SEP 10 1996

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ENGINEERING DATA TRANSMITTAL

Page 1 of 1

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2. To: (Receiving Organization) 300 Area LEF Engineering	3. From: (Originating Organization) 300 Area LEF Engineering	4. Related EDT No.: 601858
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1	1	Cog. Eng. A.R. Olander	<i>A.R. Olander</i>	9/5/96	L6-04	W.A. Hooper			P8-24	3	
1	1	Cog. Mgr. D.L. Halgren	<i>D.L. Halgren</i>	9/5/96	L6-04	C.M. Loll			L6-04	3	
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18. Signature of EDT Originator <i>A.R. Olander</i> Date: 9/5/96	19. Authorized Representative for Receiving Organization <i>D.L. Halgren</i> Date: 9/5/96	20. Cognizant Manager <i>D.L. Halgren</i> Date: 9/5/96	21. DOE APPROVAL (if required) Ctrl. No. NA ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments
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BD-7400-172-1

ACCEPTANCE AND OPERABILITY TEST REPORT FOR THE 327 BUILDING RETENTION PROCESS SEWER DIVERTER STATION

A.R. Olander

Westinghouse Hanford Company, Richland, WA 99352

U.S. Department of Energy Contract DE-AC06-87RL10930

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Key Words: 340 Facility, Retention Process Sewer, Project W353,
Diverter Station, Acceptance Test Procedure, Operability Test Procedure

Abstract: This test report includes the results of acceptance and operability testing of the 327 building diverter station. The test included steps for flushing, calibrating, and operating the system on backup power.

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Aren A. Olander
Release Approval

9/10/96
Date

Release Stamp

Approved for Public Release

ACCEPTANCE AND OPERABILITY TEST PROCEDURE REPORT FOR THE
327 BUILDING RETENTION PROCESS SEWER DIVERter STATION

WHC-SD-W353-ATR-001
Rev. 0

Author
A. R. Olander
September 4, 1996

WMC-SD-W353-ATR-001 Rev. 0 ACCEPTANCE AND OPERABILITY TEST REPORT FOR THE 327 BUILDING RETENTION PROCESS SEWER DIVERTER STATION	Page 2
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1.0 OPERABILITY SUMMARY

The system was tested and is functioning as required by the operating organization. The operating goals for the new system are as follows:

- o Bypass for alarm response and in-situ calibration.
- o Reduce the alarm setpoint from 50,000 pCi/l to 5,000 pCi/l with a measurement time of 6 seconds
- o Operate on backup power.

Each of these goals was achieved performed during the test.

2.0 TEST CHANGES

The were no changes to the test procedure.

3.0 SETPOINTS AND POWER

The detector installed in the 327 building is RDA-7AS 107. The calibration setpoints are listed in table 3.1.

Table 3.1 Calibration Setpoints

	Vendor	Actual
High Voltage (Volts)	950-1070	989
Dead Time	9.97E-7	1.0E-7
Source Strength 2/26/96 (pCi/l)	1.016E+5	1.06E+5
Calibration Constant	4.42E-3	2.24E-3
Background Reading (pCi/l)	7.97E+3-8.17E+3	5.32E+3
Check Source Reading (pCi/l)	1.25E+3-8.3E+3	6.0E+4

The breaker to de-energize the system is SF-16.

4.0 RESULTS

There were no problems with the executing the flushing steps in the procedures, but the water pressure may be too low. The pressure may not be sufficient to remove a heavy sediment from the piping. A more powerful sump pump may need to be purchased for flushing operations.

The calibration source could not be inserted on the first attempt. The detector spool piece has a threaded and welded flange. The source must be inserted into threaded flange side. The test was postponed until the detector was re-oriented. Even with proper orientation the source was difficult to insert. Some possible corrections to improve the fit are to grind the weld fillets smooth, hone the counting chamber, and lubricate the volume source.

The diverter valve relay has an adjustable timer. The timer can be set from 0 to 30 minutes. Attempts were made to set the timer between 1/2 and 1 minute.

The system operated normally when the power cord was unplugged. There were no interruptions in the monitoring or diversion capability when the system was operating off of the battery supply.

