8/17/81

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LZP 1370-3	FIRST AID, DECONTAMINATION AND EVACUATION OF EXPOSED AND/OR CONTAMINATED CASUALTIES	00	10/80	02
LZP 1380-1	CONTROL OF OIL SPILLS	00	10/80	02

DETERMINATION OF REACTOR COOLANT CHLORIDE CONCENTRATION AT THE HIGH RADIATION SAMPLING SYSTEM

A. PURPOSE

The purpose of this procedure is to delineate a method of determining the reactor coolant chloride concentration at the High Radiation Sampling System (HRSS) during normal and post-accident conditions. This procedure includes chloride standardization, sample analysis, system flushing and column regeneration sections.

B. REFERENCES

1. Sentry Equipment Corporation, Post Accident Sample System, Volume 1.

2. LZP 1330-29, "Sampling at the High Radiation Sampling System (Valve Operations at the HRSS Valve Control Panel)."

3. LZP 1330-22, "Calibration of the Model 10 Dionex Ion Chromatograph."

C. PREREQUISITES

1. The operator should be familiar with the operation of the ion chromatograph.

2. Verify that instrument air, approximately 100 psig, and nitrogen, approximately 60 psig, are available at the Chemical Analysis Panel (CAP), OPLE1J.

3. Fill a four liter collapsable container with demineralized water. Remove excess air from the bottle and label the bottle. Connect the bottle to the waterline in the reagent storage facility in the CAP, OPLE1J, open the container valve and then vent the feed lines.

4. Check that the containers of eluent, regenerant, and chloride standard are approximately half full, fill if necessary.

5. Check and vent pumps if air bubbles are visible in the sight glass. Venting is normally required when the eluent and regenerant containers are filled.

6. Ensure that the ion-exchange columns in use have been calibrated.

7. Reagents:

   a. 0.010 M Sodium tetraborate ($Na_2B_4O_7 \cdot 10H_2O$) (E-2).

   b. 0.006 M Sodium carbonate ($Na_2CO_3 \cdot 10H_2O$) (E-1).

   c. 1 N Sulfuric acid (H_2SO_4) (REGEN).

   d. 1 ppm Chloride standard (CAL-3).

8. The sample must have been obtained in accordance with Reference 2 prior to performing this procedure.

9. Notify Rad/Chem Supervision if any problems are encountered at the HRSS panels.

D. PRECAUTIONS

1. A Regulatory Guide 1.3 or 1.4 release of fission products implies extremely high levels of radioactivity. Dose rates may be high enough to prevent entry into many areas of the plant that are normally habitable. Rad/Chem Supervision should be contacted prior to entry into any area when such a release of fission products is suspected.

2. Wear radiation dosimetry as recommended by Rad/Chem Supervision.

3. Wear protective clothing and respiratory protection as recommended by Rad/Chem Supervision.

4. Appropriate survey instruments should be available for monitoring during this procedure.

5. New calibration curves are required when columns are changed, since each set of columns will show slightly different results with respect to peak height and possibly retention time.

6. Calibration should be checked after making up new eluent. Results will differ if the concentration of the new eluent differs from the old.

5. LIMITATIONS AND ACTIONS

1. This analysis must be completed within 24 hours following an accident condition.

2. Under post-accident conditions, column regeneration should be performed as soon as practicable after completing the chloride analysis. Regeneration will significantly reduce or virtually eliminate the resin columns as a radiation source.

3. The calibration curve should be checked every four samples by analyzing a chloride standard.

4. The resin columns should be replaced every year, and new calibration curves developed.

5. This procedure is to be used for measuring chloride concentration for the range of 0.1 to 20 ppm in primary coolant water samples. The estimated precision is about ± 15 percent for the range of 0.1 to 1 ppm and ± 20 percent for the range of 1 to 20 ppm. Accuracy of analysis for the higher range can be improved to about ± 10 percent by calibration in that range. A chloride determination can be obtained within 15 minutes after primary coolant is charged to the ion chromatograph.

6. Retention time for any ionic species will vary with pump stroke setting. Pump stroke should remain constant for routine analytical use.

7. Regeneration is required about once every four hours during continuous operation of the system.

8. During continuous operation of the system, the columns must be cleaned on a daily basis or every other regeneration by pumping 0.006 M sodium carbonate through the columns for a 15-20 minute period. This is done prior to regeneration of the suppresser column.

9. This procedure, though intended for use under post-accident conditions, can be used for sampling at the HRSS panels during normal operations, during which the precautions may have limited applications. However, normal routine sampling precautions should be observed.

F. PROCEDURE

NOTE

For noun names associated with the valves operated in this procedure, refer to Attachment B.

1. Verify the following valve lineup at the LSP. OPEN:

   a. RC-V-1.1 (closed).

   b. RC-V-1.2 (closed).

   c. RC-V-1.3 (closed).

   d. RC-V-1.4 (closed).

   e. RC-V-1.5 (closed).

   f. Verify RC-V-4 is closed. Connect the flush water hose to RC-D-1 and open the flush water line valve.

   g. RC-V-5.1 (closed).

   h. RC-V-5.2 (closed).

   i. RC-V-2 (closed).

   j. RC-V-9 (closed).

   k. RC-V-11 (closed).

   l. RC-V-20 (closed).

   m. RC-V-21 (closed).

   n. RC-V-16 (closed).

   o. RC-V-8.1 (closed).

   p. RC-V-8.2 (closed).

   q. RC-DV-1 (BYPASS).

   r. RC-V-18 (5 o'clock).

s. RC-V-19 (BYPASS).

t. RC-V-22 (TO CHEM PANEL).

u. RC-V-17 (closed).

v. RC-V-7 (open).

w. RC-V-3 (open).

2. Verify the following valve lineup at the CAP, OPLE1J:

a. Connect the flush water hose to C-3 and open the flush water line valve.

b. V-10 (open).

c. V-11 (open).

d. V-12 (open).

e. V-2 (open).

f. V-8 (open).

g. V-15 (closed).

h. V-9 (closed).

i. V-29 (TO NITROGEN SUPPLY).

j. V-5 (CLOSED).

k. V-6 (OXYGEN CALIB SOLUTION).

l. V-7 (YSI OXYGEN ANALYZER).

3. Startup the Ion Chromatograph at the CAP, OPLE4J, in accordance with the following:

a. Place the POWER and AIR switches to ON position.

b. Place LOAD/INJECT switch in LOAD position.

c. Place the S-2 switch in the UP position.

d. Place the SEPARATOR switch in the SEP-1 position.

e. Place the SUPPRESSOR switch in the SUP-1/RGN-2 position.

4. Startup the conductivity meter at the CAP OPLE1J, in accordance with the following:

a. Set MODE switch to ZERO and adjust the meter to zero with the screw below the meter face.

b. Set MODE switch to CAL to set the meter at full scale. CAL is adjusted with the screw at the top of the meter circuit board. The adjustment screw is labeled METER.

c. Set the MODE switch to LIN.

d. Set the umho full scale switch to 30. After operation of the system for approximately 30 minutes, set the switch to 1.

e. Set the OFFSET range switch to X 10.

5. Perform the system baseline stabilization in accordance with the following:

a. At the CAP, OPLE1J, check that the eluent pump switch is ON.

NOTE

Retention time for any ionic species will vary with pump stroke setting. Pump stroke should remain constant for routine analytical use.

b. Turn the pump switch on the CMP, OPLE4J, to the ON position.

c. Turn the gauge switch on the CMP, OPLE4J, to the ON position. Normal operating pressure is 200 psig, however, pressure will fluctuate due to the pump reciprocating.

d. Operate the system for approximately 30 minutes or until the baseline stabilizes with the umho setting in the 1 position.

6. Perform the chloride calibration check in accordance with the following at the CAP, OPLE1J, or as otherwise directed:

   a. Align valve V-5 to CHLORIDE CALIB SOLUTION.

   b. Adjust valve V-15 until sufficient flow is indicated by the red flow indicator light. Allow the line to flush for a minimum of two (2) minutes.

   c. At the CMP, OPLE4J, place the LOAD/INJECT switch in the INJECT position. Turn on the chart recorder (the switch is located inside on the lower right as the recorder is pulled out).

   d. Press the PIP event recorder button on the CAP, OPLE1J, conductivity meter or mark the inject position on the chart paper of the recorder. Record the standard identification and date and time of analysis on the chart paper.

   e. Turn valve V-5 to the CLOSED position.

   f. After approximately one minute, place the LOAD/INJECT switch at the CMP, OPLE4J, in the LOAD position. The chloride peak will occur at approximately six minutes after injection. This peak height may be used as the reference point to determine the chloride concentration in subsequent unknown samples. Turn off the chart recorder on the CMP, OPLE4J.

   g. The chloride standard will be automatically flushed from the analyzer. Allow approximately ten (10) minutes to complete this operation.

   h. Align valve V-5 to LIQUID SAMPLE.

   i. Align valve V-29 to the vent position.

