### Engineering Data Transmittal

**To:** 300 Area LEF Engineering  
**From:** 300 Area LEF Engineering  
**Related EDT No.:** 616207  
**Originator:** A.R. Olander  
**System/Bldg./Facility:** RPS/324/340  
**Equip./Component No.:** 324 Diverter  
**Proj./Prog./Dept./Div.:** LES/300 AREA LEF  
**Originator Remarks:** For Release

**Receiver Remarks:** None

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**DATA TRANSMITTED**

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<th>Item No.</th>
<th>Document/Drawing No.</th>
<th>Sheet No.</th>
<th>Rev. No.</th>
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<td>Acceptance and Operability Test Report for the 324 Building Retention Process Sewer Diverter Station</td>
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**Approval Designator (F)**

- E. S, Q, D or N/A
- (see WHC-CM-3-5, Sec. 12.7)

**Reason for Transmittal (G)**

1. Approval  
2. Release  
3. Information  
4. Review  
5. Post-Review  
6. Dist. (Receipt Acknow. Required)

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2. Approved w/comment  
3. Disapproved w/comment  
4. Reviewed no/comment  
5. Reviewed w/comment  
6. Receipt acknowledged

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**Signature of EDT Originator**

A.R. Olander  
**Signature Date**  

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**Authorized Representative Date for Receiving Organization**

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**Cognizant Manager Date**

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**DOE APPROVAL (if required)**

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</tbody>
</table>
ACCEPTANCE AND OPERABILITY TEST REPORT
FOR THE 324 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: 618090   UC: 506
Org Code: 86730  Charge Code: A234C
B&R Code: 39E31302   Total Pages: 26

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

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Approved for Public Release

A-6400-073 (10/95) GEF321
ACCEPTANCE AND OPERABILITY TEST PROCEDURE REPORT FOR THE 324 BUILDING RETENTION PROCESS SEWER DIVERTER STATION

WHC-SD-W353-ATR-003
Rev. 0

Author
A. R. Olander
September 4, 1996
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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:

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

Each of these goals was achieved performed during the test.

2.0 TEST CHANGES

The only change was to section 11.0, the final conditions section. The 324 building manager wanted to ensure adequate background data was collected before reducing the alarm setpoint. The alarm setpoint was set at 100,000 pCi/l for a couple of days before being scaled back to 5,000 pCi/l.

3.0 SETPOINTS AND POWER

The detector installed in the 324 building is RDA-7AS 108. The calibration setpoints are listed in table 3.1.

<table>
<thead>
<tr>
<th></th>
<th>Vendor</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Voltage (Volts)</td>
<td>989</td>
<td>989</td>
</tr>
<tr>
<td>Dead Time</td>
<td>9.97E-7</td>
<td>1.0E-7</td>
</tr>
<tr>
<td>Source Strength 2/26/96 (pCi/l)</td>
<td>1.016E+5</td>
<td>1.05E+5</td>
</tr>
<tr>
<td>Calibration Constant</td>
<td>4.42E-3</td>
<td>3.04E-3</td>
</tr>
<tr>
<td>Background Reading (pCi/l)</td>
<td>7.97E+3</td>
<td>4.73E+3</td>
</tr>
<tr>
<td>Check Source Reading (pCi/l)</td>
<td>6.38E+3</td>
<td>6.38E+3</td>
</tr>
</tbody>
</table>

The breaker to de-energize the system is #5 in panel A of EDL 101.
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 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 324 BUILDING RETENTION PROCESS SEWER DIVERTER STATION

WHC-SD-W353-ATP-003
Rev. 0

Author
A. R. Olander
May 29, 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 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 move potentially contaminated water through a portion of the piping. The air supply must be regulated to ensure operators hose connections are not exposed to excessive air pressure.

2.1.3 Due to limited space tripping hazards will present. Only those directly involved in test will be allowed into the service gallery.

2.2 PLANT PRECAUTIONS

2.2.1 Discharges may be sent from the 324 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 324 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 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 be 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 supply air and water as requested by WHC operators. The operators must be qualified to use 324 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.
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 initiating 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 ready for testing.

