MAY 02 1996 (21) Sta. 21

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

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1	WHC-SD-ER3297-TRP-001		0	DECANT PUMP ASSEMBLY AND CONTROLS QUALIFICATION TESTING TEST REPORT	Q	1,2		

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)	1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved w/comment 6. Receipt acknowledged

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(See Approval Designator for required signatures)

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1	1	Cog.Eng. T.W. Staehr	T.W. Staehr		H5-61						
1	1	Cog. Mgr. R.P. Marshall	R.P. Marshall		H5-61						
1	1	QA T.K. Cordray	T. K. Cordray	4/29/96	B1-50						
		Safety									
		Env.									
1	1	F.M. Hauck	F.M. Hauck	5/1/96	S2-47						

18. T.W. Staehr 4/29/96
Signature of EDT Originator — Date

19. _____ _____
Authorized Representative for Receiving Organization — Date

20. R.P. Marshall 4/29/96
Cognizant Manager — Date

21. DOE APPROVAL (if required)
Ctrl. No.
[ ] Approved
[ ] Approved w/comments
[ ] Disapproved w/comments

BD-7400-172-2 (04/94) GEF097

Decant Pump Assembly and Controls Qualification Testing - Test Report

T. W. Staehr
Westinghouse Hanford Company, Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-87RL10930

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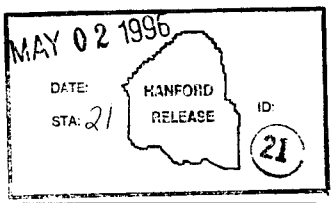
Key Words: decant, pump, controls, qualification, test, instrumentation

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.



Karen A. Noland 5/2/96
Release Approval Date

Release Stamp

Approved for Public Release

DECANT PUMP ASSEMBLY AND CONTROLS QUALIFICATION TESTING TEST REPORT

April 1996

F. M. Hauck

T. W. Staehr

Westinghouse Hanford Company
Richland, Washington

CONTENTS

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)	3. Originator's Name, Organization, MSIN, and Telephone No.	3a. USQ Required?	4. Date
Supplemental [ ] Direct Revision [X] Change ECN [ ] Temporary [ ] Standby [ ] Supersedure [ ] Cancel/Void [ ]	T. W. Staehr, 7F520, R3-27, 372-3013	[ ] Yes [X] No	2/14/95
	5. Project Title/No./Work Order No. SLUDGE WASHING DECANT PUMP	6. Bldg./Sys./Fac. No. 241-AZ	7. Approval Designator Q
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-ER3297-TS-001, Rev. 1	9. Related ECN No(s). 611893	10. Related PO No. NA

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

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

A. Chu	S3-08	R.W. Ulbricht	B4-40
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		

RELEASE STAMP

OFFICIAL RELEASE BY WHC

DATE FEB 22 1995

STA 4

13

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

A-7900-013-1

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1) 616681

15. Design Verification Required
[X] Yes
[ ] No

16. Cost Impact

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

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

Document Number/Revision	Document Number/Revision	Document Number Revision

20. Approvals

Signature	Date	Signature	Date
OPERATIONS AND ENGINEERING		ARCHITECT-ENGINEER	
Cog. Eng. T.W. Staehr TW Staehr	2/15/95	PE	
Cog. Mgr. J. E. Van Beek [illegible]	2/15/95	QA	
QA T. K. Cordray J.K. Cordray	2/12/95	Safety	
Safety		Design	
Environ.		Environ.	
Other J.M. Adam	2/19/95	Other	
		DEPARTMENT OF ENERGY	
		Signature or a Control Number that tracks the Approval Signature	
		ADDITIONAL	

RECORD OF REVISION	(1) Document Number WHC-SD-ER3297-TS-001	Page 1

(2) Title
Test Specification for Decant Pump and Winch Assembly

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) Cog. Engr.	(6) Cog. Mgr. Date
0	(7) EDT-605592 6/9/94		
1	Incorporates ECN 611893		
2 RS	Incorporates ECN 616681	[signature]	[signature] 2/15/95

A-7320-005 (08/91) WEF168

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

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 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

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DATE FEB 22 1995
STA 4

A-6400-073 (08/94) WEF124

TEST SPECIFICATION FOR DECANT PUMP AND WINCH ASSEMBLY

TABLE OF CONTENTS

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.

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 on individual exception form (see figure 3). This enables case by case resolution and approval of each exception.

A. Turbidity Analyzer OIT-01 Signal

DELETE TKC

__ 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 teat 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.

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~~ 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 ~~10~~ 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. ~~10~~ 15 seconds and the pump should continue to run.

*2B 8. While pump is running push Pump E-Stop (PLC input X55 off). Pump should immediately stop running and appropriate alarm should annunciate.

*2B 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 = [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)

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)

*3 B 1. Connect winch controls via the winch terminal box to the PLC control panel per the interconnection diagrams provided. (Ref. dwg. H-2-821432)

*3 B 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.

*3 B 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.

*3 B 4. Lower the winch 3" and set the Upper Safety Limit (USL) rotary limit switch to open at this cable length. Initial USL = ____ inches.

*3 B 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	3"	K101
USL	V2 + K102	V32	0	K102
UL	V2 + K103	V33	3"	K103
LL	V2 + K104	V34	261"	K104
LSL	V2 + K105	V35	267"	K105
LML	V2 + K106	V36	273"	K106

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

*38 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.

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 C42 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.

*28 __ 13. While winch is raising floating intake push Winch E-Stop (PLC input X56 off). Winch should stop in place. Appropriate alarm should annunciate.

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.

*28 __ 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.

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.

*28 __ 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.

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 ~~SELECT~~ 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 ~~SELECT~~ 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.

*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.

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~~" 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 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.

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-~~F7~~ F8).

9. Repeat Step B3 with keyboard controls (Shift-~~F8~~ 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. 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. New~~ setpoint = ___ ppm. Valve should change to Recirc position.
raise reading temporarily by using zero check switch on turb. analyzer

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."

~~DELETE~~ 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.
RECORD PER # 14

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 ___ 18. Reenter 100 ppm for high discharge turbidity setpoint.

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 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.

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

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

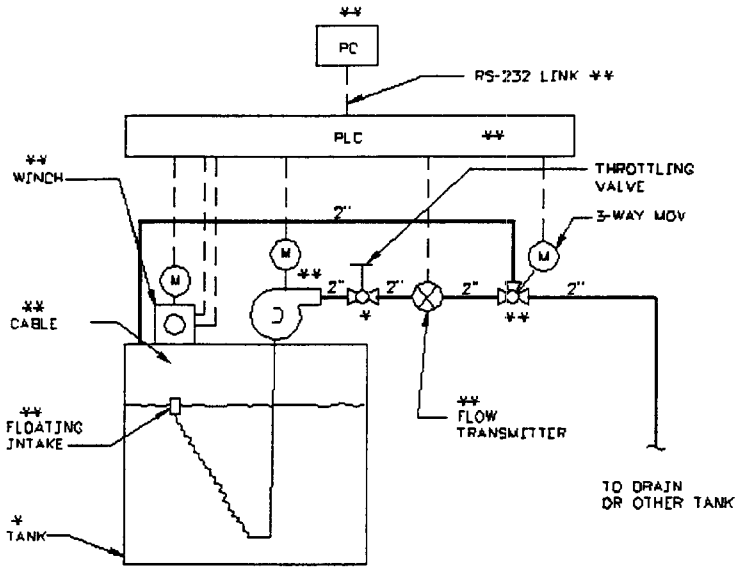


FIGURE 1 - DECANT PUMP TEST CONFIGURATION

*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 PEABODY FLOWAY
Pump Identification No 6411-2225-IP-TX1-XCC-3	No of Stages 7
Motor Full Load Rated AMPS 35.5	Motor Service Factor 1.15
Motor Rated Horsepower 30	Service S G 1.2
Raised RPM 3505	Purchased Order No MBL-XBB-419574

Performance Test Requirements

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

Run-In Requirements

1. Flow 100 GPM for 7 Hrs Continuous X
2. Flow GPM for Hrs Not Continuous
3. Motor Bearing temperature 180 °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 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 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 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

INDEX

DECANT PUMP TEST REPORT

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.

1

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

2

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.

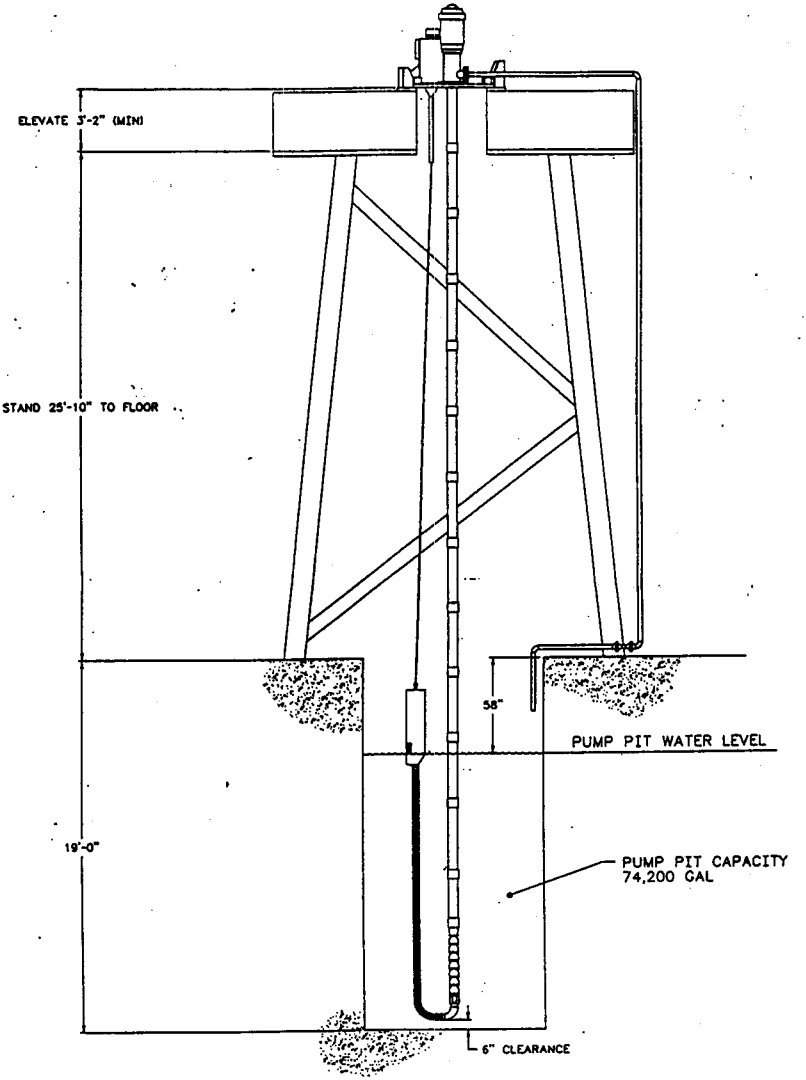
The pump is to be set up in the 'ice house' test area, on the vertical pump tower over the test sump. The 47' 6" long pump will require to be elevated an additional 3' 2" to allow a minimum of 6" clearance of the suction elbow on the sump floor. Set the liquid level at approximately 5 feet below the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

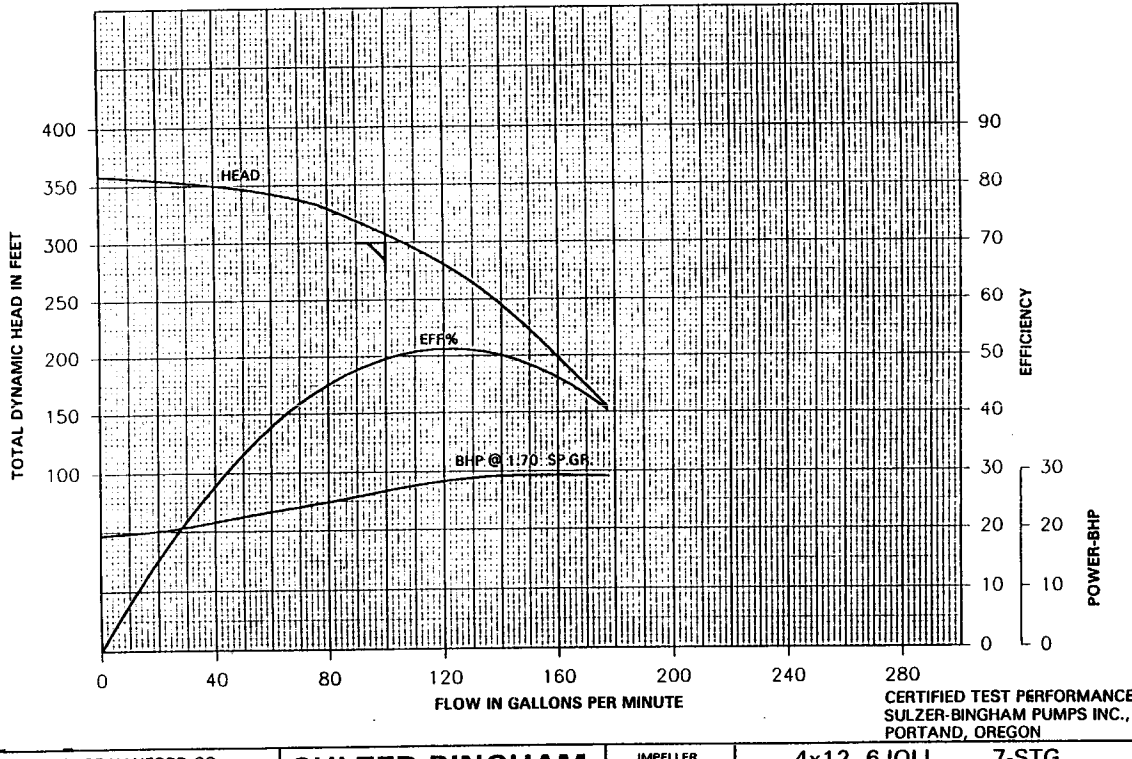
- Measure pump discharge pressure at pipe 3P-3.1, at the pump and use hose to the deadweight tester in the control room.
- Measure differential pressure of the venturi with a 25 LB. Barton differential pressure gage, located in the control room.
- Power is to be measured with a wattmeter, in the control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

49848



CERTIFIED TEST PERFORMANCE
SULZER-BINGHAM PUMPS INC.,
PORTAND, OREGON

WESTINGHOUSE HANFORD CO. SLUDGE TRANSFER DECANT PUMP PUMP #: 101T243	**SULZER BINGHAM PUMPS INC** TW 12/20/94	IMPELLER MAX DIA	4x12 6JOLL 7-STG.			
		DIA IMPELLER 3.80"	IMPLR. PATT.	3570 RPM		
		EYE AREA SQ IN		CURVE NO. 49848	REV	

III. TEST DATA

SULZER BINGHAM PUMPS INC

TEST DEPARTMENT - TEST DATA SHEET

CURVE NO. 49844

PUMP SIZE & TYPE	STAGES	CUSTOMER	PUMP TESTED
4 x 12 6 JOLL	7	Westinghouse Hanford Company	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	68	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 P 2"VENTURI F= 39.53 PSI	GPM	Hv 29.28 PER 1000	GAGE TO GAGE	DISCH PSIG	SUCT PSIG	TDH (FT H2O)	POWER WATT	B.H.P.	PUMP EFF	AT FIELD SPEED/SP.GR. FLOW IN GPM	T.D.H. IN FEET	POWER IN BHP
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	3576	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	256.3	255	17.1	50.8%	134.4	256.6	29.1
7	3567	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
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Bob Faulkner 12/21/94
Q.E.

Ron Frew 12/21/94

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

CERTIFIED BY: [signature] 12/21/94

VIBRATION DATA

CUSTOMER: *WESTINGHOUSE HANFORD CO.*

PROJECT: *SLUDGE TRANSFER DECANT PUMP*

SERIAL NO.: *101T243*

SIZE & TYPE: *4x12 6JOLL*

DATE: *12/19/94* BY: *TW*

START: *14:30* STOP: *15:30*

INSTRUMENT: *CSI-2110*

TEST SPEED: *3600*

VIBRATION MEASURED ON DRIVER STAND

	FLOW (GPM)	LOCATION	VELOCITY-IN/SEC ALL PASS	1X	3X	5X		
H	25	X	0.10	0.07	0.05	0.02		
V	25	Y	0.04	0.01	0.02	0.02		
A								
H	52	X	0.10	0.07	0.05	0.02		
V	52	Y	0.04	0.01	0.03	0.02		
A								
H	76	X	0.09	0.07	0.05	0.03		
V	76	Y	0.04	0.01	0.02	0.02		
A								
H	100	X	0.09	0.07	0.04	0.03		
V	100	Y	0.04	0.01	0.02	0.01		
A								
H	179	X	0.08	0.07	0.03	0.03		
V	179	Y	0.04	0.02	0.02	0.01		
A								
H								
V								
A								
H		FORMULA FOR CONVERSION FROM VELOCITY TO DISPLACEMENT: 19100V/CPM=D						
V		V = VELOCITY IN IN/SEC.						
A		CPM = ACTUAL RUNNING SPEED OF 3571 RPM						
H		D = DISPLACEMENT IN MILS						
V								
A				MILS				
H	25	X		0.37				
V	25	Y		0.05				
A								
H	52	X		0.37				
V	52	Y		0.05				
A								
H	76	X		0.37				
V	76	Y		0.05				
A								
H	100	X		0.37				
V	100	Y		0.05				
A								
H	179	X		0.37				
V	179	Y		0.11				
A								
H								
V								
A								

SULZER BINGHAM PUMPS INC

TEST DEPARTMENT - TEST DATA SHEET

PUMP SIZE & TYPE	STAGES	CUSTOMER	PUMP TESTED
4x12 6JOLL	7	WESTINGHOUSE HANFORD COMPANY	101T243

PROJECT: SLUDGE TRANSFER DECANT PUMP

CONDITION	RPM	T.D.H.	GPM	EFF	SP GR	EYE DIA	AREA	DISCH	SUCT ID		TEST BY	DATE	START		STOP
FIELD								3.07			TW	12/20/94	6:15		13:15

TEST MOTOR: JOB-30-3600

STG	IMP PATTERN	VANES	IMP MAX DIA	IMP TEST DIA

RUN-IN TEST

* TOTAL POWER CONSUMPTION

RUN NO	SPEED RPM	CAPACITY P 2"VENTURI F = 39.53 PSI	CAPACITY GPM	Hv 29.28 PER 1000	DISCHARGE PSIG	FEET OF WATER	SUCT FEET OF H20	TDH (FT H20)	POWER WATT	POWER B.H.P. *	TIME	AMPS PHASE 1	AMPS PHASE 2	AMPS PHASE 3	TEMP. DEGREES F. AMB-IENT	TEMP. DEGREES F. LOWER MOTOR BRG.
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
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CERTIFIED TEST PERFORMANCE
SULZER-BINGHAM PUMPS
PORTLAND OREGON
DATED: 12/20/94

CERTIFIED BY:_____

VIBRATION DATA

CUSTOMER: *WESTINGHOUSE HANFORD CO.*

PROJECT: *SLUDGE TRANSFER DECANT PUMP*

SERIAL NO.: *101T243* *RUN-IN TEST*

SIZE & TYPE: *4x12 6JOLL*

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 ALL PASS	1X	3X	5X		TIME
H	100	X	0.10	0.07	0.06	0.04		6:15
V	100	Y	0.05	0.02	0.03	0.02		6:15
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								
H	FORMULA FOR CONVERSION FROM VELOCITY TO DISPLACEMENT: 19100V/CPM=D							
V			V=VELOCITY IN IN/SEC.					
A			CPM= ACTUAL RUNNING SPEED OF 3571 RPM					
H			D=DISPLACEMENT IN MILS					
V								
A								
H			.07 IN/SEC=.37 MILS					
V			.02 IN/SEC=.11 MILS					
A			.01 IN/SEC=.05 MILS					
H								
V								
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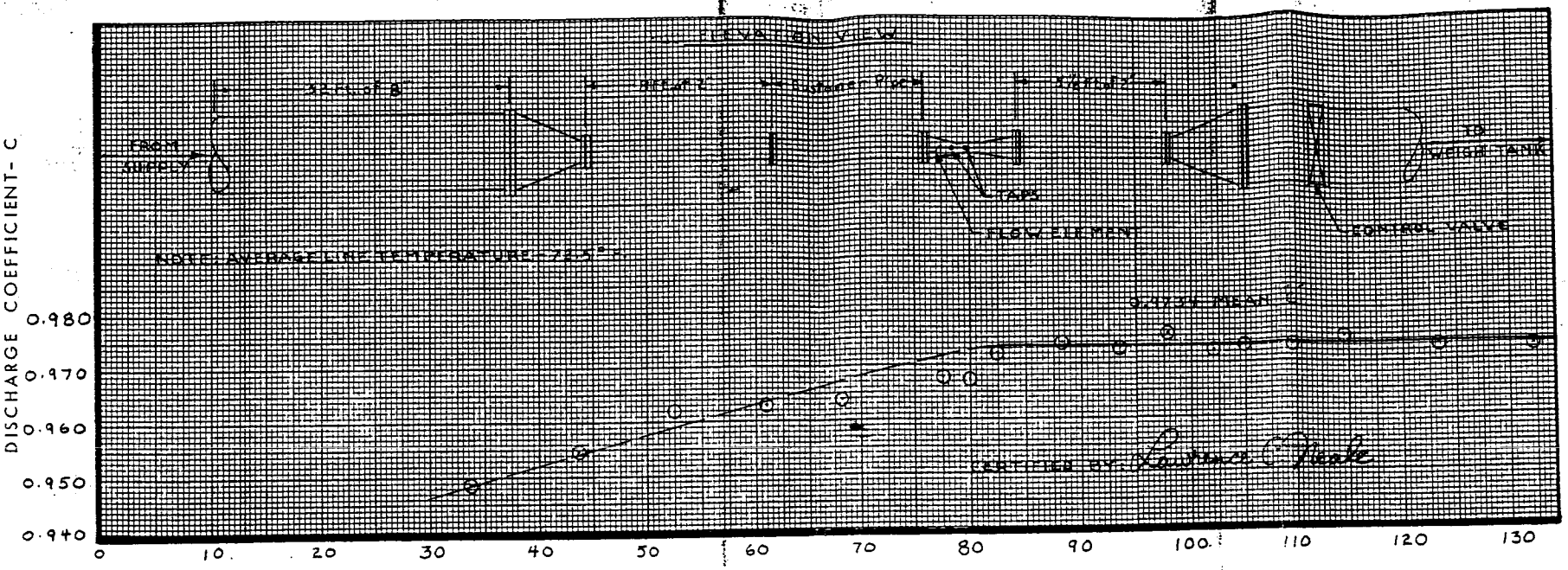
A								

IV. INSTRUMENTATION CALIBRATION



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

Q_a = actual flow rate in cubic feet per second

C = discharge coefficient - dimensionless

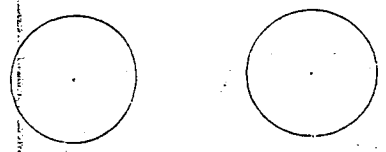
h = pressure differential in feet of water at run temperature

K_M = 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



Upstream Diameter 1.938"

Throat Diameter 0.8746"

DIMENSIONS FURNISHED BY B.-W. Co.

CALIBRATION OF
2" X 7/8" VENTURI METER
BINGHAM – WILLAMETTE COMPANY
P.O. No. 54079
CONTROL No. E 791648
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: Line	Manometer: Hg	Manometer: H_2O	WEIGHT W lbs.	TIME t sec.	DIFFERENTIAL: Reading	DIFFERENTIAL: Feet Line Fluid	FLOW Q cfs.	FLOW Q gpm	$R_D \times 10^{-5}$	C			MARK
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			O
5		"	"		2790	294.529	20.383	21.351	0.1522	68.31	1.155	0.9639			O
6		"	"		2578	305.364	16.220	16.990	0.1357	60.91	1.030	0.9630			O
7		"	"		2548	420.655	8.494	8.897	0.0974	43.72	0.7387	0.9548			O
8		"		73.0	2257	483.558	5.362	5.353	0.0750	33.66	0.5692	0.9486			O
9		"	73.0		2524	346.630	12.091	12.665	0.1170	52.51	0.8880	0.9620			O
10		"	"		3590	334.062	26.017	27.253	0.1727	77.51	1.311	0.9679			O
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	0.9723			⊗
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															O
19															O
20															O
21															O

MARK: ⊗ Points included in the mean C

O Points not included in the mean C

CERTIFIED BY: Lawrence C. Neale

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.K

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

	MAKE	MODEL	SERIAL#	DUE DATE
1	FLUKE/SOLN	8500	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: Joseph R. Cinella Jr.

Instrument Technician

Form No. 681-6

SULZER BINGHAM PUMPS INC.

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

ENTERED DEC 07 1994

INSTRUMENT LAB

CERTIFICATE OF CONFORMANCE/CALIBRATION

940517

CERTIFICATION NO.

DATE: 12-6-94

This is to certify that: Make Bingham, Model DWTC,

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: Lab

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	Heise	CMM	29874	4-25-95
2	Heise	CMM	29887	2-9-95
3	Sauber	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 D92.18 Rev. 2 Mfg ___ Date ___ Volume ___

Certified by: Joseph R. Cicalo 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

940384

CERTIFICATION NO.

