Volume 08

Section 04

08-S-04-905

Revision 0

Date: 8-16-82

CHEMISTRY INSTRUCTION

POST ACCIDENT SAMPLING/ANALYSES

SAFETY RELATED

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1.0 PURPOSE

This instruction is designed to be a guide to the Chemistry Section for collecting, analyzing, and monitoring parameters during a post accident situation where reactor water activities may approach 10 Ci/ml immediately following the accident.

2.0 REFERENCES

2.1 USNRC Regulatory Guide 1.97; December, 1980

2.2 Chemistry Instruction 08-S-04-14; Sample Preparation for Counting

2.3 Chemistry Instruction 08-S-04-104; Operation of Conductivity Bridge

2.4 Chemistry Instruction 08-S-04-107; Operation of pH Meter, and 08-S-04-109, Operation of Orion 701 Ion Analyzer

2.5 Chemistry Instruction 08-S-04-316; Development and Use of Calibration Curve for Chloride Determination using the Chloride Electrode

2.6 Chemistry Instruction 08-S-04-303; Boron in Reactor Water, and 08-S-04-320; Development and use of Calibration Curve for Boron Determination using the Fluoroborate Electrode

2.7 Chemistry Instruction 08-S-04-133; Operation of Gas Chromotograph

2.8 USNRC Docket No 50-341; Suitability Evaluation of Post Accident Chemistry Analysis Procedures

3.0 DEFINITIONS

3.1 Post Accident Sample System - The system designed to draw high active samples following a post accident condition resulting in activities as high as 10 Ci/ml in the reactor water.

4.0 PREREQUISITES

4.1 Prior to sampling in a condition that very high activities are suspected, all of the following should be done:

4.1.1 Determine which, if any, functions of the Post Accident monitoring System have failed and outline which samples are to be taken and the methods by which the samples will be analyzed, consistent with ALARA.

4.1.2 The Plant Chemist should brief all involved chemistry personnel to insure they are cognizant of their duties.

4.1.3 The Hot Lab should be set up and prepared for receiving and analyzing high radiation samples.

4.1.4 All instrumentation that will be used for performing analyses has been inventoried and confirmation made that calibration due for instruments are within the prescribed dates.

4.1.5 Ascertain that the required reagents, chemicals, standards and solution are available and that the shelf lives of each have not been exceeded.

4.1.6 Notified the Health Physics Section of sampling intentions and obtained dose extensions for the personnel who will be handling and/or analyzing samples, if required. An RWP will be required.

4.1.7 Obtained suitable anti-contamination clothing and dosimetry as deemed necessary by the Health Physics Section.

4.1.8 Sufficient monitoring equipment with up-to-date calibration has been made available as deemed necessary, by the Health Physics Sections.

4.1.9 A coordinated time schedule is established with the Health Physics Section and the Operations Section for exact time of sample and planned transfer routes in order to exclude unessential personnel.

4.1.10 The Plant Chemist's permission is received prior to drawing any high activity sample.

4.2 Attachments

4.2.1 Attachment I; Post Accident Pre-Sampling Work Sheet

4.2.2 Attachment II; Post Accident Apparatus and Reagent Monthly Inventory Check Off List

4.2.3 Attachment III; Gas Sample Analysis Work Sheet

4.2.4 Attachement IV; Liquid Sample Analysis Work Sheet

4.2.5 Attachment V; Time vs Dose Rate Graph

4.2.6 Attachment VI; Shielding vs Dose Rate Graph

5.0 PRECAUTIONS

5.1 Each individual involved should verify that he/she is properly badged and protected against the very high radiation dose rates, surface contamination and airborne contamination.

5.2 Shielding and distance principles should be utilized to minimize radiation doses to personnel.

5.3 Each individual should closely monitor their accrued radiaton dose by pocket dosimeter and estimate their stay time by using the Time vs Dose Rate Graph, Attachment V.

5.4 No sample under these conditions should be taken unless absolutely necessary.

5.5 As much time as possible between shut down and sample time should elapse to allow for as much radioactive decay of the short-lived nuclides as possible.

5.6 After a sample is taken, as much time as possible should be taken before opening the sample flasks to allow for decay before handling, consistent with the time requirement of Reference 2.1.

5.7 Prior to sampling, quick disconnect fittings should be bagged or sleeved to contain all drops.

6.0 INSTRUCTIONS

6.1 Time Requirements

6.1.1 After the decision is made to sample, the combined sampling and analysis times should not exceed 3 hours, with the exception of the chloride analysis, for which up to 24 hours is allowed.

6.1.2 For in-line parameters, back-up equipment will be capable of performing analysis once per day for seven days following the onset of the accident, then one sample per week until the accident condition no longer exists.

6.1.3 All required times are subject to plant conditions. If conditions are severe enough, no samples will be taken and these time requirements will not apply until the decision to draw the first sample is made.

