Acknowledge alarm and message.
- 11/01/94 ~~SKC~~ 12. Attempt to restart pump. Pump should not start. Push Confirm button. Alarm should disappear. Attempt to restart pump. Pump should start. Stop pump.
- 11/01/94 ~~SKC~~ 13. Repeat Steps F9 thru F12 with the pump in Manual mode. All alarms should appear but pump should continue to run even if no confirmation is given, as in Step 10. Place value of 60 minutes back in TCP14 register for "Ann Vent S/D Unconfirmed" alarm delay.
- 11/01/94 ~~SKC~~ 14. Simulate level between 364-370" (PLCV setpoint). HI liquid level alarm should annunciate. Acknowledge alarm.
- 11/01/94 ~~SKC~~ 15. Set the liquid level to above 370" (PLCV setpoint). HI-HI liquid level alarm should annunciate. Acknowledge alarm.
- 11/01/94 ~~SKC~~ 16. Set the liquid level to between 24-66" (PLCV setpoint). LO liquid level alarm should annunciate. Acknowledge alarm.

- 1/10/96 ~~14~~ 17. Set the liquid level to below 24" (PLCV setpoint) LO-LO liquid level alarm should annunciate. Acknowledge alarm.
ZK

4.4.5 Winch Tests in Local Mode (Using OIP)

A. Select Winch Controls

- ✓ 1. Use F2, the SELECT button, to cycle through the equipment choices and select the Winch. When "WINCH UP [ON/OFF] DN [ON/OFF] CL=[XXXXX]" WT=[XXXXX]# (1st line) / "LOCAL [ON/OFF] AUTO [ON/OFF] MAN [ON/OFF] SETUP [ON/OFF]" (2nd line) message is displayed, the Winch has been selected for control.

B. Auto/Manual/Setup Mode Selection

- ✓ 1. Push F3, the MAN/AUTO button. The 2nd line of the display should read "LOCAL ON AUTO ON MAN OFF SETUP OFF" message.
- ✓ 2. Push MAN/AUTO button. The display should read "LOCAL ON AUTO OFF MAN ON SETUP OFF" message.
- ✓ 3. Push F9, the WINCH SETUP MODE button. Display should read "LOCAL ON AUTO OFF MAN OFF SETUP ON" message.

C. Up /Down Controls

- ✓ 1. In Local/Auto Mode, push F5, the UP button. Winch should not respond.
- ✓ 2. Message displayed should read "WINCH MUST BE IN LOCAL/MANUAL MODE TO" (OIP message #22 on 1st line) "USE THIS CONTROL (USE ACK TO RETURN)" (OIP message #32 on 2nd line).
- ✓ 3. In Local/Auto Mode, push F8, the DOWN button. Winch should not respond.
- ✓ 4. Message displayed should read "WINCH MUST BE IN LOCAL/MANUAL MODE TO" (#22 on 1st line) "USE THIS CONTROL (USE ACK TO RETURN)" (#32 on 2nd line).
- ✓ 5. In Local/Manual Mode, push F5, the UP button, message displayed should read "WINCH UP ON DN OFF CL= 368" WT= 80 # (1st line) / "LOCAL ON AUTO OFF MAN ON SETUP OFF" (2nd line)
- ✓ 6. With UP button continuously pushed in, winch should pull floating intake up until USW or UL is reached or UP button is released.
- ✓ 7. In Local/Manual Mode, push F8, the DOWN button, message displayed should read "WINCH UP OFF DN ON CL=   " WT=   # (1st line) / "LOCAL ON AUTO OFF MAN ON SETUP OFF" (2nd line)
- ✓ 8. With DOWN button continuously pushed in, winch should lower floating intake down until LSW or LL is reached or DOWN button is released.

- 1/10/96 8 Repeat steps C5 and C6 and while winch is raising intake, push Winch E-Stop button on front of panel. Winch should stop in place.
- 1/10/96 10 Repeat steps C7 and C8 and while winch is lowering intake, push Winch E-Stop button on front of panel. Winch should stop in place.

D. Setup Mode at OIP

1. Reset values in V31 to V36 to 0 using TISOFT.
2. With the pump off, the winch selected and in SETUP mode, and the pump intake float in a lowered position, push the UP button. Winch should begin raising the intake and continue even after the UP button is released.
3. Click on the STOP button while the winch is being raised. Winch should stop immediately.
4. Click on the UP button to raise the intake again. It should continue to raise until the USL is reached and then stop. "WINCH LENGTH CAL SUCCESSFUL" message should be displayed.
5. Verify that new cable length setpoints have been placed in registers V31 thru V36.

4.4.6 Decant Pump Discharge Valve FV-01 Tests in Remote Mode (Using PC)

NOTE: The turbidity reading can be temporarily raised above the H-HI (Pump Off) setpoint by holding the zero check button on the analyzer. Simulate turbidity levels to achieve the required values necessary for testing purposes.

[2]

NOTE: As a result of the testing done in Portland, OR at Sulzer Bingham Pumps, it transpired that there were no identifiable requirements for the valve Auto mode. Instead of deleting it all together from the Operator Interface PC screens and software, however, the valve Auto button shall remain on the screens but shall be grayed out. It is more than likely that a requirement for the Valve Auto mode will surface in the not too distant future and rather than having to add it back in at that time it is more cost effective to leave it in but disabled. If after the first decanting has been completed, or at some later date, there still is not an identifiable requirement for the Valve Auto mode, the logic can be modified at that time. All steps and/or sections marked with a [2] shall now be ignored.

CAUTION: Make sure Decant Pump is turned off.

[2]

A. Auto/Manual Mode Selection

1. Click on AUTO button. AUTO button should be highlighted in light blue.
2. Click on MAN button. MAN button should be highlighted in light blue.
3. Repeat Step A1 using keyboard controls (Shift-F5).
4. Repeat Step A2 using keyboard controls (Shift-F6).
- B. Transfer, Recirc, Backflush Selection Controls

- ✓ 1. With valve in Remote/Manual mode, click on XFER button. Valve should go to Transfer position and XFER button should be highlighted in light blue.
- ✓ 2. With Transfer limit switch inputs forced off (PLC inputs X50 and X57 off), push the XFER button again. The "Transfer Position Failure" alarm should annunciate and the valve should continue to rotate until the inputs are released from the forced off state or the RECIRC or BACKFL button is pushed.
- ✓ 3. With valve in Remote/Manual mode, click on RECIRC button. Valve should go to Recirc position and RECIRC button should be highlighted in light blue.
- ✓ 4. With Recirc limit switch input forced off (PLC input X49 off), push the RECIRC button again. The "Recirc Position Failure" alarm should annunciate and the valve should continue to rotate until the input is released from its force or the TRANSFER or BACKFL button is pushed.
- ✓ 5. With valve in Remote/Manual mode, click on BACKFL button. Valve should go to Recirc Backflush position and BACKFL button should be highlighted in blue.
- ✓ 6. With Recirc/Backflush limit switch input forced off (PLC input X51 off), push the BACKFL button again. The "Backflush Position Failure" alarm should annunciate and the valve should continue to rotate until the input is released from its force or the TRANSFER or RECIRC button is pushed.
- ✓ 7. With valve in Recirc Backflush position, attempt to start Decant Pump in Remote/Manual mode. Pump should not respond. Message should read "Pump can not be started when valve is in BACKFL position."
- ✓ 8. Repeat Step B1 with keyboard controls (Shift-F8).
- ✓ 9. Repeat Step B3 with keyboard controls (Shift-F7).
- ✓ 10. Repeat Step B5 with keyboard controls (Shift-F9).
- ✓ 11. With valve in either RECIRC or TRANSFER position, start pump and click on BACKFL button. Valve should not respond. Message should read "Valve can not be put in BACKFL position when pump is ON".
- ✓ 12. With pump running repeat tests B1 and B3. With valve in Recirc position, record the flow 118 GPM. Verify that orifice plate is limiting flow between 100-120 GPM.
- ✓ 13. With valve in Remote/Auto mode, click on BACKFL button. Valve should not change position. Message should read "Valve position can not be manually changed in AUTO mode."
- ✓ 14. With pump running and valve in Remote/Auto mode, lower high discharge turbidity setpoint below reading recorded earlier for probe in water. New setpoint =   ppm.
- ✓ 15. With valve in Remote/Auto mode, click on XFER button. Valve should not change position. Message should read "Valve position can not be manually changed in AUTO mode."

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- ✓ 16. With pump running and valve in Remote/Auto mode, raise high discharge turbidity setpoint above reading recorded earlier for probe in water. New setpoint = ____ ppm. Valve should change to Transfer position.
- ✓ 17. With valve in Remote/Auto mode, click on RECIRC button. Valve should not change position. Message should read "Valve position can not be manually changed in AUTO mode."
- ✓ 18. Reenter 100 ppm for high discharge turbidity setpoint.
- 1/10/96 [1] ✓ 19. With the valve in Recirc position, turn the pump on. Raise the turbidity reading to between 75 and 100 ppm. After a delay of approximately 20 seconds, the turbidity HI alarm should annunciate and pump continues to run.
JLC
- 1/10/96 [1] ✓ 20. Raise the turbidity reading above 100 ppm. After a delay of approximately 20 seconds, the turbidity HI-HI alarm should annunciate and the pump continues to run.
JLC
- 1/10/96 [1] ✓ 21. Clear all turbidity alarms and repeat Step B19 with the valve in Transfer mode. After a delay of approximately 20 seconds, the turbidity HI alarm should annunciate and pump continue to run.
JLC
- 1/10/96 [1] ✓ 22. Repeat Step B20 with the valve in Transfer mode. After a delay of approximately 20 seconds, the pump should stop and the turbidity HI-HI alarm annunciate.
JLC

4.4.7 Decant Pump Discharge Valve Tests in Local Mode (Using OIP)

A. Select Valve Controls

- ✓ 1. Use F2, the SELECT button, to cycle through the equipment choices and select the Valve. When "VLV XFER [ON/OFF] REC [ON/OFF] REC/BACKFLUSH [ON/OFF]" (1st line) / "REMOTE [ON/OFF] LOCAL [ON/OFF] AUTO [ON/OFF] MAN [ON/OFF]" (2nd line) message is displayed, the Valve has been selected for control.

