ENCLOSURE 1

Updates Included In This Submittal

DIABLO CANYON EMERGENCY PLAN
IMPLEMENTING PROCEDURES

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CURRENT

EMERGENCY PLAN

IMPLEMENTING PROCEDURES

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08/27/84

PG&E Pacific Gas and Electric Company

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

NUMBER EP R-2
REVISION 5
DATE 6/15/84

TITLE EMERGENCY PROCEDURE
RELEASE OF AIRBORNE RADIOACTIVE MATERIALS

IMPORTANT TO SAFETY

APPROVED R. C. Thornberry 8-1-84
PLANT MANAGER DATE

SCOPE

This procedure describes the steps to be taken to initially evaluate and recover from the consequences of an airborne release that results in an Unusual Event, Alert, Site Area, or General Emergency. It does not describe the operation of the plant equipment necessary to terminate or minimize the release. This latter subject is covered in the appropriate OP series Emergency Procedure for the particular release mechanism. This procedure and changes thereto requires PSRC review.

GENERAL

Any release of radioactive material in excess of that allowed by Technical Specifications will require corrective action to eliminate the release. In addition, actions will be required to assess the effect of the release on personnel on-site and the general public in the vicinity of the site. (See Figure 1.) The calculations required for the assessment are described in the appendices to this procedure. Figure 2 provides a flow chart for use in deciding which appendices to use.

SYMPTOMS

1. The following symptoms in a Radiological Controlled Area indicate that an airborne release may be occurring in the Controlled Area:

   a. There is actual or suspected leakage of water, steam, or noncondensible gases from any vessel or piping system containing primary coolant, liquid radwaste, or gaseous radwaste.

   b. Damage occurs to a submerged, irradiated fuel assembly with the resultant release of significant quantities of noncondensible gases.

   c. Alarms occur on CAMs.

d. A fire occurs in radioactive materials.

e. G-M type survey instruments in the area begin to show an increasing background count rate.

NOTE: The external dose rate produced by airborne levels near MPC is very low and may not be noticed on a dose rate meter. However, it produces a noticeable increase on a G-M survey instrument.

f. A major radioactive material spill occurs.

2. There are numerous indications available in the control room to identify and diagnose a possible airborne release. These vary depending upon the mechanism of the release, and are covered in detail in the OP series Emergency Procedures and EP G-1, "Accident Classification and Emergency Plan Activation." However, the most likely symptom(s) will involve alarms on at least one of the area and/or process radiation monitors.

IMMEDIATE ACTIONS

1. Personnel in the Area

a. Unless qualified and equipped with appropriate monitoring and/or respiratory equipment, evacuate the area and proceed to access control.

b. Notify the control room.

2. The Shift Foreman (interim Site Emergency Coordinator) shall:

a. Clear the affected area.

This can be done most efficiently by sounding the emergency signal. The emergency signal shall be sounded for the following circumstances:

1) Airborne contamination is widespread. Refer to EP R-4, "High Radiation (In-Plant)."

2) Major damage occurs to plant equipment. Refer to appropriate OP procedure or EP G-1, "Accident Classification and Emergency Plan Activation."

3) Site evacuation may be necessary. Refer to EP G-5, "Evacuation of Nonessential Site Personnel."

4) Mobilization of personnel is necessary. Refer to EP G-2, "Establishment of the Onsite Emergency Organization" and EP G-4, "Personnel Assembly and Accountability."

5) The Shift Foreman deems it necessary.

b. Establish an appropriate interim onsite emergency organization in accordance with EP G-1, "Accident Classification and Emergency Plan Activation."

1) Assign operators to terminate the release using appropriate OP series emergency procedures.

2) Have the Emergency Evaluations and Recovery Coordinator (normally the Shift Engineer) evaluate the events causing the release to determine initial classification. Then begin preliminary evaluation of the actual or potential severity of the release and verify the classification. Instructions for performing this preliminary evaluation are contained in the Subsequent Actions section of this procedure.

3) Assign the Emergency Liaison Coordinator and the Liaison Assistant to initiate the notifications required of offsite agencies and plant staff in accordance with EP G-2 "Establishment of the Onsite Emergency Organization" and EP G-3 "Notification of Offsite Organizations."

c. Treat any injured personnel in accordance with EP R-1, "Personnel Injury (Radiologically Related) and/or Overexposure."

SUBSEQUENT ACTIONS

1. Subsequent Actions Common to All Events

a. Perform notification required to establish an appropriate long-term onsite emergency organization in accordance with EP G-2, "Establishment of Onsite Emergency Organization."

NOTE: Sounding of the Site Emergency Signal is sufficient notification during normal working hours.

b. Alert offsite organizations in accordance with EP G-3, "Notification of Offsite Organizations."

1) Prompt notification of County and other offsite authorities should occur within about 15 minutes for the Unusual Event class and sooner (consistent with the need for other emergency actions) for other classes.

2) Periodic updates on the status of the emergency shall be provided to the County and other offsite organizations. Use Form 69-10581, "Initial Emergency Notification Form," giving as much information as is known at the time. The information in parts A and B of form 69-10262 should be developed as completely as possible in the evaluation, and provided to the TSC and EOF staffs when available.

c. Evaluate the internal exposure received by affected personnel using the instructions given in Emergency Procedure R-1, "Personnel Injury (Radiologically Related) and/or Overexposure."

2. Classify the Emergency

a. General

1) To a large extent, subsequent actions are based upon the potential severity of the occurrence, as identified by the emergency classification. Therefore, the Emergency Evaluations and Recovery Coordinator (EERC) shall inform the Site Emergency Coordinator at the earliest possible time whether the emergency is classified as an Unusual Event, Alert, Site Area or General Emergency using the appropriate Emergency Operating Procedure and EP G-1, "Accident Classification and Emergency Plan Activation."

<u>NOTE</u>: If core damage is a possibility, the Shift Engineer should be directing his attention towards its assessment and the task of classifying the accident should be assigned to someone else, such as an Assistant Control Operator.

2) The EERC shall keep the Site Emergency Coordinator apprised of any suggested escalation or reduction of the emergency classification.

b. How to Verify the Initial Classification of the Emergency

There are three general methods for verifying the classification of an emergency which is initially based on the accident scenario:

- estimate actual release rate,
- use accident summary sheets, or
- perform offsite monitoring.

Each of these is discussed below.

The method for initially classifying the emergency is to diagnose the most likely cause (LOCA, steam line break, gas decay tank rupture, etc.) and base the classification on this information.

- Go to the appropriate OP series procedure and use the guidance contained therein (Appendix Z) to classify the accident.
- If the emergency does not fit any OP series procedure, or if the guidance in the OP series procedure is inappropriate for the actual situation, go to EP G-1.

  EP G-1 gives examples of typical emergency scenarios which fall into each accident classification. Classify the emergency at a level consistent with the scenario which most closely approximates the actual situation.

- If multiple emergency situations are occurring simultaneously, such that the probability of a release of radioactive materials is increased over what it would be for a single occurrence, classify the emergency one level higher than it would otherwise have been based on the most severe single occurrence.

1) Verify Emergency Classification Based On Actual Release Rate

a) General

The best way to verify classification based on the accident scenario is to estimate the magnitude of the release rate and compare that to the site boundary dose criteria for each classification (See Appendix 1). However, using release rate information to classify the emergency is subject to the following:

(1) If the classification based upon the emergency scenario is more severe than would be warranted by release data, use the conservative (emergency scenario) classification. The reason for this is that EP G-1 specifies a classification for many events based upon the potential for a release, and this conservative classification must be used even if the actual release does or can not materialize.

(2) If the release data indicates a classification more severe than the classification based upon the scenario, use the conservative classification based on release data, if the release data is considered to be reliable.