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TEST PROCEDURE

ACCEPTANCE AND OPERABILITY TEST PROCEDURE FOR THE
327 BUILDING RETENTION PROCESS SEWER DIVERter STATION

WHC-SD-W353-ATP-001

Author
A. R. Olander
April 10, 1996

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1.0 PURPOSE

This Acceptance/Operability test procedure (ATP/OTP) verifies the adequacy and operability of the newly installed radiation detectors. The tests are separated into different sections. Section 6.0 contains steps to ensure operators will be able to flush and drain the piping. Section 7.0 will ensure the detector and UPS have been correctly installed. Section 8.0 provides step for field calibration of the detector. Section 9.0 will utilize the sump pumps to pressurize the piping and check for leaks. The background radiation levels are recorded in section 10.0. Section 11.0 is a full system check. The steps necessary to return the system to a standby condition are listed in section 12.0.

2.0 PRECAUTIONS

2.1 PERSONNEL SAFETY

- 2.1.1 There is a potential for contamination in the retention process sewer (RPS) piping. Follow the requirements of the Radiation Work Permit (RWP).
- 2.1.2 Air will be used to blow potentially contaminated water from the piping. The air supply must be regulated for contamination control and to ensure operators are not exposed to excessive air pressure.
- 2.1.3 Due to ventilation fan noise hearing protection is required in the basement of the 327 building.

2.2 PLANT PRECAUTIONS

- 2.2.1 Discharges will be sent from the 327 building to both the 307 basins and 340 vault tanks. Before sending waste to the vault tanks operators working at 340 must be notified to ensure there is no work in proximity to the RLWS piping.
- 2.2.2 To ensure 327 building operations are not disrupted, air and water supply systems must be secured at the conclusion of each test session.
- 2.2.3 Clean up all spills as soon as practicable. If unable to be immediately cleaned up, post a sign near the spill to warn personnel.

3.0 ADMINISTRATION

3.1 WHC TEST ENGINEER

3.1.1 The test engineer must be a certified 340 cognizant engineer.

3.1.2 The test engineer may make minor changes to the test procedure. Such changes must adhere to the following guidelines.

- a. Change does not adversely impact test results or expected outcome.
- b. Change does not affect personnel safety. ANY personnel related safety changes MUST be approved by the test engineer and a safety representative. Such approval MUST be obtained even if the change appears to improve personnel safety.
- c. Change does not affect plant or equipment safety.

3.2 WHC OPERATORS

3.2.1 The 340 operators are to certified 340 systems operators.

3.2.2 The operators will take direction from the Test Engineer.

3.3 PNNL OPERATORS

PNNL operators will be required to operate the sump pumps and supply air as requested by WHC operators. The operators must be qualified to use 327 building systems.

3.4 WHC INSTRUMENT TECHNICIAN

Instrument technicians will be required to calibrate the detector using a vendor supplied source. The technicians must have previous diverter station system maintenance experience.

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3.5 PNNL RADIATION CONTROL TECHNICIANS

Radiation control technicians will be required to establish initial conditions and monitor changes to systems with potential contamination.

3.6 KEH CONSTRUCTION FORCES

Construction workers will be required to make changes as necessary to ensure equipment operability. For example some systems may leak when water is introduced. Construction forces will also supply tools and equipment necessary to test the installation (operations will supply the drum and submersible pump).

3.7 CHANGES

Changes to the test procedure are made per the instructions contained in appendix A.

3.8 PROCEDURE SEQUENCE

The OTP sections are written in the recommended sequence. The Test Engineer may deviate from this sequence as conditions allow.

The PREREQUISITES and TEST PREPARATIONS sections must be completed prior to performance of any other sections.

3.9 EXCEPTIONS

Test exceptions will not be made during this test.

3.10 SIGNATURES

Persons signing or initialing for performance steps certify that they have personally witnessed or performed the step(s) or that they have received a direct report of step completion from test personnel.

4.0 PREREQUISITES

- 4.1 The WHC project engineer or delegate declares the installation is complete and is ready for testing.

AR Olander for J.A. Neely / 4/18/96
WHC Project Engineer Date

- 4.2 The 327 Building Facility Manager approves the start of testing activities.