ENTERED OCT 0 5 1994

DATE: 9-8-94

This is to certify that: Make Raytek, Model Ravenger PM,

Serial No. 1A5515, 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	543.8	544	4	
5			5	
6			6	
7			7	
8			8	
9			9	
10			10	

Instrument primary location: Maint

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	Omega	Omnical	1898	10-25-94
2				
3				
4				

Date due for next calibration:

Date: 3-8-95 Week #: 9510

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 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

940525

CERTIFICATION NO.

DATE: 12-21-94

This is to certify that: Make Sperry, Model SPR-1030,

Serial No. AKE 8887, was inspected and tested by SBPI instrument laboratory personnel and upon receipt was found in the following condition: Good.

CALIBRATION TABLE (Initial)

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

Instrument primary location: Block house

Calibration location: Onsight ____ Laboratory ✓

Note's & Adj: AC Amps Cal'd only
+/- 3% MFG spec
N.A.R

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

	MAKE	MODEL	SERIAL#	DUE DATE
1	HP	3466A	1716A12411	2-11-95
2	RFL	828	562	2-9-95
3	Fluke	805-10	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. SPERRY Date 9-1-94 Volume ✓

Certified by: Joseph R. Cirillo Jr.

Form No. 681-6

Instrument Technician

SULZER BINGHAM PUMPS INC.

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

INSTRUMENT LAB

CERTIFICATE OF CONFORMANCE/CALIBRATION

940401

CERTIFICATION NO.

ENTERED OCT 0 6 1994

DATE: 9-15-94

This is to certify that: Make Weston, Model 329,

Serial No. 44507, 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	1	
2 .201	.2	2	
3 .301	.3	3	
4 .401	.4	4	
5 .501	.5	5	
6 .601	.6	6	
7 .701	.7	7	
8 .802	.8	8	
9 .902	.9	9	
10 1.002	1.0	10	

Instrument primary location: AG / Pumptest

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	Weston	PRW	001	1-27-95
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. Cibella

Instrument Technician

Form No. 681-6

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: 940298

Date of Calibration: 7-25-94

This is to certify that: Make CSI

Model# 3110-30 Serial# 3354

was 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 ☐ _____

CALIBRATION TABLE

Initial Units= G's

After Adj. Units=

@ Hz	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			
5 950	1	.9912		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-S

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	18446	2-14-95
2				
3				
4				
5				
6				

Instrument Primary Location: A6

Notes:

Calibration location: Onsite ☐ Laboratory ☑

Date due for next calibration: 1-29-95

Certified by: Joseph R. Cicalo

Title: INST Tech

Form 681-5

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: 940236

Date of Calibration: 6-2-94

This is to certify that: Make SBPI

Model# 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 Attached

CALIBRATION TABLE

	Initial Units= STD	IUT	%ERROR		After Adj. Units= 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

Pg 1 of 2

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 D92.16 Rev. 4

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

	Make	Model#	Serial#	Due Date
1	Sauter	RC-1631	B28844	3-10-95
2	Troemner	Master Weights	7841.16	1-10-96
3				
4				
5				
6				

Instrument Primary Location: AC/CAP/W18

Notes: N/A

Calibration location: Onsite ☐ Laboratory ☑

Date due for next calibration: 6-2-95

Certified by: Joseph L. Cella

Title: 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 Represenative) 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.E. and O.D.E. 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
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/sfty/hanforddocument file name (optional)

SFS No.

JOB SAFETY ANALYSIS

Page 1 of 2

Project No. DECANT PUMP - A3101	Work Order No. ER3297	Area VENDOR'S	Bldg.
Prepared By M.W. MANDERBACH	Date 1/30/95	KEH No. DECANT - REV. 0	

Scope/Description: PERFORM TESTING ON THE DECANT PUMP AT VENDOR'S SHOP

Emergency Contact Person(s): Primary: TOM DAVIS, SBP
Secondary:

Emergency Radio/Phone No.: (503) 226-5591

Specific Work Location(s):
SULZER BINGHAM PUMPS, PORTLAND, OREGON

KNOWN OR POTENTIAL HAZARDS

	Yes	No	Reference KEH	Reference Contractor		Yes	No	Reference KEH	Reference Contractor
1. Radiation Area Work ✓*		✓	RAD 1		10. Respiratory Hazards ✓		✓	IH 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 10O						
8. Asbestos Inspection Report *		✓	IS 3		✓ = Formal training required				
9. Hazardous Materials ✓		✓	IS 10D		* = Items that require a permit/form/report				

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	✓		READ KEH PROCEDURE IS10 A
9. Wet/Slippery Floors	✓		WEAR NON-SLIP SOLED FOOTWEAR
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.

KEH Supervision

Industrial Safety Representative READ DAVIS KEH TELCON 1/29/95 7:00 AM

N/A
Industrial Hygiene, if required

KEH 0898.01 (11/93) KEF047

SFS No.

JOB SAFETY ANALYSIS (Continued) — Page 2 of 2

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

KEH 0898.02 (05/93) KEF047

KAISER ENGINEERS HANFORD

Title	Number	Revision
	DECANT	0
Approved By	Effective Date	Page
1/30/95	1/30/95	3
Date 1 of 1		

KEH-0305.00 (08/91) (EF) KEF039

APPENDIX C: TEST SPECIFICATION EXCEPTIONS

8 Pages

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

EXCEPTION NO.	Project No.	QTP. No.	Rev.
01	U-101, Decant Pump	WHC-SD-ER3297-TS-001	2
Recorded by	**Organization**	**Date**	**QTP Page No.**
FM Hauck	ICF KH	12-19-94	4
Step No.	**Requirement**		
3.4.6	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 **[X] Exception Accepted-as-is*** **[ ] Other***

***Explanation**

Typical motor loads were at approximately ½ of the rated HP and temperatures have remained constant throughout the Run-in test.

Test Director (name/Org)	Date	Cog Engineer	Date
FM Hauck ICF KH	4/17/96	RJ Steele	4/17/96
QA Engineer	**Date**	**Other**	**Date**
W.J.K. Conway	4/26/96		

EXCEPTION NO.	Project No.	QTP. No.	Rev.
02	U-101, Decant Pump	WHC-SD-ER3297-TS-001	2
Recorded by	**Organization**	**Date**	**QTP Page No.**
FM Hauck	ICF KH	12-19-94	4
Step No.	**Requirement**		
3.4.7	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 **[X] 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)	Date	Cog Engineer	Date
FM Hauck ICF KH	4/17/96	DW Stacks 4/17/96	4/17/96
QA Engineer	**Date**	**Other**	**Date**
J. K. Condray	4/26/96		

EXCEPTION NO.	Project No.	QTP. No.	Rev.
03	U-101, Decant Pump	WHC-SD-ER3297-TS-001	2
Recorded by	**Organization**	**Date**	**QTP Page No.**
FM Hauck	ICF KH	12-19-94	5
Step No.	**Requirement**		
4-1	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 **[X] 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)	Date	Cog Engineer	Date
FM Hauck ICF KH	4/17/96	JW Stacha	4/17/96
QA Engineer	**Date**	**Other**	**Date**
J K Conaway	4/26/96		

EXCEPTION NO.	Project No.	QTP. No.	Rev.
04	V-101, Decant Pump	WHC-SD-ER3297-TS-001	2
Recorded by	**Organization**	**Date**	**QTP Page No.**
FM Hauck	ICF KH	12-19-94	6
Step No.	**Requirement**		
4.3.4	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 **[X] Exception Accepted-as-is*** **[ ] Other***

***Explanation**

Either measurement is satisfactory for determining the electrical power consumed.

Test Director (name/Org)	Date	Cog Engineer	Date
FM Hauch ICF KH	4/17/96	DW Stacks	4/17/96
QA Engineer	**Date**	**Other**	**Date**
D.K. Condray	4/26/96		

EXCEPTION NO.	Project No.	QTP. No.	Rev.
1B	U-101, Decant Pump	WHC-SD-ER3297-TS-001	2
Recorded by	**Organization**	**Date**	**QTP Page No.**
Chris Winkler	WHC OPS	3-1-95	8
Step No.	**Requirement**		
4.4.2.B-1	**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

[X] Retest Approved and Accepted **[ ] Exception Accepted-as-is*** **[ ] Other***

***Explanation**

Test Director (name/Org)	Date	Cog Engineer	Date
J.M. Hanchar / CF IKH	4/17/96	D.W. Stacks	4/17/96
QA Engineer	**Date**	**Other**	**Date**
J.K. Gardner	4/26/96		

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

[X] Retest Approved and Accepted **[ ] Exception Accepted-as-is*** **[ ] Other***

***Explanation**

Test Director (name/Org)	Date	Cog Engineer	Date
WM Ranch ICF KH	4/17/96	TW Steele	4/17/96
QA Engineer	**Date**	**Other**	**Date**
J.K. Conley	4/26/96		

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

EXCEPTION NO.	Project No.	QTP. No.	Rev.
3B	U-101, Decant Pump	WHC-SD-ER3297-TS-001	2
Recorded by	**Organization**	**Date**	**QTP Page No.**
Chris Winkler	WHC OPS	3-1-95	11,12
Step No.	**Requirement**		
4.4.4.A1-5, B1-7	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*** **[X] Other***

***Explanation**

Software change. No retest required

Test Director (name/Org)	Date	Cog Engineer	Date
JM Hamish ILFKH	4/17/96	JW Steele	4/17/96
QA Engineer	**Date**	**Other**	**Date**
D.K. Condray	4/26/96		

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

ENGINEERING CHANGE NOTICE

Page 1 of 2

COMPLETE

1. ECN 626155

Proj. ECN

2. ECN Category (mark one)	3. Originator's Name, Organization, MSIN, and Telephone No.	3a. USQ Required?	4. Date
Supplemental [ ] Direct Revision [X] Change ECN [ ] Temporary [ ] Standby [ ] Supersedure [ ] Cancel/Void [ ]	T.W. Staehr, 73530, H5-61, 372-3013	[ ] Yes [X] No	11/8/95
	5. Project Title/No./Work Order No. SLUDGE WASHING DECANT PUMP	6. Bldg./Sys./Fac. No. 241-AZ	7. Approval Designator Q
	8. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-ER3297-TS-001, Rev. 3	9. Related ECN No(s). 197434	10. Related PO No. NA

11a. Modification Work	11b. Work Package No.	11c. Modification Work Complete	11d. Restored to Original Condition (Temp. or Standby ECN only)
[ ] Yes (fill out Blk. 11b) [X] No (NA Blks. 11b, 11c, 11d)		Cog. Engineer Signature & Date	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	[X]	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	S.G. Romero	S2-47
T.K. Cordray	G1-50	T.W. Staehr	H5-61
F.M. Hauck	S2-47	G.R. Tardiff	S5-05
G.T. Maclean	H5-49		
M.W. Manderbach	S2-47		
M.J. Ramos	S2-47		

RELEASE STAMP

OFFICIAL RELEASE 58
BY WHC
DATE NOV 10 1995
Sta. #

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

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A-7900-013-1

WHC-SD-EN3297-IRP-001, REV 0

ENGINEERING CHANGE NOTICE

1. ECN (use no. from pg. 1) 626155

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

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

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

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

Document Number/Revision	Document Number/Revision	Document Number Revision

20. Approvals

OPERATIONS AND ENGINEERING	Signature	Date
Cog. Eng.	TW Steele	11/8/95
Cog. Mgr.	Darryl Lambert	11/10/95
QA	W Steele for T.K. Cordray per telecon	11/10/95
Safety		
Environ.		
Other		

ARCHITECT-ENGINEER	Signature	Date
PE		
QA		
Safety		
Design	JM Damsker	11/10/95
Environ.		
Other	GS Romero	11/10/95

DEPARTMENT OF ENERGY

Signature or a Control Number that tracks the Approval Signature

ADDITIONAL

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 11/10/95

Kara Broz

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 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.

8. RELEASE STAMP

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RECORD OF REVISION	(1) Document Number WHC-SD-ER3297-TS-001	Page i

(2) Title
Test Specification for Decant Pump and Winch Assembly

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release	
		(5) Cog. Engr.	(6) Cog. Mgr. Date
0	(7) EDT-605592 6/9/94		
1	Incorporates ECN 611893		
2	Incorporates ECN 616681		
3	Incorporates ECN 197434		
RS 4	Incorporates ECN 626155	D.J. Steele	Barry Lambert 11/10/95

TEST SPECIFICATION
FOR DECANT PUMP AND WINCH ASSEMBLY

TABLE OF CONTENTS

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

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.

Section No.	Description
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 AZ1D1-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 0 and latest ECN).

H-2-821436, H-2-621437, H-2-821438 (sheets 1-3) and H-2-821439; as well as, instrumentation 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 winch on power rack. Connect 460-480VAC 3A circuit from size 0 reversing starter on power rack to winch 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, WHC-SD-ER3297-TRP-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

(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)

(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

✓ *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 C1 for Remote Mode.

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 teat 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.

✓ 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.*

1/10/96 JKC 8. While pump is running push Pump E-Stop (PLC input X55 off). Pump should immediately stop running and appropriate alarm should annunciate.

1/10/96 JKC 9. Release Pump E-Stop. Pump should remain off.

JKC 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 JKC 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 JKC 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 JKC 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.

1/10/96 JKC 14. Repeat Step C10 in Remote/Auto Mode.

1/10/96 JKC 15. Repeat Step C11 in Remote/Auto Mode.

1/10/96 JKC 16. Repeat Step C12 in Remote/Auto Mode.

1/10/96 JKC 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 ✓ 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 ✓ 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.

1/12/96 11. Lower flow to below 40 GPM (Pump Flow Rate Lo-Lo alarm setpoint). Pump should stop immediately and the "PUMP STOPPED ON LOW FLOW CUTOUT" alarm message should be displayed and the alarm annunciated.

1/12/96 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 CUTOUT" alarm message should be displayed and the alarm annunciated.

1/10/96 13. Repeat Step C9 in Local/Auto Mode.

" 14. Repeat Step C10 in Local/Auto Mode.

" 15. Repeat Step C11 in Local/Auto Mode.

" 16. Repeat Step C12 in Local/Auto Mode.

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

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.

✓ 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 ✓ JRC 13. While winch is raising floating intake push Winch E-Stop (PLC input X56 off). Winch should stop in place. Appropriate alarm should annunciate.

✓ 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.

1/10/96 ✓ 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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✓ 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 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.

1/12/96 1. Place system in Remote mode and simulate the liquid level to a value greater than the maximum float height of 285" (PLC#).

1/12/96 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".

1/10/96	JKC	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.
1/10/96	JKC	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.
1/10/96	JKC	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 600" (PLCV).
1/10/96	JKC	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.
1/10/96	JKC	7.	Repeat Step F5 in Manual mode.
1/10/96	JKC	8.	The Loose Cable Alarm should annunciate. Test the winch UP and DOWN buttons.
1/10/96	JKC	9.	Put the pump in Auto mode. Lower the tank level signal to less than 66". 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."
1/10/96	JKC	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.
1/10/96	JKC	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.
1/10/96	JKC	12.	Attempt to restart pump. Pump should not start. Push Confirm button. Alarm should disappear. Attempt to restart pump. Pump should start. Stop pump.
1/10/96	JKC	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.
1/10/96	JKC	14.	Simulate level between 364-370". (PLCV setpoint) HI liquid level alarm should annunciate. Acknowledge alarm.
1/10/96	JKC	15.	Set the liquid level to above 370". (PLCK setpoint) HI-HI liquid level alarm should annunciate. Acknowledge alarm.
1/10/96	JKC	16.	Set the liquid level to between 24-66". (PLCK setpoint) LO liquid level alarm should annunciate. Acknowledge alarm.

1/12/96 17. Set the liquid level to below 24". (PLCV setpoint) LO-LO liquid level alarm should annunciate. Acknowledge alarm.

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 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.

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-01Tests in Remote Mode (Using PC)

[1] NOTE: The turbidity reading can be temporarily raised above the Hi-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

[2] ✓ 1. Click on AUTO button. AUTO button should be highlighted in light blue.

[2] ✓ 2. Click on MAN button. MAN button should be highlighted in light blue.

[2] ✓ 3. Repeat Step A1 using keyboard controls (Shift-F5).

[2] ✓ 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."*

✓ 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] ✓ JVC 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.

1/10/96 [1] ✓ JVC 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.

1/10/96 [1] ✓ JVC 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.

1/10/96 [1] ✓ JVC 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.

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".

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	"Rake 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

12/22/95

___ 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).

12/22/95

___ 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.

12/22/95

___ 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: 1 1 . 4 feet.

12/22/95

___ 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.

12/22/95

___ 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: 2 1 . 8 feet.

12/22/95

___ 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: 3 5 . 8 feet.

12/22/95

___ 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.

12/22/95

___ 9. Adjust the TIME (MIN.) rotary dial to 6 minutes (5 minutes minimum and 25 minutes maximum)

1/10/96

___ 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.

1/10/96

___ 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.

1/10/96

___ 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 JKC 1. Place SSM in manual by clicking on MAN button with mouse. MAN button should be highlighted in light blue.

1/10/96 JKC 2. Repeat test A1 with AUTO button. The AUTO button should be highlighted in light blue.

1/10/96 JKC 3. Repeat test A1 using keyboard controls (F6).

1/10/96 JKC 4. Repeat test A2 using keyboard controls (F5).

B. Up Control

1/10/96 JKC 1. Place the Motor Control switch in the AUTO position. When the probe begins its descent proceed to step 2.

1/10/96 JKC 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 postion.

1/10/96 JKC 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 JKC 4. Repeat test B2 using keyboard controls (F6 and F7).

1/10/96 JKC 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 (clarities 0-19, respectively) with the new values. These values are scaled and rounded to nearest integer value and placed in registers V150 to V169 (clarities 0-19, respectively). It is these rounded values which are displayed by the PC and OIP.

1-10-96 JKC 1. Using TISOFT program enter 0 value for registers V66 to V85. On SSM screen verify that all profile clarities are at 0 value.

1-10-96 JKC 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 JKC 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 JKC 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 JKC 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 JKC 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 JKC 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 JKC 1. With SSM in Local/Manual mode, push F5, the UP button. The probe is raised to the fully retracted position.

1/10/96 JKC 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].

1/12/96 JKC 1. Using TISOFT program enter 0 value for registers V66 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"

1/10/96 WA JKC 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

1/10/96 WA JKC 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.

1/10/96 WA JKC 2. With pump not running and JT-01 powered, record the amperage shown on the control screen. Reading = 0 A.

1/10/96 WA JKC 3. With pump running at normal flow of ~100 GPM, record the amperage shown on the control screen. Reading = 23 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 jeoprody. Without the LSW interlock, it is possible to

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 JWA JKC 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 JWA JKC 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 JWA JKC 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 JWA JKC 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 JWA JKC 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.

JWA JKC 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 EE PLACED IN SETUP MODE WITH UPPER SAFETY WEIGHT EXCEEDED".

JWA JKC 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.

JWA JKC 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.

JWA JKC 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.

JWA JKC 10. RESET the bypass. Set weight above 45# again, winch should begin lowering and continue until OW is reached.

1/10/96 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 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 13. Repeat Step A1 using keyboard controls (F11).

" 14. Repeat Step A2 using keyboard controls (Y, L, U, P and Ctrl-F1 respectively).

" 15. Repeat Step A3 using keyboard controls (Ctrl-F3).

" 16. Repeat Step A4 using keyboard controls (F12).

" 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 jeoprody. 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 1. Starting at an access level below 9000, select Maintenance Menu screen by clicking on the MAINT. MENU button. Maintenance Menu screen appears.

1/12/96 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 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 4. An alarm indicating that the cable length 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 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.

1/10/96 6. Place the winch in MANUAL mode. Exceed the UL by simulating signal less than the setpoint. The UL alarm should annunciate. Acknowledge the alarm. Attempt to raise the float by clicking on the UP button. Winch should not respond.

1/10/96 7. With BYPASS selected and UL tripped, click on the winch UP button. The winch should begin raising the float.

1/10/96 8. RESET the bypass and raise the simulated cable length above the UL. Alarm and status messages should disappear.

" 9. Repeat Step B1 using keyboard controls (F11).

" 10. Repeat Step B2 using keyboard controls (Y, L, U, P and Ctrl-F1 respectively).

" 11. Repeat Step B3 using keyboard controls (Ctrl-F5).

" 12. Repeat Step B4 using keyboard controls (F12).

" 13. Repeat Step B5 using keyboard controls (Ctrl-F6).

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 jeoprody. 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 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 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.

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 (Ctrl-F7).

10. Repeat Step C5 using keyboard controls (Ctrl-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.

1/10/96 16. RESET the USL bypass and close the circuit to energize it (ZSH-01 input true). Alarm and status messages should disappear.

1/10/96 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.

1/10/96 18. Repeat Step C11 using keyboard controls (Ctrl-F9).

1/10/96 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.

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.

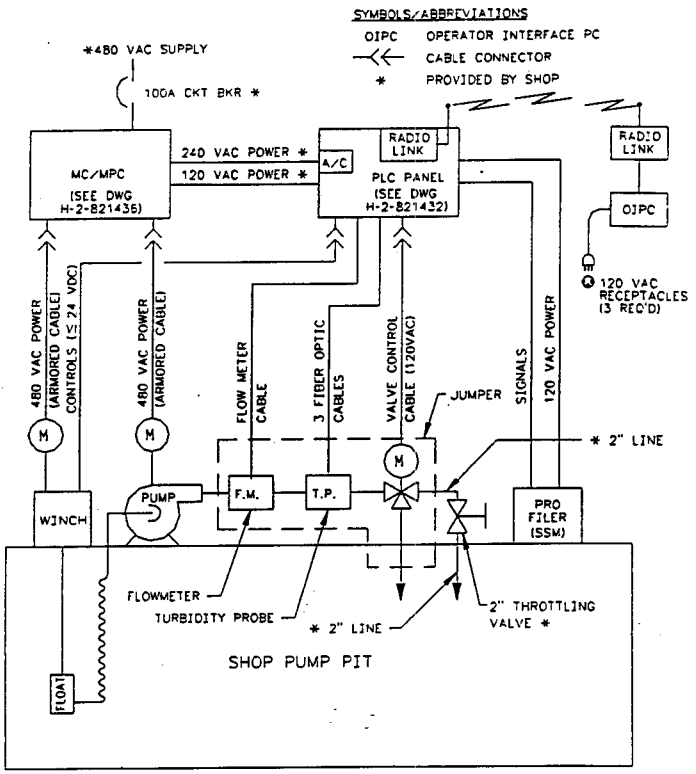
7.0 NOTES

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



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 _____

Pump Identification No 6411-2225-IP-TXI-XCC-3

Motor Full Load Rated AMPS 35.5

Motor Rated Horsepower 30

Raised RPM 3505

Manufacturer PEABODY FLOWAY

No of Stages 7

Motor Service Factor 1.15

Service S G 1.2

Purchased Order No MBL-XBB-419574

Performance Test Requirements

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

Run-In Requirements

1. Flow 100 GPM for 7 Hrs Continuous X
2. Flow _____ GPM for _____ Hrs Not Continuous _____
3. Motor Bearing temperature 180 °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. Adjusment

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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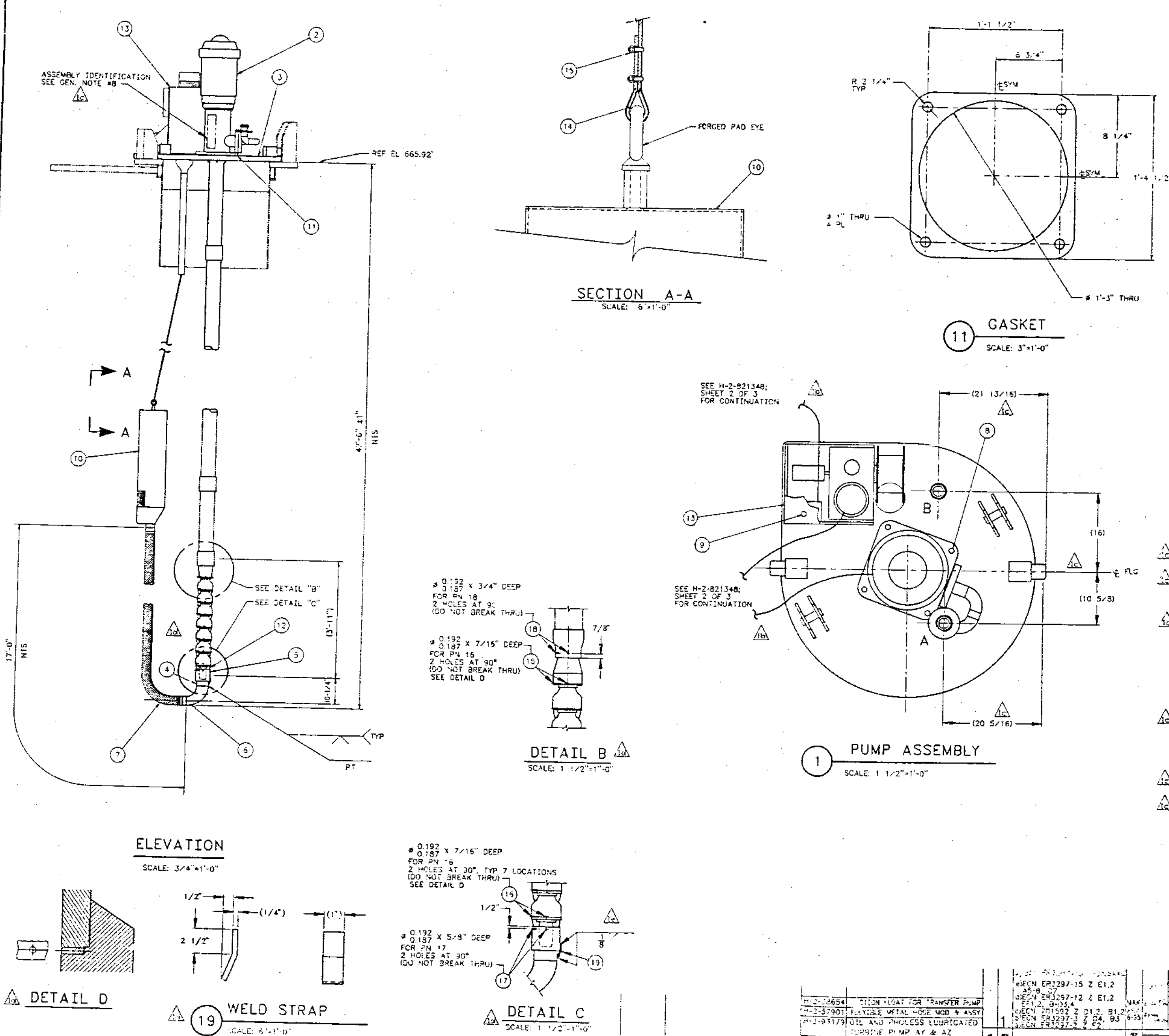