(3) Both whole body and thyroid exposure must be considered when making a classification based upon release data. Classify the emergency based upon the most conservative of these two values.

b) Dose (and Release Rate) Criteria for Classifying an Emergency

The criteria for classifying an emergency based on dose are summarized in Appendix 1. Release rate criteria are given for use if a dose calculation cannot be done.

c) Instructions

Regardless of whether the calculation is performed on EARS or manually the basic technique is as follows:

(1) Determine the classification criteria using Appendix 1. Use real meteorological data if possible, or the default values given as necessary.

(2) Determine the noble gas and iodine release rates in curies/second. These may be based on actual radiation monitor readings or estimates derived from the FSAR cases or tank sample data. The Appendices give detailed instructions for the following common methods.

(a) Use of plant vent noble gas monitors RE-14 or RE-29. (See Appendix 2.)
(b) Use of plant vent iodine monitor RE-24. (See Appendix 3.)
(c) Use of main steam line monitors or RCS coolant sample results during S/G tube rupture. (See Appendix 4.)

(3) Compare the estimated release rate data with the criteria values. Formulae and assumptions used for this comparison are in Appendix 5.

2) Classify Emergency Using Accident Summaries

Appendix 6 contains summary sheets for each accident analyzed in the FSAR. They can be used to estimate the severity of an accident. If EARS is in use the summary in EARS can be modified to reflect actual plant conditions.

3) Classify Emergency Based On Field Monitoring Data

a) General

As discussed in Appendix 1, the accident classification definitions are based upon dose rates at the site boundary. In theory, therefore, field data taken at the site boundary should provide a direct method of classifying the accident. In practice, this is only the third best technique because there is the possibility that you will miss the plume center, and also because it takes considerable time to deploy monitoring teams. This will, however, provide data on radiation exposure to personnel.

b) Instructions

Appendix 5 summarizes the basic formulas related to environmental monitoring that are useful in classifying accidents and in projecting doses.

NOTE: At this point, the emergency classification is confirmed. Go to Steps 3, 4, 5, or 6 for Unusual Event, Alert, Site Area Emergency, or General Emergency, respectively. Be alert for changes in plant conditions necessitating a classification change.

3. Subsequent Actions for an Unusual Event

a. Make the best possible quantification of the extent of any offsite release using the results of air samples, effluent monitors, environmental monitoring, or other techniques.

b. Conduct appropriate cleanup and re-entry operations.

NOTE: General guidelines for cleanup and re-entry are contained in EP RB-6, "Area and Equipment Decontamination."

c. Close-out the event with a verbal summary to offsite agencies and complete the following written reports:

1) Plant Problem Report (see Nuclear Plant Administrative Procedure C-12).

2) Written summary within 24 hours.

d. All records generated by the utilization of this procedure for an exercise or emergency shall be forwarded the next working day to the Assistant Plant Manager/Support Services for review and retention.

1) Records generated from exercises will be categorized as non permanent and retained for a minimum of five years.

2) Records generated from actual emergency events will be categorized as lifetime and placed into lifetime storage in accordance with procedure "Requirements and Retention and Extended Storage of Operation Phase Activity Records (AP E-1S1)."

4. Subsequent Actions for an Alert

   a. If the release has the potential for necessitating onsite protective measures (i.e., if it is more than about 10 times the threshold levels for an Alert), initiate onsite monitoring in accordance with EP RB-7 "Onsite Radiological Monitoring." Make a check of downwind onsite assembly areas to determine if any protective measures are needed for onsite personnel.

   b. If the results of the initial assessment indicate that site personnel are receiving significant exposures, and that evacuation can measurably reduce it, the Site Emergency Coordinator shall order their evacuation either offsite (preferred) or to an upwind site location (if the duration of the release is expected to be very short). Refer to EP G-5, "Evacuation of Nonessential Site Personnel" for evacuation criteria.

   c. Provide periodic meteorological assessments to offsite authorities and, if any releases are occurring, dose projections for actual releases.

      1) Activation of EARS in the EARAUT mode is the preferred method for transmitting dose projections.

      2) If EARS is not available in either the automatic (EARAUT) or manual (EARMAN) mode, perform appropriate hand calculations using Appendices 2 - 5. Refer also to Procedures EP RB-8 through 12 for additional information and assessment guidance as additional personnel are available. Use form 69-10262 to transmit assessment information when appropriate.

   d. Perform Comprehensive Follow-up Surveys Onsite

      1) Personnel Assembly Areas

         Although a preliminary assessment should have been made at personnel assembly areas, if the release was substantially in excess of limits, it is wise to check or recheck these locations as time and conditions permit, with the following objectives:

         a) To verify that long-term evacuation is not required if personnel were not previously evacuated based upon the initial assessment.

b) To obtain iodine and particulate samples if these were not obtained earlier (assuming that significant quantities of iodine and particulate matter were released, and that the cloud has not long since passed).

c) To run smear surveys to see whether decontamination is required. If significant activity is found, the smear pads should be counted on a Multi Channel Analyzer to assist in determining the isotopes to which persons might have been exposed. (If significant personnel exposure is suspected, the persons should also be whole body counted.)

2) Remainder of Site

Downwind areas which may have been contaminated should be checked for contamination to provide data for determining the necessity and extent of cleanup operations. Smear samples should be retained for subsequent isotopic analysis if required.

e. Perform Offsite Monitoring as Warranted

If the estimate of curie release and/or onsite monitoring indicates that offsite effects are negligible (as they would be for most Alert conditions), offsite monitoring may not be necessary. However, if there is a realistic possibility that offsite locations may have become contaminated, local government agencies should be alerted and an offsite monitoring program should be instituted for the following purposes:

1) Determine the need for long-term decontamination or impoundment of foodstuffs, even if offsite personnel evacuation is not required.

<u>NOTE</u>: These decisions are the responsibility of local government agencies. However, current governmental recommendations are summarized in EP RB-10, "Protective Action Guidelines."

2) Allay any public concern.

3) Obtain background data for reports to regulatory agencies.

If protective actions are appropriate, this should be communicated to San Luis Obispo County, without delay, as soon as approved by the Site Emergency Coordinator (see Form 69-10581, "Initial Emergency Notification Form"). Be alert for changes in plant conditions, which may change a potential release to an imminent release (with a resultant change in appropriate protective action).

b. Provide periodic meteorological assessments to offsite authorities and, if any releases are occurring, dose projections for actual releases.

   1) Activation of EARS in the EARAUT Mode is the preferred method for transmitting dose projections.

   2) If EARS is not available in either the automatic (EARAUT) or manual (EARMAN) mode, perform appropriate hand calculations using Appendices 2 - 6. Refer also to procedures EP RB-8 through 12 for additional information and assessment guidance as additional personnel are available. Use Form 69-10262 to transmit assessment information when appropriate.

c. Perform Offsite Monitoring

A Site Area Emergency release is of sufficient magnitude such that some offsite protective measures, such as evacuation of persons in portions of the LPZ, or long-term impoundment of foodstuffs, may be required near the site boundary. Therefore, a nearsite and offsite monitoring program should be established for the following purposes:

   1) Initially, the program should be directed toward identifying those areas where measurable radiation exposure exists personnel evacuation may be necessary to prevent persons from exceeding the recommended evacuation criteria doses of 500 mrem whole body and/or 5 rem thyroid.

   2) Once any immediate evacuation is accomplished, the program should be set up to determine the need for long-term decontamination or impoundment of foodstuffs, which may be desirable even in areas where prompt personnel evacuation was not required.