[2] B. Auto/Manual Mode Selection

- [2] ✓ 1. Push MAN/AUTO button until 2nd line of display shows "REMOTE OFF LOCAL ON AUTO OFF MAN ON" message. Valve is now in Local/Manual mode.
- [2] ✓ 2. Push MAN/AUTO button once so that display shows "REMOTE OFF LOCAL ON AUTO ON MAN OFF" message. Valve is now in Local/Auto mode.

C. Transfer, Recirc, Backflush Selection Controls

- ✓ 1. With valve in Local/Manual mode, push F6, the XFER/RECIRC/BACKFL button, until 1st line of display shows "VLV XFER ON REC OFF REC/BACKFLUSH OFF".
- ✓ 2. Valve should go to Transfer position.
- ✓ 3. With valve in Local/Manual mode, push F6, the XFER/RECIRC/BACKFL button, until 1st line of display shows "VLV XFER OFF REC ON REC/BACKFLUSH OFF".

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- ✓ 4. Valve should go to Recirc position.
- ✓ 5. With valve in Local/Manual mode, push F6, the XFER/RECIRC/BACKFL button, until 1st line of display shows "VLV XFER OFF REC OFF REC/BACKFLUSH ON".
- ✓ 6. Valve should go to Recirc Backflush position.
- ✓ 7. With valve in Recirc Backflush position, attempt to start Decant Pump in Remote/Manual mode. Pump should not respond.
- ✓ 8. With pump running, repeat test C5. Valve should not respond.
- ✓ 9. With valve in Local/Auto mode, attempt to reposition valve. Valve should not change position.

4.4.8 Suspended Solids Monitor (SSM) Test Preparation

A. Provide 115 VAC power to SSM (Turbidity Profiler)

1. Energize temporary power to power rack and close appropriate breaker(s). Check for 110-120VAC power at PLC panel terminals TB-AC-1: TB's 1, 2, and 3.

2. Connect SSM power cable to TB-AC-2, TB's 108 (H - from contact A of connector), 109 (N - from contact B of connector) and 110 (G - from contact C of connector).

3. Close disconnect TB 108. Check voltage between TB's 108 and 109. Reading = 119 VAC.

B. Provide temporary water supply for SSM probe spray wash ring.

1. Connect water supply (4 gpm minimum at 40-100 psig) for spray washing to clean turbidity probe and cable. Cleaning occurs automatically whenever the probe is raised and stops when the probe touches the contact plate at the fullest retraction.

C. Configure SSM

1. Place dip switch S2 switches in the following positions:

Sw.	Position	Description
1	Open	SSM used as stand-alone device (not under supervisory control)
2	Open	Relay contact configured for SSM Failure Alarm
3	Closed	Relay contact configured for SSM Failure Alarm
4	Closed	Relay contact configured for SSM Failure Alarm
5	Open	4-20mA output is internally controlled
6	Open	4-20mA output is proportional to bottom sludge depth

Sw.	Position	Description
7	Open	"Raise switch" close/open sequence is necessary to start profiles (This is how PLC controls profiling via a control relay contact).
8	Closed	4-20mA output is proportional to bottom sludge depth: 4mA = 0 sludge depth & 20mA = sludge depth equal to water depth setting

2. With the probe fully retracted, set the WATER DEPTH rotary dial to 000 and the DIST. TO WATER to best estimate of actual distance between probe and water (waste).

3. With the PROBE in the fully retracted position, switch the Motor Control switch to LOWER position. The PROBE will move down to the DIST. TO WATER distance.

4. Trim the DIST. TO WATER setting until the top of the sensor is about even with the water surface. Record settings on rotary switches: 17 2 feet.

5. Place Motor Control switch in RAISE position. The probe will raise to its fully retracted position and stop when it touches the contact plate. The probe spray wash automatically washes the probe as it is raised.

6. Estimate water depth by subtracting DIST. TO WATER setting from depth of pump pit. Set the WATER DEPTH rotary dial to this value. Record setting: 31 8 feet.

7. With the PROBE in the fully retracted position, switch the Motor Control switch to LOWER position. The PROBE will move down to the sum of the DIST. TO WATER and the WATER DEPTH settings. Trim the WATER DEPTH setting until the probe cable begins to slacken. Subtract 1 foot at a time from the WATER DEPTH setting until slack disappears and record this setting: 25 8 feet.

8. Place Motor Control switch in RAISE position. The probe will raise to its fully retracted position and stop when it touches the contact plate. Place the Motor Control switch in the STOP position.

9. Adjust the TIME (MIN.) rotary dial to 8 minutes (5 minutes minimum and 25 minutes maximum)

10. Place the Motor Control switch in the AUTO position. This starts an internal timer which triggers a complete profiling cycle after a 1 minute delay.

11. The probe is lowered to the 1st of 20 steps in the profiling cycle. The 1st step is at the DIST. TO WATER setting. The probe will continue to stop at 19 more steps so that the WATER DEPTH is divided into 20 equal parts.

12. Verify the SSM completes one cycle and the probe returns to the fully retracted position. Place the Motor Control switch in the STOP position.

4.4.9 SSM Tests in Remote Mode (Using Personal Computer (PC))

A. Auto/Manual Modes

- 1/10/96 JWC 1. Place SSM in manual by clicking on MAN button with mouse. MAN button should be highlighted in light blue.
- 1/10/96 JWC 2. Repeat test A1 with AUTO button. The AUTO button should be highlighted in light blue.
- 1/10/96 JWC 3. Repeat test A1 using keyboard controls (F6).
- 1/10/96 JWC 4. Repeat test A2 using keyboard controls (F5).

B. Up Control

- 1/10/96 JWC 1. Place the Motor Control switch in the AUTO position. When the probe begins its descent proceed to step 2.
- 1/10/96 JWC 2. Place SSM in Manual mode by clicking on the MAN button with mouse. Click on UP button. Profiler control relay is energized and probe is immediately raised to fully retracted position.
- 1/10/96 JWC 3. Place SSM in AUTO mode by clicking on the Auto button. Relay is deenergized and when the probe begins its descent proceed to step 4.
- 1/10/96 JWC 4. Repeat test B2 using keyboard controls (F6 and F7).
- 1/10/96 JWC 5. Repeat test B3 using keyboard controls (F5), and stop after repeating step B4.

C. Automatic Profiling Cycle

NOTE: Probe is raised by SSM when "RAKE SWITCH" circuit on SSM Controller is closed and dip switch S2-7 is open. This circuit is wired to a SSM control relay normally open (N.O.) contact (in PLC panel) which closes when the relay is energized. When relay is deenergized, contact opens and SSM resumes auto profiling after 1 minute time delay. The four position (AUTO/RAISE/STOP/LOWER) Motor Control switch on the SSM Controller must be in the AUTO position in order to respond to PLC control which is effected through the "RAKE SWITCH" circuit.

SSM communicates 20 clarity values to the PLC Basic module during the profile cycle. When the SSM completes the last measurement (#20) it flip-flops the Profile Complete bit (resets to 0 if 1 or sets to 1 if 0) and the Basic module senses a change in this bit. The Basic module then loads PLC registers V66 to V85 (claritys 0-19, respectively) with the new values. These values are scaled and rounded to nearest integer value and placed in registers V150 to V169 (claritys 0-19, respectively). It is these rounded values which are displayed by the PC and OIP.

- 1/10/96 JWC 1. Using TISOFT program enter 0 value for registers V66 to V85. On SSM screen verify that all profile claritys are at 0 value.
- 1/10/96 JWC 2. Place SSM in AUTO mode and click on SET PROFILE INTERVAL. Window pops up and displays changeable field with current Profile Interval displayed in minutes.

- 1/10/96 ~~SA~~ ~~SKC~~ 3. Repeat step C2 using keyboard controls (F8). Enter value 1 minute more than that set on SSM Controller TIME (MIN.) rotary dial. Value displayed = 7 minutes.
- 1/10/96 ~~SA~~ ~~SKC~~ 4. At the completion of the 20th clarity measurement, the probe is raised and sensing Profile Complete, the PLC energizes relay for remainder of PROFILER INTERVAL. When PROFILER INTERVAL has elapsed, the relay deenergizes and after delay of approximately 1 minute SSM begins new profile cycle.

4.4.10 SSM Tests in Local Mode (Using Operator Interface Panel (OIP))

A. Select SSM Controls

- 1/10/96 ~~SA~~ ~~SKC~~ 1. Switch to Local mode, then repeatedly push F2, the SELECT button, to cycle through the equipment choices and select the SSM by stopping at the message "SSM PROFILE INTERVAL [XXXXX] AUTO [ON/OFF] LOC [ON/OFF]" (1st line) / "00CL[XXXXX] 01CL[XXXXX] 02CL[XXXXX] 03CL[XXXXX]" (2nd line).

B. AUTO/MANUAL Mode selection

- 1/10/96 ~~SA~~ ~~SKC~~ 1. Push F3, the MAN/AUTO button until the 1st line of display shows "SSM PROFILE INTERVAL [XXXXX] AUTO OFF LOC ON". The SSM is now in Local/Manual mode (if AUTO OFF then SSM in manual mode by default).
- 1/10/96 ~~SA~~ ~~SKC~~ 2. Push MAN/AUTO button once so that display shows "SSM PROFILE INTERVAL [XXXXX] AUTO ON LOC ON". The SSM is now in Local/Auto mode.

C. Up Control

- 1/10/96 ~~SA~~ ~~SKC~~ 1. With SSM in Local/Manual mode, push F5, the UP button. The probe is raised to the fully retracted position.
- 1/10/96 ~~SA~~ ~~SKC~~ 2. With probe in lowered position and SSM in Local/Auto mode, push F5, the UP button. The SSM does not retract the probe.