NOTE

If in-line pH and conductivity measurements using the In-Line Sampling and Analysis Apparatus (ISAA) are to be done while doing step 6.2, do steps 6.6.2.d(3)(a) through 6.6.2.d(3)(u) where applicable.

6.2 Obtain a desired grab sample and/or perform an on-line chemical analysis or other desired functions according to the following sections of Chemistry Instruction 08-S-04-904, Post Accident Monitoring System (PAMS) Operations:

6.2.1 Sample Cask Attachment, 6.2.1

6.2.2 Containment or Drywell Atmosphere Grab Sample, 6.2.8

6.2.3 Off-Gas Sample, 6.2.10

6.2.4 High Pressure Un-diluted Liquid Grab Sample, 6.2.11

6.2.5 Diluted (1000:1) Grab Sample, 6.2.12

6.2.6 Decontamination of the PAMS, 6.2.9

6.2.7 Sample Cask Removal, 6.2.9

6.3 Movement of Sample Cask

NOTE

If determined by Health Physics that the person drawing the sample is approaching his exposure limit, another person may perform actual movement of the sample/cask.

6.3.1 When control has concurrence from Health Physics that the sample transport route is cleared of unnecessary personnel, move the cask to the designated area using the cleared transport route as directed by control.

NOTE

It is recommended that the sample cask be taken from the 93' elevation Turbine Building through the access hatch into the 93' radwaste elevation, moved to the 118' elevation Radwaste Building via the freight elevator, and delivered to the Hot Laboratory via the shortest route from the elevator.

6.3.2 Place the sample cask as near as possible to the last cubicle area adjacent to the Radwaste Control Room.

6.4 Sample Transfer

NOTE

Sample removal steps may be done in the Turbine Building.

6.4.1 For each cask from which a sample is to be transferred, place rubber septas on two 120 cc vials, evacuate them to about 20 inches Hg, label one of the vials as radwaste and the other with sample name, sample date, and time. Seal each vial in a clean plastic bag.

For gas samples (Sec 6.4.5.g) add a known volume of water (5-10 ml) prior to evacuating. NOTE If liquid manometer is not available

6.4.2 For gas samples, obtain another 120 cc (or greater) vial, fill it with water and seal it with a rubber septa.

NOTE

(Step 6.4.2)

Sealing of water vial is not necessary, if radiation levels of the samples permit. If the water vial is not sealed, the hypodermic needle in Step 6.4.3 will not be required.

6.4.3 Deliver a hypodermic needle for venting the water vial and the prepared sample and radwaste vials to the decant location, and place the evacuated sample vial into a portable cask.

NOTE

If a liquid sample is to be transferred, proceed to step 6.8.5.

6.4.4 Evacuate the bypass tubing of the gas sample cask as follows:

a. Attach a syringe assembly, with a hypodermic needle in each, to the top and bottom "quick disconnect" of the sampling cask.

b. Insert the needle of the lower syringe assembly through the septa of the vial containing water and the upper syringe needle through the septa of the vial marked "bypass radwaste."

c. Insert a hypodermic needle through the septa of the water vial to provide a vent.

d. Open the bypass valve (middle valve) and allow the bypass line to fill with water.

e. When water is being delivered into the waste vial at an even flow, close the bypass valve.

6.4.5 Transfer the gas sample as follows:

a. Remove the upper syringe assembly from the radwaste vial and insert it through the septa of the 120 cc sample vial in the portable cask.

b. Open the upper sampling cask isolation valve, then slowly open the lower isolation valve, and allow the gas sample to flow into the evacuated sample vial.

c. When a steady stream of water begins to flow after the gas tranfer, close the lower isolation valve, then the upper isolation valve.

d. Measure and record the radiation dose rate of the gas sample.

e. Remove the hypodermic needle from the septa of the sample vial and insert the needle into a rubber stopper.

f. Transfer the sample to the fume hood which has been prepared for receiving the sample.

g. Using a liquid manometer, return the sample vial to atmospheric pressure. If a manometer was NOT to be used invert the vial allowing water to enter the neck. Insert a needle and NOTE allow air to bubble through the water until the bubbling stops.

The gas volume in the sample cask is approximately 30 cc and if the water is extracted from the sample vial, 1 cc of the gas in the 120 cc sample vial is equal to approximately 0.25 cc of the original sample.

h. When finished with the sample, seal all hypodermic needle penetrations with a dab of silicone grease.

6.4.6 Evacuate the bypass tubing of the liquid sample cask as follows:

a. Attach the "vent assembly" to the upper "quick disconnect."

b. Attach the "syringe assembly" to the lower "quick disconnect."

c. Push the needle of the syringe through the plastic bag and through the septa of the radwaste vial.

d. Open the bypass valve (middle valve) and the vent valve to allow the flush water to flow into the radwaste vial.

e. Close the bypass and vent valve.