S.A. Weigher		/ 6/3/96
WHC Project Engineer		Date

4.2 The 324 Building Facility Manager approves the start of testing activities.

M.J. Moran		/ 6-3-96
Date

5.0 EQUIPMENT AND SUPPLIES

- Measuring Tape
- Pressure Regulator
- 50' Air Hose
- WHC Bypass Line
- Funnel
- Gloves as specified in RWP
- Submersible Pump
- Drip pans (wall height 5" max)
- Two Water Hoses (10' & 20')
- Volume Source
- Open Top Drum
- 5 gallon water jug with spout
- Rags

6.0 Install WHC Bypass

6.1 Verify that building personnel have reduced flow and flow through the construction bypass line has slowed.


6.3 Place catch pan below upstream hose connection and disconnect.

6.4 Have RCT survey hose connection and threaded pipe for contamination.

6.5 Elevate detached hose and roll it up while walking towards the downstream connection.

6.6 Disconnect hose at the downstream end and have RCT survey the hose connection and threaded pipe.

6.7 Bag the hose as required by building personnel.

6.8 Cap downstream connection.
6.9 Install WHC bypass hose.
6.10 Verify valve 340-DR-V-2 is closed
6.13 Inspect bypass for leaks, repair as required.

7.0 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.

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

<table>
<thead>
<tr>
<th>Valve</th>
<th>Position</th>
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<tbody>
<tr>
<td>Diverter Valve</td>
<td>TO RPS</td>
</tr>
<tr>
<td>340-BP-V-1</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-BP-V-2</td>
<td>OPEN</td>
</tr>
<tr>
<td>340-BP-V-3</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-BP-V-4</td>
<td>OPEN</td>
</tr>
<tr>
<td>340-CO-V-1</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-CO-V-2</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-CO-V-3</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-DR-V-1</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-DR-V-2</td>
<td>CLOSED</td>
</tr>
</tbody>
</table>
Figure 1: 324 Diverter Valve Identification
7.2 Position the drum with submersible pump close to 340-CO-V-1. Verify pump power cord is undamaged.
7.3 Connect one end of the hose to building water supply.
7.4 Connect pump discharge hose to hose connection at 340-CO-V-3.
7.5 Fill the drum about 75% full with clean water.
7.6 Open valve 340-CO-V-3.
7.7 Plug in submersible pump to the GFCI to start pumping.
7.8 Open valve 340-CO-V-1 to charge piping with clean water.
7.9 Open valve 340-BP-V-3
7.10 Flush until most of the drum is empty.
7.11 Close valve 340-BP-V-3.
7.12 Close valve 340-CO-V-3.
7.13 Unplug submersible pump to discontinue pumping.
7.15 Disconnect and secure the water supply line and source.
7.16 Connect a drain hose to valve 340-DR-V-1.
7.17 Connect the discharge end of the hose to valve 340-DR-V-2.
7.18 Connect air line with regulator to the building air supply near the stair landing.
7.19 Connect the other end of the air line to the quick connect at valve 340-CO-V-2.
7.20 Adjust the pressure regulator to 5 psi.
7.21 Open valve 340-CO-V-2.
7.22 Open valve 340-CO-V-1.
7.23 Open valve 340-DR-V-1.
7.24 Open valve 340-DR-V-2.

Note: During the blowout procedure closely watch the flexible bypass line. If the line begins to flatten and then expand near the upstream bypass immediately close valve 340-DR-V-2. A fluctuating line means the air is flowing upstream rather than pushing the water downstream.

7.25 Increase the air pressure gradually to a maximum of 20 psi. Back off the pressure if the bypass line begins to fluctuate.

7.26 Continue the air blow for about 5 minutes.

7.27 Close valve 340-DR-V-2.


The following steps will be used to relieve air pressure in the detector piping. The valve sequence must be performed quickly to avoid backing water into basement drains.

