21

Page 1 of 1

2. To: (Receiving Organization)
300 Area LEF Engineering

3. From: (Originating Organization)
300 Area LEF Engineering

4. Related EDT No.:
616202

5. Proj./Prog./Dept./Div.:
LES/300 AREA LEF

6. Cog. Engr.:
A.R. Olandery

7. Purchase Order No.: 16968

8. Originator Remarks:
For Release

9. Equip./Component No.:
325 Diverter

10. System/Bldg./Facility:
RPS/325/340

11. Receiver Remarks:
None

12. Major Assm. Dwg. No.:
H-3-304695

13. Permit/Permit Application No.:
NA

14. Required Response Date: NA

15. DATA TRANSMITTED[illegible]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	1. Approved	4. Reviewed no/comment
	2. Release	5. Post-Review	2. Approved w/comment	5. Reviewed w/comment
	3. Information	6. Dist. (Receipt Acknow. Required)	3. Disapproved w/comment	6. Receipt acknowledged

(G)	(H)	17.	SIGNATURE/DISTRIBUTION (See Approval Designator for required signatures)
-----	-----	-----	---

[illegible]

18.

AR Olander 9/5/98
Signature of EDT Date
Originator

19.

[Signature] 9/5/96
Authorized Representative Date
for Receiving Organization

20.

9/5/96
Cognizant Manager Date

21. DOE APPROVAL (if required)
Ctrl. No. NA
☐ Approved
☐ Approved w/comments
☐ Disapproved w/comments

ACCEPTANCE AND OPERABILITY TEST REPORT FOR THE 325 BUILDING RETENTION PROCESS SEWER DIVERTER STATION

A.R. Olander

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

EDT: 618089 UC: 506
Org Code: 86730 Charge Code: A234C
B&R Code: ~~39EW31302~~ Total Pages: 23
EW3130020 KN

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 325 building diverter station. The test included steps for flushing, calibrating, and operating the system on backup power.

TRADEMARK DISCLAIMER. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

Printed in the United States of America. To obtain copies of this document, contact: WHC/BCS Document Control Services, P.O. Box 1970, Mailstop H6-08, Richland WA 99352, Phone (509) 372-2420; Fax (509) 376-4989.

Karen A. Olander 9/10/96
Release Approval Date

Approved for Public Release

WHC-SD-W353-ATR-002 Rev. 0 ACCEPTANCE AND OPERABILITY TEST REPORT FOR THE 325 BUILDING RETENTION PROCESS SEWER DIVERTER STATION	Page 1
---	-----------

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

WHC-SD-W353-ATR-002
Rev. 0

Author
A. R. Olander
September 3, 1996

<p>WHC-SD-W353-ATR-002 Rev. 0</p> <p>ACCEPTANCE AND OPERABILITY TEST REPORT FOR THE 325 BUILDING</p> <p>RETENTION PROCESS SEWER DIVERTER STATION</p>	<p>Page</p> <p>2</p>
--	----------------------

TABLE OF CONTENTS

1.0	OPERABILITY SUMMARY	3
2.0	TEST CHANGES	3
3.0	SETPOINTS AND POWER	3
4.0	RESULTS	5
	TEST PROCEDURE	6

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 one of these goals was achieved performed during the test.

2.0 TEST CHANGES

The first change to the test procedure was to use a process water rather than water from the fire system. The facility operations organization has back flow protected their process water system and a hose bib was near the diverter station so there was no reason to tap into the fire system.

The second change was to section 10.0, the final conditions section. The test was written so that the system would be in flow through configuration at the end of the test until the operating procedures could be updated. The procedures were updated prior to finishing the test so the system was put on-line.

The testing was interrupted when the vendor specified setpoints did not provide appropriate response. A generic work package was used during the troubleshooting activities. The attempted corrections included tightening leads, replacing suspect high voltage connectors (the installed connectors did not appear to be high voltage type), and shortening the high voltage signal cable. After the changes were made a the high voltage/response plateau was determined by calculating the figure of merit as described in the *On-Line Liquid Monitor Manual*, Page 4-1. The figure of merit curve is shown as Figure 1. The curve shows that the appropriate high voltage setting is 1080 volts.

3.0 SETPOINTS AND POWER

The detector installed in the 325 building is RDA-7AS 106. The calibration setpoints are listed in table 3.1.

325 Diverter Figure of Merit

Table 3.1 Calibration Setpoints

	Vendor	Actual
High Voltage (Volts)	950	1080
Dead Time	9.97E-7	1.0E-7
Source Strength 2/26/96 (pCi/l)	1.016E+5	1.05E+5
Calibration Constant	3.42E-3	3.21E-3
Background Reading (pCi/l)	9.7E+3	1.11E+4
Check Source Reading (pCi/l)	8.3E+4	7.52E+4

The breaker to de-energize the system is #24 in panel P-J-B-J3.