7. Purge the system for the reactor coolant sample in accordance with the following at the LSP, OPL3CJ.

   a. At the CAP, OPLE1J, verify V-5 is aligned to LIQUID SAMPLE.

   b. Open RC-V-1.1 (-1.2, -1.3, -1.4, or -1.5), depending on sample source.

c. Open RC-VREL-1 until RC-FI-1 indicates 35-40 inches of water. Purge for a minimum of five (5) minutes. Slowly close RC-VREL-1 until RC-FI-1 indicates 12-15 inches of water. Continue the purge for a minimum of one (1) minute.

d. Close RC-V-3.

e. Open RC-V-2.

f. Adjust RC-VREL-2 until RC-FI-2 indicates 18-22 inches of water.

g. Verify that the flow rate at the CAP Ion Chromatograph line is 15 ml/min by observing the red indicator on the CAP, CPLE1J, is lit. Flush for a minimum of five (5) minutes.

8. Analyze the sample in accordance with the following at the CAP, CPLE1J, or as otherwise directed:

a. At the CMP, CPLE4J, place the LOAD/INJECT switch in the INJECT position and turn on the chart recorder.

b. Press the PIP event recorder button on the CAP conductivity meter or mark the inject position on the chart paper at the CMP CPLE4J. Record the sample source, date and time of analysis, on LRC Form 1097C, Attachment A.

c. After approximately one minute, place LOAD/INJECT switch on the CMP, CPLE4J, in the LOAD position. The chloride peak will occur at approximately six minutes after injection. Turn off the chart recorder.

d. Turn valve V-5 to the DEMIN WATER position. Flush with demineralized water for a minimum of two (2) minutes.

e. If the chloride peak goes off-scale, a reanalysis must be completed using a larger microme setting (3 umho). Align V-5 to LIQUID SAMPLE, flush for a minimum of one (1) minute, and repeat Steps F.8.a. through F.8.c.

9. Flush the system in accordance with the following at the LSP, CPLC8J, or as otherwise directed:

a. At the CAP, CPLE1J, align V-5 to LIQUID SAMPLE.

b. At the Valve Control Panel, CPLC9J, secure the sampling lineup in accordance with Reference 2, Steps F.1.d.6) through F.1.d.7).

c. At the LSP, CPLD8J, close RC-V-1.1 (-1.2, -1.3, -1.4, or -1.5).

d. Open RC-V-4.

e. Adjust RC-VREL-2 until RC-FI-2 indicates 18-22 inches of water. Flush with demineralized water for a minimum of three (3) minutes.

f. Close RC-V-7.

g. Open RC-V-3.

h. Adjust RC-VREL-1 until RC-FI-1 indicates 35-40 inches of water. Flush with demineralized water for a minimum of one (1) minute.

i. Close RC-V-3.

j. Open RC-V-1.1 (-1.2, -1.3, -1.4, or -1.5) and flush with demineralized water for a minimum of five (5) minutes.

k. Close RC-V-1.1 (-1.2, -1.3, -1.4, or -1.5).

l. Open RC-V-8.1 and RC-V-8.2.

m. Adjust RC-VREL-2 until RC-FI-2 indicates 18-22 inches of water. Flush with demineralized water for a minimum of three (3) minutes.

n. At the CMP, CPLE4J, cycle the LOAD/INJECT switch at least three times. Return it to the LOAD position.

o. At the CAP, CPLE1J, align V-5 to CLOSED.

p. Turn V-5 on the CAP, CPLE1J, to LIQUID SAMPLE and flush with demineralized water for a minimum of two (2) minutes.

q. Turn V-5 to OXYGEN CALIB SOLUTION.

r. At the CAP. OPLE1J, close the flush water valve and disconnect the flush water hose from D-3.

s. Secure flushing by closing the following valves on the LSP, OPLO8J:

1) RC-V-8.2.

2) RC-V-8.1.

3) RC-V-2.

4) RC-V-3.

5) RC-V-4.

t. At the LSP, OPLO8J, close the flush water valve and disconnect the flush water hose from RC-D-1.

u. At the Valve Control Panel, OPLC9J, secure the system lineup in accordance with Reference 2, Steps F.1.d.8) through F.1.f.

10. Regenerate the columns in accordance with the following:

a. Under post-accident conditions, column regeneration is performed as soon as practicable after completing the chloride analyses. Regeneration will significantly reduce or virtually eliminate the resin columns as a radiation source.

b. Column regeneration is performed every 4 hours if the ion chromatograph is in continuous use. The need for column regeneration under other conditions is indicated by a high baseline conductivity, or a significant change in the time for the chloride peak to occur, or change in peak height when running the chloride standard. A sodium carbonate flush is performed prior to every other regeneration. Go to step F.10.e. if only regeneration is required.

c. Perform the following lineup for flushing of the resin columns:

1) Place the MODE switch on the CAP, CPLE1J, conductivity meter at ZERO.

2) Place the E1 switch on the CMP, CPLE4J, in the ON (up) position.

3) Place the E2 switch on the CMP, CPLE4J, in the OFF (down) position.

4) Place the SEPARATOR switch on the CMP, CPLE4J, in the SEP-1 (up) position.

5) Place the SUPPRESSOR switch on the CMP, CPLE4J, in the SUP-1/RGN-2 (up) position.

6) Place the PUMP switch on the CMP, CPLE4J, in the ON (up) position.

d. The valve lineup in Step F.10.c will provide for sodium carbonate flushing of both columns. Operate for 15-20 minutes, then turn the E1 switch on the CMP, CPLE4J, to the OFF position (down) and flush for 10 minutes.

e. Place the PUMP switch on the CMP, CPLE4J, in the off (down) position.

f. On the CMP, CPLE4J, turn the SUPPRESSOR switch to the SUP-2/RGN-1 (down) position.

g. Depress the REGENERATION START button on the CMP, CPLE4J. The system timer is set to provide for a 15 minute acid regeneration followed by a 45 minute water rinse, do not change the setting. After one hour the system will shut off automatically and the red ready light will be activated.

11. Secure the system after completion of column regeneration in accordance with the following:

a. Turn the ion chromatograph POWER switch on the CMP, CPLE4J, to OFF.

b. Turn the AIR switch to OFF on the CMP, CPLE4J.

c. Turn the GAUGE switch to OFF, on the CMP, CPLE4J.

12. Calculate the chloride concentration in accordance with the following:

    a. Measure the height of the chloride standard peak (PH_s), units, and record on LRC FORM 1097C (Attachment A).

    b. Measure the height of the sample peak (PH_d), units, and record on LRC Form 1097C (Attachment A).

    c. Calculate and record the chloride concentration in accordance with LRC FORM 1097C (Attachment A).

13. Attach the strip chart from the ion chromatograph to LRC FORM 1097C (Attachment A) and forward to Rad/Chem Supervision.

G. CHECKLISTS

1. None.

H. TECHNICAL SPECIFICATION REFERENCES

1. None.

ATTACHMENT A

LA SALLE COUNTY STATION

Post-Accident Analysis of Chloride Worksheet

SAMPLE SOURCE: Date	Time
C_s Chloride Standard Concentration, ppm	1.00 ppm
Step F.12.a. PH_s Chloride Standard Peak Height, units	
Step F.12.b. PH_u Sample Peak Height, units	
Step F.12.c. C_u Sample Chloride Concentration, ppm	

$$C_u = \frac{(C_s) \times (PH_u)}{(PH_s)}$$

LRC FORM 1097C

ATTACHMENT B

VALVE LISTING

RC-V-1.1	Reactor Recirc Loop B Sample Cutout Valve
RC-V-1.2	RT Demin Inlet Sample Cutout Valve
RC-V-1.3	RHR Loop A Sample Cutout Valve
RC-V-1.4	RHR Loop B Sample Cutout Valve
RC-V-1.5	RT Demin Outlet Sample Cutout Valve
RC-V-2	Sample Source Isolation Valve
RC-V-3	Sample Purge Cutout Valve
RC-V-4	Flushing Water Isolation Valve
RC-V-5.1	Pressurized Sample Inlet Isolation Valve
RC-V-5.2	Pressurized Sample Outlet Isolation Valve
RC-V-7	Diluted Sample bypass Valve
RC-V-8.1	RC-SF-1.2 Inlet Isolation Valve
RC-V-8.2	RC-SF-1.2 Outlet Isolation Valve
RC-V-9	RC-EV-1 Isolation Valve
RC-V-10	RC-EV-1 Evacuation Cutout Valve
RC-V-11	Off-gas 4-way Valve
RC-V-12	Argon to Air Ejector Cutout Valve
RC-V-13	Off-gas Vial Evacuation Cutout Valve
RC-V-14	Argon Supply to Off-gas Vial Cutout Valve
RC-V-15	Off-gas Sample to Gas Chromatograph Isolation Valve
RC-V-16	RC-SF-1.2 [illegible]ge Cutout Valve
RC-V-17	Reactor Co[illegible] Sample Cutout Valve
RC-V-18	Reactor Coolant Undiluted Sample Backflush Cutout Valve
RC-V-19	Reactor Coolant Undiluted Sample Injection Valve
RC-V-20	RC-C-1 Fill valve
RC-V-21	RC-C-1 Isolation valve
RC-V-22	Liquid Sample to CAP Isolation Valve
RC-DV-1	Reactor Coolant Diluted Sample Injection Valve
RC-DV-2	Off-gas Sample Injection valve
RC-VREL-1	Reactor Coolant Purge Throttle Valve
RC-VREL-1	Reactor Coolant Sample Throttle Valve
V-1	Off-gas Sample to Gas Chromatograph
V-2	Ion Chromatograph to Waste
V-5	Ion Chromatograph Sample Source Selection
V-6	C_2 Analyzer Sample Source Selector
V-7	C_2 Analyzer Selection
V-8	C_2 Analyzer Discharge Valve
V-9	C_2 Calibration Solution Cutout