7.31 Open valve 340-BP-V-3 to release air pressure.
7.32 Close valve 340-BP-V-3.
7.33 Open valve 340-BP-V-4.
7.34 Open valve 340-BP-V-2.
7.35 Close valve 340-CO-V-1.
7.36 Close valve 340-DR-V-1.
7.37 Remove and secure hose and air line.
7.38 Remove drain hose and have RCT survey connections. Bag for transport to 340.
7.39 Remove the source insertion blind flange and check for water.

\[\text{Water Present? Yes/No}\]

7.40 If water is present in the piping, wipe as dry as possible.

7.41 Consult with the building RCT for waste disposal requirements.

\[\text{AR Oliphant} \quad \text{6/3/96}\]
\[\text{Test Engineer \quad Date}\]

8.0 CHECK DETECTOR WIRING

The purpose of this section is to verify the detector has been wired correctly. The 324 alarms may be generated by limit switches on the diverter valve or by instrument trouble. Notify the 324 building manager and 340 and or TEDF facility of potential alarms.

8.1 Verify or switch on the UPS and then the enclosure's power strip power switch.

8.2 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.

8.3 If there are no problems, the interwiring has been correctly done.

\[\text{AR Oliphant} \quad \text{6/3/96}\]
\[\text{Test Engineer \quad Date}\]

9.0 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 324 personnel should be notified about potential diverter alarms.
9.1 Have the instrument technician verify SRM300 settings for the corresponding detector element.

<table>
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<tr>
<th></th>
<th>RDA-7AS 105</th>
<th>RDA-7AS 106</th>
<th>RDA-7AS 107</th>
<th>RDA-7AS 108</th>
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<tr>
<td>High Voltage (Volts)</td>
<td>1070</td>
<td>950</td>
<td>950-1070</td>
<td>989</td>
</tr>
<tr>
<td>Dead Time</td>
<td>9.97E-7</td>
<td>9.97E-7</td>
<td>9.97E-7</td>
<td>9.97E-7</td>
</tr>
<tr>
<td>Source Strength</td>
<td>1.016E+5</td>
<td>1.016E+5</td>
<td>1.016E+5</td>
<td>1.016E+5</td>
</tr>
<tr>
<td>Calibration</td>
<td>3.81E-3</td>
<td>3.42E-3</td>
<td>4.42E-3</td>
<td>4.42E-3</td>
</tr>
<tr>
<td>Background Reading</td>
<td>9.17E+3</td>
<td>9.7E+3</td>
<td>7.97E+3</td>
<td>7.97E+3</td>
</tr>
<tr>
<td>Check Source Reading</td>
<td>1.25E+3</td>
<td>8.3E+4</td>
<td>1.25E+3</td>
<td>1.25E+3</td>
</tr>
</tbody>
</table>

9.2 Set background to near 0.

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

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

\[ A = A_0 (0.5)^{t/T_{1/2}} \]

Initial Activity = 6195 dps
Time in years since 1/12/96
Half Life of Cs-137 = 30.17 years

Source Strength = \[ \frac{105}{60} \] pCi/l

9.5 Set the count time to 6 seconds.

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

9.7 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.

\[ \text{Flange to Source Distance} = 14.75 \]
9.8 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).

9.9 Pull the source out using the cord and make sure it does not bind as it is extracted.

9.10 Adjust background until it reads an average value of zero pCi/l. The background 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.

9.11 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.

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

9.13 Replace source insertion blind flange.

10.0 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.

10.1 Open valve 340-BP-V-3.

10.2 Open valve 340-BP-V-1.

10.3 Close valve 340-BP-V-2.

10.4 Close valve 340-BP-V-4.

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

10.6 Pull UPS power plug to simulate a power outage.
10.7 Notify building manager that an alarm will be generated.

10.8 Insert the check source by turning the key switch.

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

10.10 Note the displayed reading and record below.

\[
\text{Check Source Value} \quad 7.21^{+3} \quad \text{pCi/l}
\]

10.11 Retract the check source by turning the key switch.

10.12 Call 340 or TEOF to verify the 324 diverter alarm was received and has cleared. Verify that 324 received a local alarm and that the alarm was received on the FMCS.