QTY	PT NO	DESCRIPTION	MATERIAL
X	1	PUMP ASSEMBLY	———
1	2	PUMP	H-2-93173-2
1	3	FLANGE ASSEMBLY	H-2-820775
AR	4	PIPE, 4" SCHED 40S, TOE	ASTM A312 GR TP 304L
1	5	COUPLING, FULL, 4" CLASS 3000, THREADED	ASTM A182 GR F 304L, SST
1	6	RDCR ELBOW, 4" x 3" SCHED 40S	ASTM A403 WP-S 304L
AR	7	FLEX METAL HOSE	H-2-57901 7
4	8	SCREW, HEX CAP OR FINISHED HEX BOLT 5/8"-11UNC-2A X 2" LG (PER ANSI/ASME B18.2.1).	ASTM A449, TYPE 1, C.S.
4	9	BOLT, HEAVY HEX HEAD, 1/2"-13UNC-2A X 2" LG	ASTM A307, GR. B, C.S.
1	10	SUCTION FLOAT	H-2-821715
1	11	GASKET, 1/8" THK, 60 DUROMETER	ETHYLENE PROPYLENE
1	12	SUCTION CASE	SEE NOTE 5
1	13	LOAD SENSING WINCH	SEE SHEET 2
1	14	WIRE ROPE THIMBLE	SEE NOTE 6
2	15	WIRE ROPE CLIP	SEE NOTE 7
16	16	PIN, SLOTTED SPRING 3/16" X 7/16" LONG	SAE 51420 COR. RESIST. STEEL
2	17	PIN, SLOTTED SPRING 3/16" X 5/8" LONG	SAE 51420 COR. RESIST. STEEL
2	18	PIN, SLOTTED SPRING 3/16" X 3/4" LONG	SAE 51420 COR. RESIST. STEEL
1	19	WELD STRAP, 1" X 5" X 1/4" THICK	ASTM A240/A276 TYPE 304L
1	20	WELD ROD 1/8" DIAMETER	300 SERIES SST

NOTES:

1. WELD AND INSPECT PER ASME/ANSI B31.3, LATEST REVISION. VT ALL WELDS AT FINAL PASS. DOCUMENT WELDS PER APPROVED INSPECTION PLAN. PT ALL DESIGNATED WELDS AT FINAL PASS.
2. PREPARE AND PAINT ALL EXPOSED CARBON STEEL SURFACES, ABOVE THE PUMP FLANGE (PN#3), EXCEPT HOLES AND THREADED AREAS) WITH TWO COATS OF VALSPAR VAL-CHEM MASTIC 75 SERIES PAINT. COLOR SHALL BE GREY. PAINT SHALL BE APPLIED IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS
3. DELETED
4. DIMENSIONS ARE IN INCHES. TOLERANCES ARE AS FOLLOWS UNLESS OTHERWISE NOTED:

FRACTIONS	± 1/8"
DECIMALS	± .06"
ANGLES	± 2°

5. SUCTION CASE IS TO REPLACE EXISTING SUCTION BELL. THE SUCTION CASE END CONDITION WILL BE A 4" NPT MALE SUCTION CASE W/NIC FILLED CARBON BRG, PER PEABODY FLOWAY PART NUMBERS #752645-1051 AND #751906-1165.
6. McMASTER CARR PN 3868T27 OR EQUIVALENT.
7. McMASTER CARR PN 8913T13 OR EQUIVALENT.
8. IDENTIFY ASSEMBLY #1, PER SPEC. HS-SS-0015, TYPE 8, WITH DRAWING NUMBER AND DRAWING REVISION NUMBER, IN LOCATION INDICATED. USE 1/2 TO 3/4 INCH HIGH BLACK CHARACTERS ON YELLOW BACKGROUND.
9. VERTICAL TURBINE PUMP ASSEMBLY RUN-IN AND TESTING SHALL BE IN ACCORDANCE WITH SPEC. WHC-SD-ER3297-TS-001.

DESIGNED	R MOSSBRUCKER
DESIGN CHECKER	RS ULBRICHT
CHECKED	RD CAMPBELL
	D LUNDGREN
	D AXFORD
	RC NISMUTH
SAFETY CLASS	3
USE	CONSTRUCTION
	605582

U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
ICF KAISER HANFORD COMPANY

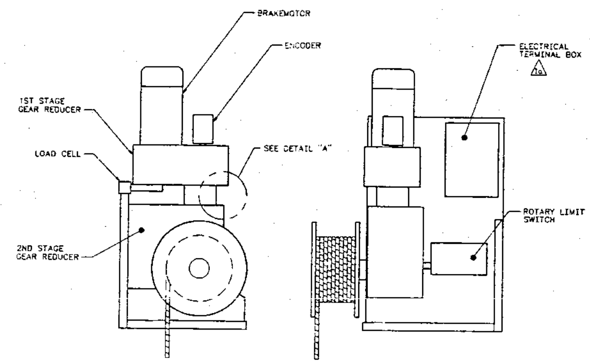
PIPING
DECANT PUMP ASSEMBLY
ELEVATION & DETAILS

PROJECT: SUPERNATE DECANT PUMP

SIZE F | 241-AZ | H-2-820774 | REV 1
SCALE: SHOWN | ER3297 | SHEET 1 OF 2

PLOT SCALE 1=15 | FHCAD

1a DELETED

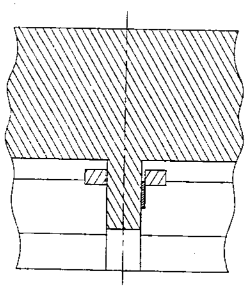


(13) WINCH

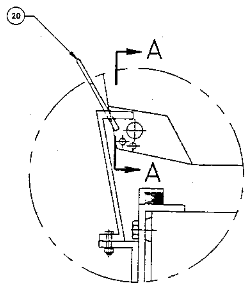
NOTES:

1. FOR NOTES AND BILL OF MATERIAL, SEE SHEET 1
2. THE REQUIREMENTS FOR THE WINCH ARE AS FOLLOWS:
   - A. CONTINUOUS LINE PULL OF 400 LBS MINIMUM.
   - B. LINE SPEED IS 10 FEET PER MINUTE, ± 10% MINIMUM.
   - * C. ROTARY LIMIT SWITCH WITH CONTACT CLOSURE FOR EACH END OF TRAVEL.*
   - D. ALL WIRING BETWEEN DEVICES AND TERMINAL BLOCKS SHALL BE DONE BY THE SELLER.
   - E. THE SELLER SHALL PROVIDE APPROPRIATE INSTRUCTIONS FOR THE EQUIPMENT FURNISHED, INCLUDING A FINAL WIRING DIAGRAM.
   - F. THE WINCH AND MOTOR SHALL BE COATED WITH AN EPOXY/POLYURETHANE SYSTEM FOR A HIGH LEVEL OF CORROSION RESISTANCE.
   - G. 0.5 HP TEFC 460 VAC/3 PHASE/60 HERTZ MOTOR, FLANGE MOUNTED AND DIRECTLY CONNECTED TO THE FIRST STAGE REDUCER.
   - H. FAIL-SAFE, SPRING APPLIED, ELECTRICALLY RELEASED BRAKE DESIGNED TO HOLD THE LOAD IN POSITION WHEN THE MOTOR IS NOT ENERGIZED. LOAD ≤1,000 LBS.
   - I. THE SECOND STAGE GEAR REDUCER SHALL BE SHAFT MOUNTED TO THE FIRST REDUCER.
   - J. A TORQUE ARM WILL BE USED TO PREVENT HOUSING ROTATION AND WILL INCORPORATE A LOAD CELL ASSEMBLY TO MEASURE THE TORQUE REACTION FROM THE SECOND STAGE REDUCER.
   - * K. PROVIDE A WEIGHT/LOAD TRANSMITTER WITH FEEDBACK 4-20 mA SIGNAL PROPORTIONAL AND LINEAR TO THE LINE TENSION & WIRED TO THE LOAD CELL. OUTPUT SIGNAL SHALL BE SPANNED AT 0-500 LBS AND DEMONSTRATED/VERIFIED BY A FACTORY TEST. TRANSMITTER (ELECTRONICS) SHALL BE FURNISHED LOOSE FOR SEPARATE MOUNTING IN PLC CONTROL PANEL BY OTHERS. LOAD CELL SHALL BE WIRED TO TERMINALS IN WINCH TERMINAL BLOCK FOR CONNECTION TO TRANSMITTER. TRANSMITTER AND LOAD CELL SHALL BE FUNCTIONALLY TESTED TOGETHER TO ENSURE CORRECT OPERATION OVER FULL RANGE OF LOAD. (0-500 LBS.)
   - * L. THE RESOLVER SHALL BE MOUNTED TO THE INPUT SHAFT OF THE SECOND STAGE REDUCER.
   - M. PROVIDE 50' MINIMUM OF 300 SERIES STAINLESS STEEL 3/16" CABLE WITH A MINIMUM BREAKING STRENGTH OF 4000 LBS.
   - N. THE WINCH DRUM SHALL BE GROOVED FOR WORKING TRAVEL OF 25' MINIMUM.
   - O. THE FRAME SHALL HAVE 4 MOUNTING HOLES FOR 1/2" BOLTS. THE BOLT HOLE PATTERN SHALL BE AS SHOWN ON H-2-820775.
   - P. ALL EQUIPMENT PROVIDED SHALL BE FULLY ASSEMBLED AND FACTORY TESTED WITH BUYER'S WITNESS PRESENT, IF BUYER FEELS IT NECESSARY TO WITNESS TEST.
   - Q. ALL DEVICES ON WINCH SHALL BE ABLE TO WITHSTAND THE FOLLOWING ENVIRONMENTAL CONDITIONS FOR APPROXIMATE LIFETIME OF 10 YEARS:
     TEMPERATURE: 2-160°F
     HUMIDITY: 0-100%
   - R. SELLER SHALL USE RADIATION RESISTANT WIRE INSULATION FOR ALL WIRING
   - S. THE WINCH SHALL BE A JEAMAR HEAVY DUTY ELECTRIC WINCH, MODEL # E400T(S).
   - T. ANY SUBSTITUTION OF EQUIPMENT SPECIFIED SHALL HAVE PRIOR APPROVAL OF THE ENGINEER.

   1a 1c * THESE DEVICES SHALL BE WIRED TO TERMINALS IN A NEMA 4X, STAINLESS STEEL TERMINATION BOX. ALL DEVICES AND TERMINATION BOX SHALL BE INTEGRALLY MOUNTED ON THE WINCH FRAME. SEE H-2-821432, SHEET 1 OF 4 FOR WINCH WIRING DIAGRAM.
3. 1b PART 20 IS FOR TRANSPORTATION AND INSTALLATION OF THE WINCH/PUMP ASSEMBLY ONLY. IT SHALL BE REMOVED PRIOR TO WINCH/PUMP OPERATION.
4. ATTACH A METAL TAG WITH WIRE TO PART 20 THAT READS "REMOVE BEFORE WINCH/PUMP OPERATION"
5. 1b ORIENTATION OF PART 20 SHALL BE APPROXIMATELY 30° FROM THE VERTICAL AS SHOWN IN DETAIL A.

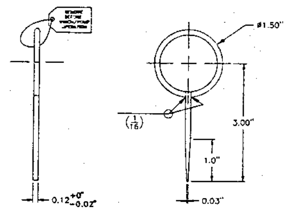


1b SECTION A-A



1b DETAIL A

SHOWN 180° FROM VIEW IN ZONE D5 FOR CLARITY OF PART 20

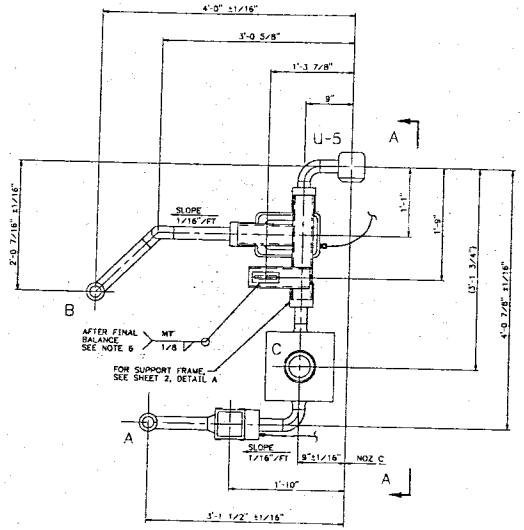


(20) ANTI-ROTATION WEDGE PIN

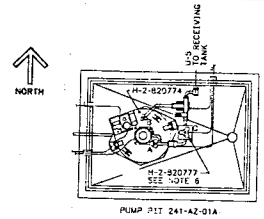
SCALE 1-1/2"=1'-0"

DESIGNER R. MOSSBRUCKER	SAFETY CLASS 3	USE CONSTRUCTION
RS ULBRICHT		605582
CHECKED RD CAMPBELL	U.S. DEPARTMENT OF ENERGY RICHLAND OPERATIONS OFFICE ICF KAISER HANFORD COMPANY	
SAFETY D LUNDGREN	PIPING DECANT PUMP ASSEMBLY ELEVATION & DETAILS	
JD AXFORD		
RC NIEMUTH		
REVIEW NO. 6	SUPERNATE DECANT PUMP	
	F 241-AZ 8404 H-2-820774	REV 1
DATE 3-31-94	SCALE NONE ER3297	SHEET 2 OF 2

PLOT SCALE: 1=8 KEHCAD

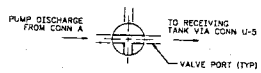


PLAN
SCALE:1 1/2"=1'-0"

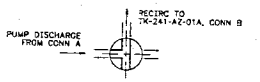


PUMP PIT 241-AZ-01A

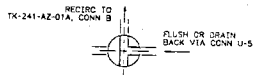
KEY PLAN
SCALE: NONE



DECANT/BACKFLUSH MODE



RECIRCULATION MODE



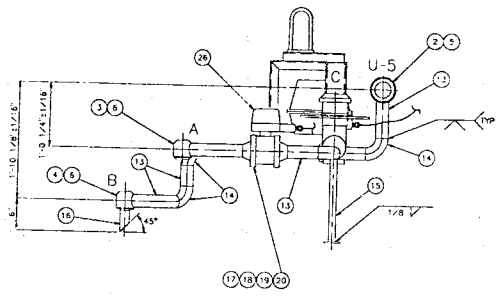
BACKFLUSH/RECIRCULATION MODE

FLOW PATTERN
3 WAY VALVE
SCALE: NONE

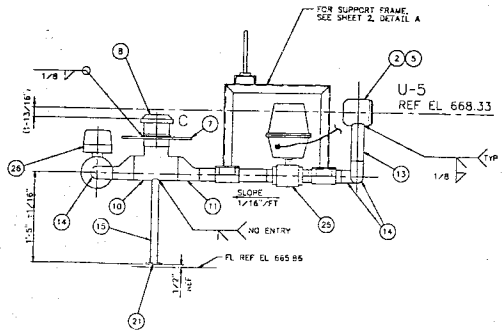
QTY	ITEM NO	DESCRIPTION	MATERIAL
X	1	ASSEMBLY	
1	2	CONNECTOR, HORIZONTAL 3"	H-2-32430-3
1	3	CONNECTOR, VERTICAL 2"	H-2-32420-2
1	4	CONNECTOR, VERTICAL 2"	H-2-32420-5
1	5	GASKET, 3" TYPE III	H-2-3997-7
2	6	GASKET, 2" TYPE III	H-2-3997-6
1	7	KICK-OFF PLATE	H-2-30600-7
1	8	MALE NOZZLE, 4" PUREX	H-2-90187-1
1	9	LIFTING BAIL	H-2-90161-1
1	10	TFE, 4", BTWLD	ASTM A403 WP-S 304L
2	11	REDUCER, 4" X 2", ECCENTRIC, BTWLD	ASTM A403 WP-S 304L
3	12	PIPE 2 1/2" SCHED 40 X 4 1/2" L	ASTM A 106 GR B
AR	13	PIPE, 2" SCHED 40S	ASTM A312 GR TP 304L
5	14	ELBOW, 2" SCHED 40 90° LR BTWLD	ASTM A403 WP-S 304L
AR	15	PIPE, 1" SCHED 40S	ASTM A312 GR TP 304L
AR	16	TUBE, 1 3/4" OD X .120 WALL	ASTM A269 GR TP 304L
2	17	FLANGE, WN RF 2" CLASS 150	ASTM A182 GR F 304L
2	18	GASKET, 4 1/4"OD X 2 1/16"ID X 1/16" THK	ANCHOR PACKING NO. 663-A
4	19	BOLT, HEX 5/8-11 UNC-2A x 5 1/4"L	ASTM A193 GR B8 304
4	20	NUT, HEX 5/8-11 UNC-2B	ASTM A194 GR 8F 303
1	21	BAR, 3" X 1/4" X 3"	ASTM A276 304L
3	22	BAR, 4 1/2" X 1/4" X 4 1/2"	ASTM A36
6	23	BAR, 1 1/2" X 1/4" X 3"	ASTM A36
AR	24	C4 x 5.4	ASTM A36
1	25	BALL VALVE, 2" 3-WAY W/ ELEC ACTUATOR	SEE NOTE 4
1	26	FLOW METER	SEE NOTE 5

NOTES:

1. FABRICATION AND TESTING SHALL BE IN ACCORDANCE WITH HANFORD SPECIFICATION HS-85-6084 REV 8.
2. HYDROSTATIC TEST SHALL BE AT 200 PSIG.
3. JUMPER WEIGHT IS 375 LB APPROX.
4. PBM VALVE 2" MP-H-17-BW-SO/PDCO-H6 FLOW PATTERN NO. 5 WITH ELECTRIC ACTUATOR NO. ER-350-3-4-AE6-AE98
5. MAGNETIC FLOWMETER, RADIOACTIVE WASTE SUPERNATE, 2" FLOWMETER SIZE, ANSI 150 LB MATING FLANGE MOUNTING ACCESSORIES, ELECTRODE MATERIAL: TANTALUM, ELECTRODE TYPE:FLUSH, FLANGELESS DESIGN, FM APPROVED NONINCENDIVE CL 1, DIV 2, NEMA 4X ENCLOSURE, EMPTY PIPE DETECTOR, OPERATING FLOW 100 GPM, MAXIMUM PRESSURE 150 PSI, OPERATING TEMPERATURE 120°F, MAXIMUM TEMPERATURE 183°F. RECOMMENDED MANUFACTURER AND MODEL IS FISCHER & PORTER 10D1475PN12PF29KY12A1111CT, WITH REMOTE INDICATING CONVERTER, FM APPROVED CL 1, DIV 2, NEMA 4X ENCLOSURE W/ 1/2" NPT CONN. 120V 50/60 HZ. ELECTRICAL REQUIREMENTS, 4-20 mA OUTPUT CURRENT, EMPTY PIPE DETECTOR, ±1/2% OF RATE ACCURACY, RECOMMENDED MANUFACTURER AND MODEL IS FISCHER & PORTER 52XM1.5BKKDOAAAC224. SUPPLIER SHALL FURNISH ALL CABLES BETWEEN FLOW TUBE AND TRANSMITTER. CABLE SHALL BE MIN. 50' LONG AND SHALL HAVE RADIATION RESISTANT INSULATION SUCH AS KEVLAR. TEFLON & PVC INSULATION ARE NOT ACCEPTABLE.
6. THIS JUMPER IS TO BE BALANCED AND INSTALLED IN THE PIT WITH JUMPER H-2-820777 ATTACHED.
7. FOR CABLES AND CONNECTORS SEE H-2-820774 SH 2 & H-2-820776 SH 3.



ELEVATION



ELEVATION A-A
SCALE:1 1/2"=1'-0"

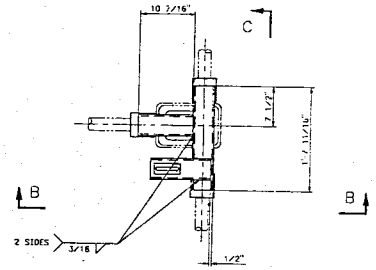
1 ASSEMBLY
SCALE: 1 1/2"=1'-0"

W. P. DANA, P.E.

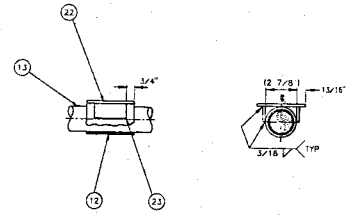
U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
UCP KAISER HANFORD COMPANY

JUMPER ASSEMBLY
241-AZ-01A U5,A,B,(C)

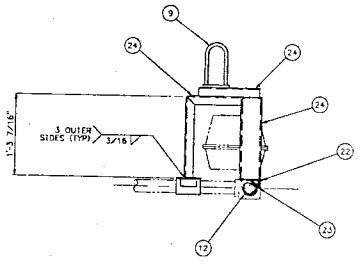
H-2-820776 0



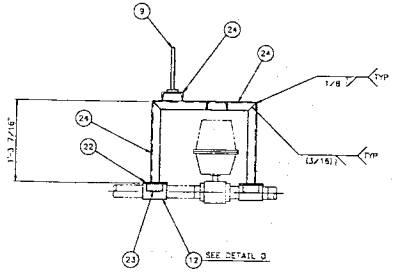
DETAIL A (SHEET 1)
SCALE: 1 1/2"=1'-0"



DETAIL D
SCALE: 3"=1'-0"



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



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

NOTES:

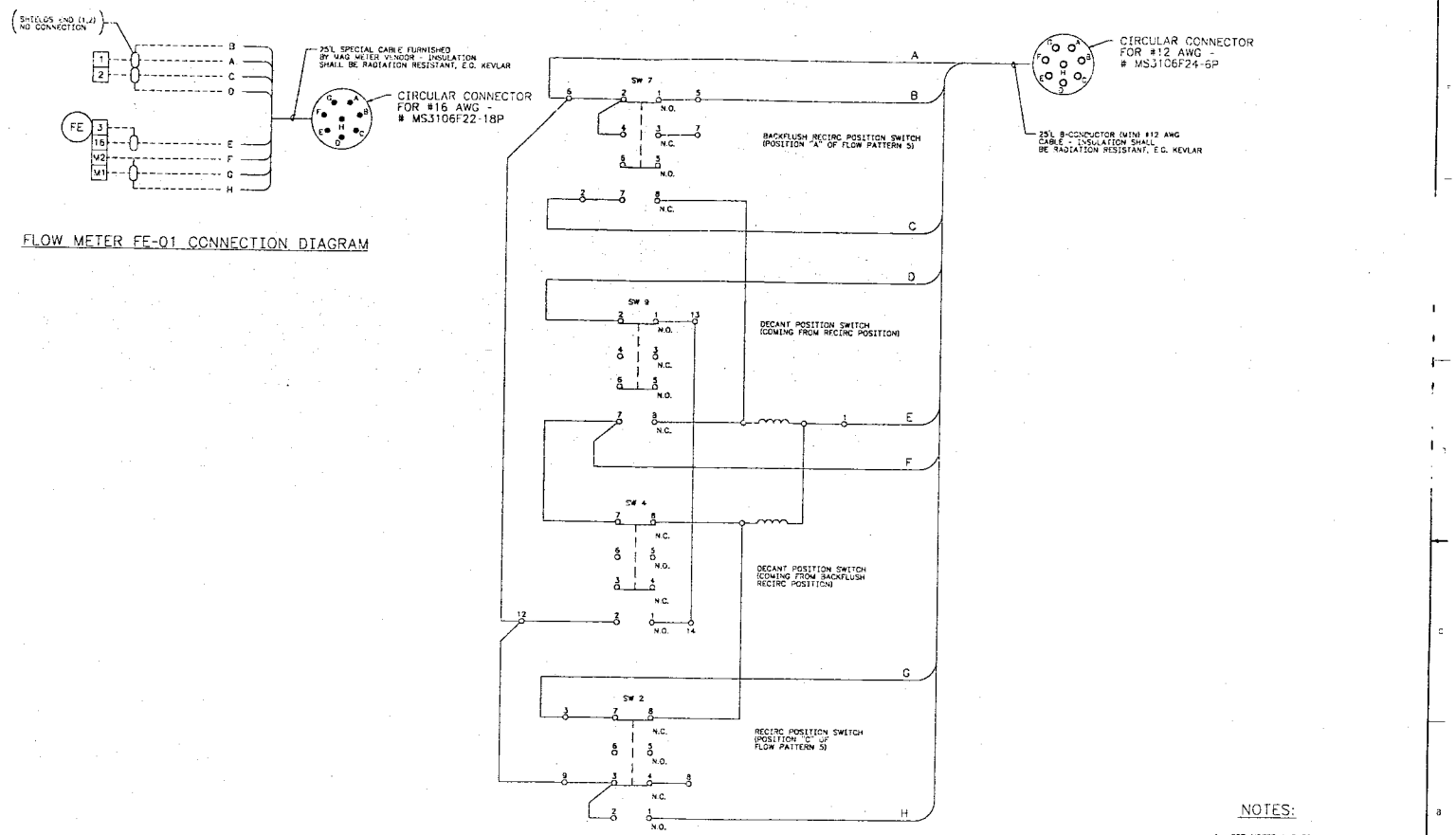
1. FOR NOTES AND BILL OF MATERIAL, SEE SHEET 1.