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.

The calibration source was difficult to insert. Some adjustment of the flange alignment was necessary before the source could be worked into the counting chamber. 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.

TEST PROCEDURE

ACCEPTANCE AND OPERABILITY TEST PROCEDURE FOR THE
325 BUILDING RETENTION PROCESS SEWER DIVERTER STATION

WHC-SD-W353-ATP-002
Rev. 1

Author
A. R. Olander
May 6, 1996

TABLE OF CONTENTS

1.0	PURPOSE	3
2.0	PRECAUTIONS	3
2.1	PERSONNEL SAFETY	3
2.2	PLANT PRECAUTIONS	3
3.0	ADMINISTRATION	4
3.1	WHC TEST ENGINEER	4
3.2	WHC OPERATORS	4
3.3	PNNL FITTERS/OPERATORS	4
3.4	WHC INSTRUMENT TECHNICIAN	4
3.5	PNNL RADIATION CONTROL TECHNICIANS	5
3.6	KEH CONSTRUCTION FORCES	5
3.7	CHANGES	5
3.8	PROCEDURE SEQUENCE	5
3.9	EXCEPTIONS	5
3.10	SIGNATURES	5
4.0	PREREQUISITES	6
5.0	EQUIPMENT AND SUPPLIES	6
6.0	FLUSH AND DRAIN CHECK	6
7.0	CHECK DETECTOR WIRING	9
8.0	BASELINE CALIBRATION OF DETECTOR	9
9.0	FULL SYSTEM OPERATION CHECK	11
10.0	FINAL CONDITIONS	12
APPENDIX A	CHANGE INSTRUCTIONS	14
	OTP CHANGE LOG	15
	SOURCE CALIBRATION SHEET	16

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 is a full system check. The steps necessary to return the system to a standby condition are listed in section 10.0.

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 low piping hard hats must be worn while in the vicinity of the diverter station.

2.2 PLANT PRECAUTIONS

- 2.2.1 Discharges may be sent from the 325 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 325 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.

WHC-SD-W353-ATR-002, Rev. 0 ACCEPTANCE AND OPERABILITY TEST PROCEDURE FOR THE 325 BUILDING RETENTION PROCESS SEWER DIVERTER STATION	Page 10
---	------------

3.0 ADMINISTRATION

3.1 WHC TEST ENGINEER

3.1.1 The test engineer must be a 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 FITTERS/OPERATORS

PNNL fitters/operators will be required to supply air and water as requested by WHC operators. The fitters/operators must be qualified to use 325 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.

WHC-SD-W353-ATR-002, Rev. 2 ACCEPTANCE AND OPERABILITY TEST PROCEDURE FOR THE 325 BUILDING RETENTION PROCESS SEWER DIVERTER STATION	Page. 11
---	-------------

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.

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.

J. C. Myers / 5/22/96
~~WHC~~ Project Engineer Date

- 4.2 The 325 Building Facility Manager approves the start of testing activities.

P. J. Gaither / 5-23-96
 P.J. Gaither Date

5.0 EQUIPMENT AND SUPPLIES

o Measuring Tape	o Rags & Plastic Bags
o Pressure Regulator	o Two Water Hoses (20' & 50')
o 100' Air Hose	o Volume Source
o Waterproof gloves	o Bucket or Drum
o Safety Glasses	o Ladder

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 ~~Notify the fire department of planned fire system water use.~~ ARB steps

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

Valve	Position
Diverter Valve	TO RPS
340-BP-V-1	CLOSED
340-BP-V-2	OPENED
340-BP-V-3	CLOSED
340-CO-V-1	CLOSED
340-CO-V-2	CLOSED
340-CO-V-3	CLOSED
340-DR-V-1	CLOSED

Figure 1: 325 Diverter Valve Identification

WHC-SD-W353-ATR-002, Rev. 0	Page
ACCEPTANCE AND OPERABILITY TEST PROCEDURE FOR THE 325 BUILDING RETENTION PROCESS SEWER DIVERTER STATION	14