6.4.7 Transfer the liquid sample as follows:

a. Remove the hypodermic needle from the septa of the radwaste vial and insert it through the septa of the sample vial in the portable cask.

b. Open the top, and bottom ~~and vent~~ isolation valves to allow the sample to flow into the sample vial.

c. Check the area radiation dose rate.

d. Obtain and record the contact dose rate of the sample.

e. Close the inlet, outlet and vent valves.

f. Do steps 6.4.5.e, 6.4.5.f and 6.4.5.h.

6.5 Grab Sample Analysis

NOTE 1

Based on levels of redioactivity, radioactive contamination and the nature of the contamination, the Senior Radiochemist will determine which approved Chemistry Procedure, what instrumentation and apparatus, and what volumes of sample will be used, consistent with the principles of ALARA.

NOTE 2

Prior to and during sampling, the required instrumentation shall be checked for up-to-date calibration and placed into operation, all reagents and apparatus shall be inventoried for each procedure and bench and/or calibration standards shall be analyzed at the discretion of the Senior Radiochemist. Systems and instrumentation are as follows:

1. Germanium Lithium Detector System

2. Gas Chromatograph

3. Fluoroborate Selective Ion Electrode, double junction reference electrode and the pH/mV that will be used with it. (if required)

4. Chloride Specific Ion Electode, double junction reference electrode and the pH/mV meter that will be used with these electrodes

5. pH and conductivity instrumentation used routinely

6. pH and conductivity using the "In-line Sampling and Analysis Assembly." (If this method is used, start up, check out, etc., must precede sampling and analysis, since sampling and analysis are concurrent.)

7. Any apparatus, instrumentation, reagents and standards associated with approved Chemistry Procedures which may be used to replace any of the above

6.5.1 Gas Analysis

a. Record sample source, date, time and initials of the person who drew the sample in the spaces provided on the worksheet.

b. Record the initials of the person who transferred the sample to the 120 cc flask and the contact dose rate (mR/Hr) of the sample in the 120 cc flask at time of transfer.

NOTE

In most, but not all cases, the person performing the analysis is not the person who drew the sample or made transfers and prepared dilutions of samples.

c. Gamma Spectral Analysis

(1) If the dose rate of the sample is within limits acceptable to the Senior Radiochemist, seal a clean, new 14.7 cc gas vial with a clean, new rubber septa and using the same gas tight syringe that will be used for pipetting the gas sample, evacuate 4 cc of air from the 14.7 cc gas vial.

(2) Eject the air from the syringe and quickly transfer (pipet) 4 cc of the gas sample from the 120 ml flask to the evacuated 14.7 cc gas vial.

NOTE

The 14.7 cc vial now contain 1 cc of the original sample.

(3) Place the 14.7 cc vial with gas sample outside of the energy field generated by the sample in the 120 ml flask, measure the dose rate of the vial at contact and record the dose rate on the worksheet.

(4) If the dose rate is less than 0.5 mR/Hr, dab the needle penetrations with silicone grease, change gloves, wrap the vial in clean plastic film (ex. Saran Wrap), twist, secure with tape, trim the excess film, place in a clean plastic bag and deliver to the detector cave that will be used for counting the sample, then proceed to step 6.5.1.c (12).

(5) If the dose rate is greater than 0.5 mR/Hr, using the table below, determine the number of dilutions which will provide a gas vial contact dose rate of less than 0.5 mR/Hr when using other sealed 14.7 cc gas vials with 1 cc of air evacuated from each vial and replace with 1 cc of gas sample in successive order, beginning with the gas sample measured in step 6.5.1.c (3).

GAS DILUTION TABLE

Sample From	Spl Vial Dose Rate (mR/Hr)	Dilutions Req'd 1 cc to 14.7 ml	ml orig. Spl in vial	Multiplication Factor
6.5.1.c (3)	<0.5	count as is	1	1
6.5.1.c (3)	0.5-8	1	.068	14.7
prev. dil.	8-120	2	.0046	217
prev. dil.	120-1900	3	.0003	3333
prev. dil.	1900-30,000	4	2.04E-5	4.9E4
prev. dil.	30,000-50,000	5	1.39E-6	7.19E5

(6) Based on the number of dilutions required, remove 1 cc of air from new, labeled (adhesive label) vials using the gas tight syringe that will be used for pipetting.

(7) Make successive dilutions by tranferring 1 cc aliquots from the previous dilution to the partially (1cc) evacuated gas vials.

(8) Using an HP dose rate instrument, measure the dose rate (mR/Hr) of each dilution.

(9) On the work sheet, record the dose rate (mR/Hr) of each dilution and indicate which dilution will be counted by checking the appropriate blank.

(10) Seal all needle penetrations in the septas of all dilutions with a small dab of silicone grease.

(11) Change gloves and wrap the dilution selected for counting in a clean sheet of plastic film (Saran Wrap), twist and secure with tape, trim the excess film, place in a plastic bag and deliver to the detector cave that will be used for counting the sample.

(12) Perform a quantitative isotopic analysis of the sample according to Chemistry Instruction 08-S-04-200 and 08-S-04-212 using the GSMCA program to collect the spectrum and the GSRAP program to analyze the spectrum.