W. P. DANA, P.E.

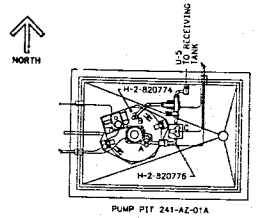
U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
ICF KAISER HANFORD COMPANY

JUMPER ASSEMBLY
241-AZ-01A U5,A,B,(C)

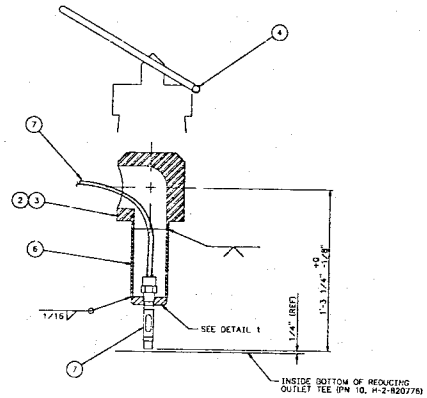
H-2-820776 0


SHIELDS GND (1,2) NO CONNECTION
FE
1
2
3
16
M2
M1
B
A
C
D
E
F
G
H
25'L SPECIAL CABLE FURNISHED BY MAG METER VENDOR - INSULATION SHALL BE RADIATION RESISTANT, E.G. KEVLAR
CIRCULAR CONNECTOR FOR #16 AWG - # MS3106F22-18P
FLOW METER FE-01 CONNECTION DIAGRAM
SW 7
SW 9
SW 4
SW 2
N.O.
N.C.
BACKFLUSH RECIRC POSITION SWITCH (POSITION "A" OF FLOW PATTERN 5)
DECANT POSITION SWITCH (COMING FROM RECIRC POSITION)
DECANT POSITION SWITCH (COMING FROM BACKFLUSH RECIRC POSITION)
RECIRC POSITION SWITCH (POSITION "C" OF FLOW PATTERN 5)
CIRCULAR CONNECTOR FOR #12 AWG - # MS3106F24-6P
25'L 8-CONDUCTOR (MIN) #12 AWG CABLE - INSULATION SHALL BE RADIATION RESISTANT, E.G. KEVLAR
3-WAY MOV-FV-01 CONNECTION DIAGRAM
NOTES:
1. FOR NOTES AND BILL OF MATERIAL, SEE SHEET 1
S. G. ROMERO, P.E.
U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
JUMPER ASSEMBLY
241-AZ-01A U5,A,B,(C)
SUPERNATE DECANT PUMP
H-2-820776
0

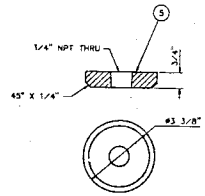
QTY	PT NO	DESCRIPTION	MATERIAL
X	1	ASSEMBLY	
1	2	CONNECTOR, VERTICAL 4" IN 3" OUT	H-2-32440-3
1	3	GASKET, 4" TYPE III	H-2-3997-8
1	4	LIFTING BAIL, FOLDING	H-2-90160-3
1	5	PLATE 3/4"	ASTM A240 304L
AR	6	PIPE, 3" SCHED 40S	ASTM A312 OR TP 304L
1	7	TURBIDITY PROBE W/ CABLE	SEE NOTE 4



KEY PLAN
SCALE: NONE



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



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

NOTES:

1. FABRICATION AND TESTING SHALL BE IN ACCORDANCE WITH HANFORD SPECIFICATION HS-85-0084 REV B.
2. INSTALL IN JUMPER H-2-820776 AND HYDROSTATIC TEST WITH H-2-820776.
3. JUMPER WEIGHT IS 35 LB APPROX.
4. TURBIDITY PROBE PROVIDED BY WHC. CUSTOM SENSORS AND TECHNOLOGY MODEL #5000. THE REQUIREMENTS ARE AS FOLLOWS:

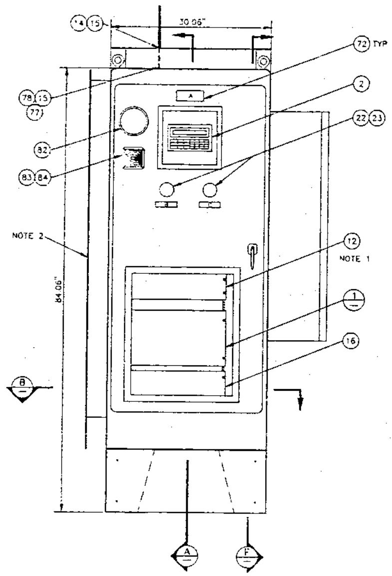
BODY MATERIAL	316 STAINLESS STEEL
MATERIAL IN CONTACT WITH SAMPLE	BODY MATERIAL, SAPPHIRE WINDOWS
OPERATING TEMPERATURE	100 °C
OPERATING PRESSURE	1000 PSIG
TRANSMISSION PATH LENGTH	0-50 mm, AS REQUIRED BY APPLICATION
OPTICAL WAVELENGTH RANGE	400-700 nm (VISIBLE REGION)
FIBER OPTIC CABLE CONNECTIONS	SMA-905 (1/4"-36 THREAD)

W. P. DANA, P.E.

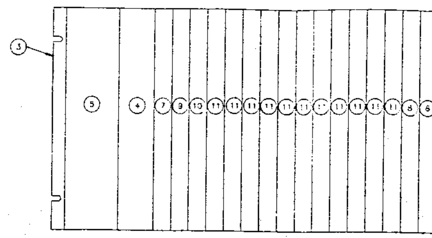
MAR 3 1994

U.S. DEPARTMENT OF ENERGY	
RICHLAND OPERATIONS OFFICE	
JUMPER ASSEMBLY	
241-AZ-01A C	
SUBSURFACE DECANT PUMP	
H-2-820777	0

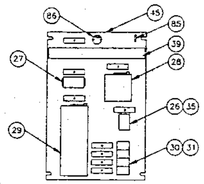
PLOT SCALE: 1:8



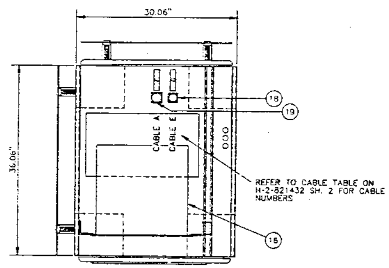
1 ENCLOSURE ASSEMBLY
SCALE: 1-1/2" = 1'-0"



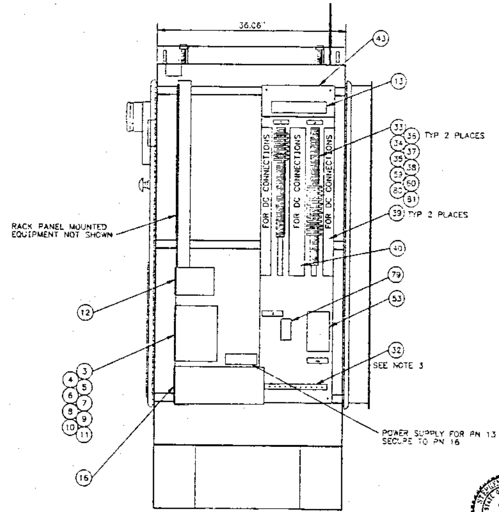
1 DETAIL
NTS



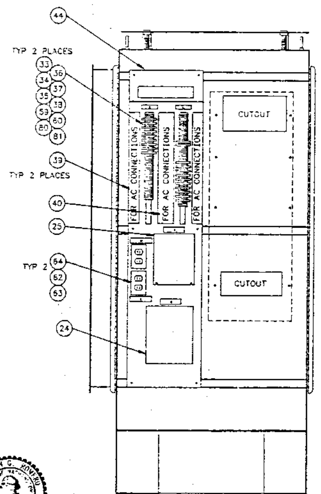
RACK PANEL, REAR VIEW
SCALE: 1-1/2" = 1'-0"



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



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



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

NAMEPLATE LEGEND (PER HPS-1-2-7)

NAMEPLATE	SIZE	LETTER SIZE	LEGEND
A	F X=5" Y=2"	1/4"	DECANT PUMP CONTROL PANEL
B	E	3/16"	WINCH EMERG. STOP
C	E	3/16"	PUMP EMERG. STOP
F	E	3/16"	WINCH CONTROL
G	E	3/16"	FV-01 (MOV)
I	C	3/16"	TB-DC-1
J	C	3/16"	TB-DC-2
K	C	3/16"	TB-AC-1
L	C	3/16"	TB-AC-2
M	E	3/16"	CR-1 DECANT PUMP
N	E	3/16"	CR-2 WINCH DOWN
O	E	3/16"	CR-3 WINCH UP
P	E	3/16"	CR-4 SSM PROBE UP
Q	E	3/16"	WIT-01 (WINCH LOAD)
R	E	3/16"	ZT-01 (CABLE LENGTH)
S	E	3/16"	24VDC POWER SUPPLY
T	E	3/16"	±15VDC POWER SUPPLY
U	E	3/16"	OY-01 (TURBIDITY)
V	E	3/16"	FT-01 (FLOWMETER)
W	E	3/16"	UTILITY OUTLET
X	E	3/16"	UPS ONLY
Y	E	3/16"	TT-01 (PANEL TEMP)
Z	E	3/16"	SSM SERIAL INTERFACE
AA	E	3/16"	HEATER

MATERIAL LIST

QTY	PN	DESCRIPTION	MATERIAL/REFERENCE
X	1	ENCLOSURE ASSEMBLY	
1	2	OPERATOR INTERFACE TERMINAL	MAPLE SYSTEMS 460B
1	3	PLC, 16 SLOT MOUNTING RACK	SIEMENS SIMATIC TI505 PPX:505-6516
1	4	PLC, CENTRAL UNIT	SIEMENS SIMATIC TI505 PPX:555-1101
1	5	PLC, POWER SUPPLY UNIT, 110 VAC IN, 5 VDC OUT	SIEMENS SIMATIC TI505 PPX:505-6660
1	6	PLC, 32 POINT 79-132 VAC DIGITAL INPUT MODULE	SIEMENS SIMATIC TI505 PPX:505-4232
1	7	PLC, 16 POINT 14-30 VDC DIGITAL INPUT MODULE	SIEMENS SIMATIC TI505 PPX:505-4316
1	8	PLC, 16 POINT 2A CONTACT RELAY OUTPUT MODULE	SIEMENS SIMATIC TI505 PPX:505-4916
1	9	PLC, 8 ANALOG INPUT/4 ANALOG OUTPUT MODULE	SIEMENS SIMATIC TI505 PPX:505-7012
1	10	PLC, BASIC MODULE	SIEMENS SIMATIC TI505 PPX:505-7101
11	11	PLC, I/O MODULE BLANK BEZEL	SIEMENS #2587705-3003
1	12	TURBIDITY ANALYZER (NOTE 4)	CUSTOM SENSORS AND TECHNOLOGY
1	13	RADIO LINK	CYLINK AIRLINK MULTIPOINT 64MP
1	14	ANTENNA, FOR RADIO LINK	CENTURION EXE-902-TN
2	15	BULKHEAD ADAPTOR, TNC FEMALE TO FEMALE HERMETICALLY SEALED	PASTERNECK PE9154
1	16	UPS, 900VA	SOLA 56-350-20
	17	DELETED	
1	18	BOX MOUNTING RECEPTACLE, CIRC CONN. 9 CONTACTS, #12 WIRE (FV-01)	MS3100F24-6S
1	19	BOX MOUNTING RECEPTACLE, CIRC CONN. 20 CONTACTS, #16 WIRE (WINCH)	MS3100F28-16S
	20	DELETED	
	21	DELETED	
2	22	PUSHBUTTON, JUMBO MUSHROOM HEAD, RED (EMERG. STOP), MAINTAINED	CULTER-HAMMER 10250T5-J53
6	23	PUSHBUTTON CONTACT BLOCK, 1 NC	CUTLER-HAMMER 10250T51
1	24	TURBIDITY PROBE, FIELD ELECTRONICS UNIT (NOTE 4)	CUSTOM SENSORS AND TECHNOLOGY
1	25	MAGNETIC FLOWMETER, REMOTE MOUNTED SIGNAL CONVERTER	FISCHER & PORTER 50XM13BXKD0AAAC224
1	26	WEIGHT TRANSMITTER (NOTE 5)	SEW-EURODRIVE HPL220
1	27	CABLE LENGTH TRANSMITTER (NOTE 5)	ASTROSYSTEMS CC100CA7-1/100-NRR
1	28	±15 VDC POWER SUPPLY	ACOPIAN TD15-40
1	29	24 VDC POWER SUPPLY, 5A	ACOPIAN B24G500
1	30	PLUG-IN RELAY WITH INDICATING LAMP, DPDT, 10A/120V	POTTER-BRUMFIELD KRP11AN-120
1	31	SOCKET, OCTAL PLUG SCREW TERMINAL	POTTER-BRUMFIELD 27E891
1	32	COPPER BUS BAR, 12"x1"x1/4"	SEE NOTE 3
300	33	TERMINAL BLOCK, UK 4	PHOENIX CONTACT 30 03 01 7
50	34	FUSED TERMINAL BLOCK, UK 6.3-HESI	PHOENIX CONTACT 30 04 17 1
2	35	MOUNTING RAIL, NS 35/7.5, DIN, 78"L	PHOENIX CONTACT 08 01 73 3
10	36	END CLAMPS, E/UK	PHOENIX CONTACT 12 01 44 2
10	37	PARTITION PLATE, ATP-UK	PHOENIX CONTACT 30 03 22 4
5	38	END COVER, D-UK 4/10	PHOENIX CONTACT 30 03 02 0
AR	39	CABLE TRAY, 2"Wx2"H	PANDUIT
AR	40	CABLE TRAY, 3"Wx2"H	PANDUIT

MATERIAL LIST CONTINUED ON SHEET 2

NOTES:

1. MOUNT RACK MOUNTED EQUIPMENT USING HARDWARE SUPPLIED WITH PN 58. EXACT LOCATION TO BE DETERMINED BY PLACING UPS AT BOTTOM, THEN PLC RACK WITH APPROX. 1" AIR SPACE BETWEEN. ALLOW MAXIMUM AIR SPACE BETWEEN PLC MOUNTING RACK AND TURBIDITY ANALYZER.
2. SEE SHEET 2 FOR ENCLOSURE ASSEMBLY MATERIALS.
3. INSTRUMENT GROUNDING BAR. MOUNT ON NON-CONDUCTIVE STAND-OFFS. DRILL AND TAP EVERY INCH FOR 10-32 SCREWS AND INSTALL SCREWS.
4. SUPPLIED BY WHC.
5. SUPPLIED BY WINCH VENDOR.
6. NAMEPLATES SHALL CONTAIN INFORMATION SHOWN AND BE BONDED IN LOCATION AS SHOWN USING CLEAR SILICONE ADHESIVE, ANY GRADE. NAMEPLATE MATERIAL TO BE .062 THICK LAMITEX LAMINATED RIGID ENGRAVING STOCK WITH WHITE SURFACE AND BLACK CORE.

NOTES CONTINUED ON SHEET 2

1 GENERAL REVISION PER ECN ER3297-5, ER3297-7, ER3297-8, ER3297-11, ER3297-14

DESIGNED A. CHU
DRAWN SG ROMERO
CHECKED MD RICKENBACH
SAFETY SEE DR/AT FORM
SEE DR/AT FORM
SEE DR/AT FORM
SG ROMERO

SAFETY CLASS 3
CONSTRUCTION
605589

U.S. DEPARTMENT OF ENERGY
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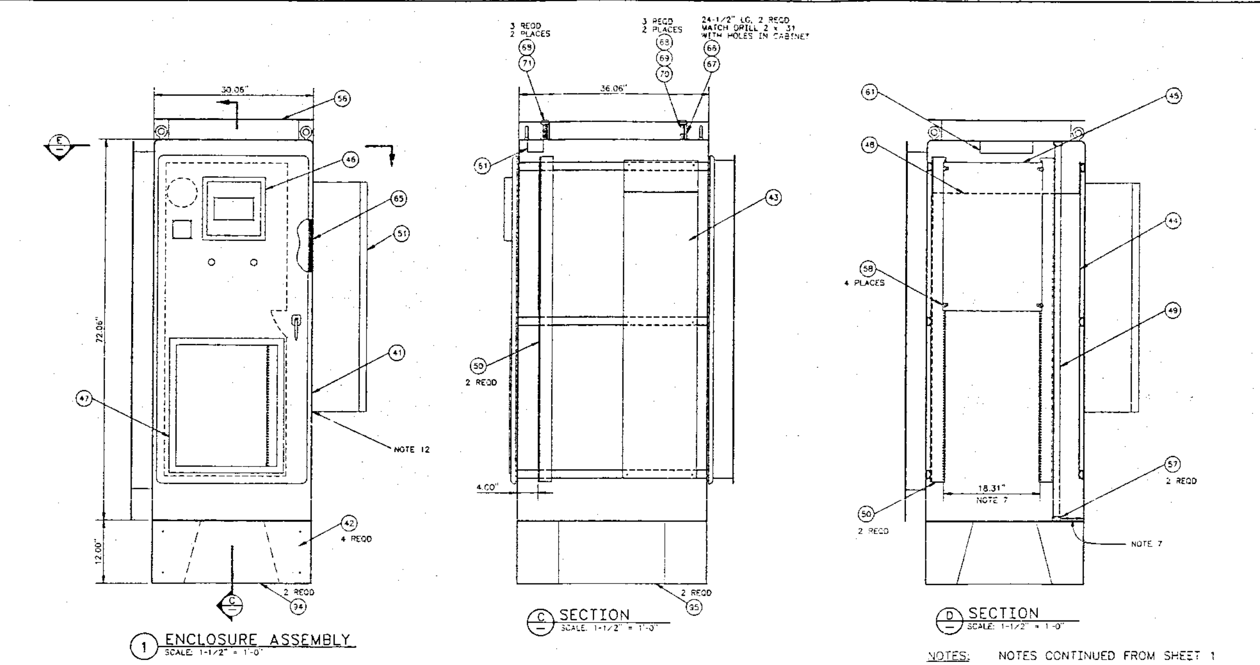
INSTRUMENTATION
PLC CONTROL PANEL
CONTROL PANEL ASSEMBLY

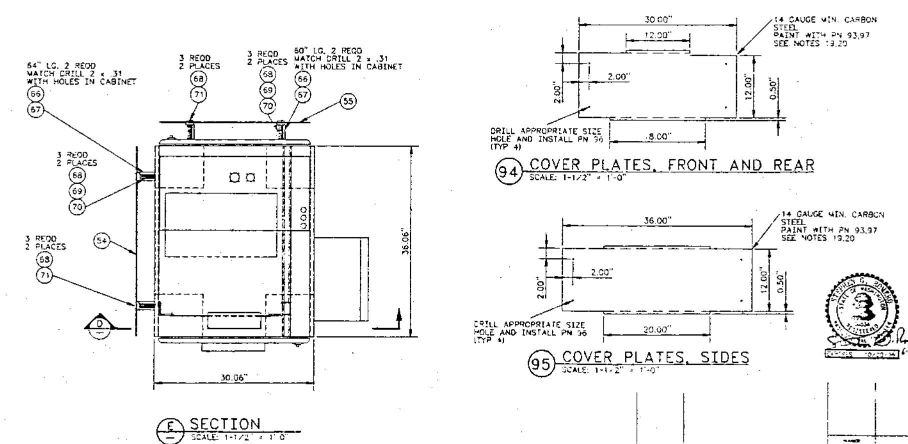
AZ-101 SUPERNATE DECANT PUMP

F | AZ-101 | 7501 | H-2-821433 | 1

SCALE SHOWN | ER3297 | SHEET 1 OF 4

CAD FILE 58214433A
DATE 05-10-94
PLOT SCALE 1=8
KEMCAD





NOTES: NOTES CONTINUED FROM SHEET 1

7. LOCATE CENTER SUPPORT AND RACK MOUNTING ANGLES TO PERMIT INSTALLATION OF 19.0" RACK MOUNTED EQUIPMENT WITH MOUNTING HOLE CENTER-TO-CENTER SPACING OF 18.31".
8. PROVIDED BY SSM VENDOR. CABLE WIRING AND CONNECTORS SHALL BE FURNISHED BY WHC. SEE INTERCONNECTION DIAGRAMS FOR PART NOS. MOUNT IN APPROX. LOCATION SHOWN WITH ADHESIVES.
9. DELETED
10. FABRRICATE PER DRAWING NO. SHOWN. ADJUST WIDTH AND LENGTH TO MATCH ENCLOSURE DIMENSIONS PER DWG. H-2-821433 SH.3.
11. BREAK ALL SHARP EDGES. REMOVE ALL BURRS.
12. APPLY A SEAL BEAD OF SILICONE CAULKING TO THE PERIMETER OF THE A/C UNIT AFTER INSTALLATION.
13. INSULATION (ITEM 65) SHALL BE APPLIED PER MANUFACTURER'S INSTRUCTIONS, USING ARMSTRONG 520 ADHESIVE ON ALL SURFACES. ALLOWABLE CLEARANCES FOR INSTALLATION OF FITTING, UNISTRUT CHANNELS AND COMPONENTS WILL BE DETERMINED AT TIME OF INSTALLATION.
14. MOUNT BULKHEAD ADAPTORS IN LOCATIONS SHOWN AT TOP OF ENCLOSURE AND SUNSHIELD. CONNECT WITH TNC MALE TO TNC MALE CABLE AND MOUNT ANTENNA ON SUNSHIELD MOUNTED ADAPTOR.
15. ALL MATERIAL SHALL BE AS SPECIFIED. ANY MATERIAL SUBSTITUTION REQUIRES WRITTEN APPROVAL OF PURCHASER.
16. TERMINAL BLOCK MOUNTING RAILS SHALL BE RAISED ABOVE CABLE TRAYS BY MOUNTING ON 1-5/8" CHANNEL USING PN 80 & 81.
17. EXACT LOCATION OF PANEL MOUNTED EQUIPMENT TO BE DETERMINED IN FIELD AS REQUIRED.
18. SET ALARM HORN DIP SWITCHES S1-S8 TO THE OPEN POSITION.
19. PREPARE AND PAINT ALL EXPOSED CARBON STEEL SURFACES WITH ONE COAT OF INDUSTRIAL RUST-INHIBITIVE PRIMER AND TWO FINISH COATS OF INDUSTRIAL ENAMEL. FINISH COLOR SHALL BE ANSI 61 GRAY. APPLY PAINT PER MANUFACTURER'S SPECIFICATIONS.