D. Automatic Profiling Cycle

NOTE: Clarity values can be viewed by selecting SSM control and using down arrow to move through chained messages showing the 20 values: 0CL[XXXXX] to 19CL[XXXXX].

- 1/10/96 ~~SA~~ ~~SKC~~ 1. Using TISOFTE program enter 0 value for registers V86 to V85. Scroll through all SSM message displays using the down arrow to verify that all profile clarities are at 0 value:

2nd line of 1st message: "00CL00000 01CL00000 02CL00000 03CL00000"
 1st line of 2nd message: "04CL00000 05CL00000 06CL00000 07CL00000"
 2nd line of 2nd message: "08CL00000 09CL00000 10CL00000 11CL00000"
 1st line of 3rd message: "12CL00000 13CL00000 14CL00000 15CL00000"
 2nd line of 3rd message: "16CL00000 17CL00000 18CL00000 19CL00000"

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11/01/96 *WA*
SKC 2. Place SSM in AUTO mode and on 1st line of 1st SSM message in SSM PROFILE INTERVAL field enter value of 1 minute more than that set on SSM Controller TIME (MIN.) rotary dial. Value displayed = 7 minutes.

4. At the completion of the 20th clarity measurement, the probe is raised and sensing Profile Complete, the PLC energizes relay for remainder of PROFILER INTERVAL. When SSM PROFILE INTERVAL has elapsed, the relay deenergizes and after delay of approximately 1 minute SSM begins new profile cycle.

4.4.11 Decant Pump Power Transmitter AZ101-JT-01 Tests

11/01/96 *WA*
SKC 1. Connect the Decant Pump Power Transmitter JT-01 located in the Decant Pump motor starter enclosure to the appropriate terminals in the PLC Panel. See reference drawing H-2-821432, sheet 4 of 4, zone E-8.

11/01/96 *WA*
SKC 2. With pump not running and JT-01 powered, record the amperage shown on the control screen. Reading = 0 A.

11/01/96 *WA*
SKC 3. With pump running at normal flow of ~100 GPM, record the amperage shown on the control screen. Reading = 2.2 A.

4.4.12 Winch Bypass Interlocks Tests

CAUTION: THE WINCH INTERLOCK BYPASSES SHOULD ONLY BE USED IN THE EVENT OF A FAILURE OF ONE OR MORE OF THE SENSORS IN THE PUMP PIT: THE WINCH LOAD CELL, RESOLVER OR ROTARY LIMIT SWITCH, DURING A DECANT OPERATION.

The winch interlock bypasses are accessible only at a level access of 9000 or higher. The shift supervisor, for example, would select Security on the maintenance screen. He or she would logon using his or her password. If his or her access level was at 9000 or higher then the WINCH INTERLOCK BYPASS button would become visible and ready for use.

Activating an interlock bypass will not deactivate any of the alarms. In fact, new alarms will be activated to alert and continuously remind operations that an interlock has been bypassed.

A. Winch Weight Transmitter WT-01 Interlocks Bypass

In the event of a winch load cell failure during a decanting campaign, a means to bypass the interlocks for the cable weight system has been provided in the form of a weight transmitter interlocks bypass. Without an operational WT-01 signal an operator must continuously monitor pump operation, process flow, tank level and cable length readings in order to successfully complete the decant operation without damaging the equipment.

The cable weight signal provides the USW - Upper Safety Weight and the LSW - Lower Safety Weight interlocks. Without the USW interlock, the cable or float could become entangled with something in the tank and the winch could pull the hose (attached to the float) off of the pump intake. The USW alarm indicates that the maximum weight expected for the floating intake and hose full of waste has been exceeded and the equipment is now in jeopardy. Without the LSW interlock, it is possible to

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have a slack cable without being aware of it. This might lead to excess contamination of the cable. The LSW alarm indicates a broken cable or a failure of the cable length measuring system.

- 1/10/96 *JAK* 1. Starting at an access level below 9000, select Maintenance Menu screen by clicking on the MAINT. MENU button. Maintenance Menu screen appears.
- 1/10/96 *JAK* 2. Click on "Security" option, then "Log-On", then "Enter User Name" and enter a user name whose access level is at 9000 or higher. Click on "Enter Password for [username]" and enter the password. The WINCH INTERLOCKS BYPASS button should become visible in the lower right hand corner of the screen. Click on this button.
- 1/10/96 *JAK* 3. Select bypass of the weight transmitter interlocks by clicking on the BYPASS WEIGHT XMTR button. The button background should be light blue while the corresponding RESET button should be white.
- 1/10/96 *JAK* 4. An alarm indicating that the weight transmitter interlocks have been bypassed is annunciated. Acknowledging the alarm stops the audible alarm but the alarm message continues to be displayed in red.
- 1/10/96 *JAK* 5. Select reset of the weight transmitter interlocks clicking on the RESET WEIGHT XMTR button. The button is light blue while the corresponding BYPASS button is white. The alarm message disappears.
- JAK* 6. Exceed the USW by simulating a signal over the setpoint and attempt to place the winch into the SETUP mode. Winch should remain in current mode with the following message displayed: "WINCH CAN NOT BE PLACED IN SETUP MODE WITH UPPER SAFETY WEIGHT EXCEEDED".
- JAK* 7. With BYPASS selected and USW exceeded, place the winch in SETUP mode. The Winch SETUP mode button should be highlighted in light blue indicating that the weight transmitter interlock bypass is in effect. The following message should be displayed: "UPPER SAFETY WEIGHT INTERLOCK HAS BEEN BYPASSED. CABLE LENGTH READING MAY BE RECALIBRATED PROVIDING UPPER SAFETY LIMIT SWITCH AND CABLE LENGTH TRANSMITTER ARE FUNCTIONAL AND NOT BYPASSED". Acknowledge message.
- JAK* 8. RESET the bypass and lower the simulated weight to less than 45# which is the ODW - Operate Down Weight setpoint. Alarm and status messages should disappear.
- JAK* 9. Place the Winch in AUTO mode. Raise the simulated weight above 45#. The winch should begin to lower the cable. Before the OW - Operate Weight setpoint is reached and the winch stops, activate the BYPASS. Winch should stop lowering. Acknowledge alarm and message.
- JAK* 10. RESET the bypass. Set weight above 45# again, winch should begin lowering and continue until OW is reached.

ref. WHC-SD-ER3297-TS-001, Rev. 4

- 1/10/96 ~~11/10/96~~ 11. Place the Winch in MANUAL mode. With the cable length greater than the USL and UL lengths (i.e., cable length in normal range) and the USW exceeded push the UP button. Winch should not respond. BYPASS the weight interlock and push the UP button. The winch should begin raising the float. Acknowledge alarm and RESET the bypass.
- 1/10/96 ~~11/10/96~~ 12. With the Winch in MANUAL mode, simulate the weight at 5# (below LSW) and push the DOWN button. Winch should not respond. BYPASS the interlock and push the DOWN button. Winch should begin lowering the float. Acknowledge alarm and RESET the bypass.
- 1/10/96 ~~11/10/96~~ 13. Repeat Step A1 using keyboard controls (F11).
- " ~~11/10/96~~ 14. Repeat Step A2 using keyboard controls (Y, L, U, P and Ctrl-F1 respectively).
- " ~~11/10/96~~ 15. Repeat Step A3 using keyboard controls (Ctrl-F3).
- " ~~11/10/96~~ 16. Repeat Step A4 using keyboard controls (F12).
- " ~~11/10/96~~ 17. Repeat Step A5 using keyboard controls (Ctrl-F4).
- B. Winch Cable Length Transmitter ZT-01 Interlocks Bypass

In the event of a cable length resolver failure during a decanting campaign, a means to bypass the interlocks for the cable length system has been provided in the form of a cable length transmitter interlocks bypass. Without an operational ZT-01 signal an operator must continuously monitor pump operation, process flow, tank level and cable weight readings in order to successfully complete the decant operation without damaging the equipment.

The cable length signal provides the UL - Upper Limit and the LL - Lower Limit interlocks. Without the UL interlock, the winch could pull the hose (attached to the float) off of the pump intake. The UL alarm indicates that the maximum height expected for the floating intake has been exceeded and the equipment is now in jeopardy. Without the LL interlock, it is possible to have a slack cable without being aware of it. This might lead to excess contamination of the cable. The LL alarm indicates that the useful cable length has been exceeded.

- 1/10/96 ~~11/10/96~~ 1. Starting at an access level below 9000, select Maintenance Menu screen by clicking on the MAINT. MENU button. Maintenance Menu screen appears.
- 1/10/96 ~~11/10/96~~ 2. Click on "Security" option, then "Log-On", then "Enter User Name" and enter a user name whose access level is at 9000 or higher. Click on "Enter Password for [username]" and enter the password. The WINCH INTERLOCKS BYPASS button should become visible in the lower right hand corner of the screen. Click on this button.
- 1/10/96 ~~11/10/96~~ 3. Select bypass of the cable length transmitter interlocks by clicking on the BYPASS POSITION XMTR button. The button should be light blue while the corresponding RESET button is white.