(13) Record count date and time, geometry, name of person performing the analysis and the activity of those isotopes listed on the work sheet.

(14) Attach the work sheet to the data printout.

d. Hydrogen and Oxygen

(1) Using a gas-tight syringe, inject an aliquot (0.5 cc) into the gas Chromatrograph, and record date and time of analysis, volume of aliquot and name of the person performing the analysis.

(2) Read, then record the gas concentrations (%) on the worksheet.

(3) If no other analyses are to be done, seal all needle penetrations that have not been sealed thus far with a dab of silicone grease, and store in the lead brick cave in the hot labortory.

6.5.2 Liquid Analyses

NOTE

Based on the radiation level(s) of the sample(s) and the possibility of airborne contamination when a sample is opened in the fume hood, the Senior Radiochemist will determine the apparatus and the method(s) by which, the sample(s) will be analyzed at all applicable steps in this procedure.

a. Do steps 6.5.1 AND 6.5.1.b.

b. Wearing required TLD's (whole body and finger rings), dosimeters and gloves, and using tongs and an HP dose rate instrument, determine as near as possible, the contact dose rate of the sample in the 120 ml flask, and place the sample in the space prepared for it behind the lead brick barricade.

c. Gamma Spectral Analysis

(1) From the dose rate obtained and at the discretion of the Senior Radiochemist, determine what volume of sample diluted to 3 ml or to 1000 ml will be required to provide a dilution with a contact dose rate in teh range of 0.05 to 0.5 mR/Hr.

(2) Prepared the 2 ml dilution in a clean, new 1 dram vial using a clean, new rubber septa or the 1000 ml dilution in a clean, new polypropylene bottle according to Chemistry Instruction 08-S-04-14.

CAUTION

At the discretion of the Senior Radiochemist, if there is concern about possible airborne contamination, the sample should not be opened to the atmosphere, and the 1 dram vial or the 1000 ml polypropylene bottle should be sealed after the diluent is placed in it and a volume of air equal to the volume of sample removed from the vial or the 1000 ml bottle before the sample is added.

NOTE

If airborne contamination is a concern, dab all needle penetrations in the septas of the sample and dilutions with silicone grease when pipetting is complete.

(3) Perform a quantitative isotopic analysis of the dilution according to Chemistry Instruction 08-S-04-200 and 08-S-04-212 utilizing the GSMCA program to collect spectrum and the GSRAP program to analyze the spectrum.

(4) Record count time and date, geometry and activities of those isotopes listed on the work sheet and sign or initial the space provided.

(5) If no other analyses are to be performed at this time, store all samples and dilutions as directed by the Senior Radiochemist.

d. pH and conductivity

NOTE

If determined by the Senior Radiochemist that the radiation level of the sample is too high, or that airborne contamination is likely if the sample is analyzed by routine methods, proceed to step 6.5.2.d(3).

(1) Use the designated fume hood if necessary, and perform a pH measurement according to Chemistry Instruction 08-S-04-104.

(2) Record initials, analysis data and the method(s) used on the worksheet.

(3) pH and conductivity using the pH and conductivity "In-line Sampling and Analysis Assembly" (ISAA).

(a) Turn the pH/mV meter and the conductivity bridge off, unplug the electrodes, drain the ISAA, fill it with buffer solution and tape adequate sleeving over both quick disconnects.

(b) Request that Operations open all root valves to permit sampling at the Post Accident Sample Panel.

NOTE

A coordinated time schedule with Health Physics and Operations must exist in order to exclude nonessential personnel, and approval for sampling must be granted by the Plant Chemist.

(c) According to the directives of HP supervision relative to the existing conditions, don protective clothing (if required), respiratory protection devices (if required), whole body and extermity TLDs and self reading dosimeter(s) as required.

(d) Select an HP survey meter, check that the calibration due is within the prescribed date and perform an instrument check.

(e) Set the HP survey instrument to the highest range before departing the laboratory.

(f) Deliver the ISAA and other apparatus to the Post Accident Sample Panel, and while enroute, continuously monitor radiation levels and the status of GAMs and ARMs.

(g) Survey the area around the "Sampling Skid," if the dose rate is too high to work in, move the "Sampling Skid" as far away from the source as possible, run the lead wires through the lead brick shielding and plug them into the appropriate jacks for each.

(h) Apply power to the instruments.

(i) Retreat, if necessary, to an area with a lower background dose rate, and allow the instrument to warm up for 5 to 10 minutes.

(j) Upon returning, adjust the pH/mV meter to the value of the buffer solution, and affirm that the conductivity bridge is functioning properly.

(k) Set the instruments to "standby."

(l) Place the "Sampling Skid" close enough to the "Sampling Panel" to attach the ISAA to the undiluted grab sample outlets, then, attach the ISAA to the outlets.

(m) Slip the sleeving over the "quick disconnects" of the sample outlets and seal the sleeving with tape.

(n) Position the shielded "Sampling Skid" as flush as possible against the sample panel wall to minimize "shine."