W.A. Hooper / 4/18/96
W.A. Hooper Date

5.0 EQUIPMENT AND SUPPLIES

- o Open top drum
- o Submersible pump
- o Extension Cord with GFCI
- o Hardware to Connect Air Hose to Garden Hose
- o Measuring Tape
- o Pressure Regulator
- o Two Hoses
- o Volume Source

6.0 FLUSH AND DRAIN CHECK

The purpose of this test is to verify the detector can be flushed and drained. Flushing will be required to remove contaminants that have accumulated in the detector drop leg. Draining the system of liquid will be necessary prior to calibrating the system.

- 6.1 Verify the following initial valve positions (See Figure 1):

Valve	Position
Diverter Valve	TO RPS
PNNL Hose Connection Valve	CLOSED
340-BP-V-1	CLOSED
340-BP-V-2	CLOSED
340-BP-V-3	OPEN
340-BP-V-4	CLOSED
340-CO-V-1	CLOSED
340-DR-V-1	CLOSED

[illegible]

ISOMETRIC

SCALE: NONE

<p style="text-align: center;">WHC-SD-W353-ATR-001, Rev. 0</p> <p style="text-align: center;">ACCEPTANCE AND OPERABILITY TEST PROCEDURE FOR THE 327 BUILDING RETENTION PROCESS SEWER DIVERter STATION</p>	<p style="text-align: center;">Page</p> <p style="text-align: center;">13</p>
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- 6.2 Have the PNNL operator verify PNNL pumps switches are in off or manual.
- 6.3 Position the drum with submersible pump close to 340-CO-V-1. Verify pump power cord is undamaged, then plug pump into a GFCI.
- 6.4 Connect pump discharge hose to hose connection at 340-CO-V-1.
- 6.5 Fill the drum about 75% full with clean water.
- 6.6 Open valve 340-CO-V-1.
- 6.7 Start submersible pump.
- 6.8 Quickly open valve 340-BP-V-4.
- 6.9 Pump majority of liquid from drum.
- 6.10 Close valve 340-BP-V-4.
- 6.11 Quickly shut off submersible pump.
- 6.12 Close valve 340-CO-V-1.
- 6.13 Disconnect pump discharge hose at 340-CO-V-1.
- 6.14 Connect a hose at 340-DR-V-1 and route the discharge to the RPS sump.
- 6.15 Open valve 340-DR-V-1.
- 6.16 Open valve 340-CO-V-1.
- 6.17 When flow has slowed have the PNNL operator connect an air hose with pressure regulator at 340-CO-V-1 (pressure must be limited to less than 20 psi).
- 6.18 Have the PNNL operator slowly increase the air flow and blow water out of piping to the RPS sump.
- 6.19 After the majority of the water has been blown out discontinue the air blow.
- 6.20 Remove the source insertion blind flange and check piping for water.

Water Present?

☒ Yes/No

*a couple of gallons maybe
less a longer blow*

- 6.21 If water is present inside the piping, wipe dry with rags.
6.22 Consult with the building RCT for rag disposal requirements.

AR Olander / 4/18/96
Test Engineer Date

7.0 CHECK DETECTOR WIRING

The purpose of this section is to verify the detector has been wired correctly.

- 7.1 Press the On/Off button on the SRM300. The reading should be approximately 2000 pCi/l.
7.2 Turn on the UPS and then the enclosure's power strip switch. If necessary, press the check source button to retract the Ba-133 check source from the SA-18S. The SRM300's reading should go to zero.
7.3 If there are no problems, the interwiring as been correctly done.

AR Olander / 4/18/96
Test Engineer Date

8.0 BASELINE CALIBRATION OF DETECTOR

This section provides instructions for gathering background data and performing a baseline calibration of the detector. The 340 and or TEDF control room operator and 327 personnel should be notified about potential 327 alarms.

- 8.1 Have the instrument technician verify SRM300 settings for the corresponding detector element.

	RDA-7AS 105	RDA-7AS 106	RDA-7AS 107 327	RDA-7AS108
High Voltage (Volts)	1070	950	950-1070 989	989
Dead Time	9.97E-7	9.97E-7	9.97E-7 1.0 ⁻⁷	9.97E-7
Source Strength 2/26/96 (pCi/l)	1.016E+5	1.016E+5	1.016E+5	1.016E+5
Calibration Constant	3.81E-3	3.42E-3	4.42E-3 2.24 ⁻³	4.42E-3
Background Reading (pCi/l)	8.17E+3	9.7E+3	7.97E+3-8.17E+3 5.32 ⁺³	7.97E+3
Check Source Reading (pCi/l)	1.25E+3	8.3E+4	1.25E+3-8.3E+4	6.38E+3

- 8.2 Set background to 0. / approximately 0

- 8.3 Set dead time to 1.0E-7 and units to pCi/l.