- 1/10/96 ~~WJ~~ 4. An alarm indicating that the cable length transmitter interlocks have been bypassed is announced. Acknowledging the alarm stops the audible alarm but the alarm message continues to be displayed in red.
JKE
- 1/10/96 ~~WJ~~ 5. Select reset of the cable length transmitter interlocks clicking on the RESET POSITION XMTR button. The button should be light blue while the corresponding BYPASS button is white. The alarm message disappears.
JKE
- 1/10/96 ~~WJ~~ 6. Place the winch in MANUAL mode. Exceed the UL by simulating signal less than the setpoint. The UL alarm should announce. Acknowledge the alarm. Attempt to raise the float by clicking on the UP button. Winch should not respond.
JKE
- 1/10/96 ~~WJ~~ 7. With BYPASS selected and UL tripped, click on the winch UP button. The winch should begin raising the float.
JKE
- 1/10/96 ~~WJ~~ 8. RESET the bypass and raise the simulated cable length above the UL. Alarm and status messages should disappear.
JKE
- " ~~WJ~~ 9. Repeat Step B1 using keyboard controls (F11).
JKE
- " ~~WJ~~ 10. Repeat Step B2 using keyboard controls (Y, L, U, P and Ctrl-F1 respectively).
JKE
- " ~~WJ~~ 11. Repeat Step B3 using keyboard controls (Ctrl-F5).
JKE
- " ~~WJ~~ 12. Repeat Step B4 using keyboard controls (F12).
JKE
- " ~~WJ~~ 13. Repeat Step B5 using keyboard controls (Ctrl-F6).
JKE
- C. Winch Cable Rotary Limit Switch Interlocks Bypass

The cable rotary limit switch is mounted directly on the winch. It has two independent cam operated switches: ZSH-01, which provides the USL - Upper Safety Limit and ZSL-01, which provides the LSL - Lower Safety Limit. In the event of a cable rotary limit switch failure during a decanting campaign, a means to bypass the interlocks for the cable limit switch has been provided in the form of USL and LSL interlock bypasses. Without an operational USL the winch setup mode cannot function correctly. Operations must closely monitor pump operation, process flow, tank level and cable weight and length readings in order to successfully complete the decant operation without damaging the equipment. In addition without the USL interlock, the winch could pull the hose (attached to the float) off of the pump intake. The USL alarm indicates that the maximum height expected for the floating intake has been exceeded and the equipment is now in jeopardy. Without the LSL interlock, it is possible to have a slack cable without being aware of it. This might lead to excess contamination of the cable. The LSL alarm indicates that the useful cable length has been exceeded.

- 1/10/96 ~~WJ~~ 1. Starting at an access level below 9000, Select Maintenance Menu screen by clicking on the MAINT. MENU button. Maintenance Menu screen appears.
JKE
- 1/10/96 ~~WJ~~ 2. Click on "Security" option, then "Log-On", then "Enter User Name" and enter a user name whose access level is at 9000 or higher. Click on "Enter Password for [username]" and enter the password. The WINCH INTERLOCKS BYPASS button
JKE

should become visible in the lower right hand corner of the screen. Click on this button.

- 1/10/96
3. Select bypass of the LSL interlocks by clicking on the BYPASS LOW SAFE LIMIT button. The button should be light blue while the corresponding RESET button is white.
  4. An alarm indicating that the LSL interlocks have been bypassed is annunciated. Acknowledging the alarm stops the audible alarm but the alarm message continues to be displayed in red.
  5. Select reset of the LSL interlocks clicking on the RESET LOW SAFE LIMIT button. The button should be light blue while the corresponding BYPASS button is white. The alarm message disappears.
  6. Place the winch in MANUAL mode. Simulate the LSL by opening the normally energized circuit (ZSL-01 input false). The LSL alarm should annunciate. Acknowledge the alarm. Attempt to lower the float by clicking on the DOWN button. Winch should not respond.
  7. With BYPASS LSL selected, cable weight > LSW (15#) and LSL still triggered, click on the winch DOWN button. The winch should begin lowering the float.
  8. RESET the LSL bypass and close the circuit to energize it (ZSL-01 input true). Alarm and status messages should disappear.
  9. Repeat Step C3 using keyboard controls (Clt-F7).
  10. Repeat Step C5 using keyboard controls (Clt-F8).
  11. Select bypass of the USL interlocks by clicking on the BYPASS HIGH SAFE LIMIT button. The button should be light blue while the corresponding RESET button is white.
  12. An alarm indicating that the USL interlocks have been bypassed is annunciated. Acknowledging the alarm stops the audible alarm but the alarm message continues to be displayed in red.
  13. Select reset of the USL interlocks clicking on the RESET HIGH SAFE LIMIT button. The button should be light blue while the corresponding BYPASS button is white. The alarm message disappears.
  14. Place the winch in MANUAL mode. Simulate the USL by opening the normally energized circuit (ZSH-01 input false). The USL alarm should annunciate. Acknowledge the alarm. Attempt to raise the float by clicking on the UP button. Winch should not respond.
  15. With BYPASS USL selected, cable length >= UL and USL still triggered, click on the winch UP button. The winch should begin raising the float.

16. RESET the USL bypass and close the circuit to energize it (ZSH-01 input true). Alarm and status messages should disappear.
17. Place the winch in SETUP mode. SETUP button should be light blue. Select BYPASS UP SAFE LIMIT. Winch transfers from SETUP mode to MANUAL mode. Winch can then be placed in AUTO mode if desired. RESET USL.
18. Repeat Step C11 using keyboard controls (Ctrl-F9).
19. Repeat Step C13 using keyboard controls (Ctrl-F10).

4.5 Run-in Pump Testing

4.5.1 Test Time Requirements

Run-in test time shall be a specified on the Acceptance Criteria form. Testing of the instrumentation and winch may be done during the run-in test period providing the testing does not require flow changes. (See NOTE 7.3)

4.5.2 Pump Run-in Test Requirements

- (a) The pump shall be run at the rated flow for the time specified on the Acceptance Criteria Form. The following data shall be recorded.

-Pump discharge pressure
-Flow
-Amps
-Watts
-Speed
-Vibration
-Motor Bearing Temperatures
-Ambient Air Temperatures

- (b) At the end of the run-in test, the watts and vibration shall be no higher than after the first hour of run-in. If they are, notify the Buyer's Representative. The pressure and flow shall not have decreased more than 2%. The bearing temperature shall not exceed that specified on the Acceptance Criteria Form.

- (c) Variations due to change in input voltage or other normal causes shall be acceptable as long as they can be corrected back to the original conditions.

- (d) Anomalies noted during the test shall be referred to the Buyer's Rep for resolution.

5.0 QUALITY ASSURANCE

The Seller shall have a Quality Assurance Program in place meeting the requirements, as a minimum, of Sections 5.1 through 5.3 shown below.

ref.

WHS-SD-ER3297-TS-001, Rev. 4

5.1 Testing or Recorded Data

The Seller's Quality Assurance representative or their designee shall provide surveillance of testing or recorded data.

5.2 Approval of Testing

The Seller's Quality assurance representative or their designee will indicate approval of the testing and the records by signing, and dating the test records after the testing is complete and the other required signatures have been applied.

5.3 Quality Assurance Records

Records that furnish documentary evidence of quality shall be specified, prepared and maintained. Records shall be legible, identifiable, and retrievable. Records shall be protected against damage, deterioration, distribution, retention, maintenance, and disposition shall be established and documented.

6.0 PREPARATION FOR DELIVERY

6.1 Following the testing prescribed, the pump shall be drained of water and dried, the test equipment removed.

6.2 If the pump is scheduled for service, moisture shall be removed by flowing dry air or other media for sufficient period to assure adequate dryness.

6.3 All pump openings and flange surfaces shall be protected during handling operations with manufactured flange covers or 6 mil thickness plastic coverings taped securely in place. Tape shall not be attached to parent metal of the pump assembly, unless specifically authorized by the Buyer's Representative.

6.4 Hoisting and Rigging procedures shall be in evidence during the installation and removal of the pump from the test facility.

7.0 NOTES

7.1 Vertical turbine pumps shall be tested in full length to ensure that they will perform to the requirements for the intended service, as well as to the suppliers data. The purpose for assembly is to ensure that the configuration will conform to the specified drawings before being placed in service.

7.2 Request for changes to the test requirements or criteria shall be addressed to the Buyer's Representative for consideration and approval.

7.3 Flow control valve adjustment after a Run-in test has begun shall not be permitted. Any drop in flow rate during the test provides valuable insight into the soundness of the pump and would be lost if the valve is adjusted.

ref. WHC-SD-ER3297-TS-001, Rev. 4

FIGURES

<u>FIGURE</u>	<u>DESCRIPTION</u>
1	PUMP TESTING ASSEMBLY SCHEMATIC
2	ACCEPTANCE CRITERIA FOR PUMP EQUIPMENT
3	EXCEPTION FORM

- H-2-821432 - INTERCONNECTION DIAGRAMS
- H-2-821436 - SINGLE LINE DIAGRAMS
- H-2-821437 - ELEMENTARY DIAGRAMS
- H-2-821439 - WIRING DIAGRAMS

DECANT PUMP SHOP TEST CONFIGURATION

ACCEPTANCE CRITERIA FOR PUMP EQUIPMENT

Work Order No. _____	Manufacturer <u>PEABODY FLOWAY</u>
Pump Identification No. <u>6411-2225-IP-TXI-XCC-3</u>	_____
Motor Full Load Rated AMPS <u>35.5</u>	No of Stages <u>7</u>
Motor Rated Horsepower <u>30</u>	Motor Service Factor <u>1.15</u>
Raised RPM <u>3505</u>	Service S G <u>1.2</u>
	Purchased Order No. <u>MBL-XBB-419574</u>

Performance Test Requirements

1. Test Fluid	Water SG=1 <u>X</u> Other _____
2. Shut Off Head	<u>360</u> Feet (min)
3. Total Head (rated)	<u>300</u> Feet (min)
4. Flow Capacity (at rated head)	<u>100</u> GPM (min)
5. Test AMPS shall not exceed	<u>35.5</u> AMPS (max)
6. Rated Voltage	<u>460</u> Volts
7. Vibration	<u>2.0</u> MILS Max @ Rated RPM
8. Impeller Clearance	<u>0.030" NOMINAL</u> Min (IN) _____ Max (IN)

Run-In Requirements

1. Flow <u>100</u> GPM for <u>7</u> Hrs Continuous <u>X</u>
2. Flow _____ GPM for _____ Hrs Not Continuous _____
3. Motor Bearing temperature <u>180</u> °F (maximum)

Special Test Requirements**Winch testing and calibration - See procedure paragraph #4.4****Deviations****Approvals**

Plant Engineering _____	Date _____
Fabrication Control _____	Date _____
Deviation Approvals _____	Date _____

NOTE: Deviations from this Acceptance Criteria can only be approved by Plant Engineering
Note any deviations in the space above

Quality Control Representative

Stamp

Date

QCRN,
JCS, or
Equal

Figure 2

APPENDIX E: CALIBRATION & SETPOINT DETERMINATION

INSTRUMENTATION CALIBRATION & SETPOINT DETERMINATION

PROCEDURES FOR DECANT PUMP WINCH CABLE LOAD

AND LENGTH SENSING SYSTEMS

6 Pages

INSTRUMENTATION CALIBRATION & SETPOINT DETERMINATION PROCEDURES FOR DECANT PUMP WINCH CABLE LOAD AND LENGTH SENSING SYSTEMS

I. Cable Load Sensing System

A. Calibration Procedure

Cable Weight Transmitter

Mfr/Model No. - Unipower HPL220

Distributor - SEW-EURODRIVE, Bramalea, Ontario, Canada

Phone: 905-791-1553

Cable Weight Load Cell

Mfr/Model No. - Rice Lake Weighing Systems RL50210-500

Distributor - Unitec Corp., Seattle, WA

Phone: 206-575-1100

The full scale output for the load cell (see attached data sheet) is 3.003 mV/V. At 10VDC excitation from the HPL220, this equates to a full-scale output of 30.03mV at the load cell full capacity of 500 lbs.