10.13 As water is flowing through the detector display output. Record the approximate background level.

\[
\text{Background Level} \quad 5-7 \quad \text{pCi/l}
\]

\[
\text{AR Olander} \quad 4/3/94
\]

Test Engineer Date

11.0 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. The test engineer will decide in conjunction with facility personnel whether to leave the system in flow through or bypass mode.

Test engineer shall circle one mode below at the end of the test.

\[
\text{Bypass} \quad \text{Flow Through} \quad \text{AR Olander} \quad 4/3/94
\]

Test Engineer/Date

Note: If system is to be left in flow through mode secure WHC bypass hose by following steps 11.1 to

11.1 Open valve 340-BP-V-1.

11.2 Open valve 340-BP-V-3.
11.3 Close valve 340-BP-V-2.
11.4 Place a drip pan under hose connect near 340-BP-V-2 and disconnect hose and elevate it.
11.5 Have RCT survey hose connection and stationary pipe cam lock for contamination.
11.6 Keep hose elevated and roll it up while walking towards 340-BP-V-4.
11.7 Drain as much water as possible from the hose and close 340-BP-V-4.
11.8 Disconnect hose at cam lock near 340-BP-V-4 and have RCT survey connections.
11.9 Bag with other hoses for storage or disposal at 340.
11.10 Place catch pan under 340-DR-V-2 and drain water into it.
11.11 Have RCT survey downstream cam lock hardware for release.
11.12 Store downstream cam lock hardware near diverter controller if released by HPT otherwise transport it to 340 for storage.
11.13 Position the valves as listed below if the system is to be left in flow through mode:

<table>
<thead>
<tr>
<th>Valve</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diverter Valve</td>
<td>TO RPS</td>
</tr>
<tr>
<td>340-BP-V-1</td>
<td>OPEN</td>
</tr>
<tr>
<td>340-BP-V-2</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-BP-V-3</td>
<td>OPEN</td>
</tr>
<tr>
<td>340-BP-V-4</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-CO-V-1</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-CO-V-2</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-CO-V-3</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-DR-V-1</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-DR-V-2</td>
<td>CLOSED</td>
</tr>
</tbody>
</table>
11.14 Position valves as listed below if the system is to be left in bypass mode:

<table>
<thead>
<tr>
<th>Valve</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diverter Valve</td>
<td>TO RPS</td>
</tr>
<tr>
<td>340-BP-V-1</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-BP-V-2</td>
<td>OPEN</td>
</tr>
<tr>
<td>340-BP-V-3</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-BP-V-4</td>
<td>OPEN</td>
</tr>
<tr>
<td>340-CO-V-1</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-CO-V-2</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-CO-V-3</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-DR-V-1</td>
<td>CLOSED</td>
</tr>
<tr>
<td>340-DR-V-2</td>
<td>CLOSED</td>
</tr>
</tbody>
</table>

11.15 Have PNNL personnel install tags as necessary to prevent diverter valve operation.

11.16 Leave UPS in auto.

11.17 Leave SRM300 in the on position.

11.18 Pour residual water from drum into catch pan and then pour the catch pans into the water container.

11.19 If desired, open valves 340-CO-V-3 and 340-CO-V-1 and pour the water into the RPS. Otherwise transport the water to 340 for disposal in the 307 basins. Close valves when done.

11.20 Have RCT release drum and clean water hose.

11.21 Clean up any residual water and have RCT survey rags.

11.22 Store 340 operations owned hoses and equipment for future flushing operations in 324 or transport to 340.
11. Scale alarms to 100,000 to gather data. ARA 6/3/96

12.0 TEST COMPLETE SIGNATURES

/ Test Engineer Date
AR Clark / 6/3/96

/ Project Engineer Date
M.J. Moran / 6/4/96
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

<table>
<thead>
<tr>
<th>Change Number</th>
<th>Change Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Last step was added to scale up the alarm point until the building manager is satisfied that 5,000 pCi/L is well above background.</td>
</tr>
</tbody>
</table>
SOURCE CALIBRATION SHEET

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.


| ISOTOPES: | Cs-137 |
| ACTIVITY (dps): | 5155 |
| 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, Radiochemist

Q A APPROVED: D. Montoya 1-31-76