      NOTE: These decisions are the responsibility of local government agencies. However, current government recommendations are summarized in EP RB-10, "Protective Action Guidelines."

f. Conduct appropriate post-accident cleanup and re-entry operations.

g. Close-out the event with a verbal summary to offsite agencies and complete the following written reports:

   1) Plant Problem Report (see Nuclear Plant Administrative Procedure C-12).

   2) Written summary within 8 hours.

h. All records generated by the utilization of this procedure for an exercise or emergency shall be forwarded the next working day to the Assistant Plant Manager/Support Services for review and retention.

   1) Records generated from exercises will be categorized as non permanent and retained for a minimum of five years.

   2) Records generated from actual emergency events will be categorized as lifetime and placed into lifetime storage in accordance with procedure "Requirements for Retention and Extended Storage of Operation Phase Activity Records (AP E-1S1).

5. Subsequent Actions for a Site Area Emergency

   a. Consider protective actions required.

   Table 1 summarizes the decision criteria for initial protective actions for an event classified as a Site Area Emergency. The protective actions which are appropriate for initial consideration are evacuation of the site and protective action zone (PAZ) 1 (The two mile radius of the plant) or a precautionary evacuation of transients on the 6-mile radius low population zone (PAZ-1 and PAZ-2). As shown in the table, neither action is required if the calculated total whole body dose to a theoretical individual at the site boundary is less than 500 mR. If the calculated total dose is greater than 500 mR then the appropriate action depends on whether the release is only a potential occurrence or whether it is actually expected to occur shortly (within 2 hours) or is occurring.

   The evacuation of non-essential personnel (in accordance with EP G-5) may be indicated even if the calculated exposure is considerably less than 500 mR if contamination of vehicles or persons is a possibility.

3) The program should provide background data for any necessary reports to regulatory agencies.

4) The program should provide the data to answer questions of public concern.

d. Recommend Additional Protective Measures for Members of the Public (if required)

Table 2 summarizes recommended protective actions for exposure to a passing plume. The area where action is taken must include the entire area in which the dose criteria have been exceeded. A somewhat larger area than this should be considered to account for uncertainties.

If protective action is required, determine which protective action zones (PAZ) are affected. On Figure 1, draw an arrow pointing in the downwind direction. Note the 22.5° sectors in this direction and on both sides of this downwind sector. Evacuate everyone within this 67.5° sector out to the radius where the dose criteria is not exceeded.

NOTE: The decision to implement protective actions and which area(s) are involved is the responsibility of local government agencies.

e. Conduct appropriate post-accident cleanup and re-entry operations.

f. Close-out the event with a verbal summary to offsite agencies and complete the following written reports:

1) Plant Problem Report (see Nuclear Plant Administrative Procedure C-12).

2) Written summary to NRC within 8 hours.

g. All records generated by the utilization of this procedure for an exercise or emergency shall be forwarded the next working day to the Assistant Plant Manager/Support Services for review and retention.

1) Records generated from exercises will be categorized as non permanent and retained for a minimum of five years.

2) Records generated from actual emergency events will be categorized as lifetime and placed into lifetime storage in accordance with procedure "Requirements for Retention and Extended Storage of Operation Phase Activity Records (AP E-1S1).

6. Subsequent Actions for a General Emergency

a. Evacuate Non-essential Site Personnel

As soon as the accident has been classified as a General Emergency, order evacuation of all nonessential site personnel in accordance with instructions given in EP G-5, Evacuation of Non-essential Site Personnel.

b. Evacuate Members of the Public from the Downwind LPZ

As soon as the accident has been classified as a General Emergency, notify the San Luis Obispo County Sheriff and recommended immediate evacuation of the LPZ (PAZ's 1 and 2) starting with the downwind direction, with the remainder of the Basic Emergency Planning Zone being placed on standby alert by sounding the Early Warning System and issuing a message on the Emergency Broadcast System.

If a release is imminent (i.e. within 2 hours), or occurring, or has occurred, which is comparable to the criteria for a General Emergency (Site Boundary dose rate of 1R/hr), also recommend sheltering in the downwind affected sector and adjacent sectors (67.5°) to the boundary of the basic EPZ (see Figure 1) or a farther distance if a total dose greater than 500 mR is calculated at further distances.

c. Provide periodic meteorological assessments to offsite authorities and, if any releases are occurring, dose projections for actual releases.

1) Activation of EARS is the preferred method for transmitting dose projections offsite.

2) If EARS is not available in either the automatic (EARAUT) or manual (EARMAN) mode, perform appropriate hand calculations using appendices 2 - 6. Refer also to procedures EP RB-8 through 12 for additional information and assessment guidance as additional personnel are available. Use Form 69-10262 to transmit assessment information when appropriate.

d. Perform Offsite Monitoring

1) General

A General Emergency release is of sufficient magnitude such that some offsite protective measures beyond the LPZ, such as evacuation or long-term impoundment of foodstuffs, may be required. Therefore, an offsite monitoring program should be established for the following purposes:

a) Initially, the program should be directed toward identifying those areas located beyond the LPZ where personnel evacuation may be necessary to prevent persons from exceeding the recommended evacuation criteria doses of 500 mrem whole body and/or 5 rem thyroid. (See Table 1.)

b) Once any immediate evacuation is accomplished, the program shall be set up to determine the need for long-term decontamination or impoundment of foodstuffs, which might be desirable even in areas where prompt personnel evacuation was not required.

NOTE: These decisions are the responsibility of local government agencies. However, current government recommendations are summarized in EP RB-10, "Protective Action Guidelines."

c) The program should provide background data for any necessary reports to regulatory agencies.

d) The program should provide the data to answer questions of public concern.

e. Recommend Additional Protective Measures

Table 2 summarizes recommended protective actions for exposure to a passing plume. The area where action is taken must include the entire area in which the dose criteria are exceeded. A somewhat larger area than this should be considered.

f. Conduct appropriate post-accident cleanup and reentry operations.

g. Close-out the event with verbal summary to offsite agencies and complete the following written reports:

1) Plant Problem Report (see Nuclear Plant Administrative Procedure C-12).

2) Written summary to NRC within 8 hours.

h. All records generated by the utilization of this procedure for an exercise or emergency shall be forwarded the next working day to the Assistant Plant Manager/Support Services for review and retention.

1) Recor s generated from exercises will be categorized as non permanent and retained for a minimum of five years.

2) Records generated from actual emergency events will be categorized as lifetime and placed into lifetime storage in accordance with procedure "Requirement for Retention and Extended Storage of Operation Phase Activity Records (AP E-1S1).

APPENDICES

1. Summary of Criteria for Classifying Emergency Based Upon Dose and Release Data

2. Instructions for Estimating Nob e Gas Release Rate Using Plant Vent Monitors RE-14 or RE-29

3. Instructions for Estimating Iodine Release Rate Using Plant Vent Monitor RE-24

4. Use of Main Stream Line Monitors or RCS Sample Results During Steam Generator Tube Rupture Accidents

5. Summary of Field Monitoring Formulae that are Useful in Classifying Accidents

6. Accident Summary Sheets

ATTACHMENTS

1. Form 69-10581, "Initial Emergency Notification Form"

2. Form 69-10262, "Emergency Status Form"

3. Figure 1, "San Luis Obispo County Protective Action Zones and Sections from Plant"

4. Figure 2, "Use of EP R-1 Tables and Appendices"

TABLE 1
PG and E Recommended Initial General Public Protectiv: Action Criteria

Emergency Classification[1]	Release Status[2]	Site Boundary Dose[3]	Appropriate Recommended Initial Protective Action[4]
A-Unusual Event	All	N/A	None
B-Alert	All	N/A	None
C-Site Area Emergency	All	<500 mR (Total W.B.)	None
"	B-Potential Release	>500 mR (Total W.B.)	C-Evacuate transients (Montana de Oro Visitors, agricultural workers, etc.) in the low population zone (PAZ's 1 and 2) starting with the affected sector and two adjacent sectors.
"	C-Imminent Release or D-Release is Occurring	"	B-Evacuation of the Site, and PAZ 1.
"	E-Release has Occurred but stopped.	"	None
D-General Emergency	A-No Release or B-Potential Release	N/A	D-Evacuate the site and low population zone (PAZ's 1 and 2) starting with the affected sector and two adjacent sectors. Alert the public in the basic emergency planning zone using the Early Warning System Sirens and EBS Broadcasts.