(o) Cover the ISAA cavity with lead bricks.

(p) Initialize purging and sampling as per Chemistry Instruction 08-S-04-904, Section 6.2.11 and measure radiation dose rates around the shielded skid.

(q) Set the instruments to read pH and conductivity.

(r) Retreat, if necessary, to an area with a lower background dose rate to allow adequate flushing sampling, and instrument stabilization.

(s) When readings have stabilized, record sample time, temperature, pH and conductivity, method used, and set the instruments to "Standby" or "Off."

(t) If not directed to retreat, decontaminate and shutdown the sampling system per Chemistry Instruction 08-S-04-904, Section 6.2.2.

(u) If directed to do so, back the shielded skid away from the ISAA and remove the ISAA per Chemistry Instruction 08-S-04-904, Section 6.2.9.

(4) Retreat from the area with or without the ISAA and other instrumentation as directed by the Senior Radiochemist.

e. Chloride

(1) Based on the radiation level and the possibility of airborne contamination from the sample, select one of the two following alternatives:

(a) If the radiation level of the sample is low and airborne contamination is not likely, analyze the sample for chloride using the approved Chemistry Instruction selected by the Senior Radiochemist, and record the analysis data and the method used in the spaces provided on the worksheet.

(b) If the radiation level is too high and/or the potential for airborne contamination exists, proceed to step 6.5.2.e (2).

(2) Don the necessary whole body and extremety TLDs, self-reading dosimeter(s), anti-contamination clothing and respiratory protection devices specified by the Health Physics Department.

(3) Using lead shielding in the fume hood prepared for this analysis, perform a chloride analysis according to Chemistry Instruction 08-S-04-316 using the Lazar Specific Ion Electrode and the Lazar double junction reference electrode.

NOTE

The Senior Radiochemist may select either the Chloride Analysis Chamber or the microdishes for analysis.

(4) Record the analysis data and the method used

f. Boron

(1) Based on the radiation level and the possibility of airborne contamination from the sample, select one of the two following alternatives:

(a) If the radiation level of the sample is low and airborne contamination is not likely, analyze the sample for boron using the approved Chemistry Instruction selected by the Senor Radiochemist, and record the analysis data and the method used in the spaces provided on the worksheet.

(b) If the radiation level is too high and/or the potential for airborne contamination exists, proceed to step 6.5.2.f(2).

(2) Don the necessary whole body and extremety TLDs, self-reading dosimeter(s), anti-contamination clothing and respiratory protection devices specified by the Health Physics Department.

(3) Using lead shielding in the fume hood prepared for this analysis and as determined by the Senior Radiochemist, analyze a small volume or a large volume sample for boron using Chemistry Instruction 08-S-04-320 for the analysis of high radiation samples.

(4) Record the analysis data and the method used in the spaces provided on the worksheet.

POST ACCIDENT PRE-SAMPLING WORKSHEET

Enter N/A in all spaces that are not applicable.

Post Accident Monitoring System

The monitoring capability of the following has/have failed:

Gross Activity _____
Isotopic Analysis _____
Hydrogen _____
Dissolved Oxygen _____
Chloride _____
pH _____
Conductivity _____
All of the above _____

Analyses of Grab Sample(s) required:

Gas Samples from: _____
_____
_____
_____
_____

Analyses (of gases) required

Gross Act. _____ Gamma Spectral _____

Chemistry personnel reporting for work on any later shift will be briefed before being allowed to enter their assigned work areas and these briefings will remain in effect until such time, because of conditions, the briefings are deemed unnecessary.

Plant Chemist _____ Date _____

Radiation dose extensions have been requested.

Plant Chemist or Senior Radiochemist _____ Date _____

When completed and initialed, the following verifies that calibration due is within the prescribed date for each instrument or system:

Instrument/System	MP&L No.	Calib. Due Date	Initial
Gamma Spectral System			
Gas Chromatograph			
pH/mV meter			
pH/mV meter			
Conductivity Bridge			
Conductivity Bridge			

When entered and initialed, the following verifies that startup, function checks, calibration curves and bench standard analyses were performed/generated in accordance with the appropriate Chemistry Instruction for each instrument and is documented in the respective Calibration Functional Check Log Book for each Instrument/System (including electrodes, lead wires, connectors, filling solutions in use, etc.):

Instrument/System	Chem. Instr.	Date Done	By	Enter By
Gamma Spectral System	08-S-04-200			
	08-S-04-212			
Gas Chromatograph	08-S-04-133			
pH/mV meter	08-S-04-109			
pH/mV meter	08-S-04-109			
Conductivity Bridge	08-S-04-104			
Conductivity Bridge	08-S-04-104			
Flouroborate and reference electrode with pH/mV meter above	08-S-04-320			
Spectrophotometer for Boron	08-S-04-303			
Chloride and reference electrode (routine) with PH/mV meter above	08-S-04-316			

Instrument/System	Chem. Instr.	Date Done	By	Enter By
Chloride and reference electrode (Lazar) with pH/mV meter above	08-S-04-316			
ISAA, pH	08-S-04-109			
ISAA, cond.	08-S-04-104			

The Senior Radiochemist confirms the following:

Applicable reagents and other solutions listed in Section 4.0 have been inventoried and replaced as required, in accordance with the applicable, approved Chemistry Instructions for reagent preparation, confirming that the shelf life for each reagent to be used, has not been exceeded.