- 8.4 Decay correct the source (active volume 1556 cc with 27 pCi/dps) and record below (see source calibration sheet in Appendix A).

$$A = A_0(0.5)^{t/T_{1/2}}$$

A_0 = Initial Activity = 6195 dps

t = Time in years since 1/12/96

$T_{1/2}$ = Half Life of Cs-137 = 30.17 years

110 days

Source Strength = 106755 pCi/l 106,755 pCi/l

- 8.5 Set the count time to 6 seconds.

- 8.6 Remove the end flange from the tee and attach a strong cord to the source's eyelet. Push the source into the tee then into the spool. The source may have to be rotated if it binds on insertion.

- 8.7 With a measuring stick verify that the source is extending 1.25 cm (0.5") out of the SA-18S main shield. The SA-18S shield is 43.5 cm (17.4") long and the source is 44.1 cm (17.63") long with a 1.25 cm (0.5") thick end plug. Measure and record the flange to source distance.

Flange to Source Distance = 15.5"

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- 8.8 Adjust calibration constant until it reads the decay corrected pCi/l value calculated in step 8.4 (the calibration constant will be in cps/pCi/l).
- 8.9 Pull the source out using the cord and make sure it does not bind as it is extracted.
- 8.10 Adjust background until it reads an average value of zero pCi/l.

The back ground determined at Eberline was most likely higher than Hanford. The SRM300 will over subtract giving zero for the average number at Hanford if no appreciable activity is in the water.

- 8.11 Repeat steps 8.8 through 8.11 until the calibration constant gives the true net pCi/l as a typical zero and span routine on an analog instrument would require. The net value will be a conservative number since the apparent source activity does not completely fill the spool as a solution would do.
- 8.12 Set alarm setpoint to 5,000 pCi/l.

/ 4-17-96
 Instrument Technician Date

9.0 LEAK CHECK PIPING

The objective of this section is to pressure test the newly installed piping. The test relies on the RPS sump pumps to pressurize the detector and piping to verify the system is free from leaks.

- 9.1 Remove tag (if required) and activate diverter valve.

9.2 Verify the following initial valve line up.

Valve	Position
Diverter Valve	TO RPS
PNNL Hose Connection Valve	CLOSED
340-BP-V-1	CLOSED
340-BP-V-2	OPEN
340-BP-V-3	OPEN
340-BP-V-4	OPEN
340-CO-V-1	CLOSED
340-DR-V-1	CLOSED

9.3 Connect a hose to the building water supply.

9.4 Fill sump about 75% full with clean water.

Note: Do not continuously flow water into the sump. Efforts should be made to minimize the quantity of water used during testing.

9.5 Have PNNL operator start sump pump.

9.6 Check system for leaks.

9.7 Have construction forces eliminate leaks as required.

9.8 If no leaks are evident, slowly throttle valve 340-BP-V-4 to create backpressure in the system (do not close the valve completely). Tighten to eliminate leaks as required.

9.9 When this section is completed then sign below

AR Dumb / 4/19/96
 Test Engineer Date

10.0 VERIFY RPS WATER BACKGROUND LEVEL

The objective of this section is to determine the background radiation reading with the pipe full of RPS water.

- 10.1 Switch the SRM300 to background mode and record value below.

Background = 300 pCi/l

Ronald G. Green 4-19-96
Instrument Technician Date

11.0 FULL SYSTEM OPERATION CHECK

The objective of this section is to demonstrate the system will detect radiation, alarm, and divert the flow into the RLWS system. The test is run under power failure conditions to verify the UPS performance.

- 11.1 Verify the UPS is in auto mode (if not, press CONTROL, 2, and then press ENTER twice.
- 11.2 Switch off power to the UPS to simulate a power outage.
- 11.3 Activate the check source by pressing the check source button. The check source will have to be pressed continuously until a reading is obtained.
- 11.4 Press the speaker button to acknowledge and silence the alarm.
- 11.5 Verify the diverter valve cycled and moved to direct flow to the RLWS.
- 11.6 Note the displayed reading and record below after releasing the pushbutton.