TABLE 1 (Cont'd)
PG and E Recommended Initial General Public Protective Action Criteria

Emergency Classification[1]	Release Status[2]	Site Boundary Dose[3]	Appropriate Recommended Initial Protective Action[4]
D-General Emergency	C-Imminent Release or D-Release is Occurring or E-Release has Occurred but stopped	N/A	D-(as above) and shelter personnel in the affected sector and two adjacent sectors to the boundary of the Basic EPZ. Specify a further distance from the plant if a total dose >500 mR is projected at further distances.

1. Refer to item 6 of Form 69-10581.
2. Refer to item 4 of Form 69-10581.
3. Calculate in accordance with EP R-2.
4. Refer to item 8 of Form 69-10581.

TABLE 2

RECOMMENDED PROTECTIVE ACTIONS TO REDUCE WHOLE BODY AND THYROID DOSE FROM EXPOSURE TO A GASEOUS PLUME

Projected Dose (rem) to the Population	Recommended Actions[a]	Comments
Whole Body - Less than 0.5[b] Thyroid - less than 5	No planned protective actions[c]. Offsite authorities may issue an advisory to seek shelter and await further instruction. Monitor environmental radiation levels.	Previously recommended protective actions may be reconsidered or terminated.
Whole Body - 0.5 to 5 Thyroid - 5 to 25	Seek shelter as a minimum. Consider evacuation/unless constraints make it impractical. Monitor environmental radiation levels. Control access to affected areas.	If constraints exist to prevent full-scale evacuation, special consideration should be given for evacuation of children and pregnant women.
Whole Body - 5 and above Thyroid - 25 and above	Conduct mandatory evacuation. Monitor environmental radiation levels and adjust area for mandatory evacuation based on these levels. Control access to affected areas.	Sheltering is an alternative if evacuation can not be promptly accomplished.

(a) These actions are recommended for planning purposes. Protective action decisions at the time of the incident must take existing conditions into consideration (e.g., weather, plume arrival time).

(b) The value of 0.5 rem whole body is based upon guidance from the State of California.

(c) At the time of the incident, officials may implement low-impact protective actions in keeping with the principle of maintaining radiation exposures as low as reasonably achievable (ALARA).

APPENDIX 1

SUMMARY OF CRITERIA FOR CLASSIFYING EMERGENCY BASED UPON DOSE AND RELEASE DATA

NOTE 1: For each classification, the actual definition is given from EP G-1. If the necessary information is available, this is the best criteria to use. This criteria is summarized in Table A. In addition, however, a set of Derived Criteria are also provided. These are calculated criteria, which are slightly less accurate because of the necessity to make calculational assumptions, but which may be more useful depending on what information is readily available.

NOTE 2: In general, derived criteria are expressed in terms of the site boundary atmosphere dilution factor, $(X/\dot{Q})_{800}$. This can be obtained from the meteorological computers or from the EARS computer. However, if this information is not readily available, default values of the criteria are given using the FSAR design basis $(X/Q)_{800}$. = 5.3×10^{-4} sec/m^3.

NOTE 3: The definitions of terms used in the equations are:

$\dot{Q}_{NG}$ = noble gas release rate (Ci/sec)

$\dot{Q}_I$ = iodine release rate (Ci/sec)

Q_{NG} = total curies of noble gas released (Ci)

Q_I = total curies of iodine released (Ci)

X_I = iodine concentration (μCi/CC or Ci/m^3)

$(X/\dot{Q})_{800}$ = centerline atmospheric dilution factor @ 800 m (sec/m^3)

A. UNUSUAL EVENT

1. Definition

Radiological effluent technical specification limits exceeded.

APPENDIX 1 (Continued)

The technical specification limits correspond to site boundary 800 m or 0.5 miles dose rates of:

a. Whole body $\geq$ 0.057 mR/hr.

b. Thyroid $\geq$ 0.170 mrem/hr.

2. Derived Criteria

a. Noble Gas Release Rate

$$\dot{Q}_{NG} \geq \frac{6.3\times10^{-7}}{(X/Q)_{800}}$$

Default Value (FSAR X/Q): $\dot{Q}_{NG} \geq 0.0012$ Ci/sec

b. Iodine Release Rate

$$\dot{Q}_{I} \geq \frac{9.2\times10^{-11}}{(X/Q)_{800}} \quad \text{(Assumed to be I-131)}$$

Default Value (FSAR X/Q): $\dot{Q}_{I} \geq 1.7\times10^{-7}$ Ci/sec

c. Centerline Iodine Concentration @ 800 m

$X_I > 9.2\times10^{-11}$ (Assumed to be I-131)

B. ALERT

1. Definition

Radiological effluents greater than 10 times technical specification limits exceeded.

This corresponds to the following dose rates at the site boundary (800 m or 0.5 miles):

a. Whole body $\geq$ 0.57 mR/hr.

b. Thyroid $\geq$ 1.70 mrem/hr.

APPENDIX 1 (Continued)

2. Derived Criteria

a. Noble Gas Release Rate

$$\dot{Q}_{NG} \geq \frac{6.3\times10^{-6}}{(X/\dot{Q})_{800}}$$

Default Value (FSAR $X/\dot{Q}$): $Q_{NG} \geq 0.012$ Ci/sec

b. Iodine Release Rate

$$\dot{Q}_{I} \geq \frac{9.2\times10^{-10}}{(X/\dot{Q})_{800}} \qquad \text{(Assumed to be I-131)}$$

Default Value (FSAR $X/\dot{Q}$): $Q_{I} \geq 1.7\times10^{-6}$ Ci/sec

c. Centerline Iodine Concentration at 800 m

$X_{I} \geq 9.2\times10^{-10}$ (Assumed to be I-131)

C. SITE AREA EMERGENCY

1. Definition

Radiological effluents correspond to greater than 50 mR/hr for 1/2 hour or greater than 500 mR/hr for 2 minutes to the whole body (or five times these levels to the thyroid) at the site boundary (800 m).

This can also be interpreted to mean an accident which produces a total dose at the site boundary of $\geq$ 17 mR (whole body) or $\geq$ 85 mrem (thyroid), which is used for comparison of calculations of total dose, for peak (puff) releases.