The hot laboratory (or assigned laboratory) has been set up to receive and analyze high radiation samples according to Section 4.0.

Adequate anti-contamination clothing and respiratory protection devices have been provided.

Proper personal dosimetry and dose rate measuring instruments deemed necessary by Health Physics Supervision have been provided.

Senior Radiochemist _____ Date _____

Dose extensions for the following personnel have been granted by the Health Physics Department:

NAME	S. S. NO.	NAME	S. S. NO.

Senior Health Physics or Senior Radiochemist _____ Date _____

Permission is granted to sample:

			Time/Date
_____	Plant Chemist	_____	_____
_____	Plant Chemist	_____	_____
_____	Plant Chemist	_____	_____
_____	Plant Chemist	_____	_____
_____	Plant Chemist	_____	_____
_____	Plant Chemist	_____	_____
_____	Plant Chemist	_____	_____
_____	Plant Chemist	_____	_____
_____	Plant Chemist	_____	_____
_____	Plant Chemist	_____	_____

Notified the Health Physics Section and the Operations Section of the intent to sample and set a time schedule for sampling and transferring samples in order to exclude unessential personnel.

Senior Radiochemist_____ Time/Date_____

POST ACCIDENT APPARTUS AND REAGENT

MONTHLY INVENTORY

CHECK-OFF LIST

Enter N/A in all spaces that are not applicable.

A. Sampling Apparatus and Reagent

1. Bag, plastic, various sizes_____
2. Buffer, solution (PH7 or 10)_____
3. Cart, electric pallet_____
4. Clothing, anti-contamination_____

   Coveralls (cloth)_____(paper)_____Skull Cap (cloth) _____

   Hoods (cloth)_____ Gloves (cloths)_____(plastic)_____ (rubber)_____

   Wet-Suit_____Shoe covers (cloth) _____ (plastic)_____ (rubber)_____

   Lab Coat (coat) _____ (paper)_____ Tape_____

5. Conductivity Bridge (ISAA) _____
6. Dosimeters, self-reading high range_____low range_____
7. Electrode(s) (ISAA) comb. PH/ref._____cond. cell (ISAA) _____
8. In-line sampling and analysis assembly (ISAA) housing _____
9. Mirror_____
10. PH/mV meter_____
11. Radiation dose rate instrument_____
12. Sampling cask and skid: gas spl_____un-dil Spl___ dil spl_____
13. Sampling and analysis shield for ISAA_____
14. Scissors_____
15. Sleeving (plastic)_____
16. Stopwatch _____
17. Valve extension for the ISAA_____
18. ISAA filling apparatus (inlet) _____(outlet)_____

B. Sample Transfer Apparatus

1. Bags (plastic)_____
2. Cask(s) portable_____
3. Labels (tape)_____
4. Needles, hypodermic_____

B. Sample Transfer Appratus (Continued)

5. Silicone grease _____
6. Stoppers, rubber _____
7. Syringe Assembly(2) _____
8. Tape _____
9. Vacuum gun with hypodermic needle _____
10. Venting assembly _____
11. Vials, 120 cc or larger with rubber septas (12 or more) _____
12. A.4 and A.11 _____

C. Analysis Apparatus and Reagents

1. Apparatus and Reagents as per Chemistry Instruction:

08-S-04-104	_____	08-S-04-109	_____
08-S-04-133	_____	08-S-04-200	_____
08-S-04-212	_____	08-S-04-303	_____
08-S-04-316	_____	08-S-04-320	_____

2. Chloride Analysis Chamber _____
3. Gas tight syringe: Micro _____ Macro _____
4. Hypodermic needles: Micro _____ Macro _____
5. Lazar (or equivalent) chloride specific ion electrode _____
6. Lazar (or equivalent) reference electrode _____
7. Plastic bags _____
8. Lead brick _____
9. Rubber septas _____
10. Rubber stoppers _____
11. Shielded sample holders _____
12. A.4 and A.11 _____

Inventory Performed By:

Sampling Inv.	Spl. Transfer Inv.	Analysis Inv.
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

GAS SAMPLE ANALYSIS WORK SHEET

Enter N/A in all spaces that are not applicable.

Sample Source _____

Sample: Date _____ Time _____ Sampled By _____

Transfer to 120 ml flask by _____

Dose Rate at contact of sample in 120 ml flask _____ mR/Hr.