V-10	Instrument Air Cutout
V-11	Demineralized Water Cutout Valve
V-12	Nitrogen Supply Cutout Valve
V-14	Argon Supply Cutout Valve
V-15	Cal-3 Isolation Valve
V-16	Cal-2 Isolation Valve
V-17	O_2 Calibration Solution Tank Recirc Valve
V-18	O_2 Calibration Solution Tank Drain Valve
V-19	Cal-3 Drain Valve
V-20	Cal-2 Drain Valve
V-24	Demin Water Fill to O_2 Cal. Soln. Tk.
V-25	Cal-1 Drain Valve
V-26	Cal-1 Isolation Valve
V-27	Nitrogen Supply to Cal-1
V-28	Nitrogen Supply to Cal-2
V-29	Nitrogen Supply to Cal-3
V-30	Cal-1 Cal-2 Selection Valve

CALIBRATION OF THE MODEL 10 DIONEX ION CHROMATOGRAPH

A. PURPOSE

The purpose of this procedure is to delineate a method for calibration of the Model 10 Dionex Ion Chromatograph at the High Radiation Sampling System (HRSS).

B. REFERENCES

1. Sentry Equipment Corporation, Post Accident Sample System, Volume 1.

2. LZP 1330-21, "Determination of Reactor Coolant Chloride Concentration at the High Radiation Sampling System."

C. PREREQUISITES

1. The operator should be familiar with the operation of the ion chromatograph.

2. Verify that instrument air, approximately 100 psig, and nitrogen, approximately 50 psig, are available at the Chemical Analysis Panel (CAP), OPLEIJ.

3. The ion exchange columns have been recently regenerated or replaced.

4. Reagents:

   a. 0.010 M Sodium tetraborate ($Na_2B_4O_7 \cdot 10H_2O$) (E-2).

   b. 0.006 M Sodium carbonate ($Na_2CO_3 \cdot 10H_2O$) (E-1).

   c. 1 N Sulfuric acid (H_2SO_4) (REGEN).

   d. Chloride standard; 1 ppm, 0.5 ppm, 0.2 ppm, and 0.1 ppm chloride.

5. Fill a four liter collapsable container with demineralized water. Remove excess air from the bottle, and label. Connect it to the waterline in the reagent storage facility. Open the container valve and vent feed lines.

6. Check that the eluent and regenerant containers are approximately half full.

7. Ensure that the chloride calibration solution tank, CAL-3, is over half full of 1 ppm chloride standard.

D. PRECAUTIONS

1. During normal operation, there are expected to be no radiation hazards associated with the performance of this procedure, however, the following precautions should be observed:

   a. A Regulatory Guide 1.3 or 1.4 release of fission products implies extremely high levels of radioactivity. Dose rates may be high enough to prevent entry into many areas of the plant that are normally habitable. Rad/Chem Supervision should be contacted prior to entry into any area when such a release of fission products is suspected.

   b. Wear radiation dosimetry as recommended by Rad/Chem Supervision.

   c. Wear protective clothing and respiratory protection as recommended by Rad/Chem Supervision.

   d. Appropriate survey instruments should be available for monitoring during this procedure if it is performed under post-accident conditions.

E. LIMITATIONS AND ACTIONS

1. Notify Rad/Chem Supervision if any problems are encountered at the HRSS panels.

2. This procedure is intended for use in calibrating the ion chromatograph in the 0.1 to 1 ppm chloride range. However, calibration can be performed in the 1 to 20 ppm range with the use of the appropriate calibration solutions and this procedure.

F. PROCEDURE

NOTE

For nomenclature associated with the valves operated in this procedure, refer to Attachment 3.

1. Verify the following valve lineup at the Liquid Sampling Panel (LSP), OPL004.

   a. RC-V-1.1 (closed).

   b. RC-V-1.2 (closed).

   c. RC-V-1.3 (closed).

   d. RC-V-1.4 (closed).

   e. RC-V-1.5 (closed).

   f. RC-V-22 (TC WASTE).

2. Verify the following valve lineup at the CAP, OPLE10:

   a. V-10 (open).

   b. V-11 (open).

   c. V-12 (open).

   d. V-2 (open).

   e. V-8 (open).

   f. V-29 (to vent).

   g. V-5 (CLOSED).

   h. V-6 (OXYGEN CALIB. SOLUTION).

   i. V-7 (YSI OXYGEN ANALYZER).

   j. V-15 (closed).

   k. V-9 (closed).

   l. Connect the flush water hose to C-3 and open the flush water line valve.

3. Start up the Ion Chromatograph at the Chemical Monitoring Panel (CMP), OPLE40, in accordance with the following:

a. Place the POWER and AIR switches to ON position.

b. Place LOAD/INJECT switch in LOAD position.

c. Place the E-2 switch in the UP position.

d. Place the SEPARATOR switch in the SEP-1 position.

e. Place the SUPPRESSOR switch in the SUP-1/RGN-2 position.

4. Start up the Conductivity Meter at the CAP, OPLE4J, in accordance with the following:

a. Set MODE switch to ZERO and adjust the meter to zero with the screw below the meter face.

b. Set the MODE switch to CAL to set the meter at full scale. CAL is adjusted with the screw at the top of the meter circuit board. The adjustment screw is labeled METER.

c. Set the MODE switch to LIN.

d. Set the umho full scale switch to 30. After operation of the system for approximately 30 minutes, set the switch to 1.

e. Set the OFFSET range switch to x 10.

5. Perform the system baseline stabilization in accordance with the following:

a. At the CAP, OPLE1J, check the effluent pump switch in ON.

b. Turn the pump switch on the CAP, OPLE4J, to the ON position.

c. Turn the gauge switch on the CAP, OPLE4J, to the ON position. Normal operating pressure is 200 psig, however, pressure will fluctuate due to the pump reciprocating.

d. Operate the system for approximately 30 minutes or until the baseline stabilizes with the umho setting in the 1 position.

6. Analyze the chloride standard in accordance with the following:

   a. At the CAP, OPLE1J, align V-5 to CLOSED and V-29 to the vent position.

   b. Open V-13 in the rear of the CAP, OPLE1J.

   c. Inject 15 ml of the 0.1 ppm chloride standard through the septum, in the rear of the CAP, OPLE1J, using caution not to inject any air bubbles with the solution.

   d. Close V-13.

   e. At the CMP, OPLE4J, place the LOAD/INJECT switch in the INJECT position. Turn on the chart recorder.

   f. Press the PIP event recorder on the CAP, OPLE1J, conductivity meter. Record the standard concentration, date and time of analysis on the chart paper.

   g. After approximately one minute, place the LOAD/INJECT switch at the CMP, OPLE4J, in the LOAD position. The chloride peak will occur at approximately six minutes after injection. Then turn off the chart recorder on the CMP, OPLE4J.

NOTE

If the chloride peak is off scale, repeat Steps F.6.b through F.6.g using a larger umho setting.

   h. The chloride standard will be automatically flushed from the analyzer. Allow approximately ten (10) minutes to complete this operation.

   i. Repeat Steps F.6.b through F.6.h for each chloride standard, 0.2 ppm and 0.5 ppm chloride.

7. Analyze the 1 ppm chloride standard in accordance with the following:

   a. Align valve V-29 on the CAP, OPLE1J, to NITROGEN SUPPLY.

b. At the CAP, CPLE1J, align valve V-5 to CHLORIDE CALIB SOLUTION.

c. At the CAP, CPLE1J, adjust valve V-15 until sufficient flow is indicated by the red flow indicator light. Flush for a minimum of two (2) minutes.

d. At the CMP, CPLE4J, place the LOAD/INJECT switch in the INJECT position. Turn on the chart recorder.

e. Press the PIP event recorder on the conductivity meter on the CAP, CPLE1J. Record the standard concentration, date and time of analysis on the chart paper.

f. On the CAP, CPLE1J, turn valve V-5 to the CLOSED position.

g. After approximately one minute, place the LOAD/INJECT switch at the CMP, CPLE4J, in the LOAD position. The chloride peak will occur at approximately six minutes after injection. Then turn off the chart recorder on the CMP, CPLE4J.

NOTE

If the chloride peak is off scale, repeat Steps F.7.b through F.7.g using a larger umho setting.

h. The chloride standard will be automatically flushed from the analyzer. Allow approximately ten (10) minutes to complete this operation.

8. Regenerate and flush the columns in accordance with the following at the CMP, CPLE4J:

a. Perform the following lineup for flushing of the resin columns:

1) Place the MODE switch on the CAP, CPLE1J, conductivity meter to ZERO.