Check Source Value 5K-6K pCi/l * as it retracts level goes to 10K

- 11.7 Retract the check source by releasing the button.
- 11.8 Call 340 or TEDF to verify the 327 diverter alarm was received and has cleared. Verify that 327 received a local alarm and that the alarm was received on the FMCS.
- 11.9 Have the PNNL operator switch the pump control to automatic.

11.10 Add water to the sump to initiate an automatic pump out.

11.11 As water is flowing from the sump note the detector display output. Record the maximum level displayed.

Maximum reading during pump out = 500 pCi/l

AR Olmuk
Test Engineer

1 4/14/86
Date

12.0 FINAL CONDITIONS

The objective of this section is to restore the system to the pretesting condition. This section will be performed at the end of each test period and when all OTP testing has been concluded.

12.1 Position the valve as listed below:

Valve	Position
Diverter Valve	TO RLWS
PNNL Hose Connection Valve	CLOSED
340-BP-V-1	OPEN
340-BP-V-2	CLOSED
340-BP-V-3	OPEN
340-BP-V-4	CLOSED
340-CO-V-1	CLOSED
340-DR-V-1	CLOSED

12.2 If necessary tag diverter valve ensure valve is not operated.

12.3 Install a caution tag to prevent diverter valve operation.

12.4 Verify that the sump pump controls are off or in manual.

12.5 Leave UPS in auto.

12.6 Leave SRM300 in the on position.

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12.7 Empty residual liquid from drum.

12.8 Store 340 operations owned hoses and equipment in drum for future flushing operations in 327.

HRD [Signature] / 4/19/96
 Test Engineer Date

[Signature] / 4/19/96
 WHC Project Engineer Date

WA Hoobler / 4/19/96
 W.A. Hoobler Date

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APPENDIX A CHANGE INSTRUCTIONS

This appendix lists all the steps necessary to make changes to the OTP. The test director or engineer are authorized to make changes.

- 1.0 Obtain test engineer approval for all changes that do not have an "NA" approval designator. If in doubt then confer with the test engineer manager.

NOTE: For other than "NA" designators an ECN will need to be issued.

- 2.0 Read "minor changes" in the administrative section under the test engineer description. Verify the test director does not need to be notified for any of the types of changes listed.
- 3.0 For all changes enter the next sequential number (starting with 001) in the change log (next page) along with a brief description.
- 4.0 If the change is "minor" in scope then make the change using pen and ink or retype the entire page. Initial/date the change or sign/date the top of a retyped page near the header. Enter the change number next to your initials or signature.
- 5.0 If a change requires an ECN then the ECN will describe how to make the change.

OTP CHANGE LOG

[illegible]

SOURCE CALIBRATION SHEET

Analytix, Inc.
1350 Seaboard Industrial Boulevard
Atlanta, Georgia 30318
404 352-8677

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

51520-404

Cs-137 Solid in Plastic Custom Source Holder

This standard radionuclide source was prepared using an aliquot measured gravimetrically from a calibrated master liquid radionuclide solution source. The master source was calibrated in an ion chamber that was calibrated by the National Physical Laboratory, Teddington, U.K., and is directly traceable to national standards. ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

Radionuclide purity and calibration were checked using a germanium gamma spectrometer system. The nuclear decay rate and assay date for this source are given below.

U.S. Patent 4,430,258; U.K. Patent GB2,149,194B; CA. Patent 1,196,776. Density of solid matrix 1.15 g/cc.

ISOTOPE:	Cs-137
ACTIVITY (dps):	6195
HALF-LIFE:	30.0 years
CALIBRATION DATE:	January 12, 1996 12:00 EST
TOTAL ERROR:	4.8%
SYSTEMATIC ERROR:	4.5%
RANDOM ERROR:	0.3%

Calculated Volume: 1556 cc

P O NUMBER 15145, C/O, Item 1

SOURCE PREPARED BY:

M. D. Currie
M. D. Currie, Radiochemist

Q A APPROVED: -

D. N. Matys 1-31-96