Gamma Analysis

	original	Dil. 1	Dil. 2	Dil. 3	Dil. 4	Dil. 5	Dil. 6
Dil. Used							
cc orig. spl	1	0.068	0.0046	0.003	2.004E-5	1.39E-6	9.46E-8
Mult. Factor	1	14.7	217	3333	4.9E4	7.19E5	1.06E7
mR/Hr.							

Count Date _____ Time _____ Geometry _____ By _____

Analysis Data

Isotope	uCi/cc at Spl Time	Isotope	uCi/cc at Spl Time
Kr-85		Xe-133	
Kr-85m		Xe-135	
Kr-87			
Kr-88			

Hydrogen and Oxygen

Date _____ Time _____ ml Sample _____ By: _____

H2 _____ % 02% _____ N _____ %

Senior Radiochemist _____ Date _____

LIQUID SAMPLE ANALYSIS WORK SHEET

* Enter N/A in all spaces that are not applicable.

Sample Source _____

Sample: Date _____ Time _____ Sample By _____

Transfer to 120 ml Flask by _____ Dose Rate _____ R/Hr

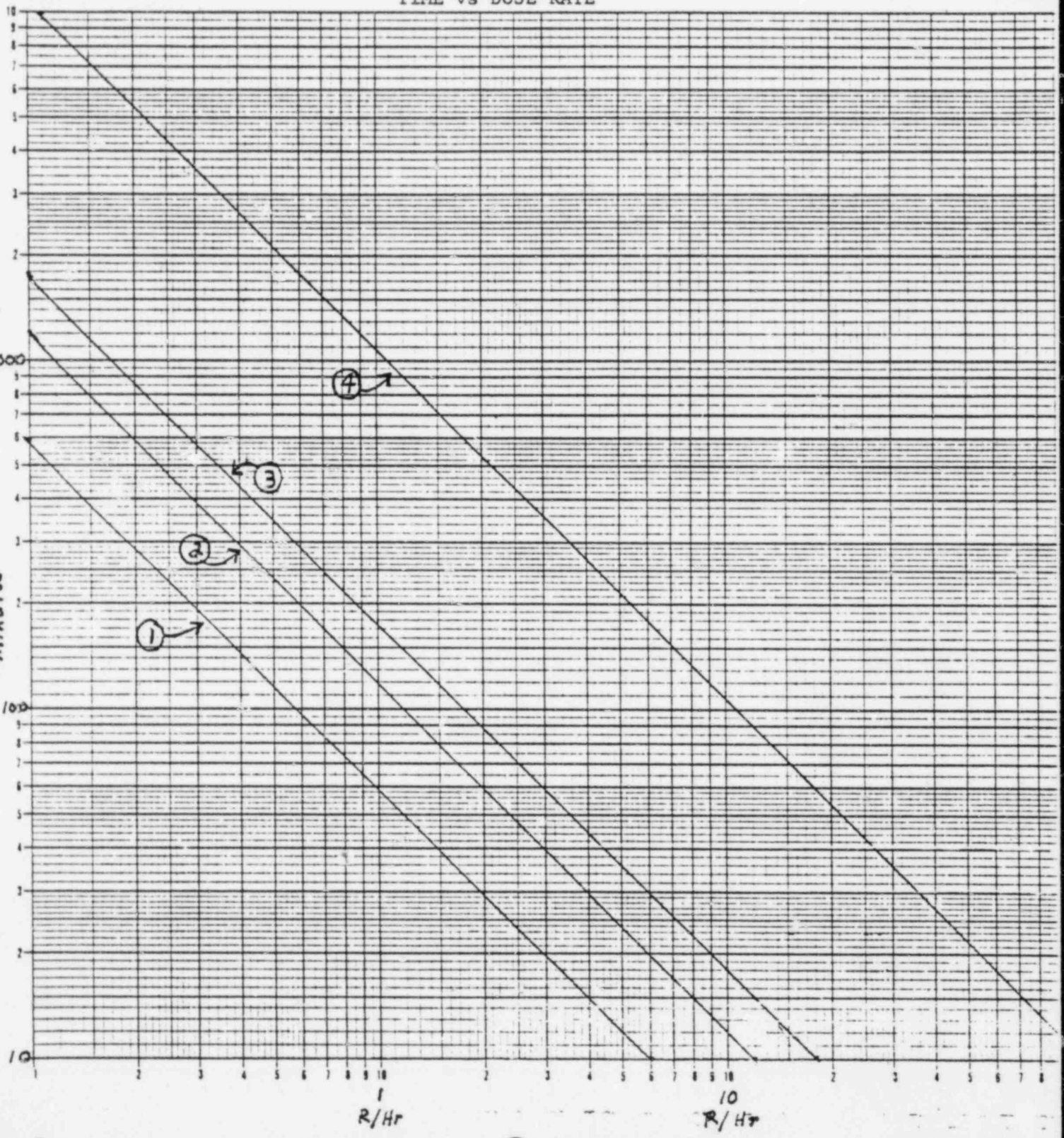
Count Date _____ Time _____ Geometry _____ By _____