2) Place the E-1 switch on the CMP, CPLE4J, in the ON (up) position.

3) Place the E-2 switch on the CMP, CPLE4J, in the OFF (down) position.

4) Place the SEPARATOR switch on the CMP, CPLE4J, in the SEP-1 (up) position.

5) Place the SUPPRESSOR switch on the CMP, CPLE4J, in the SUP-1/REN-2 (up) position.

6) Place the PUMP switch on the CMP, CPLE4J, in the ON (up) position.

b. This lineup will provide for sodium carbonate flushing of the separator column. Operate for 15-20 minutes, then turn the E-1 switch to the water position (down) and flush for 10 minutes.

c. Place the pump switch on the CMP, CPLE4J in the OFF (down) position.

d. Place the SUPPRESSOR switch in the SUP-2/REN-1 position.

e. Depress the regeneration start button. The system timer must be set to provide for a 15 minute acid regeneration followed by a 45 minute water rinse. After one hour the system will shut off automatically and the red ready light will be activated.

9. Secure the system after completion of column regeneration in accordance with the following:

a. Turn the ion chromatograph POWER switch on the CMP, CPLE4J, to OFF.

b. Turn the AIR switch on the CMP, CPLE4J, to OFF.

c. Turn the GUAGE switch on the CMP, CPLE4J, to OFF.

10. Plot the chloride calibration curve in accordance with the following:

a. Measure the height of each peak for its respective standard; 0.1 ppm, 0.2 ppm, 0.5 ppm and 1.0 ppm chloride.

b. On a sheet of linear graph paper, plot the peak height, in units, on the vertical axis and the chloride concentrations, in ppm, on the horizontal axis. Refer to Attachment A.

c. Draw the best fit straight line through the data points.

11. Attach the strip chart from the ion chromatograph to the chloride calibration curve and forward to Rad/Chem Supervision for review.

G. CHECKLISTS

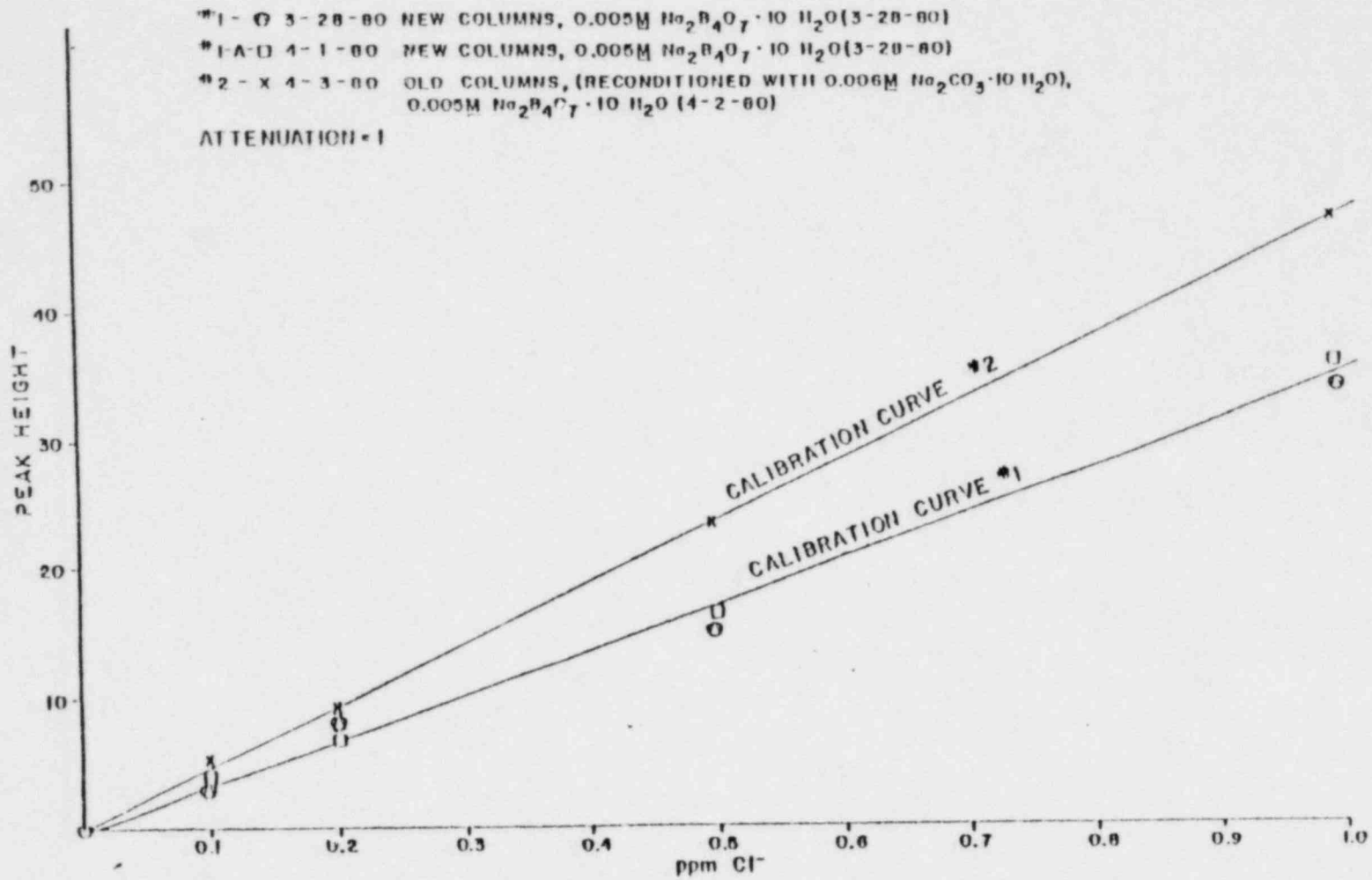
1. None.

H. TECHNICAL SPECIFICATION REFERENCES

1. None.

ATTACHMENT A

CHLORIDE CALIBRATION CURVES



ATTACHMENT B

VALVE LISTING

RC-V-1.1	Reactor Recirc Loop B Cutout Valve
RC-V-1.2	RT Demin Inlet Cutout Valve
RC-V-1.3	RHR Heat Exchanger A Cutout Valve
RC-V-1.4	RHR Heat Exchanger B Cutout Valve
RC-V-1.5	RT Demin Outlet Cutout Valve
V-2	Ion Chromatograph to Waste
V-5	Ion Chromatograph Sample Source Selection Valve
V-6	O_2 Analyzer Sample Source Selection Valve
V-7	O_2 Analyzer Selection Valve
V-8	O_2 Analyzer Discharge Valve
V-9	O_2 Calibration Solution Cutout Valve
V-10	Instrument Air Cutout Valve
V-11	Demineralized Water Cutout Valve
V-12	Nitrogen Supply Cutout Valve
V-13	Ion Chromatograph Manual Injection Valve
V-15	Cal-3 Isolation Valve
V-19	Cal-3 Drain Valve
V-29	Nitrogen Supply to Cal-3

DETERMINATION OF REACTOR COOLANT pH, CONDUCTIVITY AND DISSOLVED OXYGEN CONCENTRATION AT THE HIGH RADIATION SAMPLING SYSTEM

A. PURPOSE

The purpose of this procedure is to delineate the steps required to determine reactor coolant pH, conductivity, and dissolved oxygen concentration at the High Radiation Sampling System (HRSS) during normal and post-accident operating conditions.

B. REFERENCES

1. Sentry Equipment Corporation, Post-Accident Sample System, Volume 1.
2. Standard Methods for the Examination of Water and Wastewater, 14th Edition, 1975, pp. 446-447.
3. LZP 1330-29, "Sampling at the High Radiation Sampling System (Valve Operation at the HRSS Valve Control Panel)."

C. PREREQUISITES

1. Verify that nitrogen, approximately 60 psig, is available at the Chemical Analysis Panel (CAP), 0PL61J.
2. Verify that nitrogen, approximately 100 psig, is available at the Liquid Sampling Panel (LSP), 0PL08J.
3. The operator should be familiar with the operation of the HRSS panels.
4. Establish communications with the Unit Nuclear Station Operator (NSO).
5. The sample must have been obtained in accordance with Reference 3 prior to performing this procedure.
6. Ensure the buffer solution tanks are approximately ¾ full of the required buffers.
7. Verify the oxygen calibration tank is filled with demineralized water.

a. Buffer, pH 4, (CAL-1).

b. Buffer, pH 7, (CAL-2).

D. PRECAUTIONS

1. A Regulatory Guide 1.3 or 1.4 release of fission products implies extremely high levels of radioactivity. Dose rates may be high enough to prevent entry into many areas of the plant that are normally habitable. Rad/Chem Supervision should be contacted prior to entry into any area when such a release of fission products is suspected.