2. Derived Criteria

a. Peak Noble Gas Release Rate ($\geq$ 2 minutes duration)

$$\dot{Q}_{NG} \geq \frac{5.6\times10^{-3}}{(X/\dot{Q})_{800}}$$

Default Value (FSAR $X/\dot{Q}$): $Q_{NG} \geq 10.5$ Ci/sec

APPENDIX 1 (Continued)

b. Average Noble Gas Release Rate ($\geq$ 30 minutes duration)

$$\dot{Q}_{NG} \geq \frac{5.6\times10^{-4}}{(X/\dot{Q})_{800}}$$

Default Value (FSAR X/Q): $\dot{Q}_{NG} \geq 1.0$ Ci/sec

c. Total Noble Gas Release

$$Q_{NG} \geq \frac{0.68}{(X/\dot{Q})_{800}}$$

Default Value (FSAR X/Q): $Q_{NG} \geq 1280$ Curies

d. Peak Iodine Release Rate ($\geq$ 2 minutes duration)

$$\dot{Q}_{I} \geq \frac{1.35\times10^{-6}}{(X/\dot{Q})_{800}}$$ (Assumed to be I-131)

Default Value (FSAR X/Q): $\dot{Q}_{I} \geq 2.5\times10^{-3}$ Ci/sec

e. Average Iodine Release Rate ($\geq$ 30 minutes duration)

$$\dot{Q}_{I} \geq \frac{1.35\times10^{-7}}{(X/\dot{Q})_{800}}$$ (Assumed to be I-131)

Default Value (FSAR X/Q): $\dot{Q}_{I} \geq 2.5\times10^{-4}$ Ci/sec

f. Total Iodine Release

$$Q_{I} \geq \frac{1.65\times10^{-4}}{(X/\dot{Q})_{800}}$$

Default Value (FSAR X/Q): $Q_{I} \geq 0.3$ Curies

D. GENERAL EMERGENCY

1. Definition

Radiological effluents correspond to 1 R/hr whole body or 5 rem/hr thyroid at the site boundary.

APPENDIX 1 (Continued)

2. Derived Criteria

a. Noble Gas Release Rate

$$\dot{Q}_{NG} \geq \frac{0.011}{(X/Q)_{800}}$$

Default Value (FSAR X/Q): $\dot{Q}_{NG} \geq 21$ Ci/sec

b. Iodine Release Rate

$$\dot{Q}_I \geq \frac{2.7 \times 10^{-6}}{(X/\dot{Q})_{800}}$$ (Assumed to be I-131)

Default Value (FSAR X/Q): $\dot{Q}_I \geq 0.005$ Ci/sec

APPENDIX 1
TABLE 1
SUMMARY OF A RELATED
EMERGENCY CLASSIFICATION CRITERIA
(FROM EP G-1)

	Site Boundry (800m or 0.5 mile)	
	WHOLE BODY	THYROID
Unusual Event	≥0.057 mR/hr	≥0.170 mR/hr
Alert	≥0.57 mR/hr	≥ 1.70 mR/hr
Site Area Emergency	≥ 50 mR/hr for 1/2 hour or peak release, > 2 min and either: ≥500 mR/hr or ≥ 17 mR	≥ 250 mR/hr for 1/2 hour or peak release, > 2 min and either: ≥2500 mR/hr or ≥ 85 mR
General Emergency	1 R/hr	5 R/hr

APPENDIX 2

INSTRUCTIONS FOR ESTIMATING NOBLE GAS RELEASE RATE USING PLANT VENT MONITORS RE-14 or RE-29

Performed By:________________________ Date_________ Time_________

APPLICABILITY

First choice if noble gas release is going out of plant vent. This appendix is for initial or subsequent assessments using the low or high range monitor. Refer to EP RB-12 for use of the mid-range monitor for subsequent and confirmatory assessments.

INSTRUCTIONS

1. Determine Plant Vent Flow Rate (in cfm) on Affected Unit

   a. Check FR-12 on Unit 2 RMS board in control room. If operable, read flow rate directly off of chart.

   F_{vent} = ____________ cfm

   b. If FR-12 is inoperable, determine the flow rate using the number of ventilation fans in operation and the following fan capacities:

   _____ FHB exhaust fans @ 35750 cfm/fan = _______ cfm
   _____ Aux Bldg exhaust fans @ 73500 cfm/fan = _______ cfm
   _____ Cont purge exhaust fans @ 55000 cfm/fan = _______ cfm
   _____ Cont H_2 purge fan @ 300 cfm/fan = _______ cfm

   Sum F_{vent} = ____________ cfm

2. Read RE-14 (on Radiation Monitoring Panel) if it is on scale. Otherwise, read RE-29 (on Post-Accident Monitoring Panel). Convert the readings to plant vent concentration using Figure 1 (for RE-14) or Figure 2 (for RE-29). Summarize the data in spaces provided.

   NOTE: On Figure 1, assume effective age<1000 hours for all accidents except a fuel handling accident where the fuel has been out of the core for at least a month.

APPENDIX 2 (Continued)

RE-14			RE-29		
Time	cpm	μCi/cc	Time	mR/hr.	μCi/cc

3. Calculate Noble Gas Release Rate

Regardless of the instrument used, the formula for calculating the noble gas release rate is:

$$\dot{Q}_{NG}(\text{Ci/sec}) = (\mu\text{Ci/cc Vent}) \times F_{vent}\ (\text{cfm}) \times 4.72 \times 10^{-4}$$

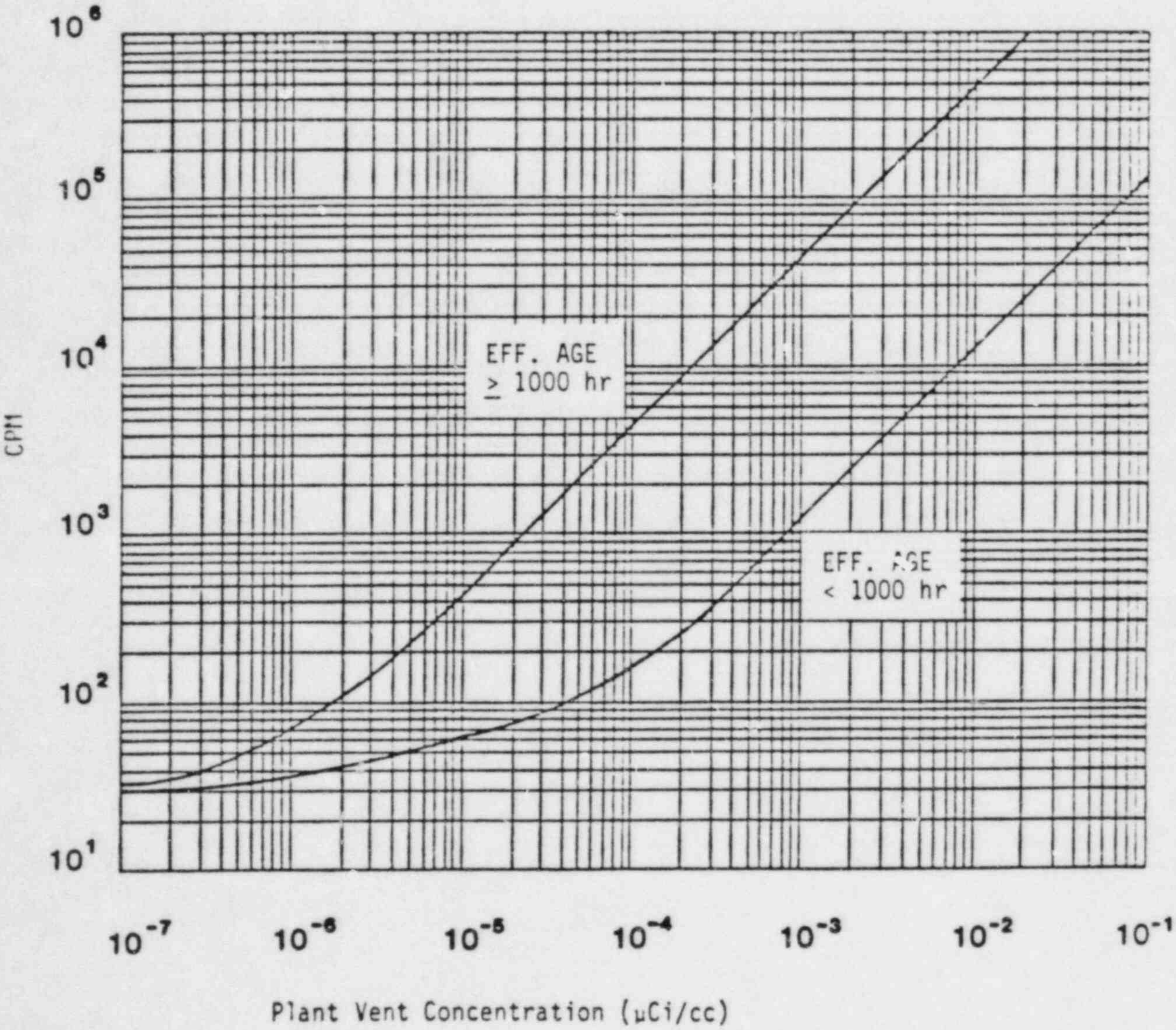
INSTR.	TIME	(μCi/cc)	x	(F_{vent})	x	(4.72×10^{-4})	=	$\dot{Q}_{NG}$ (Ci/sec)
RE-___			x		x	(4.72×10^{-4})	=	
RE-___			x		x	(4.72×10^{-4})	=	
RE-___			x		x	(4.72×10^{-4})	=	
RE-___			x		x	(4.72×10^{-4})	=	
RE-___			x		x	(4.72×10^{-4})	=	
RE-___			x		x	(4.72×10^{-4})	=	
RE-___			x		x	(4.72×10^{-4})	=	
RE-___			x		x	(4.72×10^{-4})	=	
RE-___			x		x	(4.72×10^{-4})	=	