MATERIAL LIST			
QTY	PN	DESCRIPTION	MATERIAL/REFERENCE
1	41	ENCLOSURE, 72"H x 30"W x 36"D NEMA 3R, DUAL ACCESS	HOFFMAN A-723036FSDA
2PR	42	FLOOR STAND KIT, 12 H	HOFFMAN A-FK-1208
1	43	PANEL, LEFT SIDE, 60"H x 14"W	HOFFMAN A-72SMP14
1	44	PANEL, RIGHT SIDE, 60"H x 14"W	HOFFMAN A-72SMP14
1	45	RACK PANEL, STEEL 19"W x 28"H	HOFFMAN A-19RP16U
1	46	WINDOW KIT, HINGED 12"H x 12"W	HOFFMAN A-PWK1212H
1	47	WINDOW KIT, STEEL 23"H x 19"W	HOFFMAN (SEE NOTE 8)
1	48	FIXED SHELF, 14 GAUGE STEEL	SEE SH4 FOR DETAIL
1	49	CENTER PANEL SUPPORT	HOFFMAN A-72FSCPS
1PR	50	RACK MOUNTING ANGLES, FULL LENGTH	HOFFMAN A-72RP24FS
1	51	AIR CONDITIONER, 8500 BTU, 230V/60HZ	McLEAN MIDWEST CR43-0826-006U
	52	DELETED	
1	53	HEATER, 800W, 230V	HOFFMAN D-AH8002B
1	54	SUNSHIELD, SIDE	H-2-140520-004 (SEE NOTE 10)
1	55	SUNSHIELD, DOOR	H-2-140520-005 (SEE NOTE 10)
1	56	SUNSHIELD, TOP	H-2-140520-006 (SEE NOTE 10)
2	57	CHANNEL, SIZE AS REQD FOR MOUNTING CENTER SUPPORT	UNISTRUT
1	58	SCREW PACKAGE (20 - #10-32 x 3/4 OVAL HEAD, NICKEL PLATED)	HOFFMAN D-L1032S
50	59	FUSE, 2A, 1/4" x 1-1/4"	AGC-2
5	60	FUSE, 10A, 1/4" x 1-1/4"	AGC-10
1	61	UTILITY LIGHT, 115V W/RECEPT.	HOFFMAN A-LTMB1
2	62	GFI RECEPTACLE BOX	PASS & SEYMOUR WPB23
2	63	GFI DUPLEX RECEPTACLE	COMMERCIAL
2	64	GFI DUPLEX RECEPTACLE COVER	HUBBLE PJ-26X
AR	65	INSULATION, 3/4 THK	ARMAFLEX II (NOTE 13)
AR	66	CLOSED CELL NEOPRENE, 1/8" THICK 30-60 DUROMETER	ASTM D2000 ANY GRADE
AR	67	CHANNEL, 3-1/4" x 1-5/8", PAINTED	UNISTRUT P5000
AR	68	HEX HD BOLT, 1/4-20UNC-2Ax5/8"LG	STL
AR	69	HEX NUT, 1/4-20UNC-2B	ASTM A 563 GR B
AR	70	WASHER, HELICAL SPR, 1/4"	COMMERCIAL
AR	71	NUT, 1/4-20UNC-2B	UNISTRUT P-1006-1420
AR	72	NAMEPLATES (SEE LEGEND)	SEE NOTE 6
30	73	QUICK STRIP MARKER, ZB-6, lgs: 1-10, 11-20, ...91-100 x 4	PHOENIX CONTACT 10 51 01 5
10	74	QUICK STRIP MARKER, ZB10: BLANK	PHOENIX CONTACT 10 53 00 1
1	75	MARKER PEN, B-PEN	PHOENIX CONTACT 10 51 99 3
AR	76	RDH MACH SCR, 10-24UNC-2Ax1/2"LG	STL
1	77	CABLE, N MALE TO TNC MALE, 36"	PASTERNECK PE3652
1	78	CABLE, TNC MALE TO TNC MALE, 12"	PASTERNECK PE3414-12
1	79	SSM SERIAL INTERFACE (SEE NOTE 8)	MT. FURY 615-0024-00
AR	80	CHANNEL, 1-5/8" x 1-5/8"	UNISTRUT P1000 OR EQUIVALENT
AR	81	CHANNEL NUTS WITH SPRINGS	FOR USE WITH PN 80
1	82	STROBE LIGHT, RED 120VAC	TOMAR 902-110-RED/FBM
1	83	ALARM HORN, ELECTRONIC 120VAC	PANALARM NT2-120A (NOTE 18)
1	84	GASKET FOR P/N 83	PANALARM 77200-68A
1	85	RTD	OMEGA TFD-EN
1	86	RTD (TEMP) TRANSMITTER, 0-200°F RANGE	OMEGA TX92-(2)
AR	87	CABLE, SINGLE TWISTED, SHIELDED PAIR 18 AWG MIN.	COMMERCIAL
AR	88	CABLE, 4 CONDUCTOR SHIELDED 18 AWG MIN.	COMMERCIAL
AR	89	CABLE, COAXIAL RG-174	COMMERCIAL
AR	90	CABLE, COAXIAL RG-59	COMMERCIAL
	91	DELETED	
1	92	BULKHEAD ADAPTOR	PASTERNECK
AR	93	PRIMER, INDUSTRIAL RUST INHIBITIVE	COMMERCIAL
2	94	COVER PLATES, FRONT AND REAR	SEE DETAIL
2	95	COVER PLATES, SIDE	SEE DETAIL
AR	96	TAPPING SCREW, 3/4", NO.14, HEX SLOTTED WASHER HEAD, STAINLESS STL	COMMERCIAL
AR	97	PAINT, WATERBORNE ACRYLIC ENAMEL, ANSI 61 GRAY	COMMERCIAL

MATERIAL LIST CONTINUED FROM SHEET 1

20. FOLD BACK 90° ALONG DOTTED LINE. FIELD TO ENSURE FIT AND ATTACH TO LEG STANDS WITH 4 SHEET METAL SCREWS. APPLY SILICONE AT ALL EDGES AFTER CABLES HAVE BEEN INSTALLED PER DWG H-2-821438, FOR FINAL INSTALLATION.

1 GENERAL REVISION PER ECN ER3297-5, ER3297-7, ER3297-8, ER3297-11, ER3297-14

CONSTRUCTION
605589
DESIGNED A. CHU
DRAWN SG ROMERO
CHECKED MD RICKENBACH
SEE DR/AT FORM
SEE DR/AT FORM
SEE DR/AT FORM
SG ROMERO

U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
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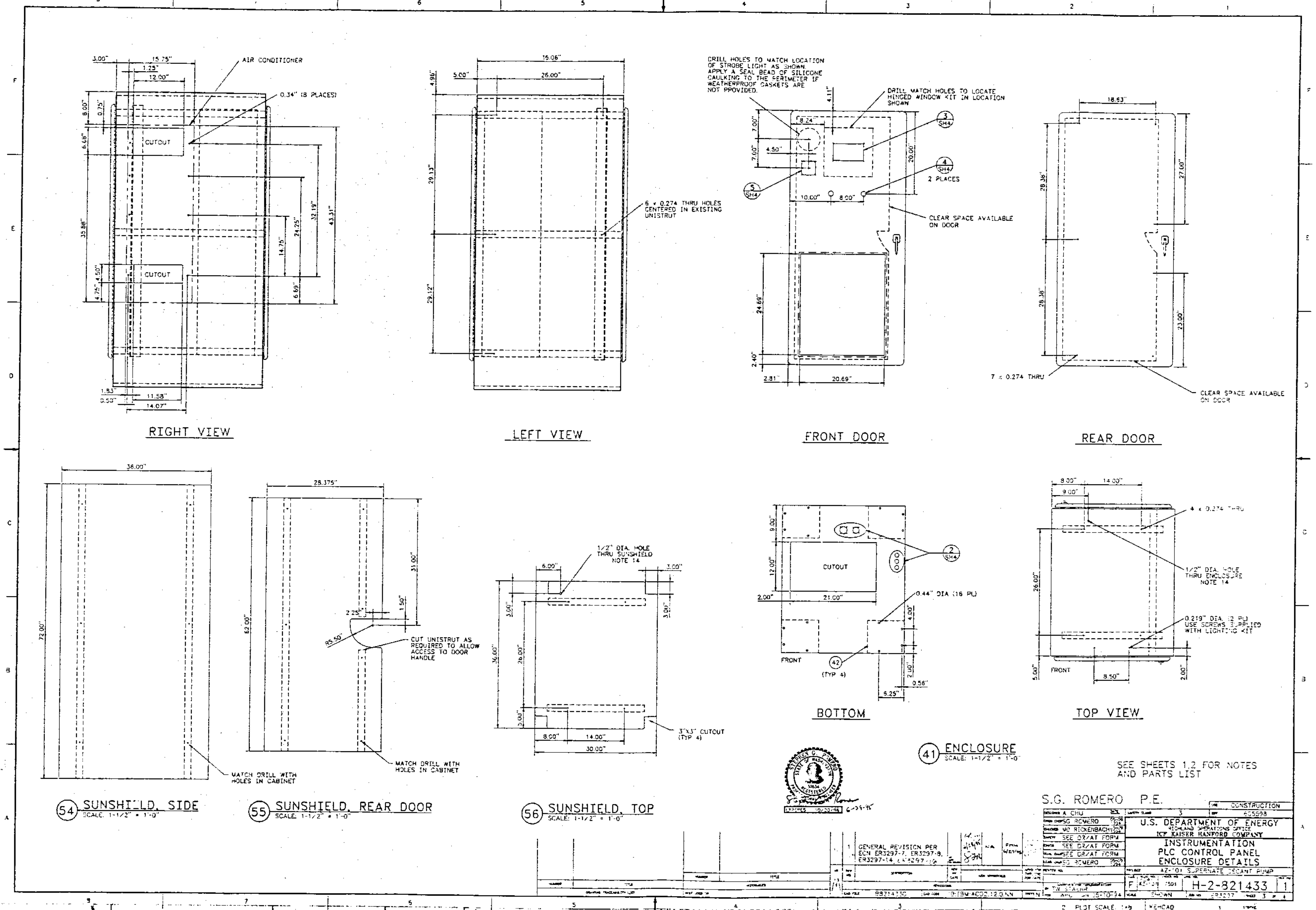
INSTRUMENTATION
PLC CONTROL PANEL
CONTROL PANEL ASSEMBLY

AZ-101 SUPERNATE DECANT PUMP

F | H-2-821433 | 1
SCALE: SHOWN | ER3297 | SHEET 2 OF 4

PLOT SCALE: 1=8 KEHCAD



RIGHT VIEW
AIR CONDITIONER
0.34" (8 PLACES)
CUTOUT
LEFT VIEW
6 x 0.274 THRU HOLES CENTERED IN EXISTING UNISTRUT
FRONT DOOR
DRILL HOLES TO MATCH LOCATION OF STROBE LIGHT AS SHOWN. APPLY A SEAL BEAD OF SILICONE CAULKING TO THE PERIMETER IF WEATHERPROOF GASKETS ARE NOT PROVIDED.
DRILL MATCH HOLES TO LOCATE HINGED WINDOW KIT IN LOCATION SHOWN
2 PLACES
CLEAR SPACE AVAILABLE ON DOOR
REAR DOOR
7 x 0.274 THRU
CLEAR SPACE AVAILABLE ON DOOR
54 SUNSHIELD, SIDE
SCALE: 1-1/2" = 1'-0"
MATCH DRILL WITH HOLES IN CABINET
55 SUNSHIELD, REAR DOOR
SCALE: 1-1/2" = 1'-0"
CUT UNISTRUT AS REQUIRED TO ALLOW ACCESS TO DOOR HANDLE
MATCH DRILL WITH HOLES IN CABINET
56 SUNSHIELD, TOP
SCALE: 1-1/2" = 1'-0"
1/2" DIA. HOLE THRU SUNSHIELD NOTE 14
3"X3" CUTOUT (TYP 4)
BOTTOM
CUTOUT
0.44" DIA (16 PL)
FRONT
(TYP 4)
TOP VIEW
4 x 0.274 THRU
1/2" DIA. HOLE THRU ENCLOSURE NOTE 14
0.219" DIA. (2 PL) USE SCREWS SUPPLIED WITH LIGHTING KIT
FRONT
41 ENCLOSURE
SCALE: 1-1/2" = 1'-0"
SEE SHEETS 1,2 FOR NOTES AND PARTS LIST
S.G. ROMERO P.E.
GENERAL REVISION PER ECN ER3297-7, ER3297-8, ER3297-14
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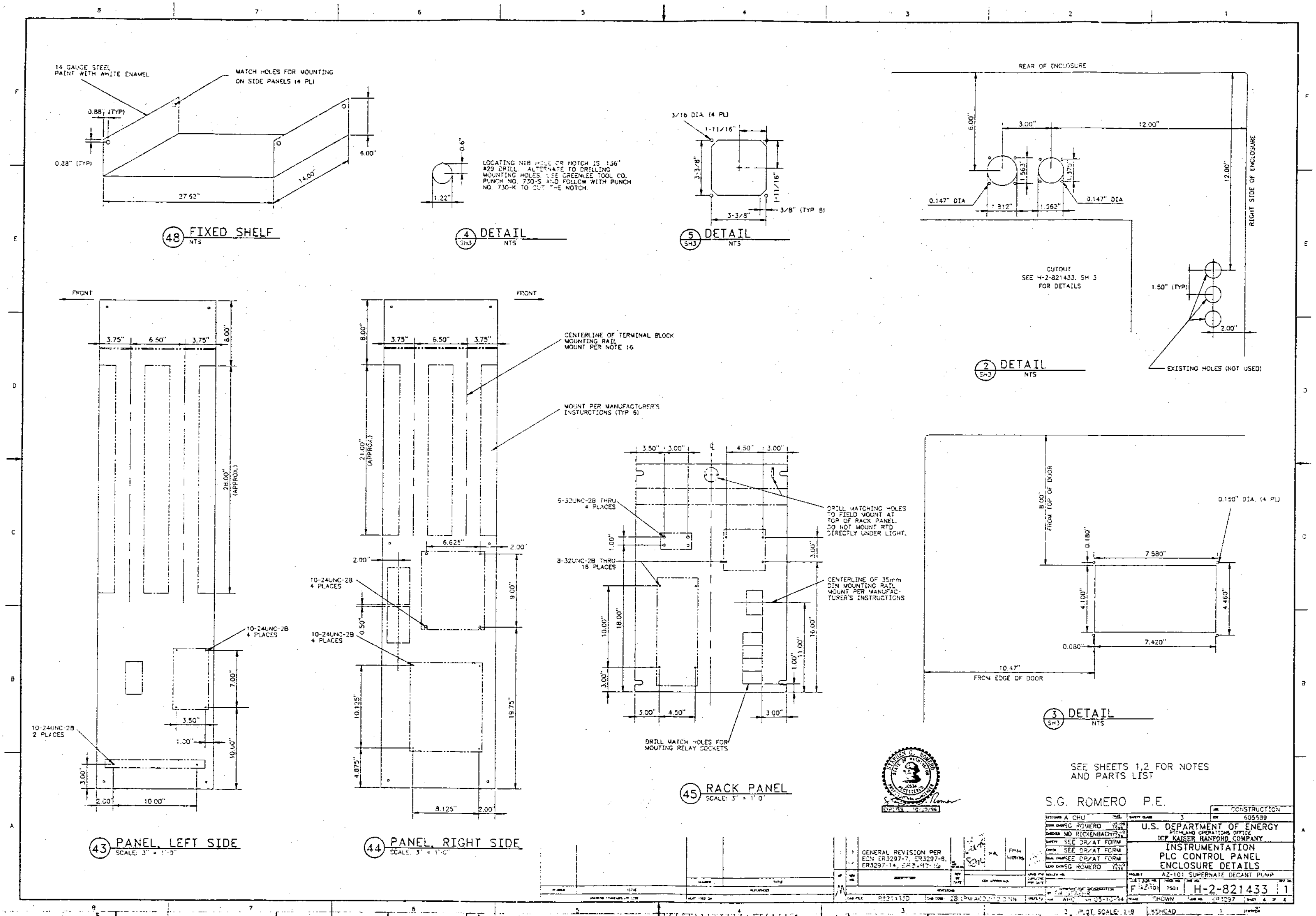
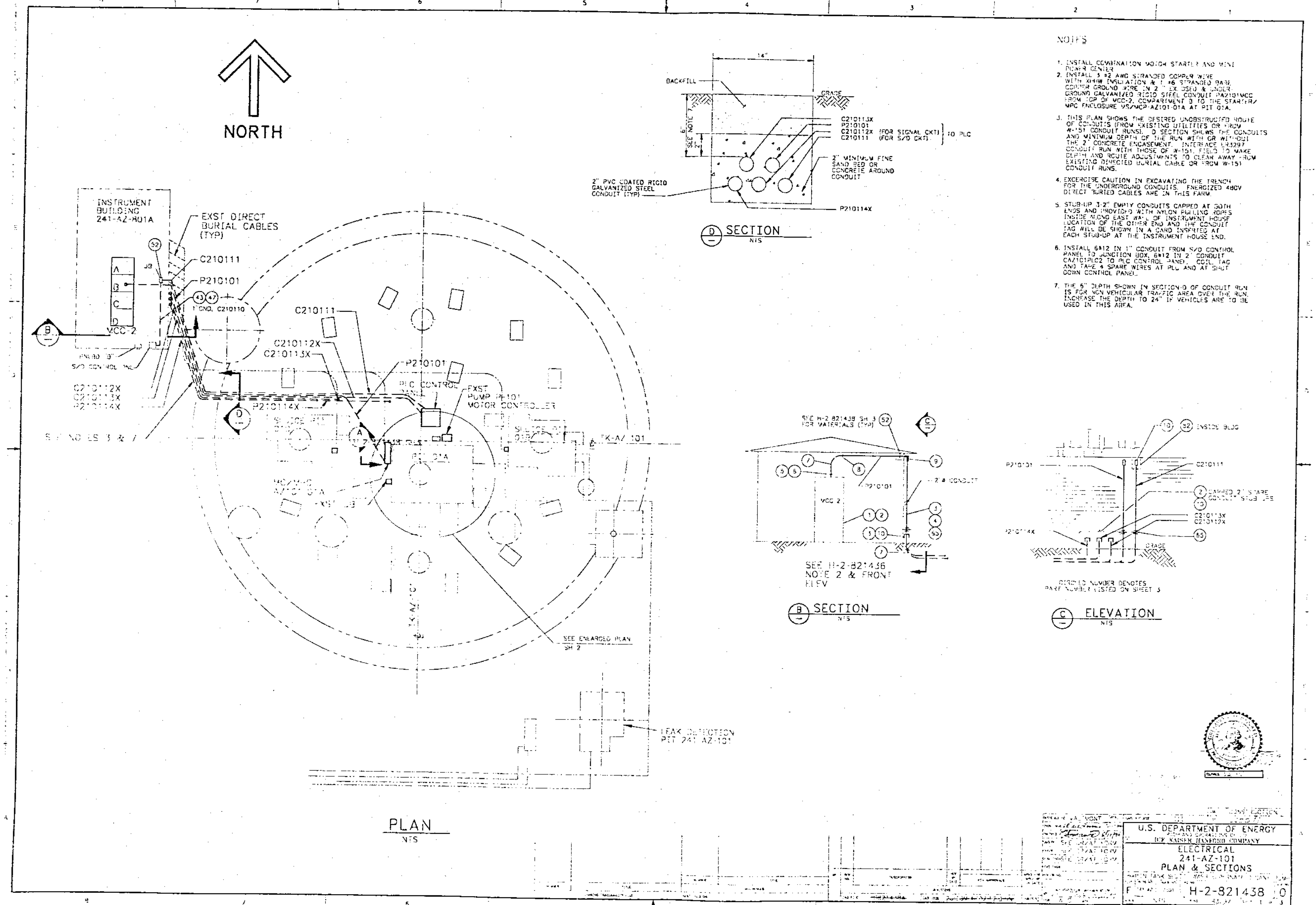
INSTRUMENTATION
PLC CONTROL PANEL
ENCLOSURE DETAILS
H-2-821433


14 GAUGE STEEL
PAINT WITH WHITE ENAMEL
MATCH HOLES FOR MOUNTING ON SIDE PANELS (4 PL)
0.88" (TYP)
0.28" (TYP)
27.62"
14.00"
6.00"
48 FIXED SHELF
NTS
LOCATING NIB HOLE OR NOTCH IS .136" #29 DRILL. ALTERNATE TO DRILLING MOUNTING HOLES, USE GREENLEE TOOL CO. PUNCH NO. 730-S AND FOLLOW WITH PUNCH NO. 730-K TO CUT THE NOTCH.
4 DETAIL
NTS
3/16 DIA. (4 PL)
1-11/16"
3-3/8"
3/8" (TYP 8)
5 DETAIL
NTS
REAR OF ENCLOSURE
6.00"
3.00"
12.00"
1.563"
1.375"
0.147" DIA
1.312"
1.562"
RIGHT SIDE OF ENCLOSURE
CUTOUT
SEE H-2-821433, SH 3
FOR DETAILS
1.50" (TYP)
2.00"
EXISTING HOLES (NOT USED)
2 DETAIL
NTS
FRONT
3.75"
6.50"
8.00"
28.00" (APPROX.)
21.00" (APPROX.)
CENTERLINE OF TERMINAL BLOCK MOUNTING RAIL MOUNT PER NOTE 16
MOUNT PER MANUFACTURER'S INSTRUCTIONS (TYP 6)
10-24UNC-2B 4 PLACES
10-24UNC-2B 2 PLACES
7.00"
3.50"
1.00"
10.00"
3.00"
2.00"
6.625"
9.00"
0.50"
10.125"
19.75"
4.875"
8.125"
43 PANEL, LEFT SIDE
SCALE: 3" = 1'-0"
44 PANEL, RIGHT SIDE
SCALE: 3" = 1'-0"
6-32UNC-2B THRU 4 PLACES
8-32UNC-2B THRU 16 PLACES
4.50"
18.00"
11.00"
16.00"
DRILL MATCHING HOLES TO FIELD MOUNT AT TOP OF RACK PANEL. DO NOT MOUNT RTD DIRECTLY UNDER LIGHT.
CENTERLINE OF 35mm DIN MOUNTING RAIL. MOUNT PER MANUFACTURER'S INSTRUCTIONS
DRILL MATCH HOLES FOR MOUTING RELAY SOCKETS
45 RACK PANEL
SCALE: 3" = 1'-0"
8.00" FROM TOP OF DOOR
0.150" DIA. (4 PL)
0.180"
7.580"
4.100"
4.460"
0.080"
7.420"
10.47"
FROM EDGE OF DOOR
3 DETAIL
NTS
SEE SHEETS 1,2 FOR NOTES AND PARTS LIST
S.G. ROMERO P.E.
CONSTRUCTION
605589
U.S. DEPARTMENT OF ENERGY
RICHLAND OPERATIONS OFFICE
ICF KAISER HANFORD COMPANY
INSTRUMENTATION
PLC CONTROL PANEL
ENCLOSURE DETAILS
AZ-101 SUPERNATE DECANT PUMP
A CHU
SG ROMERO
MD RICKENBACH
SEE DR/AT FORM
SG ROMERO
GENERAL REVISION PER ECN ER3297-7, ER3297-8, ER3297-14
H-2-821433
1
ER3297
PLOT SCALE: 1:8