2. Wear radiation dosimetry as recommended by Rad/Chem Supervision.

3. Wear protective clothing and respiratory protection as recommended by Rad/Chem Supervision.

4. Appropriate survey instruments should be available for monitoring during this procedure.

E. LIMITATIONS AND ACTIONS

1. Notify Rad/Chem Supervision if any problems are encountered at the HRSS panels.

2. This procedure, though intended for use under post-accident conditions, can be used for sampling at the HRSS panels during normal operations, during which the precautions may have limited applications. However, normal routine sampling precautions should be observed.

3. Calibration operations must be performed prior to flowing reactor coolant to the CAP. OPLEIU.

4. When operating at a high oxygen level, the Rexnord analyzer will achieve an equilibrium value in approximately fifteen (15) minutes. After calibration of the probe in a dissolved oxygen concentration of approximately 8 ppm, the probe will take approximately two hours to recover to oxygen levels in the low ppb range. However, the Rexnord is not designed for use in a post-accident condition.

5. When filling the dissolved oxygen recirculation tank, maintain a distance of three inches between

the final water level and the recirculation spray nozzle.

6. A recirculation time of one hour is required to achieve complete air saturation of the recirculation tank water.

7. pH readings are to be taken only after termination of flow and stabilization of the meter readout.

8. The oxygen analyzers should be calibrated weekly when in use and when the analyzer is suspected to be out of calibration.

9. The pH instrument should be standardized at least once per day when in use, and when the instrument is suspected to be out of calibration.

10. The conductivity instrument should be calibrated at least once per quarter and when the instrument is suspected to be out of calibration.

11. If the Rexnord analyzer has been in a shutdown condition for a period longer than two (2) weeks, the probe should be conditioned by flowing demineralized water through the flow assembly for a minimum of thirty (30) minutes prior to calibration.

12. The pH and conductivity monitors and dissolved oxygen analyzer must be energized for a period of 30 minutes prior to calibration or analyses being performed.

F. PROCEDURE

NOTE

For noun names associated with the valves operated in this procedure, refer to Attachment C.

1. At the Chemical Monitoring Panel (CMP), OPL640, verify the INJECT/LOAD switch for the Ion Chromatograph is in the LOAD position to permit final system flushing.

2. At the Liquid Sampling Panel (LSP), OPL080, verify the following valve lineup:

a. RC-V-1.1 (closed).

b. RC-V-1.2 (closed).

c. RC-V-1.3 (closed).

d. RC-V-1.4 (closed).

e. RC-V-1.5 (closed).

f. Verify RC-V-4 is closed. Connect the flush water hose to RC-D-1 and open the flush water line valve.

g. RC-V-5.1 (closed).

h. RC-V-5.2 (closed).

i. RC-V-2 (closed).

j. RC-V-16 (closed).

k. RC-V-8.1 (closed).

l. RC-V-8.2 (closed).

m. RC-DV-1 (BYPASS).

n. RC-V-9 (CLOSED).

o. RC-V-20 (closed).

p. RC-V-21 (closed).

q. RC-V-11 (CLOSED).

r. RC-V-18 (6 o'clock).

s. RC-V-19 (BYPASS).

t. RC-V-22 (TO CHEM PANEL).

u. RC-V-17 (closed).

v. RC-V-7 (open).

w. RC-V-3 (open).

3. At the CAP. OPLE1J. verify the following valve lineup:

a. V-1C (open).

b. V-11 (open).

c. V-12 (open).

d. V-8 (open).

e. V-2 (open).

f. V-27 (vent).

g. V-28 (vent).

h. V-29 (vent).

i. V-1b (closed).

j. V-2b (closed).

k. V-5 (CLOSED).

l. V-9 (closed).

m. V-17 (closed).

n. V-24 (closed).

o. V-6 (OXYGEN CALIB SOLUTION).

p. V-3J (TC CAL-1. (pH-4 buffer tank)).

q. Connect the flush water hose to J-3 and open the flush water line valve.

4. For post-accident sampling, align valve V-7 on the CAP. OPLE1J. to the YSI OXYGEN ANALYZER position. For normal sampling, align valve V-7 to the BEKNURD OXYGEN ANALYZER position.

5. Start-up the pH meter at the Chemical Monitoring Panel (CMP). OPLE41. in accordance with the following:

a. Place the internal S-1 toggle switch to the ON position.

6. Start-up the conductivity monitor at the CMP, OPLE4J, in accordance with the following:

a. Observe that the meter reading is on zero when the selector switch is on ZERO. If so, proceed to step F.6.c. If this is not the case, disconnect the power cable and recheck the mechanical zero with power off. If necessary, use a small screwdriver to adjust the meter's mechanical zero through the center hole in front of the panel.

b. Reconnect the power cable and observe the mechanical zero. The meter should point to zero. If the pointer is not on zero, carefully adjust internal trimmer R36 to bring the pointer to zero.

c. Turn the selector switch to CHECK. The meter indicator should move to CHECK on the meter scale. If the meter does not CHECK properly, it is out of calibration, inform Rad/Chem Supervision.

d. Switch the selector switch to MEASURE. The monitor is now ready for operation.

7. For post-accident sampling, start-up the YSI dissolved oxygen analyzer in accordance with Step F.8. For sampling during normal operations, start-up the Rexnord dissolved oxygen analyzer at the CMP, OPLE4J, in accordance with the following:

a. Check that the power switch is in the OFF position.

b. Use a small screwdriver to adjust the mechanical zero through the black screw on the meter face.

c. Place the power switch in the ON position.

d. Turn the function select switch to the ZERO position.

e. Use a small screwdriver to turn the ZERO ADJ for a zero reading on the instrument.

f. Turn the FUNCTION switch to the "20 mg/l" position.

8. For post-accident sampling, start-up the YSI dissolved oxygen analyzer at the CMP. OPLE4J, in accordance with the following:

a. Turn the POWER switch to ON.

b. Turn the O_2 FILTER switch to OFF.

c. Turn the O_2 RANGE switch to 0-20 ppm.

d. Turn the PEN INPUT to ZERO.

e. Turn the CHART SPEED to RAPID.

f. Adjust the PEN ZERO control until the pen traces a line on the 0-20 chart scale at 0.

g. Turn the CHART SPEED to 10.

h. Turn the PEN INPUT to O_2.

9. If the calibration of the O_2 analyzer to be used has been performed for the week, proceed to Step F.10. If the calibration has not been performed, recirculate the dissolved O_2 calibration tank in accordance with the following at the CAP, OPLE1J:

a. Observe the level in the oxygen calibration tank CAL-4. If water must be added to the tank, open V-24 and fill the tank then close V-24.

b. Open fully V-17.

c. Turn the recirculation pump ON. Indicator lights for the pump should light on both the CAP, OPLE1J, and CMP, OPLE4J.

d. Recirculate the water for a period of one (1) hour.

e. Continue to recirculate until the actual calibration is performed. When the actual

calibration is performed, read and record the temperature of the water in CAL-4 on LRC Form 1097A (Attachment A).

f. Determine the dissolved oxygen concentration from Attachment B and record it on LRC Form 1097A (Attachment A).

10. If the pH instrument has been standardized for the day, proceed to Step F.11. If the pH instrument has not been standardized for the day, proceed in accordance with the following at the CAP, OPL610, or as otherwise directed:

a. Align V-30 to pH calibration tank CAL-1, pH 4 buffer tank.

b. Align V-6 to pH CALIB SOLUTION.

c. Align V-27 to the nitrogen supply line.

d. Adjust V-25 until sufficient flow is indicated by the red flow indicator light. Allow to flush for a minimum of two (2) minutes.

e. Turn V-6 counterclockwise to OXYGEN CALIB SOLUTION to terminate flow and align V-27 to the vent position.

f. Adjust the pH meter reading to indicate a pH buffer value of 4.0 by turning standardize control R-3, on the pH meter at the CMP, OPL640.

g. Observe the pH monitor reading for two (2) minutes and adjust if drift exceeds ± 0.1 pH units.

h. Align V-6 to DEMIN WATER and flush for a minimum of two (2) minutes.

i. Close V-25.

j. Align V-30 to pH calibration tank CAL-2, pH 7 buffer tank.

k. Align V-28 to the nitrogen supply line.

l. Align V-6 to pH CALIB SOLUTION and adjust V-16 until the red flow indicator is lit. Allow to flush for a minimum of two (2) minutes.

m. Turn V-6 counterclockwise to the OXYGEN CALIB SOLUTION to terminate flow and align V-28 to vent position.

n. Observe the pH reading and record on LRC Form 1097A (Attachment A). The pH reading should be within ± 0.5 pH units of the buffer value of 7.0. If the value is not ± 0.5 pH units, repeat Steps F.10.a through F.10.m.

o. Align V-6 to DEMIN WATER and flush for a minimum of two (2) minutes.

p. Close V-10.

11. If the oxygen analyzer to be used has been calibrated for the week, proceed to Step F.12. If it has not been calibrated, proceed in accordance with the following at the CAP, OPLEIJ, or as otherwise directed:

a. Open V-9.

b. Align V-6 to OXYGEN CALIB SOLUTION.

c. Observe that recirculation pump is ON.

d. Close V-17 until 200 ml/min flow rate is indicated by the red flow indicator. Allow to flush for a minimum of five (5) mirutes.

e. While flushing, adjust the O_2 calibration knob on the YSI monitor or the CAL ADJ on the Rexnord monitor, at the CAP, OPLE4J, to indicate the dissolved oxygen concentration in ppm previously determined in Step F.9.f.

f. Turn the recirculation pump OFF.

g. Close V-9.

h. Align V-6 to LIQUID SAMPLE.