DATE____________________ BY______________________________

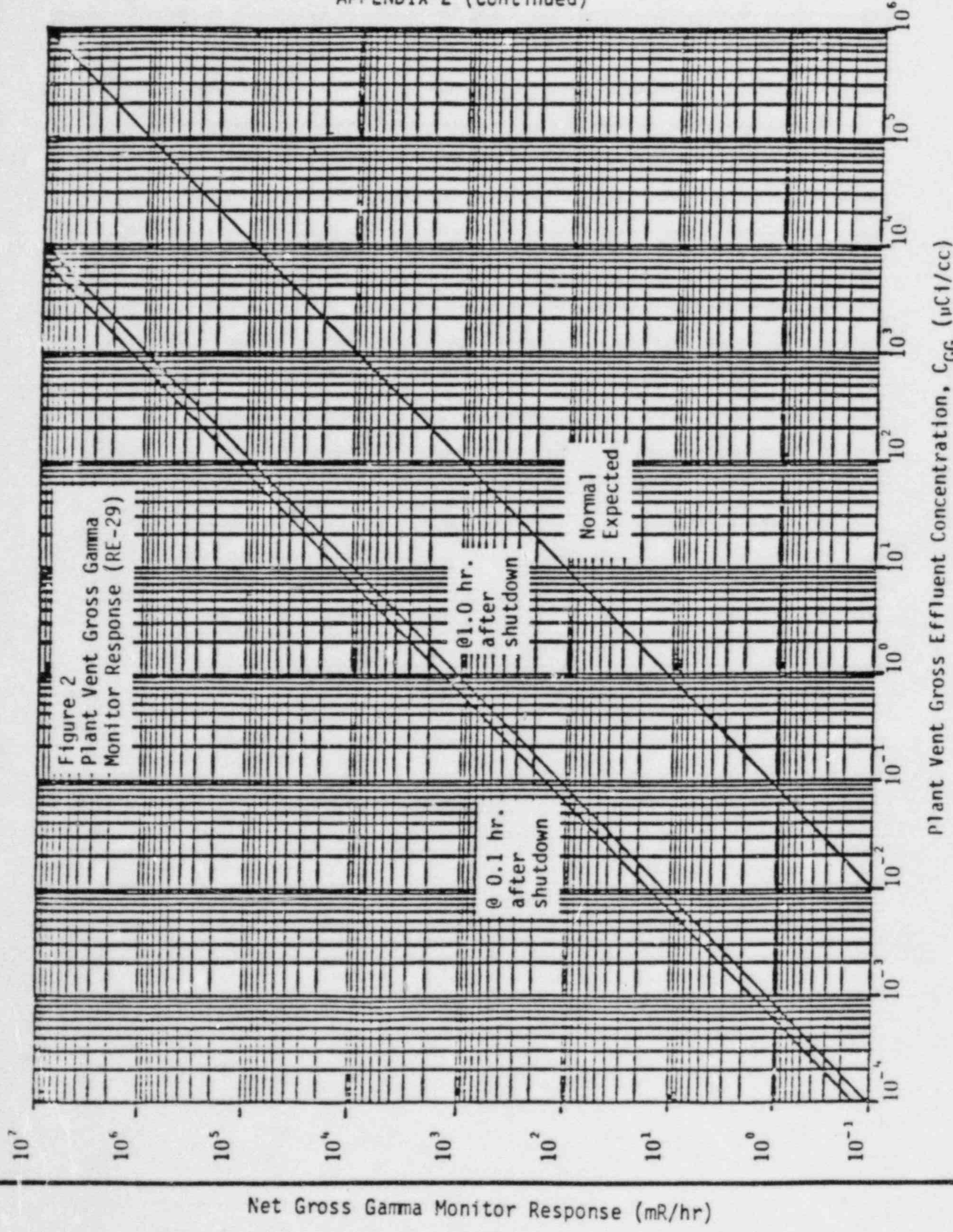
APPENDIX 2 (Continued)

FIGURE 1

RESPONSE OF PLANT VENT RADIOGAS MONITOR (RE-14)



APPENDIX 2 (Continued)



APPENDIX 3

INSTRUCTIONS FOR ESTIMATING IODINE RELEASE RATE USING PLANT VENT MONITOR RE-24

Performed By______________________________ Date__________ Time__________

APPLICABILITY

RE-24 is for initially estimating the iodine release rate for minor accidents, where the release path is the plant vent. RE-24 will go off scale for any release equivalent to the criteria for a Site Area Emergency or above, and dose rates may make instrument inaccessible. Under such circumstances, refer to EP RB-12 for use of the mid and high range iodine monitor. A technique is given for initially estimating high release rates using RE-24 for use prior to obtaining the results for analysis of the cartridge from RE-24 to other instruments.

INSTRUCTIONS

1. Determine Ratio of Plant Vent Flow Rate to Sampler Flow Rate

   a. Sampler Flow Rate

      Read at instrument. Otherwise assume the normal setting of 1.55 cfm.

      F_{samp} = ______________ cfm

   b. Plant Vent Flow Rate

      1. Check FR-12 on Unit 2 RMS board in control room. If operable, read flow rate directly off of chart.

         F_{vent} = ______________ cfm

      2. If FR-12 is inoperable, determine the flow rate using the number of ventilation fans in operation and the following fan capacities:

         _____FHB exhaust fans @ 35750 cfm/fan = ________ cfm
         _____Aux Bldg exhaust fans @ 73500 cfm/fan = ________ cfm
         _____Cont purge exhaust fans @ 55000 cfm/fan = ________ cfm
         _____Cont H_2 purge fan @ 300 cfm/fan = ________ cfm

         Sum F_{vent} = ______________ cfm

APPENDIX 3 (Continued)

c. Calculate Flow Rate Ratio

$FRR = F_{vent} \div F_{samp}$ = ________ ÷ ________ = ________

2. Obtain Reading On Instrument and Calculate Release Rate

a. Turn the toggle switch on the front of the instrument to the $\mu Ci/sec(x10^{-11})$ position.

b. Turn the SCALE FACTOR switch to the "1000" position. This switch is located inside the door on the lower front part of the instrument. Record the scale factor in the blank in paragraph 2.d. below.

c. To allow for instrument response time wait at least one (1) minute and then read the chart. Enter this reading in the blank in paragraph 2.d. below. The chart reading is a number between 1 and 1000. If the instrument does not read on scale, I-131 is not a significant contribution to the accident.

d. To account for iodine plateout, a plateout factor of 1.1* is to be used.

e. Calculate the release rate using the formula

$\dot{Q}_I$ (Ci/sec)=(Chart Reading)x(scale Factor)x(Plateout Factor)x(FRR)x 10^{-17}.