NORTH
INSTRUMENT BUILDING 241-AZ-H01A
EXST DIRECT BURIAL CABLES (TYP)
C210111
P210101
VCC-2
S/O CONTROL PNL
C210112X
C210113X
P210114X
SEE NOTES 3 & 7
C210112X
C210113X
P210101
PLC CONTROL PANEL
EXST PUMP P-101 MOTOR CONTROLLER
P210114X
TK-AZ-101
SEE ENLARGED PLAN SH 2
LEAK DETECTION PIT 241-AZ-101
PLAN
NTS
BACKFILL
GRADE
SEE NOTE 7
C210113X
P210101
C210112X (FOR SIGNAL CKT)
C210111 (FOR S/O CKT)
TO PLC
2" MINIMUM FINE SAND BED OR CONCRETE AROUND CONDUIT
2" PVC COATED RIGID GALVANIZED STEEL CONDUIT (TYP)
P210114X
SECTION
NTS
SEE H-2-821438 SH 3 FOR MATERIALS (TYP)
SEE H-2-821436 NOTE 2 & FRONT ELEV
SECTION
NTS
INSIDE BLDG
CAPPED 2" SPARE CONDUIT STUB UPS
C210113X
C210112X
GRADE
CIRCLED NUMBER DENOTES PART NUMBER LISTED ON SHEET 3
ELEVATION
NTS
NOTES
1. INSTALL COMBINATION MOTOR STARTER AND MINI POWER CENTER
2. INSTALL 3 #2 AWG STRANDED COPPER WIRE WITH XHHW INSULATION & 1 #6 STRANDED BARE COPPER GROUND WIRE IN 2" EXPOSED & UNDERGROUND GALVANIZED RIGID STEEL CONDUIT PA2101MCC FROM TOP OF MCC-2, COMPARTMENT 3 TO THE STARTER/MPC ENCLOSURE VS/MCP-AZ101-01A AT PIT 01A.
3. THIS PLAN SHOWS THE DESIRED UNOBSTRUCTED ROUTE OF CONDUITS (FROM EXISTING UTILITIES OR FROM W-151 CONDUIT RUNS). D SECTION SHOWS THE CONDUITS AND MINIMUM DEPTH OF THE RUN WITH OR WITHOUT THE 2" CONCRETE ENCASEMENT. INTERFACE ER3297 CONDUIT RUN WITH THOSE OF W-151. FIELD TO MAKE DEPTH AND ROUTE ADJUSTMENTS TO CLEAR AWAY FROM EXISTING DIRECTED BURIAL CABLE OR FROM W-151 CONDUIT RUNS.
4. EXCERCISE CAUTION IN EXCAVATING THE TRENCH FOR THE UNDERGROUND CONDUITS. ENERGIZED 480V DIRECT BURIED CABLES ARE IN THIS FARM.
5. STUB-UP 3-2" EMPTY CONDUITS CAPPED AT BOTH ENDS AND PROVIDED WITH NYLON PULLING ROPES INSIDE ALONG EAST WALL OF INSTRUMENT HOUSE. LOCATION OF THE OTHER END AND THE CONDUIT TAG WILL BE SHOWN IN A CARD INSERTED AT EACH STUB-UP AT THE INSTRUMENT HOUSE END.
6. INSTALL 6#12 IN 1" CONDUIT FROM S/D CONTROL PANEL TO JUNCTION BOX, 6#12 IN 2" CONDUIT CAZ101PLC2 TO PLC CONTROL PANEL. COIL, TAG AND TAPE 4 SPARE WIRES AT PLC AND AT SHUT DOWN CONTROL PANEL.
7. THE 5" DEPTH SHOWN IN SECTION D OF CONDUIT RUN IS FOR NON VEHICULAR TRAFFIC AREA OVER THE RUN. INCREASE THE DEPTH TO 24" IF VEHICLES ARE TO BE USED IN THIS AREA.
U.S. DEPARTMENT OF ENERGY
ICF KAISER HANFORD COMPANY
ELECTRICAL
241-AZ-101
PLAN & SECTIONS
H-2-821438
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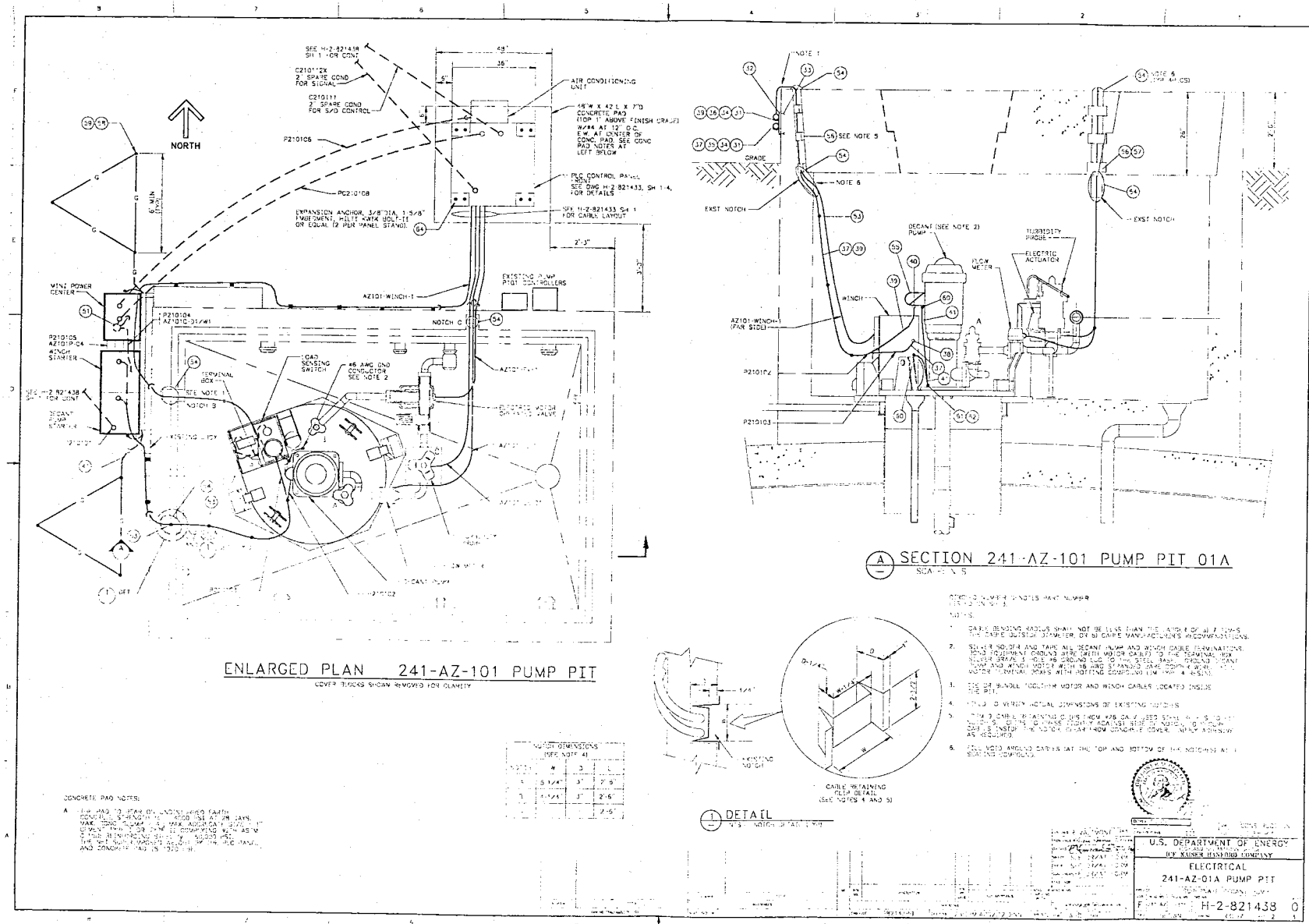
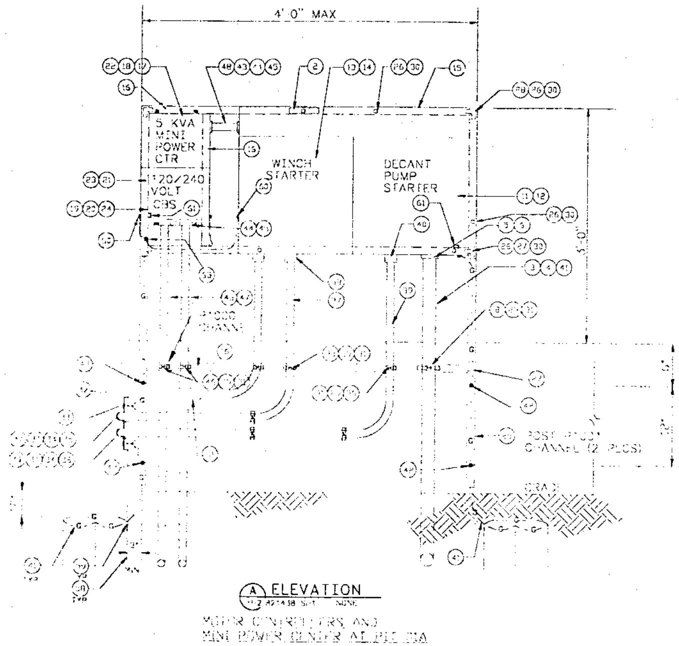

NORTH
AIR CONDITIONING UNIT
PCC CONTROL PANEL
EXPANSION ANCHOR, 3/8" DIA, 1 5/8" EMBEDMENT, HILTI KWIK BOLT-TZ OR EQUAL (2 PER PANEL STAND).
MINI POWER CENTER
WINCH STARTER
LOAD SENSING SWITCH
#6 AWG GND CONDUCTOR SEE NOTE 2
TERMINAL BOX
EXISTING PUMP PIGT CONTROLLERS
AZ101-WINCH-1
NOTCH C
NOTCH B
ELECTRIC MOTOR OPERATED VALVE
GRADE
EXST NOTCH
DECANT (SEE NOTE 2) PUMP
TURBIDITY PROBE
ELECTRIC ACTUATOR
FLOW METER
WINCH
AZ101-WINCH-1 (FAR SIDE)
P210102
P210103
ENLARGED PLAN 241-AZ-101 PUMP PIT
COVER BLOCKS SHOWN REMOVED FOR CLARITY
SECTION 241-AZ-101 PUMP PIT 01A
SCALE: 1" = 5'
DETAIL
CABLE RETAINING CLIP DETAIL (SEE NOTES 4 AND 5)
EXISTING NOTCH
CONCRETE PAD NOTES:
NOTCH DIMENSIONS (SEE NOTE 4)
U.S. DEPARTMENT OF ENERGY
ELECTRICAL
241-AZ-01A PUMP PIT
H-2-821438 0



A ELEVATION

MOTOR CONTROLLERS AND MINI POWER CENTER AT PIT 01A

NOTES: 1. CIRCLED NUMBERS DENOTES PART NUMBER LISTED ON THE MATERIAL LIST AT RIGHT.

2. THREE GROUND RODS SHALL BE DRIVEN IN EARTH TO FORM A TRIANGLE. THE TOP OF THE ROD SHALL BE AT LEAST 12" BELOW GRADE AND SPACED NOT LESS THAN 6FT APART.

MATERIALS

QTY	PART NO	DESCRIPTION
6	58	GROUND ROD, COPPERWELD STEEL, 5/8" x 9'-0"
6	59	GROUND CLAMP FOR 5/8" GROUND ROD
5	60	LUG FOR #6 AWG STRD CU WIRE
4	61	LUG FOR 3 BARREL FOR #6 AWG
AR	62	SILVER BRAZING ROD
4	63	SOLDERLESS CONNECTOR, SPLIT BOLT, #6AWG
8	64	ANCHOR, EXPANSION, 3/8"DIA x 1-5/8"EMBEDMENT, HILTI KWIK BOLT II
4	65	UNION, 2"

MATERIALS

QTY	PART NO	DESCRIPTION
1	1	CIRCUIT BREAKER, 100 AMP, 3 POLE, 600V
1	2	NAMEPLATE, MC/MPC-A/101 01A (3/4" HIGH LETTERS)
300'	3	CONDUIT, GALV RIGID STL, 2"
350'	4	WIRE, 1/C #2AWG, STRD CU, XHHW INS (MCC TO MC/MPC)
20	5	LOCKNUT, 2"
10	6	BUSHING, GROUNDING TYPE, 2"
10	7	CONDUIT BEND, 90° 2"
6	8	CONDUIT CLAMP, 2"
2	9	CONDUIT OUTLET, TYPE LB, 2"
6	10	CONDUIT CAP, 2"
1	11	COMBINATION STARTER, 100AMCP/NEMA SIZE 3 FVNR
1	12	NAMEPLATE, "DECANT PUMP STARTER" (1/2" HIGH LETTERS)
1	13	COMBINATION STARTER, 3AMCP/NEMA SIZE 0 FVR
1	14	NAMEPLATE, "WINCH STARTER" (1/2" HIGH LETTERS)
1	15	ENCLOSURE, NEMA 3R, FOR ITEMS 11 AND 13
10'	16	CHANNEL, P1000
1	17	MINI POWER CENTER, 5KVA, 1 PH, 480-120/240V TRANSF
1	18	NAMEPLATE, "5KVA MINI POWER CENTER" (1/2" HIGH LETTERS)
2	19	CIRCUIT BREAKER, 15 AMP, 1 POLE, 120VAC
1	20	CIRCUIT BREAKER, 15 AMP, 2 POLE, 240VAC
1	21	NAMEPLATE, "120/240 CIRCUIT BREAKERS" (3/8" HIGH LETTERS)
1	22	NAMEPLATE, "MAIN PRIMARY BREAKER" (3/8" HIGH LETTERS)
1	23	NAMEPLATE, "MAIN SECONDARY BREAKER" (3/8" HIGH LETTERS)
1	24	NAMEPLATE, "CKT1-3 240V AC, CKT2 120V PLC/INSTR CKT3-PLC LT & GFI RCPT" (3/8" HIGH LETTERS)
20'	25	CHANNEL, P1001
30	26	SCREW, HEX HD, CAP, 1/2" x 2"
4	27	FITTING FOR 1-5/8" CHANNEL, A1031
2	28	FITTING FOR 1-5/8" CHANNEL, A1036
30	29	NUT, 3/8-16 SCREW, W/SPRING
30	30	NUT, 1/2-13 SCREW, W/SPRING
30	31	SCREW, HEX HD CAP, 3/8-16
10'	32	CHANNEL, 13/16" WIDE, P7000
20	33	ANCHOR, EXPANSION, 1/4" DIA, 1-1/8" EMBEDMENT, HILTI KWIK BOLT
20	34	NUT, 13/16" CHANNEL, W/SPRING, P5006-1420
[illegible]	35	CABLE CLAMP, ONE HOLE, 1/2" DIA
[illegible]	36	CABLE CLAMP, ONE HOLE, 3/4" DIA
[illegible]	37	CABLE, COPPER, 3/C #12 W/GND, TYPE MC 600V
4	38	CONNECTOR, WATERTIGHT, FOR ITEM 37
20'	39	CABLE, COPPER, 3/C #6 W/GND, TYPE MC 600V
4	40	CONNECTOR, WATERTIGHT, FOR ITEM 39
100'	41	WIRE, 1/C #6 STRANDED, BR COPPER, GND WIRE (MCC 2 TO MC/MPC)
4	42	ANCHOR, EXPANSION, 3/8"DIA X 2-1/2" EMBEDMENT HILTI KWIK BOLT II
10'	43	CONDUIT, RIGID GALV STL, 1"
4	44	LOCKNUT, 1"
2	45	BUSHING, 1"
4	46	CLAMP, ONE HOLE, 1"
600'	47	WIRE, 1/C, #2AWG STRANDED, COPPER, XHHW (MC/MPC TO PLC)
20'	48	WIRE, 1/C #6AWG STRANDED, COPPER, XHHW (WINCH STR MPC)
1	49	AMMETER, 5A SCALE
1	50	CURRENT TRANSFORMER 100:5
1	51	CONDUIT OUTLET, TYPE LB, 1"
1	52	JUNCTION BOX, W/COVER, 8"x6"x3-1/2"
20	53	CABLE TIES, RELEASABLE, FOR 1" CABLE
AR	54	SEALING COMPOUND, [illegible]
AR	55	POTTING COMPOUND, [illegible]
2	56	STRIP, CABLE RETAINING, FABRICATED
AR	57	ADHESIVE, SILICON

U.S. DEPARTMENT OF ENERGY
ICF KAISER HANFORD COMPANY
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241-AZ-101
DETAILS & MATERIALS
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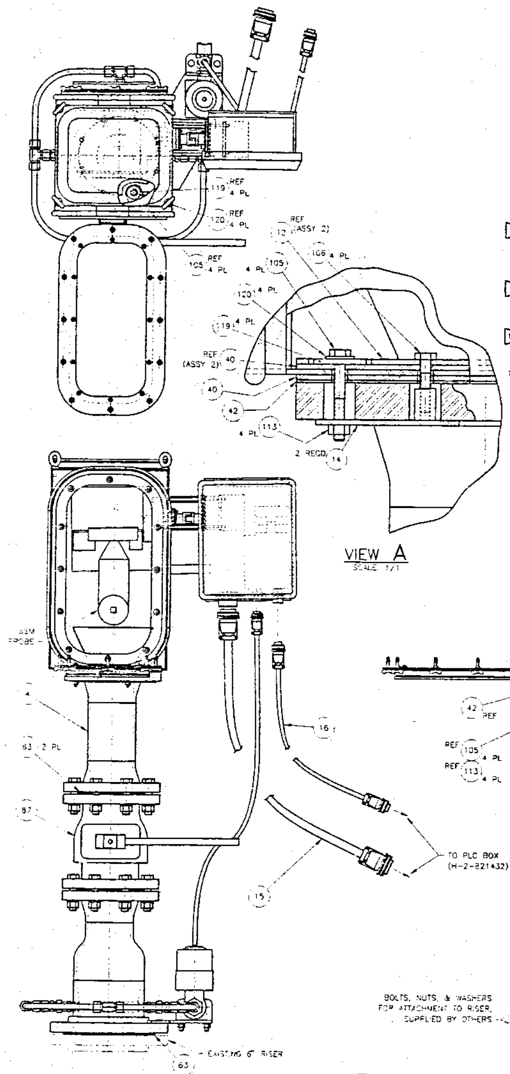
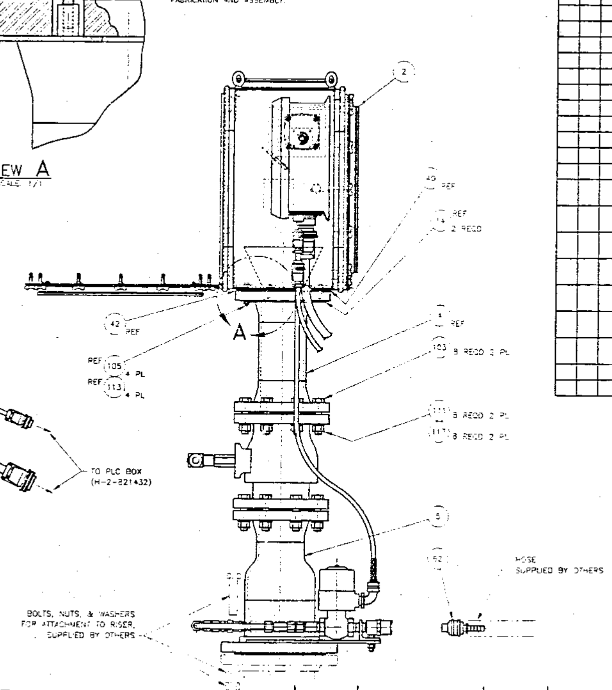




GENERAL NOTES: (UNLESS OTHERWISE SPECIFIED)

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1982. ALL DIMENSIONS ARE IN INCHES.
2. TOLERANCES: .XX = ±.03 HOLES = $^{+.015}_{-.000}$ .XXX = ±.010 ANGULAR = ±1°
3. REMOVE ALL BURRS AND BREAK SHARP EDGES.
4. ALL MACHINED SURFACES 125/ PER ANSI B46.1.
5. WELD AND INSPECT SST WELDS PER HS-VS-0013. VT ALL WELDS AT FINAL PASS. PT FINAL PASS OF DESIGNATED WELDS.
6. WELD AND INSPECT CARBON STEEL WELDS PER ANSI/AWS D1.1. WELDING QUALIFICATIONS PER ASME SECTION IX ARE ACCEPTABLE. VT ALL WELDS AT FINAL PASS. PT FINAL PASS OF DESIGNATED WELDS.
7. ADHERE ALL GASKETS TO BASE METAL WITH A THIN FILM OF RTV (ANY COLOR).
8. THE ALTERED SSM ENCLOSURE (ITEM 51), THE PROFILER SENSOR (ITEM 76), AND THE CABLE REEL ASSEMBLY (ITEM 77) ARE FACTORY ASSEMBLED BY THE VENDOR INTO A SINGLE UNIT. SHOP PERSONNEL SHALL SEPARATE ITEM 51 FROM ITEMS 76 AND 77. TEMPORARY REMOVAL OF ANY ITEMS FROM WITHIN ITEM 51 MAY BE DONE AT THIS TIME TO FACILITATE THE ALTERATION.
9. PAINT EXTERIOR SURFACES OF ITEMS 4 & 5 (WITH THE EXCEPTION OF GASKETED SURFACES) WITH ONE PRIMER COAT OF AMERCOAT #88 & TWO FINISH COATS OF AMERCOAT #33. FINAL COAT TO BE GRAY. APPLY IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
10. IDENTIFY ITEM NUMBERS 2, 4, & 5 WITH THE DRAWING NO., PART NO. & REV NO. PER HS-BS-0015 TYPE B IN THE LOCATIONS INDICATED USING 1/2 INCH YELLOW CHARACTERS ON A RECTANGULAR BLACK BACKGROUND. PAINT PER NOTE 9.
11. ITEMS AND/OR ASSEMBLIES MAY BE MATCH DRILLED WHEREVER PRACTICABLE TO FACILITATE FABRICATION AND ASSEMBLY.

PARTS LIST/MATERIAL LIST

-160	-150	-140	-130	-120	-110	-100	-090	-080	-070	-060	-050	-040	-030	-020	-010	PART/DASH NUMBER	DESCRIPTION	MATERIAL/REFERENCE	SHEET	ITEM NO
															X	-010	ASSEMBLY		1	1
														X	1	-020	ENCLOSURE/SSM ASSEMBLY		2	2
													X	1		-030	ENCLOSURE SUB-ASSEMBLY		5	3
												X			1	-040	EXTENSION		4	4
											X				1	-050	WASH STATION MANIFOLD ASSEMBLY		9	5
										X	1					-060	WASH STATION SUB-ASSEMBLY		9	6
									X				2			-070	DOOR PANEL SUB-ASSEMBLY		6	7
								X					1			-080	SSM MOUNTING PANEL SUB-ASSY		5	8
							X	1								-090	BRG MOUNTING PANEL SUB-ASSY		6	9
						X								2		-100	DOOR SUB-ASSEMBLY		7	10
					X									2		-110	DOOR WINDOW RETAINER SUB-ASSY		7	11
				X										1		-120	GUIDE FUNNEL ASSY		4	12
			X											1		-130	TOP WINDOW RETAINER SUB-ASSY		3	13
		X													2	-140	BACKING, HALF RING SUB-ASSEMBLY		8	14
	X														1	-150	CABLE ASSEMBLY, SIGNAL		11	15
X															1	-160	CABLE ASSEMBLY, POWER		11	16
																				17
																				18
																				19
													1			-001	BOTTOM PANEL, .120 (11 GA) SH	ASTM A 240 304 OR 304L SST	5	20
													4			-002	HINGE EYE, .120 (11 GA) SHEET	ASTM A 240 304 OR 304L SST	6	21
													8			-003	CORNER FILLER, .120 (11 GA) SH	ASTM A 240 304 OR 304L SST	5	22
														2		-004	HINGE PIN, ⌀3/16 ROUND BAR	ASTM A 276 304 OR 304L SST	6	23
							4									-005	PANEL STUD	ASTM A 276 304 OR 304L SST	6	24
			16		12											-006	RETAINER STUD	ASTM A 276 304 OR 304L SST	7	25
														1		-007	BEARING HOUSING, 1/4 PLATE	ASTM A 240 304 OR 304L SST	3	26
														2		-008	BRG SEAL HOUSING, 3/16 PLATE	ASTM A 240 304 OR 304L SST	3	27
														1		-009	MOTOR SHAFT SEAL HSG, 3/16 PL	ASTM A 240 304 OR 304L SST	4	28
														1		-011	MOTOR SHAFT SEAL RETAINER, .0595 (16 GA) SHEET	ASTM A 240 304 OR 304L SST	4	29
														2		-012	BEARING SEAL RETAINER, .0595 (16 GA) SHEET	ASTM A 240 304 OR 304L SST	4	30
														4		-013	SSM ENCLOSURE SPACER, 1/2 HEX	ASTM A 582 OR A 276 303 OR 304 SST	4	31
														4		-014	REEL-HOUSING SPACER, 3/8 HEX	ASTM A 582 OR A 276 303 OR 304 SST	4	32
														1		-015	DRIVE SHAFT	ASTM A 582 OR A 276 303 OR 304 SST	4	33
														4		-016	MOTOR MTG STUD, #10-24 UNC-2A ALL THREAD	ANY GRADE SST	4	34
														2		-017	BRG HOUSING GASKET, 1/16 THK 40 DUROMETER ±5	SOFT NEOPRENE (WHC STORES) (0033-8105-100)	3	35
														1		-018	BRG MOUNTING GASKET, 1/16 THK 40 DUROMETER ±5	SOFT NEOPRENE (WHC STORES) (0033-8105-100)	3	36
														1		-019	MOTOR SHAFT SEAL HOUSING GSKT, 1/8 THK 40 DUROMETER ±5	SOFT NEOPRENE (WHC STORES) (0033-8105-125)	4	37
														4		-021	DOOR WINDOW GASKET, 1/8 THK 40 DUROMETER ±5	SOFT NEOPRENE (WHC STORES) (0033-8105-125)	7	38
														2		-022	TOP WINDOW GASKET, 1/8 THK 40 DUROMETER ±5	SOFT NEOPRENE (WHC STORES) (0033-8105-125)	3	39
														[illegible]	1	-023	4" FLG/ENCL/FUNL GSKT, 1/8 THK 40 DUROMETER ±5	SOFT NEOPRENE (WHC STORES) (0033-8105-125)	8	40
														2		-024	DOOR SEALING GASKET, 1/4 THK 40 DUROMETER ±5	SOFT NEOPRENE (WHC STORES) (0033-8105-150)	8	41
															1	-025	SPACER, 4" FLANGE .0595 (16 GA) SHEET	ASTM A 240 304 OR 304L SST	8	42
													1			-026	TOP WINDOW PANEL .120 (11 GA) SHEET	ASTM A 240 304 OR 304L SST	6	43

THE PARTS/MATERIAL LIST IS CONTINUED ON SHEET 2

DRAWING TRACEABILITY LIST | DWG NO | TITLE | NEXT USED ON | REFERENCES | REF NUMBER | TITLE

CADFILE 8822934A | REVISIONS | CADCODE (XIS 6.21.AC02:12:SS)

AJ PALOMBI

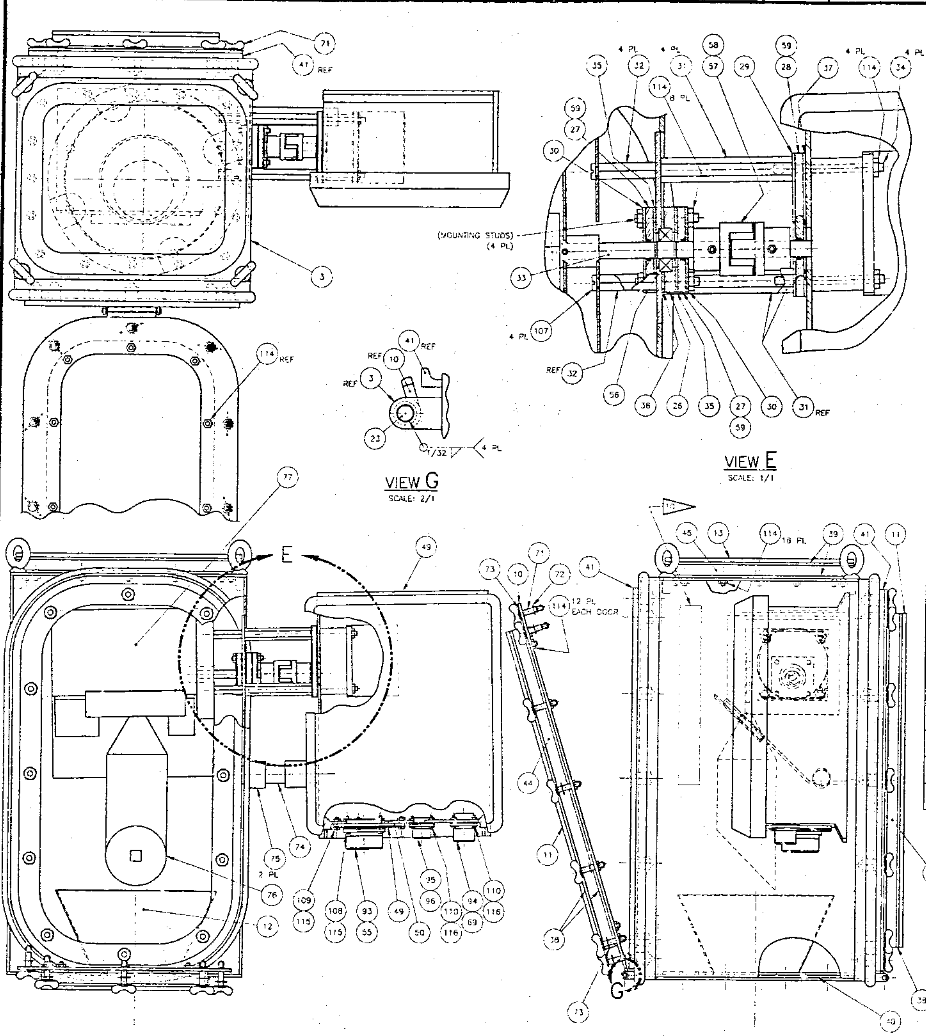
U.S. DEPARTMENT OF ENERGY
DOE Field Office, Richland
Westinghouse Hanford Company