12. Purge the LSP, OPL08J, and CAP, OPLEIJ, in accordance with the following:

a. At the CAP, OPLE1J, verify V-6 is aligned to LIQUID SAMPLE.

b. At the LSP, OPL08J, open RC-V-1.1 (-1.2, -1.3, -1.4, or -1.5) depending on the sample source.

c. At the LSP, OPL08J, open RC-VREL-1 until RC-FI-1 indicates 35-40 inches of water. Purge for a minimum of five (5) minutes. Slowly close RC-VREL-1 until RC-FI-1 indicates 12-15 inches of water. Continue the purge for a minimum of one (1) minute.

d. Close RC-V-3 on the LSP, OPL03J.

e. Open RC-V-2 on the LSP, OPL08J.

f. At the LSP, OPL08J, adjust RC-VREL-2 until RC-FI-2 indicates 18-22 inches of water.

g. Verify that the flow rate at the CAP, OPLE1J, is 200 ml/min by observing the red flow indicator is lit. Adjust RC-VREL-2 on the LSP, OPL08J, if necessary to obtain proper flow rate.

h. At CMP, OPLE4J, turn YSI CHART SPEED to RAPID and verify PEN INPUT is set to O_2 if the YSI monitor is to be used for the analysis.

13. To perform the sample analyses, proceed in accordance with the following:

a. Purge the CAP, OPLE1J, for a minimum of fifteen (15) minutes. During purging, proceed to Step F.13.b.

b. Determine the dissolved oxygen concentration at the CMP, OPLE4J, in accordance with the following as appropriate:

1) If the Rexnord dissolved oxygen meter is being used, observe the meter reading and turn to a lower scale position as the meter reading decreases. Allow to purge for fifteen (15) minutes, then record the dissolved oxygen reading on LRC Form 1097A (Attachment A).

2) If the YSI dissolved oxygen meter is being used, flush for five (5) minutes or until the YSI trace is linear.

c. Observe and record the conductivity meter reading and the temperature of the sample stream from the CMP, OPLE4J. Record on LRC Form 1097A (Attachment A).

d. At the CAP, OPLE1J, turn V-5 counterclockwise to OXYGEN CALIB SOLUTION to terminate flow.

e. After terminating flow, permit the pH reading to stabilize for a minimum of two (2) minutes. Record the pH reading on LRC Form 1097A (Attachment A).

14. Flush the CAP, OPLE1J, and LSP, OPL08J, in accordance with the following:

a. At the CAP, OPLE1J, align V-6 to LIQUID SAMPLE.

b. At the Valve Control Panel, OPLC9J, secure the sampling lineup in accordance with Reference 3, Step F.1.d.6) through F.1.d.7).

c. At the LSP, OPL08J, close RC-V-1.1 (-1.2, -1.3, -1.4, -1.5).

d. At the LSP, OPL08J, open RC-V-4.

e. At the LSP, OPL08J, adjust RC-VREL-2 until RC-FI-2 indicates 18-22 inches of water. Flush with demineralized water for a minimum of three (3) minutes.

f. At the LSP, OPL08J, close RC-V-7.

g. At the LSP, OPL08J, open RC-V-3.

h. At the LSP, OPL08J, adjust RC-VREL-1 until RC-FI-1 indicates 35-40 inches of water. Flush with demineralized water for a minimum of one (1) minute.

i. At the LSP, OPL08J, close RC-V-3.

j. At the LSP, OPL08J, open RC-V-1.1 (-1.2, -1.3, -1.4, -1.5) depending on the sample source

sampled, and flush with demineralized water for a minimum of five (5) minutes.

k. At the LSP, OPLD8J, close RC-V-1.1 (-1.2, -1.3, -1.4, -1.5).

l. At the LSP, OPLD8J, open RC-V-8.1 and RC-V-8.2.

m. At the LSP, OPLD8J, adjust RC-VREL-2 until RC-FI-2 indicates 18-22 inches of water. Flush with demineralized water for a minimum of three (3) minutes.

n. At the CAP, OPLE1J, turn V-6 to OXYGEN CALIB SOLUTION.

o. At the CAP, OPLE1J, turn V-5 to LIQUID SAMPLE and flush with demineralized water for a minimum of three (3) minutes.

p. At the CAP, OPLE1J, turn V-5 to CLOSED.

q. At the CAP, OPLE1J, close the flush water valve and disconnect the flush water hose from D-3.

r. Secure flushing by closing the following at the LSP, OPLD8J:

1) RC-V-8.2.

2) RC-V-8.1.

3) RC-V-2.

4) RC-V-4.

s. At the LSP, OPLD8J, close the flush water valve and disconnect the flush water hose from RC-DV-1.

15. Secure the sample system in accordance with the following at the CMP, OPLE4J or as otherwise directed:

a. On the pH monitor, turn switch S-1 to the OFF position.

b. On the conductivity monitor, turn the function select switch to the ZERO position.

c. If the Rexnord monitor was used, turn the function select switch to the ZERO position.

d. If the YSI monitor was used, check that the YSI power switch is in the OFF position and remove the chart paper, mark the chart paper with date, time, chart speed, C_2 range, and sample point.

e. Secure the system lineup in accordance with Reference 3, Steps F.1.a.8 through F.1.f.

16. If the sample pH temperature exceeds 20-30°C, pH to 25°C in accordance with the following:

$$pH_f = pH_1 + 0.03\ (T_1 - 25)$$

where: pH_f = pH corrected to 25°C.

pH_1 = pH from Step F.13.e.

T_1 = temperature (°C) from Step F.13.c.

Record the results on LRC Form 1097A (Attachment A).

17. Correct the measured conductivity to 25°C in accordance with the following formula:

$$C_1 = \frac{C_2 - 0.018 + (5.8E\text{-}5 \times T_1^2)}{1 + 0.018\ (T_1 - 25°C))}$$

where: C_1 = Conductivity corrected to 25°C.

C_2 = Conductivity from Step F.13.c.

T_1 = Temperature °C from Step F.13.c.

Record the results on LRC Form 1097A (Attachment A).

18. Record the dissolved oxygen concentration off the YSI chart paper on LRC Form 1097A (Attachment A) as appropriate.

19. Forward all paperwork and chart recordings to Rad/Chem Supervision for review.

G. CHECKLISTS

1. None.

H. TECHNICAL SPECIFICATION REFERENCES

1. 3/4.4.4.

ATTACHMENT A
LaSalle County Station
HRSS Analyses

Date: _____

pH, LZP 1330-23

Standardization Init/Time: _____

Calibration Check Init/Time: _____

Measured pH: (pH-7) _____

Buffer pH Value: 7.0

Check SAT/UNSAT, ±0.1 pH units: _____

Sample Init/Time: _____

Sample Temperature, °C: _____

Measured pH: _____

If the sample pH temperature exceeds 20-30° C, correct the pH to 25° C in accordance with the following:

$$pH_f = pH_1 + 0.03\ (T_1 - 25)$$

Where: pH_f = pH corrected to 25°C

pH_1 = measured pH

T_1 = Sample Temperature, °C

Conductivity, LZP 1330-23

Sample Init/Time: _____

Sample Temperature, °C: _____

Measured Conductivity, umho/cm: _____

Correct the measured conductivity to 25° C using the following formula:

$$C_1 = \frac{C_2 - \left[0.018+(5.8E\text{-}5 \times T_1^2)\right]}{1 + 0.018\ (T_1 - 25^{\circ}C)}$$

Where: C_1 = Conductivity corrected to 25°C

C_2 = Measured Conductivity

T_1 = Sample Temperature, °C

Dissolved Oxygen, LZP 1330-23

Calibration Init/Time: _____

Recirc. Water Temperature, °C: _____

Recirc. Water O_2 Conc., mg/l: _____

Sample Init/Time: _____

Sample D.O., mg/l: _____

Off-Gas LZP 1330-27

Vacuum, RC-G-2.1., Step F.1.d.4. _____

Pressure, RC-G-2.1., Step F.2.t. _____

Pressure, RC-G-2.1., Step F.2.y. _____

Sample Init/Time: _____

Comments: _____

Reviewed: _____

pH at 25°C: _____ Conductivity at 25°C, umho/cm: _____

LRC FORM 1097A

ATTACHMENT B

SOLUBILITY OF OXYGEN IN WATER
EXPOSED TO WATER-SATURATED AIR

TEMPERATURE °C	DISSOLVED OXYGEN mg/l	TEMPERATURE °C	DISSOLVED OXYGEN mg/l
0	14.6		
1	14.2	26	8.2
2	13.8	27	8.1
3	13.5	28	7.9
4	13.1	29	7.8
5	12.8	30	7.6
6	12.5	31	7.5
7	12.2	32	7.4
8	11.9	33	7.3
9	11.6	34	7.2
10	11.3	35	7.1
11	11.1	36	7.0
12	10.8	37	6.9
13	10.6	38	6.8
14	10.4	39	6.7
15	10.2	40	6.6
16	10.0	41	6.5
17	9.7	42	6.4
18	9.5	43	6.3
19	9.4	44	6.2
20	9.2	45	6.1
21	9.0	46	6.0
22	8.8	47	5.9
23	8.7	48	5.8
24	8.5	49	5.7
25	8.4	50	5.6