TIME	(Reading) x	scale (Factor) x	(Plateout) x	(FRR) x	(10^{-17}) =	$\dot{Q}_I$ (Ci/sec)
			1.1*		10^{-17}	
			1.1*		10^{-17}	
			1.1*		10^{-17}	
			1.1*		10^{-17}	
			1.1*		10^{-17}	
			1.1*		10^{-17}	
			1.1*		10^{-17}	
			1.1*		10^{-17}	

(*Transmission = 1 - iodine plateout). Based on a 0.3 micron particle size the plateout is 7.7%. The resulting transmission is 0.9, which results in a correction factor of 1.1 for the purposes of emergency release rate calculation.

APPENDIX 3 (Continued)

3. Calculating Release Rate If Cartridge is analyzed in the Lab

Sometimes it is desirable to take the cartridge to the counting room. If so, have the technician report the total µCi of I or I-131 contained on the cartridge.

a) Activity on Cartridge (A_{cart}) = ________µCi (circle I or I-131)

b) Estimate the time over which the release has persisted (in seconds).

$$\Delta t_{RELEASE} = \_\_\_\_\_\_\_\_ (SEC)$$

c) Calculate the average release rate using the equation:

$$\dot{Q}_I \text{ (Ci/sec)} = \frac{[A_{cart} \text{ (µCi)}] \times [1.1^*] \times (FRR) \times 10^{-6}}{[\Delta t_{RELEASE} \text{ (Sec)}]}$$

$$= \frac{(\quad) \times (1.1) \times (\quad) \times 10^{-6}}{(\quad)} = \_\_\_\_\_\_\_\_ \text{ Ci/sec}$$

4. Calculating Release Rate If RE-24 is Inaccessible

NOTE: This method is very approximate and is an interim technique only.

a. Take a gamma dose rate measuring instrument and approach RE-24 as close as possible, being careful not to exceed personnel exposure limits.

b. Get as close to RE-24 as you can and take a Radowl reading (in R/hr) and also estimate the distance (in meters) you are from RE-24.

Dose Rate (DR) = ________R/hr
Distance to RE-24 (d) = ________m

c. Estimate the time over which the release has persisted (in seconds). $\Delta t_{RELEASE}$ = sec

*Iodine plateout correction factor of 1.1 based on 0.3 micron particle size.

APPENDIX 3 (Continued)

d. Calculate the release rate from the equation.

$$\dot{Q}_I \text{ (Ci/sec)} = \frac{60 \times (DR) \times (d)^2 \times (FRR)}{(\Delta t_{RELEASE})}$$

$$= \frac{60 \times (\quad) \times (\quad)^2 \times (\quad)}{(\quad)}$$

$$= \underline{\qquad\qquad} \text{ Ci/sec}$$

5. Calculating Release Rate If RE-24 is Accessible, But Dose Rates Are Too High To Permit Cartridge To Be Collected

a. Proceed as in paragraph 4 above, with the following exceptions:

1) Open Cartridge holder door and take dose reading on exposed cartridge. Again, estimate distance in meters.

DR = __________ R/hr
d = __________ m

b. Calculate the release rate from the equation:

$$\dot{Q}_I \text{ (Ci/sec)} = \frac{1.3 \times (1.1^*) \times (DR) \times (d)^2 \times (FRR)}{(\Delta t_{RELEASE})}$$

$$= \frac{1.3 \times (1.1) \times (\quad) \times (\quad)^2 \times (\quad)}{(\quad)}$$

$$= \underline{\qquad\qquad} \text{ Ci/sec}$$

NOTE: The reason the equations are different is because there is less shielding when the cartridge is exposed.

*Iodine plateout correction factor of 1.1 based on a 0.3 micron particle size.

APPENDIX 4

Use of Main Steam Line Monitors or RCS Sample Results During Steam Generator Tube Rupture Accidents.

PERFORMED BY____________________ DATE__________ TIME__________

APPLICABILITY

One of the most difficult accidents to estimate the release rate for is a S/G Tube Rupture. This is due to uncertainties in primary to secondary leak rate and in steam release rate to the atmosphere. The release pathway for a secondary system release will largely depend on identifying the affected Steam Generator and whether or not it's associated Main Steam Isolation Valve (MSIV) has been closed. When the MSIV is open and the condenser is used as the principal heat sink, the condenser air ejectors release via the Plant Vent, which is a monitored release point. If the Condenser is unavailable or if the MSIV is closed, steam flow from the affected Steam Generator should be assumed to be released via atmospheric steam dumps. The instantaneous release rate (Q) may be calculated below using the radioactivity concentration of the primary or secondary system.

INSTRUCTIONS

1. Determine the effluent stream concentration, C(μCi/cc) by one of the two following methods:

   1.A. Main Steam Line Monitors (RE-71, 72, 73 & 74). This is the preferred method, but it is possible that radioactivity levels in secondary system steam (or water if the steam-line is flooded) may be too low for Monitors RE-71 - 74 to come on-scale. Otherwise, enter appropriate data below and perform the indicated calculations:

TIME______ BY______	Main Steam Line Monitor Channel*				
	RE-71	RE-72	RE-73	RE-74	
(1) Reading (CPM)					
(2) Total Conc (C_{Total}) From Figure A**					

*NOTE: Re-71 corresponds to Steam Generator (S/G) number 1, RE-72 to S/G-2, RE-73 to S/G-3, and RE-74 to S/G-4.

**Use emergency (Initial Release Curve) values.

APPENDIX 4 (Continued)

To calculate the fraction of total steam line activity attributable to Noble Gases, Iodines, and Particulates, some assumptions and calculations have to be performed. If the FSAR design basis steam generator tube rupture is assumed, then the fraction of the total activity in the steam line can be broken down as follows:

$C_{NOB\ GAS} = C_{TOTAL} \times 0.9990(F^1{}_{NG})$

$C_{IODINE} = C_{TOTAL} \times 0.000195(F^1{}_{I})$ - DEFAULT VALUES

$C_{PART} = C_{TOTAL} \times 0.000005(F^1{}_{PART})$

However, these fractions should be adjusted based on reactor coolant sample analyses, and partitioning factors. To accomplish this, first determine the relative concentrations of noble gases, iodines, and particulates in the reactor coolant as described below:

Calculate Fractional Reactor Coolant Activity

$F_{NG} = \frac{\text{(Total Noble Gas Activity of Reactor Coolant)}}{\text{(Total Reactor Coolant Activity)}} =$ ____________

$F_{I} = \frac{\text{(Total Iodine Activity of Reactor Coolant)}}{\text{(Total Reactor Coolant Activity)}} =$ ____________

$F_{PART} = \frac{\text{(Total Particulate Activity of Reactor Coolant)}}{\text{(Total Reactor Coolant Activity)}} =$ ____________

Calculate Fractional Steam-Line Activity

$$F^1{}_{NG} = \frac{(F_{NG})(PF_{NG})}{[(F_{NG})(PF_{NG}) + (F_I)(PF_I) + (F_{PART})(PF_{PART})]}$$

$$F^1{}_{I} = \frac{(F_{I})(PF_{I})}{[(F_{NG})(PF_{NG}) + (F_I)(PF_I) + (F_{PART})(PF_{PART})]}$$

$$F^1{}_{PART} = \frac{(F_{PART})(PF_{PART})}{[(F_{NG})(PF_{NG}) = (F_I)(PF_I) + (F_{PART})(PF_{PART})]}$$

APPENDIX 4 (Continued)
VALUES OF STEAM GENERATOR PF (PARTIONING FACTOR)

Radionuclide Group	Steam Generator Water Level: Empty	Normal	Flooded
Noble Gases (PF_{NG})	1.0	1.0	1.0
Iodines (PF_I)	0.1	0.01	1.0
Particulates (PF_{PART})	0.01	0.01	1.0

Calculate Steam-Line Concentration

$C_{NOB\ GAS} = C_{TOTAL} \times F^1_{NG} =$ ______________ $\frac{\mu Ci}{cc}$

$C_{IODINE} = C_{TOTAL} \times F^1_{I} =$ ______________ $\frac{\mu Ci}{cc}$

$C_{PARTICULATES} = C_{TOTAL} \times F^1_{PART} =$ ______________ $\frac{\mu Ci}{cc}$

Proceed to Section 2.