We initially set the Cable Weight Transmitter "Units" to 250 (lbs.) and the "Full Scale" at 15 (mV). With these settings there was no response from the load cell and transmitter until the actual load was over 50 lbs. This is probably due to the inertia inherent in the winch first and second stage gear reducers. Since we required more sensitivity at the low end of the scale to make the controls work, we boosted the sensitivity of the transmitter/load cell combination by changing the Units to 999 lbs. (highest setting possible) and the Full Scale to 10mV (lowest setting possible). We then adjusted the PLC scaling until the weight indicated on the Operator Interface PC most closely matched the test loads ranging from 0 to 172.5 lbs. The table below shows that a PLC scaling of 0-4000 lbs. was most accurate and that value is currently used.

The published linearity of the load cell is .03% of full scale (see attached data sheet). The differences in the measured weights as displayed on the Operator Interface PC and the actual weights hung on the winch cable are for the most part much greater than .03%. This is of little concern, however, since the most important aspect of this measurement is its repeatability.

Cable Load Sensing Calibration

Actual Weight in LBS.	Measured Weight at PLC 0-4000 LBS. scale	Measured Weight at PLC 0-5000 LBS. scale
22	3.4	4.5
42	30.1	40.6
62	58.4	70.5
82	79.2	102.3
102	103.3	140.0
122	132.7	169.7
142	157.3	197.1
162	173.2	225.2
172.5	192.5	237.1

B. Empirical Determination of Winch Cable Weight Setpoints

NOTE: Cable weight tests are performed with water in the tank.

1. **Lower Safety Weight (LSW)** - Manually lower the floating intake until cable is fully slack and Cable Weight = 0 LBS. Raise winch until cable slack disappears. Record this as the LSW and enter as real number in K122 (see table below).
2. **Operating Weight (OW)** - Manually raise the winch until floating intake is about 12" above floating level. Start pump and record this as the OW and enter as real number in K120 (see table below).
3. **Operate Down Weight (ODW)** - With pump running, raise floating intake with winch until intake opening is about 12" below surface of water. Record weight as ODW and enter as real number in K118 (see table below).
4. **Unsubmerged Weight (UW)** - With pump off, raise winch until floating intake is completely unsubmerged with most of the hose still submerged. Record this as the UW and enter as real number in K116 (see table below).
5. **Upper Safety Weight (USW)** - Raise winch until floating intake and all of the hose, with residue water, are completely unsubmerged. Stop winch and observe weight reading. Add 10 lbs. and record this as the USW and enter as real number in K114 (see table below).
6. With TISOFT software, enter USW, UW, ODW, OW & LSW in appropriate K registers of PLC.

Cable Weight Setpoint	Setpoint In LBS.	PLC Constant Register
USW (Upper Safety Weight)	200	K114
UW (Unsubmerged Weight)	110	K116
ODW (Operate Down Wt)	45	K118
OW (Operating Weight)	30	K120
LSW (Lower Safety Weight)	15	K122

II. Rotary Limit Switches

A. Adjustment

Limit Switch

Mfr/Model No. -

The winch is supplied with a rotary limit switch with a high and low set of contacts, mounted in a Nema 4 enclosure, which is mounted on the second stage gear reducer. The rotary limit switch is connected via auxiliary gears to the main gears of the second stage gear reducer. See attached cut sheet.

The Upper Safety Limit (USL) limit switch is located on the left side, perpendicular to the shaft of the winch drum. It was set by using the winch to raise the floating intake to the maximum desired height (see discussion of USL for Cable Length Sensing System below). The cam was then rotated per manufacturer's instructions until the switch "clicked" indicating that the switch had actuated (N.O. contact closed). The floating intake was then lowered until the switch opened again with an observed deadband of approximately 20 inches, and then raised again to confirm the switch setting repeatability. The USL actuated at the same reading of 305".

The Lower Safety Limit (LSL) limit switch is located at the back of the switch enclosure, parallel to the shaft of the winch drum. It was set by lowering the floating intake until it rested on the bottom of the empty pit in a fully reclining position (see discussion below). The cam was then adjusted and the setting repeatability confirmed in the same manner as the Upper Safety Limit limit switch. The LSL actuated at the same reading of 572"

III. Cable Length Sensing System

A. Calibration Procedure

Cable Length Transmitter

Mfr/Model No. - Astrosystems Durapot 100-3698-7

Cable Length Resolver

Mfr/Model No. - Astrosystems ST-23-1/100-NRR

Distributor - Astrosystems, New York state

Phone: 516-328-1600 contact: Bob Brinka

The resolver is a 100 turn model which means that it takes 100 turns for the resolver to go through one output cycle, which corresponds to a transmitter output range of 4-20mA. Since the gear ratios between the winch and the resolver do not afford exactly 100 turns of the resolver for 600 inches of cable as expected, an adjustment to the scaling had to be made in the PLC. This was done in the following manner.

After detaching the floating intake from the end of the cable, the cable was pulled up and 20 feet (240 inches) were measured with a measuring tape from the end of the cable and a piece of black tape was wrapped around the cable at the 20 foot mark. The cable was then dropped back down into the pit and then, while the winch was put into manual control mode, completely rewound onto the drum. The resolver was disconnected and rotated to give a zero (0) reading from the transmitter (displayed at the Operator Interface PC). The resolver was then reconnected to the winch and the cable was then lowered and stopped just as it began to emerge from the winch cable guide tube which is pointed down into the tank. The reading of the transmitter was recorded at that point. The cable was then lowered until the black tape began to emerge from the cable guide tube. This represented 240 inches of cable. The first reading was subtracted from the second reading and this value was used with the actual distance of 240 inches to give a ratio of 1.1009. This ratio was multiplied by the 0-600 range previously entered into the PLC for the cable length signal. This resulted in the new range value which was calculated to be 0-660.55. This is now the range entered into the scaling function for the cable length signal in the PLC. The calibration was confirmed by raising and lowering the cable the pre-measured distance of 240 inches and verifying the proper indication.

B. Empirical Determination of Winch Cable Length Setpoints

NOTE: The cable length tests are performed with the test pit empty.

Due to the lack of a camera in the tank, a method has been devised to remotely recalibrate the cable length setpoints relying on the instantaneous cable length value at the moment when the Upper Safety Limit (USL) rotary limit switch is tripped. This allows the operator to recalibrate the cable length setpoints, if at any time, it becomes obvious that the cable length is incorrect. The operator places the winch in Setup mode and recalibrates all of the cable length setpoints at one time. In order to accomplish automatic recalibration, the cable length setpoints are stored as calculated values in the PLC in "V" registers. Each cable length setpoint has an empirically derived offset associated with it. Each offset is added to the USL value when recalibration is triggered by pushing the UP button in Setup mode. Once established by these series of tests, these offsets should not change and therefore are stored in the PLC memory for constants or the "K" registers. The USL does not require calibration since it is the instantaneous reading from the cable length transmitter whenever the USL rotary limit switch is tripped to close. The USL offset is therefore 0" and is stored in K102.

1. Raise the winch until the floating intake has been raised to its maximum height without putting the hose under tension. Set the Upper Safety Limit (USL) rotary limit switch to close at this cable length. Record the reading from the cable length transmitter: 305".
2. Lower floating intake 3 inches until reading = 308". This will be the point at which the float will stop when the UL is reached. Record 3 inches as the Upper Limit offset and enter as integer number in K103 (see table below).
3. Lower floating intake until float is almost fully reclining on bottom of pit. This will be

the point at which the float will stop when the LL is reached. Record the reading from the cable length transmitter: 566". Subtract 305" (reading at USL) from reading at LL. $566 - 305 = 261$ inches. Enter this value as the Lower Limit offset in K104.

4. Lower floating intake until float is fully reclining on bottom of pit and cable is slack. This will be the point at which the float will stop when the LSL is reached. Record the reading from the cable length transmitter: 572". Subtract 305" (reading at USL) from reading at LL. $572 - 305 = 267$ inches. Enter this value as the Lower Safety Limit offset in K105. This is done for display purposes only since the input from the LSL rotary limit switch is actually used for the control of the winch.

The cable length offsets and the calculated setpoints are stored in the following registers. TISOFT software must be used to enter offsets, since access to K registers is required.