ATTACHMENT C

VALVE LISTING

RC-V-1.1	Reactor Recirc Loop B Sample Cutout Valve
RC-V-1.2	RT Demin Inlet Sample Cutout Valve
RC-V-1.3	RHR Loop A Sample Cutout Valve
RC-V-1.4	RHR Loop B Sample Cutout Valve
RC-V-1.5	RT Demin Outlet Sample Cutout Valve
RC-V-2	Sample Source Isolation Valve
RC-V-3	Sample Purge Cutout Valve
RC-V-4	Flushing Water Isolation Valve
RC-V-5.1	Pressurized Sample Inlet Isolation Valve
RC-V-5.2	Pressurized Sample Outlet Isolation Valve
RC-V-7	Diluted Sample Bypass Valve
RC-V-8.1	RC-SF-1.2 Inlet Isolation Valve
RC-V-8.2	RCSF-1.2 Outlet Isolation Valve
RC-V-9	RC-EV-1 Isolation Valve
RC-V-10	RC-EV-1 Evacuation Cutout Valve
RC-V-11	Off-Gas 4-way Valve
RC-V-12	Argon to Air Ejector Cutout Valve
RC-V-13	Off-gas Vial Evacuation Cutout Valve
RC-V-14	Argon Supply to Off-gas Vial Cutout Valve
RC-V-15	Off-gas Sample to Gas Chromatograph Isolation Valve
RC-V-16	RC-SF-1.2 Argon Purge Cutout Valve
RC-V-17	Reactor Coolant Grab Sample Cutout Valve
RC-V-18	Reactor Coolant Undiluted Sample Backflush Cutout Valve
RC-V-19	Reactor Coolant Undiluted Sample Injection Valve
RC-V-20	RC-C-1 Fill Valve
RC-V-21	RC-C-1 Isolation Valve
RC-V-22	Liquid Sample to CAP Isolation Valve
RC-DV-1	Reactor Coolant Diluted Sample Injection Valve
RC-DV-2	Off-gas Sample Injection Valve
RC-VREL-1	Reactor Coolant Purge Throttle Valve
RC-VREL-1	Reactor Coolant Sample Throttle Valve.
V-1	Off-gas Sample to Gas Chromatograph
V-2	Ion Chromatograph to Waste.
V-5	Ion Chromatograph Sample Source Selection
V-6	O_2 Analyzer Sample Source Selection
V-7	O_2 Analyzer Selection.
V-8	O_2 Analyzer Discharge Valve
V-9	O_2 Calibration Solution Cutout
V-10	Instrument Air Cutout
V-11	Demineralized Water Cutout Valve
V-12	Nitrogen Supply Cutout Valve
V-14	Argon Supply Cutout Valve
V-15	Cal-3 Isolation Valve
V-16	Cal-2 Isolation Valve
V-17	O_2 Calibration Solution Tank Recirc Valve
V-18	O_2 Calibration Solution Tank Drain Valve
V-19	Cal-3 Drain Valve
V-20	Cal-2 Drain Valve
V-24	Demin Water Fill to O_2 Cal. Soln. Tk.
V-25	Cal-1 Drain Valve
V-26	Cal-1 Isolation Valve
V-27	Nitrogen Supply to Cal-1
V-28	Nitrogen Supply to Cal-2
V-29	Nitrogen Supply to Cal-3
V-30	Cal-1 Cal-2 Selection Valve

SAMPLING OF CONTAINMENT AIR AT THE HIGH RADIATION SAMPLING SYSTEM

A. PURPOSE

The purpose of this procedure is to delineate a method of obtaining a containment air sample at the High Radiation Sampling System (HRSS) supplementing the containment monitors during normal and post-accident conditions.

B. REFERENCES

1. Sentry Equipment Corporation, Post-Accident Sample System, Volume 1.
2. LZP 1330-29, "Sampling at the High Radiation Sampling System (Valve Operation at the HRSS Valve Control Panel)."
3. LZP 1330-31, "HRSS Sample Movement."
4. AAIS-CCP-0002, "General Radionuclide Analysis of a Gas Sample."
5. AAIS-CCP-0003, "Particulate Radionuclide Analysis."
6. AAIS-CCP-0004, "Iodine Radionuclide Analysis."
7. Action Item Record (AIR), 1-81-494.
8. Hewlett Packard Program Instructions, "I-131 Equivalent Concentration."
9. GSEP Environmental Director Emergency Plan Implementing Procedure ED-16, "Quick Estimate of Offsite Dose From Unplanned Release: Liquid and Gaseous."
10. Calculations of Distance Factors for Power and Test Reactor Sites, Chemical Information Document, Division of Licensing and Regulations, Washington, D.C., 23 March 62. TID 14844, Table III.

C. PREREQUISITES

1. Verify that nitrogen pressure, approximately 100 psig, is available at the Containment Air Control Panel (CCP), CPLE2J. Verify that argon pressure,

approximately 80 psig, is available to the sample partitioner panel.

2. Verify that the CCP printer power is ON and the printer is set to the proper date and time.

3. Set the CCP FUNCTION SELECT to the SF1-SF3/GGD position and observe the following at the CCP, CPLE2J:

   a. The POWER ON light turns on.

   b. Annunciator windows glow steady in:

ROW	COL
1	1
1	2
1	3
2	2

   c. The flow monitor 20% and 100% flow lights turn on for approximately 25 seconds after power is first applied.

NOTE

There is no flow at this time.

   d. The 20 minute Gross Gamma Detector (GGD) timer is energized.

NOTE

There is no GGD included in this system, however, the steps were included to clarify the timer sequencing.

4. Press the annunciator RESET pushbutton to turn off all lighted annunciator windows.

5. Press the system RESET button.

6. Press the exercise RESET button.

7. Press the exercise START button.

8. Depress the exercise STOP button.

NOTE

The exercise STOP button should remain in, and glow red.

9. Verify all air and solenoid valve selector switches on the CCP, OPLE2J, are positioned to CLOSE.

10. Press the PILOT LIGHT TEST pushbutton on the CCP, OPLE2J, and observe all pilot lights are functional.

11. Press the annunciator TEST button on the CCP, OPLE2J, and verify the following:

    a. Horn sounds.

    b. Annunciator windows flash on and off in:

ROW	COL
1	1
1	2
1	3
2	2

    c. Annunciator window in ROW 2, COL 1 lights up and remains lighted.

    d. Annunciator window in ROW 2, COL 3 is off. This position has no operator function.

12. Release the annunciator TEST pushbutton. Verify that the annunciator window in ROW 2, COL 1 turns off and remains off.

13. Press the annunciator ACKNOWLEDGE pushbutton on the CCP, OPLE2J. Verify the following:

    a. Horn turns off.

    b. All flashing windows change to a steady glow.

NOTE

If desired, push the TEST pushbutton to retest ROW 2, COL 1 lamps. ROW 2, COL 1 lamps remain lighted

as long as the TEST pushbutton is pressed. The other windows will maintain a steady glow.

14. Press the annunciator RESET pushbutton on the LCP, OPLE2J. Verify that all annunciator windows return to the normal (off) condition.

15. At the Containment Air Sampling Panel (CASP), OPL09J, verify the following:

    a. The green INACTIVE pilot light is on.

    b. All four green SAMPLE FLASK INACTIVE pilot lights are on.

16. Obtain the sample in accordance with Reference 2 prior to performing this procedure.

17. Equipment:

    a. Partioner sampling assembly.

D. PRECAUTIONS

1. A Regulatory Guide 1.3 or 1.4 release of fission products implies extremely high levels of radioactivity. Dose rates may be high enough to prevent entry into many areas of the plant that are normally habitable. Rad/Chem Supervision should be contacted prior to entry into any area when such a release of fission products is suspected.

2. Wear radiation dosimetry as recommended by Rad/Chem Supervision.

3. Wear protective clothing and respiratory protection as recommended by Rad/Chem Supervision.

4. Appropriate survey instruments should be available for monitoring during this procedure.

5. A LOW NEGATIVE CABINET PRESSURE ALARM, at the Containment Air Control Panel, OPLE2J, implies a potential for airborne activity leaking into the HRSS room. Investigate and correct the problem immediately to preclude contamination of the area.

E. LIMITATIONS AND ACTIONS

1. The exercise stop pushbutton, when pushed, will stop automatic sequencing and disable the start pushbutton.

2. If any problems are encountered at the HRSS panels, contact Rad/Chem Supervision.

3. This procedure, though intended for use under post-accident conditions, can be used for sampling at the HRSS panels during normal operations, during which the precautions listed may have limited applications. However, normal routine sampling precautions should be observed.