- 6.3 Have ~~PNNL pipe fitter~~ connect one end of the hose to the connection on ~~fire system.~~
process water system. ^{#2} ARD 5/22/96 RPS 5/24/96
 - 6.4 Screw the other end of the hose to connection on valve 340-CO-V-2.
 - 6.5 Have the PNNL pipe fitter open the water valve on the fire system.
 - 6.6 Open valve 340-CO-V-2.
 - 6.7 Open valve 340-CO-V-1.
 - 6.8 Open valve 340-BP-V-3.
 - 6.9 Flush for 30 seconds.
 - 6.10 Close valve 340-BP-V-3.
 - 6.11 Close valve 340-CO-V-1.
 - 6.12 Disconnect and secure the water supply line and source.
 - 6.13 Connect a drain hose to valve 340-DR-V-1. Place the discharge in the local RPS sump.
 - 6.14 Open valve 340-DR-V-1.
 - 6.15 Open valve 340-CO-V-1 to drain the water from the detector system.
 - 6.16 When flow has slowed, connect an air hose with pressure regulator at 340-CO-V-3 (pressure must be limited to 20 psi).
 - 6.17 Close valve 340-CO-V-2.
 - 6.18 Open valve 340-CO-V-3.
 - 6.19 Slowly increase the air flow and blow water out of piping to the RPS sump.
 - 6.20 After most of the water is out, discontinue the air blow.
 - 6.21 Close valves 340-CO-V-3 and 340-CO-V-1.
 - 6.22 Remove the source insertion blind flange and check for water.
- Water Present? Yes/No
- 6.23 If water is present in the piping, wipe as dry as possible.

- 6.24 Secure hoses and consult with the building RCT for waste disposal requirements.

AR Clark

Test Engineer

1 5/23/96
Date

7.0 CHECK DETECTOR WIRING

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

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

AR Clark

Test Engineer

1 5/23/96
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 325 personnel should be notified about potential diverter alarms.

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

	RDA-7AS 105	RDA-7AS 106	RDA-7AS 107	RDA-7AS108
High Voltage (Volts)	1070	950 1080	950-1070	989
Dead Time	9.97E-7	9.97E-7 1.00E-7	9.97E-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 5.21E-3	4.42E-3	4.42E-3
Background Reading (pCi/l)	8.17E+3	9.7E+3 1.11E+4	7.97E+3 8.17E+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 near 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

$$\text{Source Strength} = \underline{105,000} \text{ pCi/l}$$

- 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.

$$\text{Flange to Source Distance} = \underline{17.25}$$

- 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.

WHC-SD-W353-ATR-002, Rev. 0 ACCEPTANCE AND OPERABILITY TEST PROCEDURE FOR THE 325 BUILDING RETENTION PROCESS SEWER DIVERTER STATION	Page 17
---	------------

8.12 Set alarm setpoint to 5,000 pCi/l.

8.13 Replace source insertion blind flange.

 Instrument Technician Date 5-30-96

9.0 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.

9.1 Open valve 340-BP-V-3.

9.2 Open valve 340-BP-V-1.

9.3 Close valve 340-BP-V-2.

9.4 Verify the UPS AC line and Ready windows have a green light.

9.5 Pull UPS power plug to simulate a power outage.

9.6 Notify building manager that an alarm will be generated.

9.7 Insert the check source by turning the key switch.

9.8 Press the speaker button to acknowledge and silence the alarm.

9.9 Verify the diverter valve cycled and moved to direct flow to the RLWS.

9.10 Note the displayed reading and record below.

Check Source Value 7.52⁺⁴ pCi/l

9.11 Retract the check source by turning the key switch.

9.12 Call 340 or TEDF to verify the 325 diverter alarm was received and has cleared. Verify that 325 received a local alarm and that the alarm was received on the FMCS.

- 9.13 As water is flowing from the sump note the detector display output. Record the approximate background level.

Background Level 16.8 pCi/l

AR Shamba

Test Engineer

1 5/30/96

Date

10.0 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.

- 10.1 Position the valve as listed below:

#3
Skipped because procedures
were complete and in field. ARS

Valve	Position
Diverter Valve	TO RPS
340-BP-V-1	CLOSED
340-BP-V-2	OPENED
340-BP-V-3	CLOSED
340-CO-V-1	CLOSED
340-CO-V-2	CLOSED
340-CO-V-3	CLOSED
340-DR-V-1	CLOSED

- 10.2 Have PNNL personnel install a tags as necessary to prevent diverter valve operation.
- 10.3 Leave UPS in auto.
- 10.4 Leave SRM300 in the on position.

- 10.5 Store 340 operations owned hoses and equipment for future flushing operations in 325.

A.R. O'Connell / 5/30/96
Test Engineer Date

J.G. Nery / 6/4/96
WHC Project Engineer Date

P.J. Gaither / 5-30-96
P.J. Gaither Date

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 engineer manager 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

Analytics, Inc.
1350 Seaboard Industrial Boulevard
Atlanta, Georgia 30318
404 352-5677

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 15146, C/O, Item 1

SOURCE PREPARED BY:

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

Q A APPROVED:

Dr. Matys 1-31-96