Setpoint/Type	Offset in Inches	Offset PLC Register	Setpoint Calc	Setpoint PLC Register
USL (Upper Safety Limit)/ Rotary Limit Switch	0 (For information purposes only)	K102	$V2 = V32$	V32 (Used for display only)
UL (Upper Limit)/ Software Limit	+3	K103	$V2 + K103 = V33$	V33
LL (Lower Limit)/ Software Limit	+261	K104	$V2 + K104 = V34$	V34
LSL (Lower Safety Limit)/ Rotary Limit Switch	+267 (For information purposes only)	K105	$V2 + K105 = V35$	V35 (Used for display only)

APPENDIX F: DRAWINGS

H-2-820774 - Decant Pump Assembly Elevation & Details
H-2-820776 - Jumper Assembly 241-AZ-01A U5, A, B, (C)
H-2-820777 - Jumper assembly 241-AZ-01A C
H-2-821433 - PLC Control Panel Control Panel Assembly
H-2-821438 - Electrical 241-AZ-101 Plan & Sections
H-2-822934 - Suspended Solids Monitor Assembly

50 Pages

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PLAN
SCALE 1/2\"/>

ELEVATION
SCALE 1/2\"/>

KEY PLAN
SCALE NONE

DECONT/BACKFLUSH MODE
SCALE NONE

REGULATION MODE
SCALE NONE

FLOW PATTERN
SCALE NONE

ELEVATION A-A
SCALE 1/2\"/>

NOTES:

1. FABRICATION AND TESTING SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE DESIGN AND CONSTRUCTION SPECIFICATIONS.
2. HYDRAULIC TEST SHALL BE AT 200 PSI.
3. JUMPER WEIGHT IS 375 LB APPROX.
4. FLOW VALVE NO. 3 WITH ELECTRIC ACTUATOR.
5. MAGNETIC FLOWMETER SHALL BE INSTALLED IN THE MAIN LINE OF THE JUMPER PUMP.
6. THE PUMP SHALL BE INSTALLED IN THE PIT WITH JUMPER H-2-820776 ATTACHED.
7. FOR GASKETS AND CONNECTORS SEE H-2-820776 SH 2.

QTY	DESCRIPTION	MATERIAL
1	ASSURANCE	
1	1 CONNECTION VERTICAL 2"	SH-32545 U
1	2 CONNECTION VERTICAL 2"	SH-32545 U
1	3 GASKET 2" TYP LIT	U-2-32545 U
2	6 GASKET 2" TYP LIT	U-2-32545 U
1	7 KICK-OUT PLATE	U-2-32545 U
1	8 WAKE NOZZLE 4" FLOW	U-2-32545 U
1	9 LIFTING BALL	U-2-32545 U
1	10 TIE 4" IRON	U-2-32545 U
2	11 REDUCER 4" X 2" CONCENTRIC BRAD	U-2-32545 U
3	12 PIPE 2 1/2" SCHED 40 X 4 1/2" L	U-2-32545 U
1	13 PIPE 2 1/2" SCHED 40 X 4 1/2" L	U-2-32545 U
3	14 ELBOW 2" SCHED 40 W/ 18 BRIM	U-2-32545 U
1	15 PIPE 1" SCHED 40	U-2-32545 U
1	16 FLANGE 2" W/ 2 CLASPS 200	U-2-32545 U
2	18 CONNET 1 1/2" X 1 1/2" X 1 1/2" W/ 18	U-2-32545 U
4	19 BOLT 1/2" X 1 1/2" X 1 1/2" W/ 18	U-2-32545 U
4	20 NUT 1/2" X 1 1/2" X 1 1/2" W/ 18	U-2-32545 U
1	21 WAS 1/2" X 1 1/2" X 1 1/2" W/ 18	U-2-32545 U
3	22 BOLT 1 1/2" X 1 1/2" X 1 1/2" W/ 18	U-2-32545 U
6	23 BOLT 1 1/2" X 1 1/2" X 1 1/2" W/ 18	U-2-32545 U
1	24 FLOW VALVE 2" 3-WAY W/ 18 ACTUATOR	U-2-32545 U

W. P. DANA, P.E.

U.S. DEPARTMENT OF ENERGY
NATIONAL BUREAU OF STANDARDS
NBS-400-101A U.S.A.B.C.
H-2-820776

NOTES:

1. FOR NOTES AND Q'LL OF MATERIAL, SEE SHEET 1.

W. P. DANA, P.E.

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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FLOW METER FE-01 CONNECTION DIAGRAM

3-WAY WOV-FV-01 CONNECTION DIAGRAM

NOTES:

1. USE NOTES AND ALL OF

S. G. ROMERO, P.E.

U.S. DEPARTMENT OF ENERGY

W. J. KROGER INVENTOR

JUMPER ASSEMBLY

2-1-AZ-01A USA/8(C)

H-2-820776

ITEM NO.	DESCRIPTION	MATERIAL
1	ASSEMBLY	H-2-82077A
2	CONNECTION VERTICAL & IN 1 OUT	H-2-82077B
3	COVER, 4" TYPE III	H-2-82077C
4	LIFTING TANK, FOLDING	H-2-82077D
5	PLATE 1/4"	ASTM A240 304L
6	PIPE, 3" SCHED 40S	ASTM A133 30 10 304
7	IDENTITY PRIMER W/ CANOE	SEE NOTE 4

NOTES:

1. FABRICATOR AND TESTING SHALL BE IN ACCORDANCE WITH MHC-SD-ER3297-TRP-001, REV 0.
  2. INSTALL IN JUMPER H-2-82077A AND H-2-82077B.
  3. JUMPER WEIGHT IS 35 LB APPROX.
  4. DESIGN TO BE APPROVED BY MHC MODEL ASSOC.
- 316 STAINLESS STEEL
100 TO 1100 PSI
AS RECEIVED BY FABRICATOR
OPERATIONAL TEMPERATURE
OPTIMIZATION WITH LENGTH
OPTIMIZATION WITH LENGTH
OPTIMIZATION WITH LENGTH
FIBER OPTIC CABLE CONNECTIONS

1 DETAIL
SCALE: 6"=1'-0"

1 ASSEMBLY
SCALE: 3"=1'-0"

W. P. DANA, P.E.

U.S. DEPARTMENT OF ENERGY	U.S. DEPARTMENT OF ENERGY
OFFICE OF NEUTRONICS	OFFICE OF NEUTRONICS
241-AZ-01A C	241-AZ-01A C
H-2-820777	H-2-820777

A diagram showing a 3x3 grid. The top row contains three empty boxes. The middle row contains three boxes, each containing a single dot. The bottom row contains three empty boxes. An arrow points from the bottom row of this grid to the first box of the bottom row of the larger grid below.

①
DETAIL
NTS

1 ENCLOSURE ASSEMBLY
SCALE: 1-1/2" = 1'-0"

SECTION
SCALE 1-1/2" = 1'-0"

SECTION
SCALE: 1/1/2"

SECTION

MANUFACTURE RECORD PER MONTH-21			LEADIN
MANUFACTURE SITE	DATE	DESCRIPTION	
A	1/4/21	GRANIT PUMP	
B	3/4/21	WASH ENGINE, STOP	
C	5/4/21	WASH ENGINE, STOP	
D	7/4/21	WASH ENGINE, STOP	
E	9/4/21	WASH ENGINE, STOP	
F	11/4/21	WASH ENGINE, STOP	
G	13/4/21	WASH ENGINE, STOP	
H	15/4/21	WASH ENGINE, STOP	
I	17/4/21	WASH ENGINE, STOP	
J	19/4/21	WASH ENGINE, STOP	
K	21/4/21	WASH ENGINE, STOP	
L	23/4/21	WASH ENGINE, STOP	
M	25/4/21	WASH ENGINE, STOP	
N	27/4/21	WASH ENGINE, STOP	
O	29/4/21	WASH ENGINE, STOP	
P	31/4/21	WASH ENGINE, STOP	
Q	3/5/21	WASH ENGINE, STOP	
R	5/5/21	WASH ENGINE, STOP	
S	7/5/21	WASH ENGINE, STOP	
T	9/5/21	WASH ENGINE, STOP	
U	11/5/21	WASH ENGINE, STOP	
V	13/5/21	WASH ENGINE, STOP	
W	15/5/21	WASH ENGINE, STOP	
X	17/5/21	WASH ENGINE, STOP	
Y	19/5/21	WASH ENGINE, STOP	
Z	21/5/21	WASH ENGINE, STOP	
AA	23/5/21	WASH ENGINE, STOP	
AB	25/5/21	WASH ENGINE, STOP	
AC	27/5/21	WASH ENGINE, STOP	
AD	29/5/21	WASH ENGINE, STOP	
AE	31/5/21	WASH ENGINE, STOP	
AF	3/6/21	WASH ENGINE, STOP	
AG	5/6/21	WASH ENGINE, STOP	
AH	7/6/21	WASH ENGINE, STOP	
AI	9/6/21	WASH ENGINE, STOP	
AJ	11/6/21	WASH ENGINE, STOP	
AK	13/6/21	WASH ENGINE, STOP	
AL	15/6/21	WASH ENGINE, STOP	
AM	17/6/21	WASH ENGINE, STOP	
AN	19/6/21	WASH ENGINE, STOP	
AO	21/6/21	WASH ENGINE, STOP	
AP	23/6/21	WASH ENGINE, STOP	
AQ	25/6/21	WASH ENGINE, STOP	
AR	27/6/21	WASH ENGINE, STOP	
AS	29/6/21	WASH ENGINE, STOP	
AT	31/6/21	WASH ENGINE, STOP	
AU	3/7/21	WASH ENGINE, STOP	
AV	5/7/21	WASH ENGINE, STOP	
AW	7/7/21	WASH ENGINE, STOP	
AX	9/7/21	WASH ENGINE, STOP	
AY	11/7/21	WASH ENGINE, STOP	
AZ	13/7/21	WASH ENGINE, STOP	
BA	15/7/21	WASH ENGINE, STOP	
BB	17/7/21	WASH ENGINE, STOP	
BC	19/7/21	WASH ENGINE, STOP	
BD	21/7/21	WASH ENGINE, STOP	
BE	23/7/21	WASH ENGINE, STOP	
BF	25/7/21	WASH ENGINE, STOP	
BG	27/7/21	WASH ENGINE, STOP	
BH	29/7/21	WASH ENGINE, STOP	
BI	31/7/21	WASH ENGINE, STOP	
BJ	3/8/21	WASH ENGINE, STOP	
BK	5/8/21	WASH ENGINE, STOP	
BL	7/8/21	WASH ENGINE, STOP	
BM	9/8/21	WASH ENGINE, STOP	
BN	11/8/21	WASH ENGINE, STOP	
BO	13/8/21	WASH ENGINE, STOP	
BP	15/8/21	WASH ENGINE, STOP	
BQ	17/8/21	WASH ENGINE, STOP	
BR	19/8/21	WASH ENGINE, STOP	
BS	21/8/21	WASH ENGINE, STOP	
BT	23/8/21	WASH ENGINE, STOP	
BU	25/8/21	WASH ENGINE, STOP	
BV	27/8/21	WASH ENGINE, STOP	
BW	29/8/21	WASH ENGINE, STOP	
BX	31/8/21	WASH ENGINE, STOP	
BY	3/9/21	WASH ENGINE, STOP	
BZ	5/9/21	WASH ENGINE, STOP	
CA	7/9/21	WASH ENGINE, STOP	
CB	9/9/21	WASH ENGINE, STOP	
CC	11/9/21	WASH ENGINE, STOP	
CD	13/9/21	WASH ENGINE, STOP	
CE	15/9/21	WASH ENGINE, STOP	
CF	17/9/21	WASH ENGINE, STOP	
CG	19/9/21	WASH ENGINE, STOP	
CH	21/9/21	WASH ENGINE, STOP	
CI	23/9/21	WASH ENGINE, STOP	
CJ	25/9/21	WASH ENGINE, STOP	
CK	27/9/21	WASH ENGINE, STOP	
CL	29/9/21	WASH ENGINE, STOP	
CM	31/9/21	WASH ENGINE, STOP	
CN	3/10/21	WASH ENGINE, STOP	
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CQ	9/10/21	WASH ENGINE, STOP	
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CT	15/10/21	WASH ENGINE, STOP	
CU	17/10/21	WASH ENGINE, STOP	
CV	19/10/21	WASH ENGINE, STOP	
CU	21/10/21	WASH ENGINE, STOP	
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CU	29/12/21	WASH ENGINE, STOP	
CV	31/12/21	WASH ENGINE, STOP	