SUSPENDED SOLIDS MONITOR ASSEMBLY

F | 241-AZ | 6000 | H-2-822934 | 0

SCALE NOTED | SHEET 1 OF 11

H-2-822934



(2) ENCLOSURE/SSM ASSEMBLY
SCALE: 1/2

PARTS LIST/MATERIAL LIST

-160	-150	-140	-130	-120	-110	-100	-090	-080	-070	-060	-050	-040	-030	-020	-010	PART/DASH NUMBER	DESCRIPTION	MATERIAL/REFERENCE	SHEET	ITEM NO
														2		-029	DOOR WINDOW, 1/2 THICK	CLEAR ACRYLIC	7	44
														1		-030	TOP WINDOW, 1/2 THICK	CLEAR ACRYLIC	3	45
										1						-031	WASH STATION BODY, 6" SCHED 120 PIPE	ASTM A 106 GR B CARBON STEEL	3	46
											1					-032	STRAIN RELIEF PLATE, 1/4 PLATE	ASTM A 240 304 OR 304L SST	9	47
											1					-033	STRAIN RLF ANGLE, L 2 X 2 X 1/4	ASTM A 276 304 OR 304L SST	3	48
														1		-034	CONNECTOR MOUNTING PLATE, .0595 (16 GA) SHEET	ASTM A 240 304 OR 304L SST	10	49
														1		-035	MOUNTING PLATE GASKET, 1/8 THK 40 DUROMETER ±5	SOFT NEOPRENE (WHC STORES) (0033-8105-125)	10	50
														1		-036 (9)	SSM ENCLOSURE, ALTERED FROM THE SSM PROFILER ENCLOSURE WITH SINGLE POINT INTERFACE & DIAGNOSTIC TERMINALS	MT. FURY CO., INC. ISSAQUAH, WA 703-0001-X 615-0024-00	10	51
																				52
																				53
																				54
														1		10-40450-26	GASKET, SEALING	BENDIX		55
														1		9100KDD	BEARING, RADIAL, SINGLE ROW, EXTRA LIGHT, SHIELDED	FAFNIR NEW BRITAIN, CT		56
														2		FC12-3/8	SHAFT COUPLING HALF, W/KEYWAYS AND SET SCREWS	BOSTON GEAR QUINCY, MASS		57
														1		XFCA12	SHAFT COUPLING INSERT, POLYURETHANE (3-JAW) TYPE	BOSTON GEAR QUINCY, MASS		58
														3		R300A-012	FLANGE BAL SEAL, LIGHT DUTY	BAL SEAL ENG. CO. SANTA ANA, CA		59
											1					1/2" TYPE F18A32 24 VDC	VALVE, NC, 24 VDC SOLENOID, 200 PSI WATER, 1/2 NPT FEMALE	MAGNATROL VALVE HAWTHORNE, NJ		60
											1					QM102	"DIX-LOCK" QUICK-ACTING CPLG, 1/2 FEM HD X 1/2 NPT FEM END	DIXON VALVE & CPLG CHESTERTOWN, MD		61
															1	QM3	"DIX-LOCK" QUICK-ACTING CPLG, 1/2 MALE HD X HOSE END	DIXON VALVE & CPLG CHESTERTOWN, MD		62
															3		GASKET, SPIRAL WOUND, 6"	SST & NON-ASBESTOS FILLER (WHC STORES) (0033-2885-350)		63
											4					1/2 GD-SS 25	SPRAY NOZZLE, FULLJET WALL MOUNTED	SPRAYING SYSTEMS CO WHEATON, IL		64
											4					SS-810-1-8	MALE CONNECTOR, 1/2 NPT MALE TO 1/2 O.D. TUBE	SWAGELOK CO. SOLON, OH		65
											4					SS-810-3	UNION TEE, 1/2 O.D. TUBE	SWAGELOK, SOLON, OH		66
											5					SS-811-PC	PORT CONNECTOR, 1/2 O.D. TUBE	SWAGELOK, SOLON, OH		67
											1					SS-810-3-8TMT	MALE RUN TEE, 1/2 O.D. TUBE X 1/2 NPTM RUN X 1/2 O.D. TUBE BRANCH	SWAGELOK, SOLON, OH		68
														1		10-40450-16	GASKET, SEALING	BENDIX		69
									24							85-35-311-55	RECEPTACLE, SHIELDED PRESS-IN, NO. 85 1/4-TURN FASTENER	SOUTHCO INC. CONCORDVILLE, PA		70
														24		85-12-103-16	STUD, WING HEAD, NO. 85 1/4-TURN FASTENER	SOUTHCO INC. CONCORDVILLE, PA		71
														24		85-34-101-20	RETAINER, STUD, SST SPLIT RING, NO. 85 1/4-TURN FASTENER	SOUTHCO INC. CONCORDVILLE, PA		72
														24		85-43-201-38	WASHER, SEALING, NO. 85 1/4-TURN FASTENER	SOUTHCO INC. CONCORDVILLE, PA		73
														AR			CONDUIT, 1/2, FLEXIBLE, SEALTITE	(WHC STORES) (1741954)		74
														2		4Q-50	1/2" LIQUIDTIGHT CONNECTOR, STRAIGHT	O-Z/GEDNEY TERRYVILLE, CONN		75

THE PARTS/MATERIAL LIST IS CONTINUED ON SHEET 5

FOR PARTS LIST, GENERAL NOTES SEE SHEET 1

DWG NO	TITLE
DRAWING TRACEABILITY LIST	

NXT NUMBER	TITLE
REFERENCES	
NEXT USED ON	

REVISIONS
CADFILE 8822934B
CADCODE DOS 8.21-ACD2-12-SS

DRAWN AJ PALOMBI

U.S. DEPARTMENT OF ENERGY
DOE Field Office, Richland
Westinghouse Hanford Company

SUSPENDED SOLIDS MONITOR ENCLOSURE ASSEMBLY

SIZE	BLDG NO	INDEX NO	DWG NO	REV
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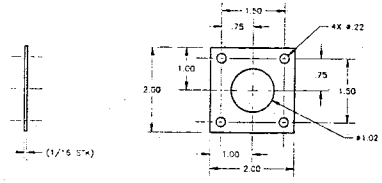
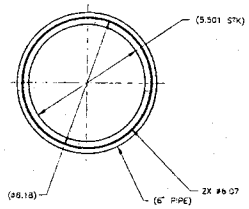
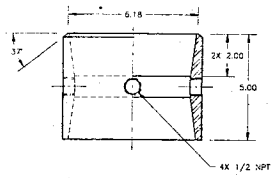
SCALE NOTED | 141082 | SHEET 2

H-2-822934

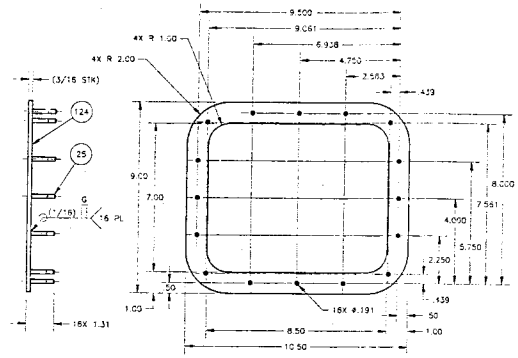


36 BEARING MOUNTING GASKET
SCALE: 1/1

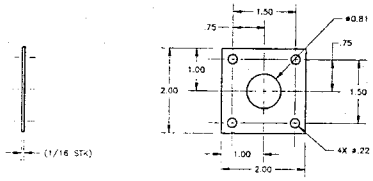




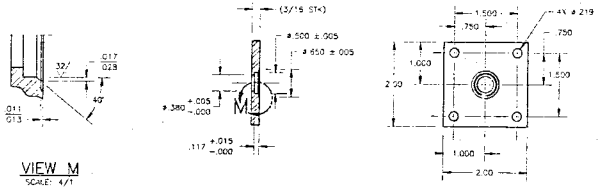
46 WASH STATION BODY
SCALE: 1/2



13 TOP WINDOW RETAINER SUB-ASSEMBLY
SCALE: 1/2



35 BEARING HOUSING GASKET
SCALE: 1/1



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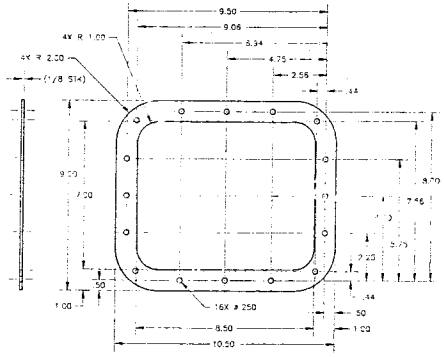
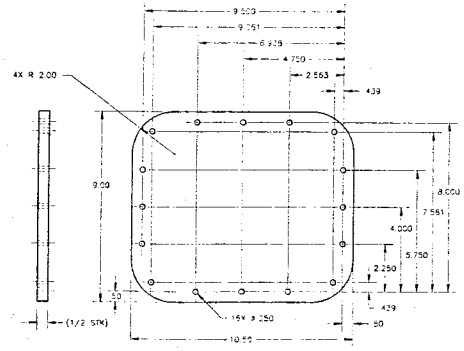
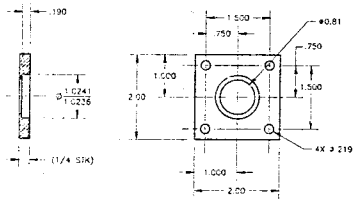
27 BEARING SEAL HOUSING
SCALE: 1/1



39 TOP WINDOW GASKET
SCALE: 1/2



45 TOP WINDOW
SCALE: 1/2



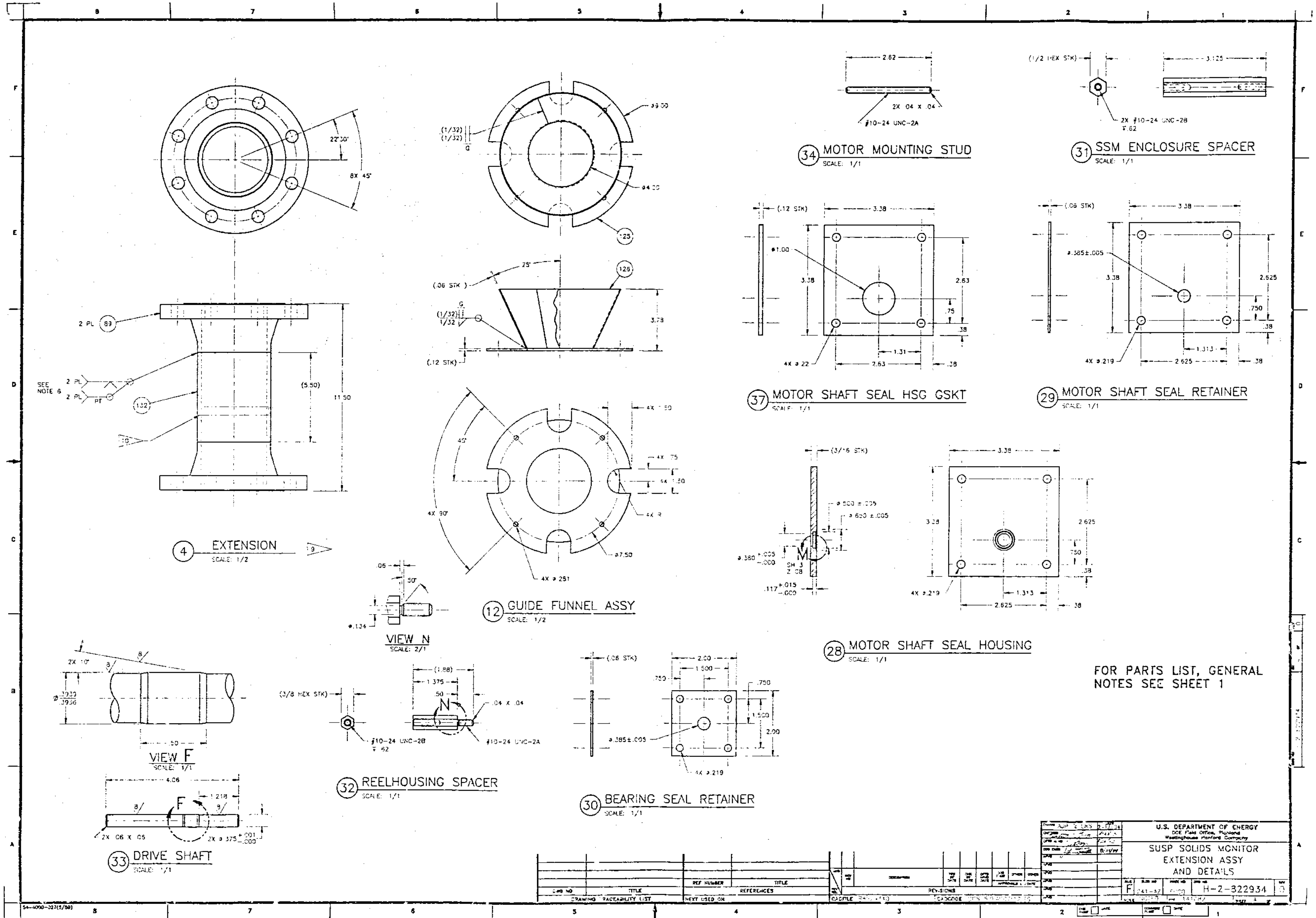
26 BEARING HOUSING
SCALE: 1/1

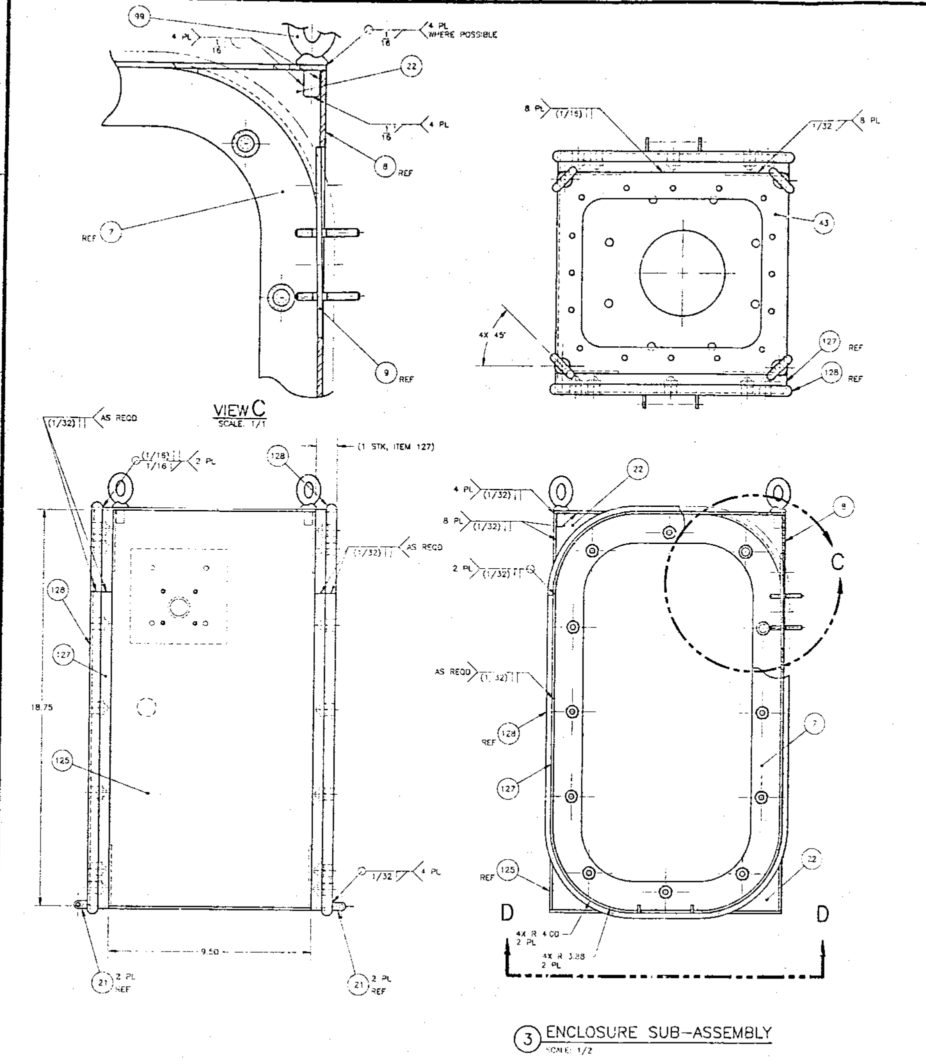
FOR PARTS LIST, GENERAL NOTES
SEE SHEET 1

U.S. DEPARTMENT OF ENERGY
DOE Field Office, Richland
Westinghouse Hanford Company

SUSPENDED SOLIDS
MONITOR
DETAILS

H-2-822934


4 EXTENSION
SCALE: 1/2
12 GUIDE FUNNEL ASSY
SCALE: 1/2
VIEW N
SCALE: 2/1
34 MOTOR MOUNTING STUD
SCALE: 1/1
31 SSM ENCLOSURE SPACER
SCALE: 1/1
37 MOTOR SHAFT SEAL HSG GSKT
SCALE: 1/1
29 MOTOR SHAFT SEAL RETAINER
SCALE: 1/1
28 MOTOR SHAFT SEAL HOUSING
SCALE: 1/1
VIEW F
SCALE: 1/1
33 DRIVE SHAFT
SCALE: 1/1
32 REELHOUSING SPACER
SCALE: 1/1
30 BEARING SEAL RETAINER
SCALE: 1/1
FOR PARTS LIST, GENERAL
NOTES SEE SHEET 1
U.S. DEPARTMENT OF ENERGY
SUSP SOLIDS MONITOR
EXTENSION ASSY
AND DETAILS
H-2-322934



PARTS LIST/MATERIAL LIST

QUANTITY REQUIRED -160	-150	-140	-130	-120	-110	-100	-090	-080	-070	-060	-050	-040	-030	-020	-010	PART/DASH NUMBER	DESCRIPTION	MATERIAL/REFERENCE	SHEET	ITEM NO
														1		515-0012-01X 610-022-64 4	PROFILER SENSOR ON 64' CABLE WITHOUT TIP SWITCH	MT. FURY CO., INC.		76
														1		3	CABLE REEL ASSEMBLY	MT. FURY CO., INC.		77
										1							REDUCER, CONCENTRIC, SCHED 40, 6" X 4", BUTT-WELD	ASTM A 234 GR B		78
											AR						CABLE, 2 CNDCT/16 AWG, SO INSUL	ANY GRADE		79
											1						PLUG, STRAIGHT, 3 PIN	(MS3106E14S-7P)		80
	1																PLUG, STRAIGHT, 37 SOCKET	(MS3106E29-21S)		81
1																	PLUG, STRAIGHT, 3 SOCKET	(MS3106E16-10S)		82
											1						CABLE CLAMP	(MS3057-6A)		83
2																	CABLE CLAMP	(MS3057-8A)		84
	2																CABLE CLAMP	(MS3057-12A)		85
											1					074-01-078	KELLEMS CORD GRIP	HUBBELL INC		86
															1	FIGURE 3245U150	BALL VALVE, 4", ANSI 150# FLANGES	WORCESTER CONTROLS MARLBOROUGH, MA		87
										1							FLANGE, 6", 150#, SLIP-ON, FORGED	ASTM A 105 CS (WHC STORES) (0044-2414-470)		88
										1		2					FLANGE, 4", 150#, WELD NECK, FORGED	ASTM A 105 CS		89
											1						NIPPLE, 1/2 IPS X 2 1/2 LONG, SCHED 40	304 SST (WHC STORES) (0050-5875-482)		90
	AR																CABLE, OUTDOOR, 9 PAIR, 20 AWG TO 16 AWG, WITH SHIELDS	ANY GRADE		91
AR																	CABLE, 3 CNDCT/12 AWG, SO INSUL			92
														1			RECEPTACLE, BOX MTG, 37 PIN	(MS3102R28-21P)		93
														1			RECEPTACLE, BOX MTG, 3 PIN	(MS3102R16-10P)		94
														1			RECEPTACLE, BOX MTG, 3 SOCKET	(MS3102R14S-7S)		95
														1		10-40450-14	GASKET, SEALING	BENDIX		96
	1																PLUG, STRAIGHT, 37 PIN	(MS3106E28-21P)		97
1																	PLUG, STRAIGHT, 3 SOCKET	(MS3106F16-10P)		98
													4				EYEBOLT, 3/8, SHOULDER BLANK	(MCMASTER-CARR #93) (8591T56 304 SST)		99
																				100
																				101
																				102

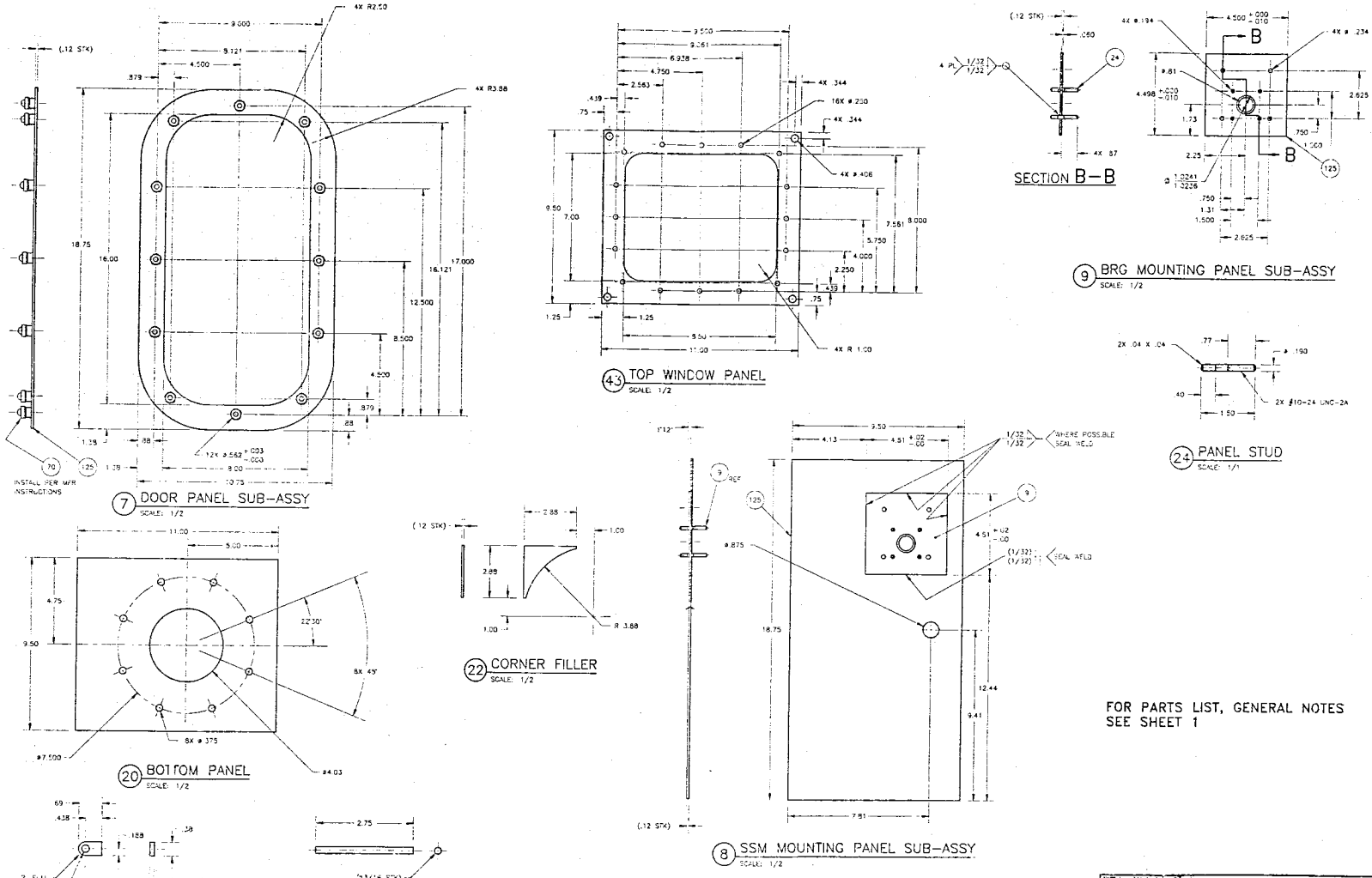
THE PARTS/MATERIAL LIST IS CONTINUED ON SHEET 9