Isotope	uCi/ml at Sample Time	Isotope	uCi/ml at Sample Time
I-131			
Cs-137			

Water Analysis

	PH	Cond.	Cl-	B
Date				
Time				
Analyst				
Temp. °C				
ml Sample	N/A	N/A	N/A	N/A
Diluted To	N/A	N/A		
MV	N/A	N/A		
Method Used				
Concentration/Value			ppm	ppm

TIME vs DOSE RATE



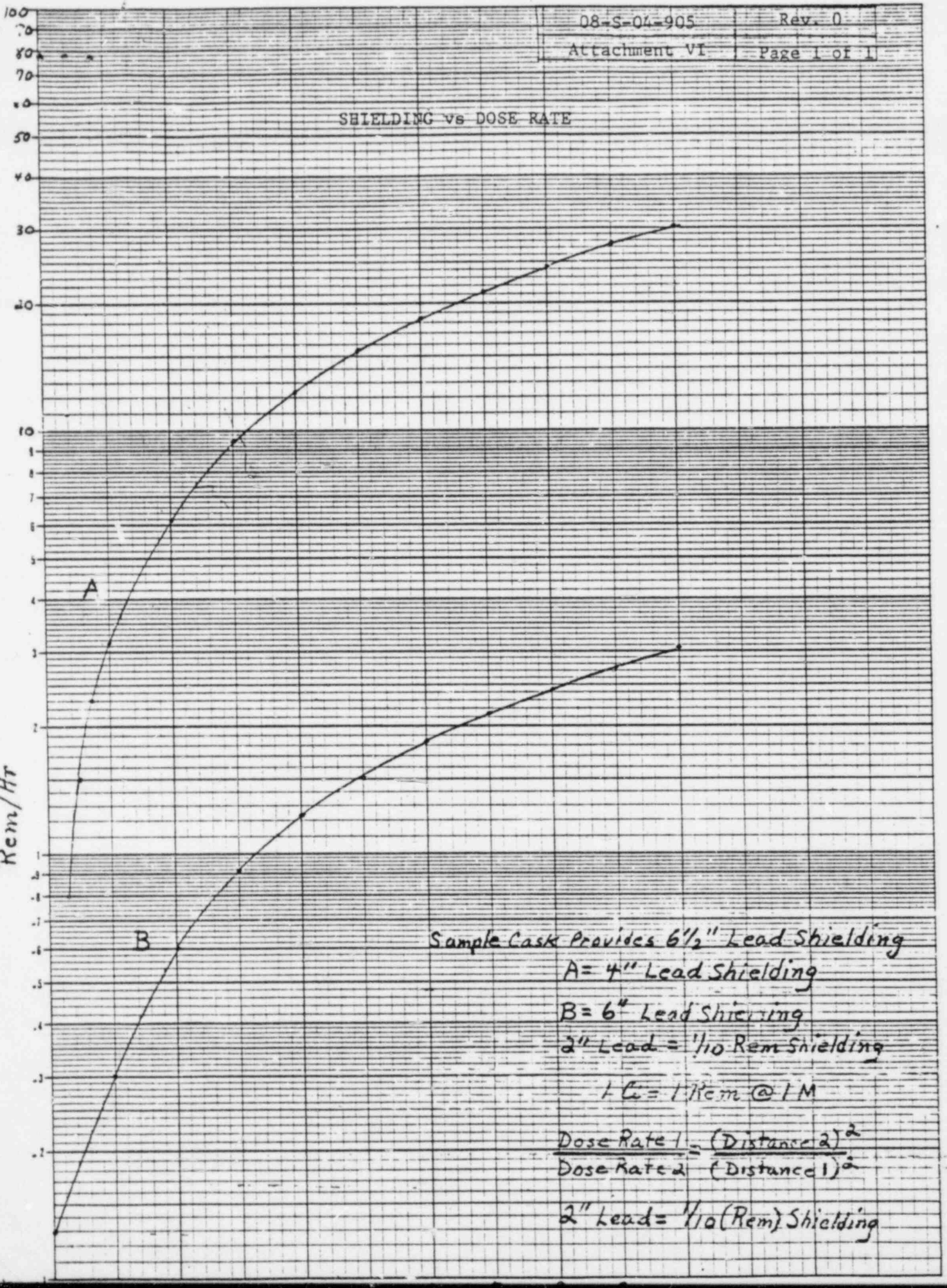
(1) 1 REM ALLOWABLE

(2) 2 REM ALLOWABLE

(3) 3 REM ALLOWABLE

(4) 18 REM EXTREMITY

SHIELDING vs DOSE RATE



Sample Cask Provides 6½" Lead Shielding

A = 4" Lead Shielding

B = 6" Lead Shielding

2" Lead = 1/10 Rem Shielding

1 Ci = 1 Rem @ 1M

$$\frac{\text{Dose Rate 1}}{\text{Dose Rate 2}} = \frac{(\text{Distance 2})^2}{(\text{Distance 1})^2}$$

2" Lead = 1/10 (Rem) Shielding