F. PROCEDURE

NOTE

For noun names associated with the valves operated in this procedure, refer to Attachment A.

1. Install the sample stack on the partitioner in accordance with the following:

   a. Install the needle on a sample cartridge.

   b. Install the cartridge on top of the partitioner. A slight twisting force is required to seat the cartridge.

   c. Install the plexiglass cover over the cartridge assembly so that the needle protrudes through the small hole in top.

   d. Install vial and septum in vial holder, then place the vial assembly on top of the cartridge stack.

2. At the CCP, OPLE2J, adjust the nitrogen pressure regulator PC-1 until the pressure gauge reads 100 psig.

3. Adjust the operator pressure regulator on the sample partitioner to 80 psig.

4. At the CCP, OPLE2J, to backflush the sample lines, OPEN SV-5, then OPEN SV-10. Allow to flush for 2 minutes.

5. After completion of the sample line backflush, to purge the sample OPEN AV-2, AV-1, and SV-1,2.

6. At the partitioner controller, place the toggle switch on the back of the controller in the UP position.

7. Set the rotary switch on the front of the partitioner controller to INITIATE SAMPLE CYCLE.

8. Press the POWER ON switch on the partitioner controller. The switch should glow red.

9. Verify the HEATER ON switch on the partitioner controller is in the ON position, glows red.

10. Select the desired number of sample injections on the partitioner controller thumbwheel. In a post accident condition, it will normally be selected to "1". This may be changed as directed by Rad/Chem Supervision.

11. Press the INITIATE SAMPLE CYCLE pushbutton to start sampling. The following actions should now occur automatically:

    a. Rotary switch moves to EVAC.

    b. After 15-20 seconds, the rotary switch will advance to VAC CK.

    c. If the system is leak-tight, the pressure will not increase more than 0.3 psi. If the pressure rises above the lower level setpoint (approximately 1.2 psi), the sampler will not advance beyond the VAC CK position. To clear the machine, perform the following sequence:

        1) Turn main power off;

        2) Manually reset the front panel rotary switch to SAMPLE INITIATE CYCLE by rotating the switch <u>counterclockwise</u>. The switch should rotate easily.

        3) Disassemble the stack and replace the cartridge, needle, and septum on gas vial. The needle should not be damaged or it may tear the septum, causing a leak.

12. The rotary switch will then cycle through 3 more EVAC and AR FILL cycles to properly flush the sample assembly.

NOTE

The following, Step F.13., must be accomplished immediately when the rotary switch has advanced to SX LOAD.

13. When the rotary switch advances to the SX LOAD position, immediately CLOSE SV-5. The sample time is to be determined when the sample stack on the partitioner pops up.

14. When the sampling sequence has been completed, the rotary switch will advance to the INITIATE SAMPLE CYCLE position. Flush the sample lines in accordance with the following at the CCP, OPLE2J:

    a. CLOSE AV-2, and backflush the sample lines for 3 minutes.

    b. CLOSE SV-1,2 and AV-1, then OPEN SV-5, and flush the sample lines for 3 minutes.

    c. CLOSE SV-5, then OPEN AV-2, and flush the sample line for 3 minutes.

    d. CLOSE SV-10 and AV-2.

15. Set the CCP FUNCTION SELECT switch to OFF.

16. Depress the POWER ON pushbutton on the partitioner controller and verify the light goes out.

17. Upon completion of the sampling operations, secure the sampling lineup in accordance with Reference 2, Steps F.4.b.6) through F.4.c.

18. To remove the partioned sample, proceed in accordance with the following:

    a. Remove the vial and housing from the partitioner. Log the following information (as appropriate) for entry into the A.A.I.S.:

1) System sampled and unit.

2) Sample location.

3) Sample time on.

4) Sample time off (this time will be the same as time on).

5) Sample date on.

6) Sample date off (this date will be the same as date on).

7) Reactor power, megawatts thermal.

8) Reactor power, megawatts electric.

9) Initials.

b. Remove the protective housing from the noble gas vial and determine the radiation level of the sample. If radiation levels warrant, place the vial in a lead shield for transporting to the analytical area.

c. Remove the protective housing from the particulate and iodine cartridges.

d. Remove needle from the sampler unit.

e. Remove the particulate and iodine cartridges.

f. Transport the samples to the sample preparation area in accordance with Reference 3.

g. Separate the particulate filter and iodine cartridge utilizing a knife to cut the connectors. Cut relatively close to the top and bottom of the samples in order to set them flat in secondary containers.

h. Place the silver zeolite iodine cartridge inlet side down into its plastic sample holder.

i. Place the particulate filter inlet side up in a plastic petri dish.

j. Wrap the sample containers in plastic wrap or seal in plastic bag.

k. Label the samples in accordance with the following:

1) System sampled and unit.

2) Sample location.

3) Sample time.

4) Sample date.

5) Sample volume.

6) Survey results.

7) Initials.

l. Prepare the post-accident sample partitioner for further sampling in accordance with Steps F.1.a. through F.1.e.

19. Perform the radioactive analysis for each sample in accordance with Reference 4, 5, or 6, as appropriate.

20. Determine the I-131 equivalent concentration using th Hewlett Packard Calculator program in accordance with Reference 8.

21. If the Hewlett Packard calculator or calculator program "I-131 Equivalent Concentration" is not available, calculate the I-131 equivalent concentration of the containment air sample in accordance with Attachment 8.

22. Calculate the iodine, particulate, and noble gases curie content in the primary containment in accordance with the following:

NOTE

Calculations should be performed on the isotopic analysis hard copy printer output.

a. Calculate the total I-131 equivalent curie content of the primary containment in accordance with the following:

$$C = \frac{(S)(1.1E10cc)}{(1E06\ uCi/Ci)}$$

where: C = Total I-131 equivalent curie content in the primary containment.

S = I-131 equivalent concentration uCi/cc, in the sample from Step F.7. or F.8.

1.1E10 cc = Primary containment free air volume.

b. Sum the particulate radionuclide concentrations, uCi/cc, from the isotopic analysis in Step F.7.

c. Calculate the total particulate curie content of the primary containment in accordance with the following:

$$C = \frac{(S)(1.1E10cc)}{(1E06\ uCi/Ci)}$$

where C = Total particulate curie content of the primary containment.

S = Particulate radionuclide concentration, uCi/cc, in the sample from Step F.10.b.

1.1E10 cc = Primary containment free air volume.

d. Sum the noble gas radionuclide concentrations, uCi/cc, from the isotopic analysis in Step F.7.

e. Calculate the total noble gas curie content of the primary containment in accordance with the following:

$$C = \frac{(S)(1.1E10cc)}{(1E06\ uCi/Ci)}$$

where: C = Total noble gas curie content of the primary containment.

S = Noble gases radionuclide concentration, uCi/cc, in the sample from Step F.10.a.

1.1E10 cc = Primary containment free air volume.

23. Report the sample results to the Rad/Chem Director for evaluation in accordance with Reference 9.

24. Route all output data and calculations to Rad/Chem Supervision for review.

G. CHECKLISTS

1. None.

H. TECHNICAL SPECIFICATION REFERENCES

1. None.

ATTACHMENT A
VALVE LISTING

AV-1	Sample Flask #1 Inlet
SV-1.2	Sample Flask #1 Outlet
SV-2.1 *	Sample Flask #2 Inlet
SV-2.2 *	Sample Flask #2 Outlet
SV-3.1 *	Sample Flask #3 Inlet
SV-3.2 *	Sample Flask #3 Outlet
SV-4.1 *	Sample Flask #4 Inlet
SV-4.2 *	Sample Flask #4 Outlet
SV-5	Sample Purge
AV-2	CASP Outlet
SV-10	Nitrogen Inlet

* NOTE: SV 2.1 through 4.2 are no longer used in this procedure.

ATTACHMENT 8

Determination of I-131 equivalent concentration of the containment air grab sample in the event that computer analysis is not available.

1. Determine the I-135 concentration in the containment air grab sample from Step F.7.

2. Determine the I-135 concentration in the containment air at T_o, the time at which the release was made to the containment, using the following equation:

$$\text{I-135 concentration (uCi/cc) at } T_o = \frac{A}{e^{-\lambda t}}$$

Where: A = I-135 concentration (uCi/cc) from procedure Step F.7.

e = 2.718

λ = 1.724 E-03 min^{-1} decay const.

t = Sample decay time (min.) - reactor shutdown to sample time (Δ T)

3. Determine the concentration of I-131, I-132, I-133 and I-134 using the following relationships:

I-131 Concentration (uCi/cc) = I-135 concentration x 1.0E-01

I-132 Concentration (uCi/cc) = I-135 Concentration x 9.23E-01

I-133 Concentration (uCi/cc) = I-135 concentration x 6.85E-01

I-134 Concentration (uCi/cc) = I-135 concentration x 1.846

4. Determine the I-131 equivalent concentration of all iodine concentrations in the containment air using the following equation:

Total I-131 Equivalent Concentration (uCi/cc) = I-131 concentration + (I-132 Concentration)(0.036) + (I-133 Concentration)(0.027) + (I-134 Concentration)(0.017) + (I-135 Concentration)(0.084)