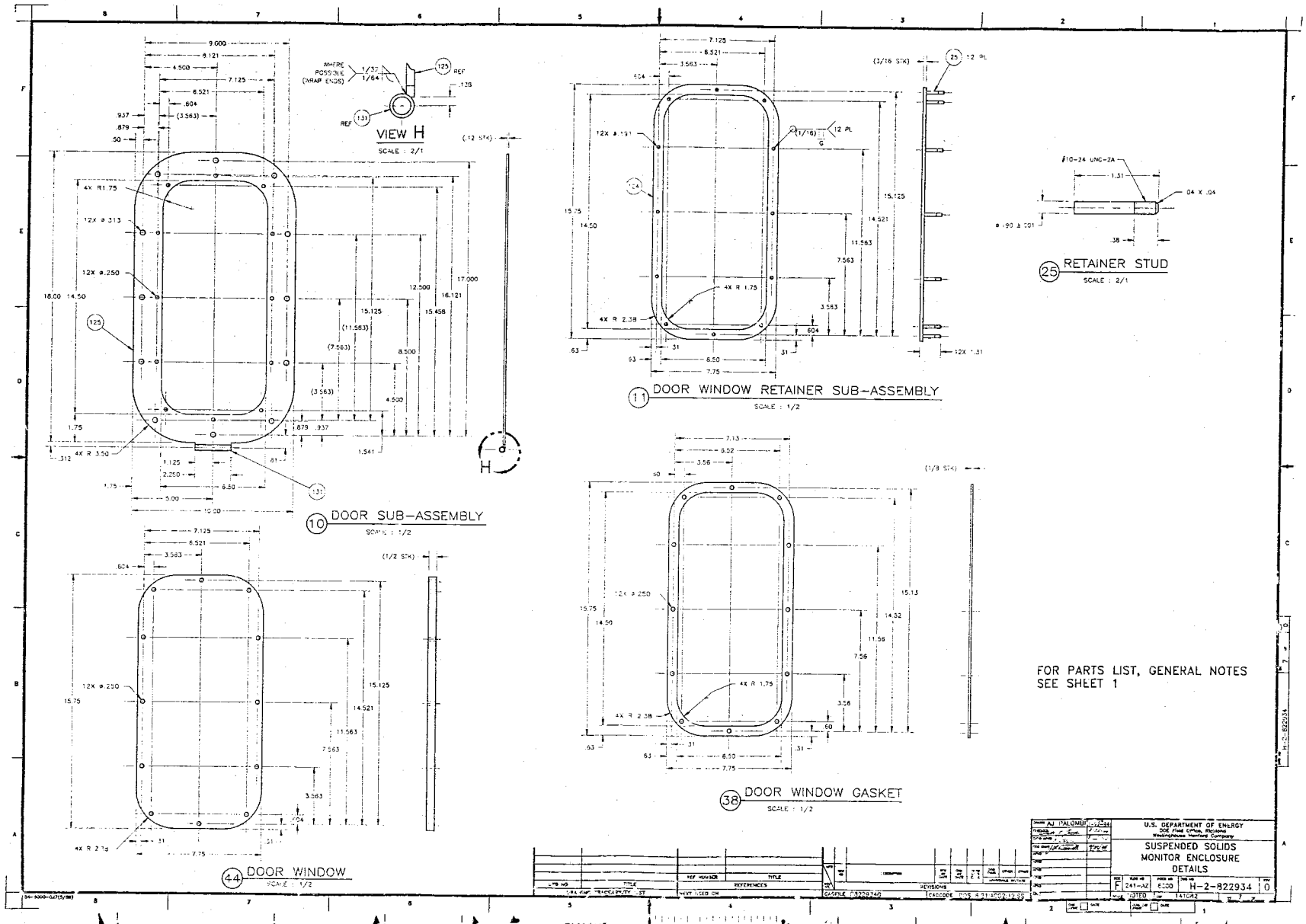
FOR PARTS LIST & GENERAL NOTES, SEE SHEET 1

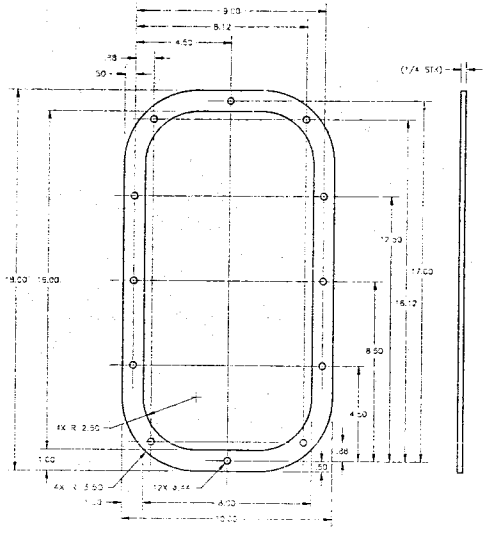
U.S. DEPARTMENT OF ENERGY
DOE Field Office, Richland
Westinghouse Hanford Company

SUSPENDED SOLIDS
MONITOR ENCLOSURE
SUB-ASSEMBLY

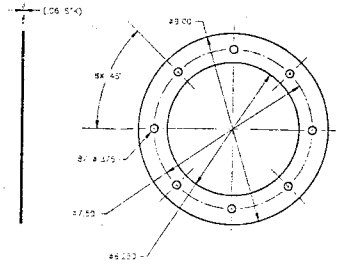
H-2-822934


7 DOOR PANEL SUB-ASSY
SCALE: 1/2
43 TOP WINDOW PANEL
SCALE: 1/2
SECTION B-B
9 BRG MOUNTING PANEL SUB-ASSY
SCALE: 1/2
24 PANEL STUD
SCALE: 1/1
20 BOTTOM PANEL
SCALE: 1/2
22 CORNER FILLER
SCALE: 1/2
8 SSM MOUNTING PANEL SUB-ASSY
SCALE: 1/2
21 HINGE EYE
23 HINGE PIN
SCALE: 1/1
FOR PARTS LIST, GENERAL NOTES
SEE SHEET 1
U.S. DEPARTMENT OF ENERGY
SUSPENDED SOLIDS
MONITOR ENCLOSURE
SUB-ASSEMBLY
H-2-822934

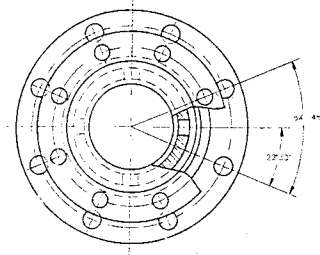

VIEW H
SCALE : 2/1
10 DOOR SUB-ASSEMBLY
SCALE : 1/2
11 DOOR WINDOW RETAINER SUB-ASSEMBLY
SCALE : 1/2
25 RETAINER STUD
SCALE : 2/1
38 DOOR WINDOW GASKET
SCALE : 1/2
44 DOOR WINDOW
SCALE : 1/2
FOR PARTS LIST, GENERAL NOTES
SEE SHEET 1
U.S. DEPARTMENT OF ENERGY
SUSPENDED SOLIDS
MONITOR ENCLOSURE
DETAILS
H-2-822934

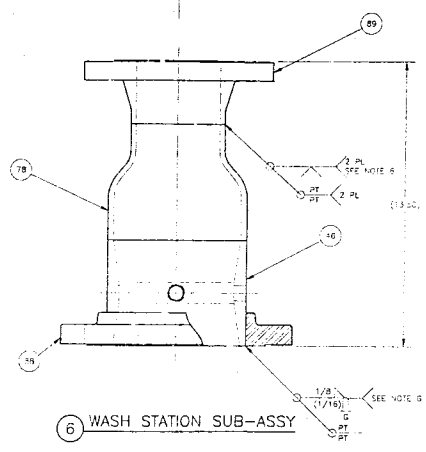


41 DOOR SEALING GASKET

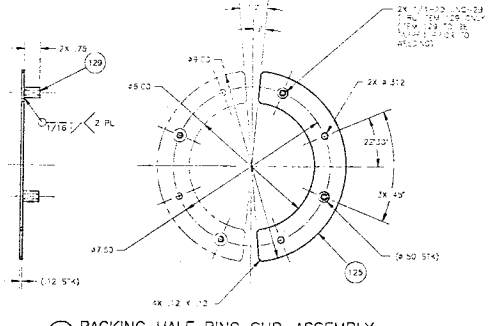


42 SPACER, 4" FLANGE

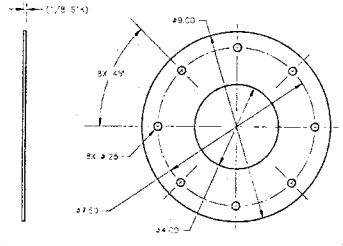




6 WASH STATION SUB-ASSY



14 BACKING HALF RING SUB-ASSEMBLY



40 4" FLG/ENCL/FUNL GASKET

SEE SHEET 1 FOR PARTS LIST AND GENERAL NOTES

U.S. DEPARTMENT OF ENERGY
DOE Field Office, Richland
Westinghouse Hanford Company

SUSPENDED SOLIDS MONITOR DETAILS

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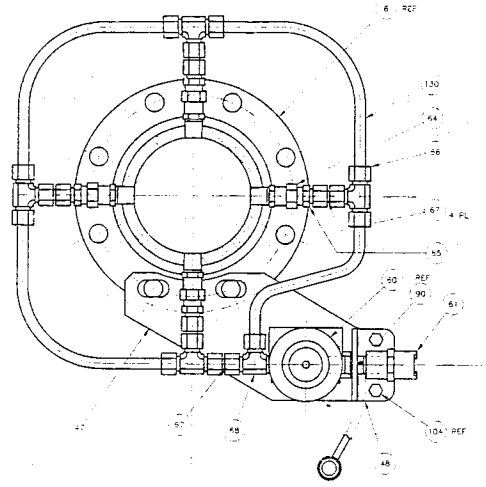
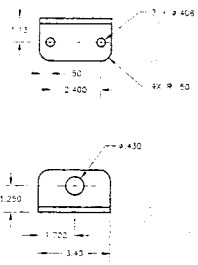
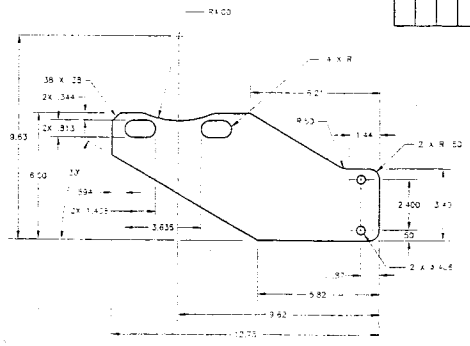
SHEET 1/2



(5) WASH STATION MANIFOLD ASSY



(48) STRAIN RELIEF ANGLE



(47) STRAIN RELIEF PLATE

PARTS LIST/MATERIAL LIST

QUANTITY PER ASSY	PART/DASH NUMBER	DESCRIPTION	MATERIAL/REFERENCE	SHEET	ITEM NO
16		SCREW, HEX HEAD CAP, 5/8-11 UNC-2A X 3 1/2 LONG	ASTM A 193 (GR B8 SST (WHC STORES) (0042-4840-545)		
2		SCREW, HEX HEAD CAP, 3/8-16 UNC-2A X 1 1/4 LONG	ASTM A 193 (GR B8 SST (WHC STORES) (0042-4840-1561)		
4		SCREW, HEX HEAD CAP, 1/4-20 UNC-2A X 2 LONG	ASTM A 193 (GR B8 SST (WHC STORES) (0042-4840-358)		
4		SCREW, HEX HEAD CAP, 1/4-20 UNC-2A X 1 1/4 LONG	ASTM A 193 (GR B8 SST (WHC STORES) (0042-4840-2220)		
4		SCREW, MACHINE, RDH, SLOTTED, #10-24 UNC-2A X 7/16 LONG	TYPE 18-8 SST (WHC STORES) (0042-5330-1391)		
4		SCREW, MACHINE, RDH, SLOTTED, #8-32 UNC-2A X 3/4 LONG	TYPE 18-8 SST (WHC STORES) (0042-5330-1149)		
12		SCREW, MACHINE, RDH, SLOTTED, #8-32 UNC-2A X 1/2 LONG	TYPE 18-8 SST (WHC STORES) (0042-5330-1145)		
8		SCREW, MACHINE, RDH, SLOTTED, #4-40 UNC-2A X 1/2 LONG	TYPE 18-8 SST (WHC STORES) (0042-5329-1001)		
16		NUT, HEX, 5/8-11 UNC-2B	ASTM A 194 GR 8 SST (WHC STORES) (0042-3910-1180)		
2		NUT, HEX, 3/8-16 UNC-2B	ASTM A 194 GR 8 SST (WHC STORES) (0042-3910-1601)		
4		NUT, HEX, 1/4-20 UNC-2B	ASTM A 194 GR 8 SST (WHC STORES) (0042-3910-1401)		
52		NUT, HEX, #10-24 UNC-2B	SST (WHC STORES) (0042-3910-1091)		
16		NUT, HEX, #8-32 UNC-2B	SST (WHC STORES) (0042-3910-1261)		
8		NUT, HEX, #4-40 UNC-2B	SST (WHC STORES) (0042-3910-1011)		
16		WASHER, LOCK, SPRING 5/8	TYPE 18-8 SST (WHC STORES) (0042-6685-1801)		
2		WASHER, LOCK, SPRING 3/8	TYPE 18-8 SST (WHC STORES) (0042-6685-1601)		
4		WASHER, FLAT, 1/2	TYPE 18-8 SST (WHC STORES) (0042-6772-1701)		
4		WASHER, FLAT, 1/4	TYPE 18-8 SST (WHC STORES) (0042-6772-1401)		

THE PARTS/MATERIAL LIST IS CONTINUED ON SHEET 10

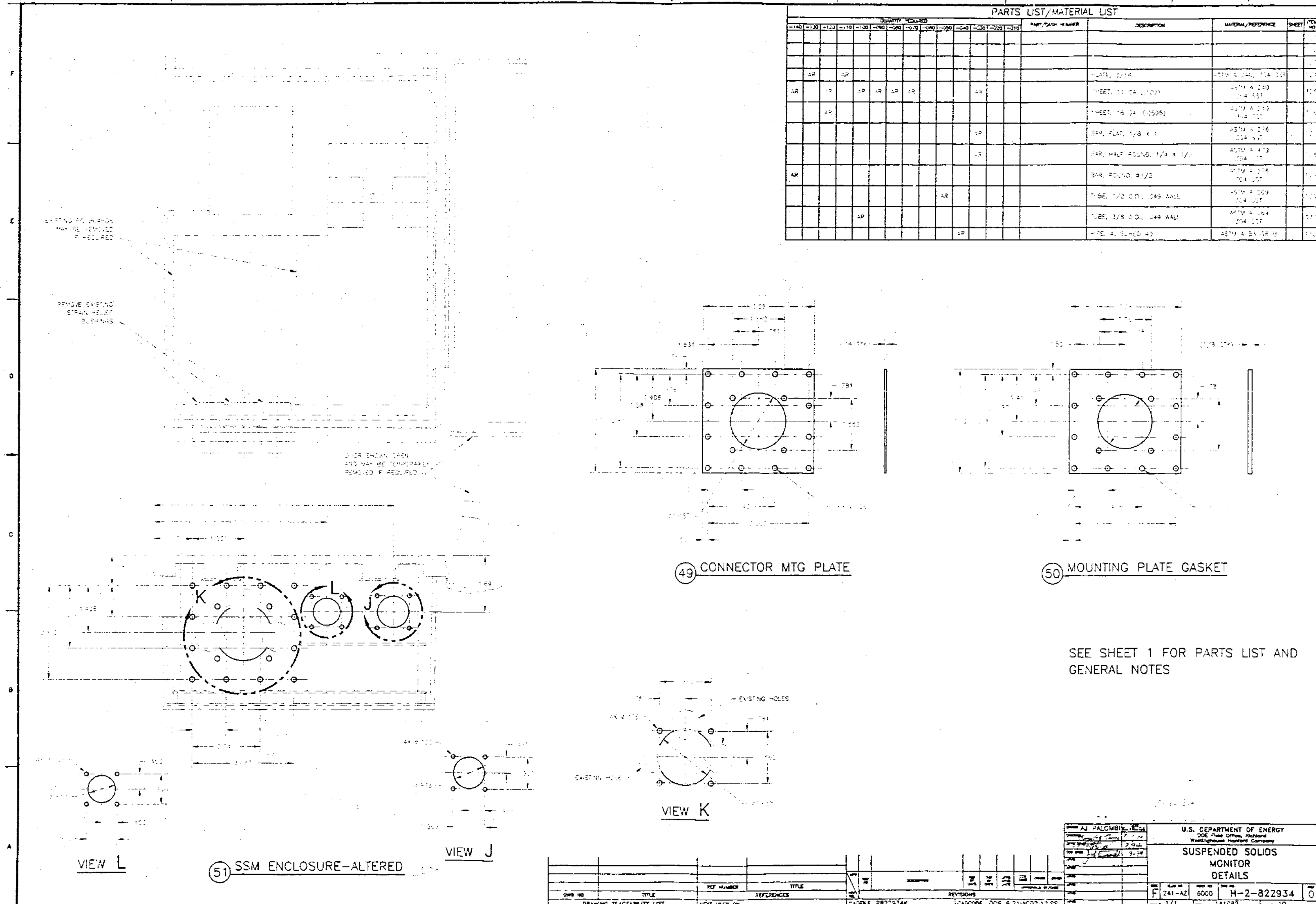
SEE SHEET 1 FOR PARTS LIST AND GENERAL NOTES

DRAWING TRACEABILITY LIST			REVISIONS					
DWG NO	TITLE	REF NUMBER / REFERENCES	TITLE / NEXT USED ON	CASFILE 822934J	CADCODE DOS 6.21,NCC2.12.SS			

DRAWN LR SAENZ	U.S. DEPARTMENT OF ENERGY, DOE Field Office, Richland, Westinghouse Hanford Company
	SUSPENDED SOLIDS MONITOR SUB-ASSY AND DETAILS
	F 241-AZ 5000 H-2-822934 0
	SHT 1/3 141082

PARTS LIST/MATERIAL LIST

QUANTITY REQUIRED -140	-130	-120	-110	-100	-090	-080	-070	-060	-050	-040	-030	-020	-010	PART/DASH NUMBER	DESCRIPTION	MATERIAL/REFERENCE	SHEET	ITEM NO
																		[illegible]
																		[illegible]
																		[illegible]
	AR		AR												PLATE, 3/16	ASTM A 240, 304 SST		[illegible]
AR		AR		AR	AR	AR	AR				AR				SHEET, 11 GA (.120)	ASTM A 240 304 SST		[illegible]
		AR													SHEET, 16 GA (.0595)	ASTM A [illegible] 304 SST		[illegible]
											AR				BAR, FLAT, 1/8 X 1	ASTM A 276 304 SST		[illegible]
											AR				BAR, HALF ROUND, 1/4 X 1/2	ASTM A 479 304 SST		[illegible]
AR															BAR, ROUND, Ø1/2	ASTM A 276 304 SST		[illegible]
									AR						TUBE, 1/2 O.D., .049 WALL	ASTM A 269 304 SST		[illegible]
				AR											TUBE, 3/8 O.D., .049 WALL	ASTM A 269 304 SST		[illegible]
										AR					PIPE, 4, SCHED 40	ASTM A 53 GR B		[illegible]



SEE SHEET 1 FOR PARTS LIST AND GENERAL NOTES

AJ PALOMBI

U.S. DEPARTMENT OF ENERGY
DOE Field Office, Richland
Westinghouse Hanford Company

SUSPENDED SOLIDS
MONITOR
DETAILS

F 241-AZ 6000 H-2-822934 0

SCALE 1/1 141082 SHEET 10

DRAWING TRACEABILITY LIST

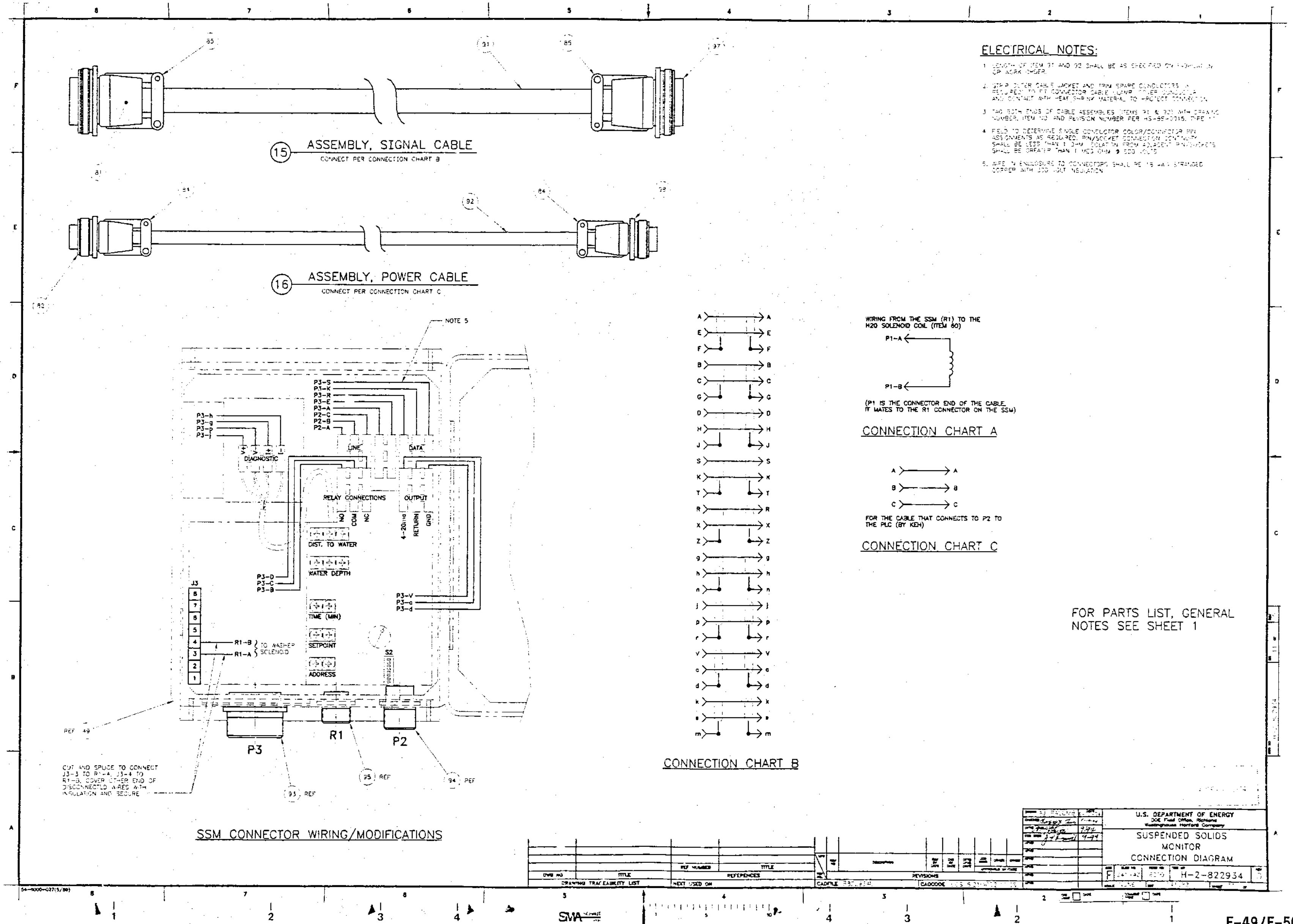
NEXT USED ON

REFERENCES

REVISIONS

CADFILE 2822934K

H-2-822934 10 0


ELECTRICAL NOTES:
15 ASSEMBLY, SIGNAL CABLE
CONNECT PER CONNECTION CHART B
16 ASSEMBLY, POWER CABLE
CONNECT PER CONNECTION CHART C
NOTE 5
P3-S
P3-K
P3-R
P3-E
P3-A
P2-C
P2-B
P2-A
P3-h
P3-g
P3-p
P3-j
DIAGNOSTIC
LINE
DATA
RELAY CONNECTIONS
NO
COM
NC
OUTPUT
4-20mA
RETURN
GND
DIST. TO WATER
WATER DEPTH
P3-D
P3-C
P3-B
P3-V
P3-c
P3-d
TIME (MIN)
SETPOINT
ADDRESS
J3
R1-B
R1-A
TO WASHER SOLENOID
S2
P3
R1
P2
REF 49
93 REF
95 REF
94 REF
CUT AND SPLICE TO CONNECT J3-3 TO R1-A, J3-4 TO R1-B. COVER OTHER END OF DISCONNECTED WIRES WITH INSULATION AND SECURE
SSM CONNECTOR WIRING/MODIFICATIONS
CONNECTION CHART B
WIRING FROM THE SSM (R1) TO THE H2O SOLENOID COIL (ITEM 60)
P1-A
P1-B
(P1 IS THE CONNECTOR END OF THE CABLE. IT MATES TO THE R1 CONNECTOR ON THE SSM)
CONNECTION CHART A
FOR THE CABLE THAT CONNECTS TO P2 TO THE PLC (BY KEH)
CONNECTION CHART C
FOR PARTS LIST, GENERAL NOTES SEE SHEET 1
U.S. DEPARTMENT OF ENERGY
SUSPENDED SOLIDS MONITOR CONNECTION DIAGRAM
H-2-822934
DRAWING TRACEABILITY LIST
REFERENCES
REVISIONS

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. Icayan	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			
G. R. Tardiff	S5-05	X			
Central Files	A3-88	X			