[illegible]

MATERIAL LIST CONTINUED ON SHEET 2

NOTES:

1. JOURNAL RECORDS AND DOCUMENTS CONCERNING THE INVESTIGATION OF THE ALLEGEDLY SUSPICIOUS ACTS OF THE PERSONS LISTED IN SECTION 1 OF THIS REPORT, INCLUDING THE PERSONS' NAMES, ALIASES, AND IDENTIFYING INFORMATION, AND THE PERSONS' RACIAL OR ETHNIC ORIGIN, AND IDENTIFYING INFORMATION.
2. USE SHEET 2 FOR ENCLOSEDURE, EXHIBIT, MATERIALS.
3. ATTACHED TO THIS REPORT ARE: (A) REPORT ON "ON-CONTINUING INVESTIGATION OF THE ACTS OF THE PERSONS LISTED IN SECTION 1 OF THIS REPORT, INCLUDING THE PERSONS' NAMES, ALIASES, AND IDENTIFYING INFORMATION, AND THE PERSONS' RACIAL OR ETHNIC ORIGIN, AND IDENTIFYING INFORMATION."
4. SUPPORTED BY WFO.
5. INVESTIGATED BY WFO.
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NOTES CONTINUED ON SHEET 2

CONSTRUCTION	DATE	BY	REVISION
CONSTRUCTION	DATE	BY	REVISION

U.S. DEPARTMENT OF ENERGY

RICHARD CREATIONS OFFICE
 100 KAISER HANFORD COMPANY
 100 KAISER HANFORD COMPANY

INSTRUMENTATION

PLC CONTROL PANEL

CONTROL PANEL ASSEMBLY	7-20
ALUMINUM CONTROL PANEL	7-21

	AS-101 SUPERNATE DECANF p.p up	

H-2-821433	7501	A ² ₂ 101	F

10-3A	Si-CHN	ER3297	part 1 of 4

2 2107 SCALE 1:5 KENCAO 1 1000000

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Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38	Q39	Q40	Q41	Q42	Q43	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55	Q56	Q57	Q58	Q59	Q60	Q61	Q62	Q63	Q64	Q65	Q66	Q67	Q68	Q69	Q70	Q71	Q72	Q73	Q74	Q75	Q76	Q77	Q78	Q79	Q80	Q81	Q82	Q83	Q84	Q85	Q86	Q87	Q88	Q89	Q90	Q91	Q92	Q93	Q94	Q95	Q96	Q97	Q98	Q99	Q100																
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NOTES: NOTES CONTINUED FROM SHEET 1

3 REGD 2 PLACES (68)
24-1/2" LO. 2 REGD MATCH DRILL 2 x 31 (66)
WITH HOLES IN CABINET

COVER PLATES, SIDES (95)

SECTION 35

COVER PLATES, FRONT AND

ENCLOSURE ASSEMBLY

SECTION 5

SECTION 241-AZ-101 PUMP PIT 01A

 
5. SHE IS CURRENTLY BEING HELD IN CONNECTION WITH THE ABOVE NAMED SUBJECTS.

DETAIL

CABLE RETAINING
CLIP DETAIL
SEE NOTES 4 AND 5

NOMINAL DIMENSIONS (SEE NOTE 4)	
A	3
B	6
C	3 1/4
D	3 1/2
E	3 1/4
F	2 5/8
G	2 5/8

[illegible]

U.S. DEPARTMENT OF ENERGY
FOR KISER HANSHOLD ENERGY

ELECTRICAL
241-AZ-01A PUMP 27T

H-2-821438

NO. FRAM. S	
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NOTES:
1. SEE ELEVATION DRAWING FOR VARIOUS DIMENSIONS.
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U.S. DEPARTMENT OF ENERGY
NATIONAL BUREAU OF STANDARDS
4101
DETAILS & MATERIALS
H-2-871458 0

[illegible][illegible]

ENCLOSURE/SSM ASSEMBLY

FOR PARTS LIST, GENERAL NOTES
SEE SHEET 1

34 MOTOR MOUNTING STUD
SCALE 1/1

31 SSM ENCLOSURE SPACER
SCALE 1/1

37 MOTOR SHAFT SEAL HSG CSKT
SCALE 1/1

29 MOTOR SHAFT SEAL RETAINER
SCALE 1/1

4 EXTENSION
SCALE 1/2

12 GUIDE FUNNEL ASSY
SCALE 1/2

28 MOTOR SHAFT SEAL HOUSING
SCALE 1/1

FOR PARTS LIST, GENERAL
NOTES SEE SHEET 1

32 REELHOUSING SPACER
SCALE 1/1

30 BEARING SEAL RETAINER
SCALE 1/1

33 DRIVE SHAFT
SCALE 1/1

REV	DATE	BY	CHKD	DESCRIPTION
1	10-10-70	W. J. HARRIS	W. J. HARRIS	ISSUED FOR PRODUCTION
2	11-10-70	W. J. HARRIS	W. J. HARRIS	REVISED TO ADD 31 SSM ENCLOSURE SPACER
3	12-10-70	W. J. HARRIS	W. J. HARRIS	REVISED TO ADD 32 REELHOUSING SPACER
4	1-10-71	W. J. HARRIS	W. J. HARRIS	REVISED TO ADD 33 DRIVE SHAFT

U.S. DEPARTMENT OF ENERGY	U.S. GOVERNMENT PRINTING OFFICE: 1969 O - 352-334
SUSP SOLIDS MONITOR	
EXTENSION ASSY	
AND DETAILS	
FIG. 1-1	FIG. 1-2
FIG. 1-3	FIG. 1-4
FIG. 1-5	FIG. 1-6
FIG. 1-7	FIG. 1-8
FIG. 1-9	FIG. 1-10
FIG. 1-11	FIG. 1-12
FIG. 1-13	FIG. 1-14
FIG. 1-15	FIG. 1-16
FIG. 1-17	FIG. 1-18
FIG. 1-19	FIG. 1-20
FIG. 1-21	FIG. 1-22
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FIG. 1-27	FIG. 1-28
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FIG. 1-31	FIG. 1-32
FIG. 1-33	FIG. 1-34
FIG. 1-35	FIG. 1-36
FIG. 1-37	FIG. 1-38
FIG. 1-39	FIG. 1-40
FIG. 1-41	FIG. 1-42
FIG. 1-43	FIG. 1-44
FIG. 1-45	FIG. 1-46
FIG. 1-47	FIG. 1-48
FIG. 1-49	FIG. 1-50
FIG. 1-51	FIG. 1-52
FIG. 1-53	FIG. 1-54
FIG. 1-55	FIG. 1-56
FIG. 1-57	FIG. 1-58
FIG. 1-59	FIG. 1-60
FIG. 1-61	FIG. 1-62
FIG. 1-63	FIG. 1-64
FIG. 1-65	FIG. 1-66
FIG. 1-67	FIG. 1-68
FIG. 1-69	FIG. 1-70
FIG. 1-71	FIG. 1-72
FIG. 1-73	FIG. 1-74
FIG. 1-75	FIG. 1-76
FIG. 1-77	FIG. 1-78
FIG. 1-79	FIG. 1-80
FIG. 1-81	FIG. 1-82
FIG. 1-83	FIG. 1-84
FIG. 1-85	FIG. 1-86
FIG. 1-87	FIG. 1-88
FIG. 1-89	FIG. 1-90
FIG. 1-91	FIG. 1-92
FIG. 1-93	FIG. 1-94
FIG. 1-95	FIG. 1-96
FIG. 1-97	FIG. 1-98
FIG. 1-99	FIG. 1-100

3 ENCLOSURE SUB-ASSEMBLY
QTY: 1/2

[illegible]

THE PARTS/MATERIAL LIST IS CONTAINED ON SHEET 9

FOR PARTS LIST & GENERAL NOTES, SEE SHEET 1

1	U.S. DEPARTMENT OF ENERGY
2	OFFICE OF NEUTRON PHYSICS
3	Neutron Physics Group
4	10000 Research Building
5	Rockville, Maryland 20850
6	ATTENTION: Mr. J. C. McLaughlin
7	DATE: 12/1/80
8	TO: Mr. J. C. McLaughlin
9	FROM: Mr. J. C. McLaughlin
10	SUBJECT: SUSPENDED SOLIDS
11	MONITOR ENCLOSURE
12	SUB-ASSEMBLY

U.S. DEPARTMENT OF ENERGY		U.S. GOVERNMENT PRINTING OFFICE	
MONITOR ENCLOSURE		DETAILS	
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
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FOR PARTS LIST, GENERAL NOTES
SEE SHEET 1

SEE SHEET 1 FOR PARTS LIST
AND GENERAL NOTES

[illegible]

47 STRAIN RELIEF PLATE

[illegible]

SEE SHEET 1 FOR PARTS LIST
AND GENERAL NOTES

[illegible]

NAME OF STUDENT	JOHN J. SLEZAK	DATE	1-2-74
ADDRESS	1000 N. 10th St.	CITY	PHILADELPHIA, PA.
STATE	PA.	ZIP	19107
TELEPHONE	215-381-1234	LABORATORY	PHYSICS
PROJECT TITLE	SUB-ASSY AND DETAILS		
PROJECT DESCRIPTION	SUSPENDED SOLIDS MONITOR		
PROJECT OBJECTIVES	H-2, R-29, J-3, J-4, J-5, J-6, J-7, J-8, J-9, J-10, J-11, J-12, J-13, J-14, J-15, J-16, J-17, J-18, J-19, J-20, J-21, J-22, J-23, J-24, J-25, J-26, J-27, J-28, J-29, J-30, J-31, J-32, J-33, J-34, J-35, J-36, J-37, J-38, J-39, J-40, J-41, J-42, J-43, J-44, J-45, J-46, J-47, J-48, J-49, J-50, J-51, J-52, J-53, J-54, J-55, J-56, J-57, J-58, J-59, J-60, J-61, J-62, J-63, J-64, J-65, J-66, J-67, J-68, J-69, J-70, J-71, J-72, J-73, J-74, J-75, J-76, J-77, J-78, J-79, J-80, J-81, J-82, J-83, J-84, J-85, J-86, J-87, J-88, J-89, J-90, J-91, J-92, J-93, J-94, J-95, J-96, J-97, J-98, J-99, J-100, J-101, J-102, J-103, J-104, J-105, J-106, J-107, J-108, J-109, J-110, J-111, J-112, J-113, J-114, J-115, J-116, J-117, J-118, J-119, J-120, J-121, J-122, J-123, J-124, J-125, J-126, J-127, J-128, J-129, J-130, J-131, J-132, J-133, J-134, J-135, J-136, J-137, J-138, J-139, J-140, J-141, J-142, J-143, J-144, J-145, J-146, J-147, J-148, J-149, J-150, J-151, J-152, J-153, J-154, J-155, J-156, J-157, J-158, J-159, J-160, J-161, J-162, J-163, J-164, J-165, J-166, J-167, J-168, J-169, J-170, J-171, J-172, J-173, J-174, J-175, J-176, J-177, J-178, J-179, J-180, J-181, J-182, J-183, J-184, J-185, J-186, J-187, J-188, J-189, J-190, J-191, J-192, J-193, J-194, J-195, J-196, J-197, J-198, J-199, J-200, J-201, J-202, J-203, J-204, J-205, J-206, J-207, J-208, J-209, J-210, J-211, J-212, J-213, J-214, J-215, J-216, J-217, J-218, J-219, J-220, J-221, J-222, J-223, J-224, J-225, J-226, J-227, J-228, J-229, J-230, J-231, J-232, J-233, J-234, J-235, J-236, J-237, J-238, J-239, J-240, J-241, J-242, J-243, J-244, J-245, J-246, J-247, J-248, J-249, J-250, J-251, J-252, J-253, J-254, J-255, J-256, J-257, J-258, J-259, J-260, J-261, J-262, J-263, J-264, J-265, J-266, J-267, J-268, J-269, J-270, J-271, J-272, J-273, J-274, J-275, J-276, J-277, J-278, J-279, J-280, J-281, J-282, J-283, J-284, J-285, J-286, J-287, J-288, J-289, J-290, J-291, J-292, J-293, J-294, J-295, J-296, J-297, J-298, J-299, J-300, J-301, J-302, J-303, J-304, J-305, J-306, J-307, J-308, J-309, J-310, J-311, J-312, J-313, J-314, J-315, J-316, J-317, J-318, J-319, J-320, J-321, J-322, J-323, J-324, J-325, J-326, J-327, J-328, J-329, J-330, J-331, J-332, J-333, J-334, J-335, J-336, J-337, J-338, J-339, J-340, J-341, J-342, J-343, J-344, J-345, J-346, J-347, J-348, J-349, J-350, J-351, J-352, J-353, J-354, J-355, J-356, J-357, J-358, J-359, J-360, J-361, J-362, J-363, J-364, J-365, J-366, J-367, J-368, J-369, J-370, J-371, J-372, J-373, J-374, J-375, J-376, J-377, J-378, J-379, J-380, J-381, J-382, J-383, J-384, J-385, J-386, J-387, J-388, J-389, J-390, J-391, J-392, J-393, J-394, J-395, J-396, J-397, J-398, J-399, J-400, J-401, J-402, J-403, J-404, J-405, J-406, J-407, J-408, J-409, J-410, J-411, J-412, J-413, J-414, J-415, J-416, J-417, J-418, J-419, J-420, J-421, J-422, J-423, J-424, J-425, J-426, J-427, J-428, J-429, J-430, J-431, J-432, J-433, J-434, J-435, J-436, J-437, J-438, J-439, J-440, J-441, J-442, J-443, J-444, J-445, J-446, J-447, J-448, J-449, J-450, J-451, J-452, J-453, J-454, J-455, J-456, J-457, J-458, J-459, J-460, J-461, J-462, J-463, J-464, J-465, J-466, J-467, J-468, J-469, J-470, J-471, J-472, J-473, J-474, J-475, J-476, J-477, J-478, J-479, J-480, J-481, J-482, J-483, J-484, J-485, J-486, J-487, J-488, J-489, J-490, J-491, J-492, J-493, J-494, J-495, J-496, J-497, J-498, J-499, J-500, J-501, J-502, J-503, J-504, J-505, J-506, J-507, J-508, J-509, J-510, J-511, J-512, J-513, J-514, J-515, J-516, J-517, J-518, J-519, J-520, J-521, J-522, J-523, J-524, J-525, J-526, J-527, J-528, J-529, J-530, J-531, J-532, J-533, J-534, J-535, J-536, J-537, J-538, J-539, J-540, J-541, J-542, J-543, J-544, J-545, J-546, J-547, J-548, J-549, J-550, J-551, J-552, J-553, J-554, J-555, J-556, J-557, J-558, J-559, J-560, J-561, J-562, J-563, J-564, J-565, J-566, J-567, J-568, J-569, J-570, J-571, J-572, J-573, J-574, J-575, J-576, J-577, J-578, J-579, J-580, J-581, J-582, J-583, J-584, J-585, J-586, J-587, J-588, J-589, J-590, J-591, J-592, J-593, J-594, J-595, J-596, J-597, J-598, J-599, J-600, J-601, J-602, J-603, J-604, J-605, J-606, J-607, J-608, J-609, J-610, J-611, J-612, J-613, J-614, J-615, J-616, J-617, J-618, J-619, J-620, J-621, J-622, J-623, J-624, J-625, J-626, J-627, J-628, J-629, J-630, J-631, J-632, J-633, J-634, J-635, J-636, J-637, J-638, J-639, J-640, J-641, J-642, J-643, J-644, J-645, J-646, J-647, J-648, J-649, J-650, J-651, J-652, J-653, J-654, J		

PARTS LIST/MATERIAL LIST

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	REMARKS
1	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
2	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
3	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
4	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
5	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
6	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
7	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
8	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
9	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
10	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
11	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
12	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
13	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
14	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
15	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
16	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
17	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
18	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
19	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
20	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
21	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
22	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
23	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
24	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
25	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
26	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
27	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
28	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
29	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
30	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
31	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
32	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
33	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
34	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
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36	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
37	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
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41	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
42	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
43	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
44	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
45	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
46	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
47	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
48	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
49	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	
50	1/2" DIA. X 1/8" THK. ALUM. PLATE	1	EA	

49 CONNECTOR MTG. PLATE

50 MOUNTING PLATE GASKET

SEE SHEET 1 FOR PARTS LIST AND GENERAL NOTES

51 SSM ENCLOSURE-ALTERED

VIEW L

VIEW J

VIEW K

DRAWING TITLE: SSM ENCLOSURE-ALTERED	
DATE: 10/1/73	BY: J. L. BROWN
DESIGNED BY: J. L. BROWN	CHECKED BY: J. L. BROWN
APPROVED BY: J. L. BROWN	REVISIONS: 1. 10/1/73
U.S. GOVERNMENT OF DEFENSE SUSPENDED RIGHTS DETAILS F-47/F-48 H-2-822934	

SM-1111

F-47/F-48

DISTRIBUTION SHEET

To	From	Page 1 of 1			
Distribution	T. W. Staehr	Date 5/1/96			
Project Title/Work Order		EDT No. 613865			
Decant Pump Assembly and Controls Qualification Test Report		ECN No. N/A			
Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
R. E. Clayton	S2-48	X			
T. K. Cordray	G1-50	X			
F. M. Hauck	S2-47	X			
R. E. Icyan	S2-47	X			
G. T. Maclean	H5-61	X			
R. P. Marshall	H5-61	X			
S. G. Romero	S2-47	X			
T. W. Staehr	H5-61	X			
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