1.B. Steam line activity can be estimated using an analysis of reactor coolant activity. This method is not as preferable as using RE-71, 72, 73, or 74, but it can provide a conservative methodology for calculating steam line concentration.

Calculate Fractional Reactor Coolant Activity

$F_{NG} = \frac{\text{(Total Noble Gas Activity of Reactor Coolant)}}{\text{(Total Reactor Coolant Activity)}} =$ ______________

$F_{I} = \frac{\text{(Total Iodine Activity of Reactor Coolant}}{\text{(Total Reactor Coolant Activity)}} =$ ______________

$F_{PART} = \frac{\text{(Total Particulate Activity of Reactor Coolant)}}{\text{(Total Reactor Coolant Activity)}} =$ ______________

APPENDIX 4 (Continued)

Calculate Fractional Steam-Line Activity

$$F^1_{NG} = \frac{(F_{NG})(PF_{NG})}{[(F_{NG})(PF_{NG}) + (F_I)(PF_I) + (F_{PART})(PF_{PART})]}$$

$$F^1_{I} = \frac{(F_{I})(PF_{I})}{[(F_{NG})(PF_{NG}) + (F_I)(PF_I) + (F_{PART})(PF_{PART})]}$$

$$F^1_{PART} = \frac{(F_{PART})(PF_{PART})}{[(F_{NG})(PF_{NG}) + (F_I)(PF_I) + (F_{PART})(PF_{PART})]}$$

PF Values are the same as provided in section 1A.

Calculate Steam-Line Concentration (Use if Steam Generator is not flooded)

$C_{NOB\ GAS}$ = (Total reactor coolant activity) x F^1_{NG} x 0.056* = ________ $\frac{\mu Ci}{cc}$

$C_{IODINES}$ = (Total reactor coolant activity) x F^1_{I} x 0.056* = ________ $\frac{\mu Ci}{cc}$

$C_{PARTICULATES}$ = (Total reactor coolant activity) x F^1_{PART} x 0.056* = ________ $\frac{\mu Ci}{cc}$

Calculate Steam-Line Concentration (Use if Steam-Generator is flooded)

$C_{NOB\ GAS}$ = (Total reactor coolant activity) x F^1_{NG} = ________ $\frac{\mu Ci}{cc}$

$C_{IODINES}$ = (Total reactor coolant activity) x F^1_{I} = ________ $\frac{\mu Ci}{cc}$

$C_{PARTICULATES}$ = (Total reactor coolant activity) x F^1_{PART} = ________ $\frac{\mu Ci}{cc}$

2. Once the radioactive steam or water concentration is determined in the steam-line using either section 1A or 1B, the release rate from the affected steam generator can be calculated in three different ways. They are described in this section. If the steam generator is flooded (solid) proceed directly to section 2C.

*Factor to account for density differences between steam and water, at approximately 558°F and 1115 (psia). This corresponds to the highest lift setpoint for the safety valves. This value will overestimate the concentration of radioactive material in steam for any lower pressure and temperature.

APPENDIX 4 (Continued)

2A. Steam Flow Rate Monitors

Each steam line at DCPP has a flow rate monitor which is capable of providing steam flow in pounds per hr (lbs/hr) and which will read on-scale if any steam line relief valves are open. Determine this release from the operators for the appropriate channel (512, 522, 532, 542).

FR = ____________ (lbs/hr)

Release Rates for noble gases, iodines, and particulates can then be calculated as:

$$\dot{Q}_{NG} = FR \ \frac{lbs}{hr} \times C_{NOB\ GAS} \ \frac{\mu Ci}{cc} \times 3.1 \times 10^{-6}* = \_\_\_\_\_\_\_\_ \frac{Ci}{sec}$$

$$\dot{Q}_{IODINE} = FR \ \frac{lbs}{hr} \times C_{IODINE} \ \frac{\mu Ci}{cc} \times 3.1 \times 10^{-6} = \_\_\_\_\_\_\_\_ \frac{Ci}{sec}$$

$$\dot{Q}_{PARTICULATES} = FR \ \frac{lbs}{hr} \times C_{PARTICULATE} \ \frac{\mu Ci}{cc} \times 3.1 \times 10^{-6} = \_\_\_\_\_\_\_\_ \frac{Ci}{sec}$$

*Factor to convert lbs/hr to cc/sec and μCi/cc to Ci/sec based on specific volume of steam.

2B. Operation of Relief and/or Safety Valves

Each steam line has six relief valves. Determine which valves are open and total the relief capacity of the open valves.

APPENDIX 4 (Continued)

Valve	Relief Capacity (If Open) in (lbs/hr)
10% Steam Dump	4.0×10^5
#1 Safety	8.5×10^5
#2 Safety	8.5×10^5
#3 Safety	8.5×10^5
#4 Safety	8.5×10^5
#5 Safety	8.5×10^5

Total relief from open valves = FR = ________ (lbs/hr)

$$\dot{Q}_{NG} = FR \ \frac{lbs}{hr} \times C_{NOB\ GAS} \ \frac{\mu Ci}{cc} \times 3.1 \times 10^{-6}* = \_\_\_\_\_\_ \frac{Ci}{sec}$$

$$\dot{Q}_{IODINE} = FR \ \frac{lbs}{hr} \times C_{IODINE} \ \frac{\mu Ci}{cc} \times 3.1 \times 10^{-6} = \_\_\_\_\_\_ \frac{Ci}{sec}$$

$$\dot{Q}_{PARTICULATES} = FR \ \frac{lbs}{hr} \times C_{PARTICULATE} \ \frac{\mu Ci}{cc} \times 3.1 \times 10^{-6} = \_\_\_\_\_\_ \frac{Ci}{sec}$$

*Factor to convert lbs/hr to cc/sec and µCi/cc. Based on the specific volume of steam.

2C. Primary to Secondary Leak Rate

Atmospheric release of steam can be estimated if the primary to secondary leak rate is known. If direct determination of this value is not possible, the default value for a steam generator tube rupture is 600 gpm.

FR = ______________ (gpm)

Calculate Equivalent Steam Flow (Use if Steam Generator is not flooded)

$$FR^1 = FR \times 1.13 \times 10^3* = \_\_\_\_\_\_ \frac{cc}{sec}$$

*Factor to convert gpm (water) to cc/sec (steam)

APPENDIX 4 (Continued)

Calculate Equivalent Water Flow (Use if Steam Generator is flooded)

$FR^1 = FR \times 63.08^{**} = \_\_\_\_\_\_\_\_ \frac{cc}{sec}$

$\dot{Q}_{NG} = FR^1 \frac{cc}{sec} \times C_{NOB\ GAS} \frac{\mu Ci}{cc} \times 10^{-6} = \_\_\_\_\_\_\_\_ \frac{Ci}{sec}$

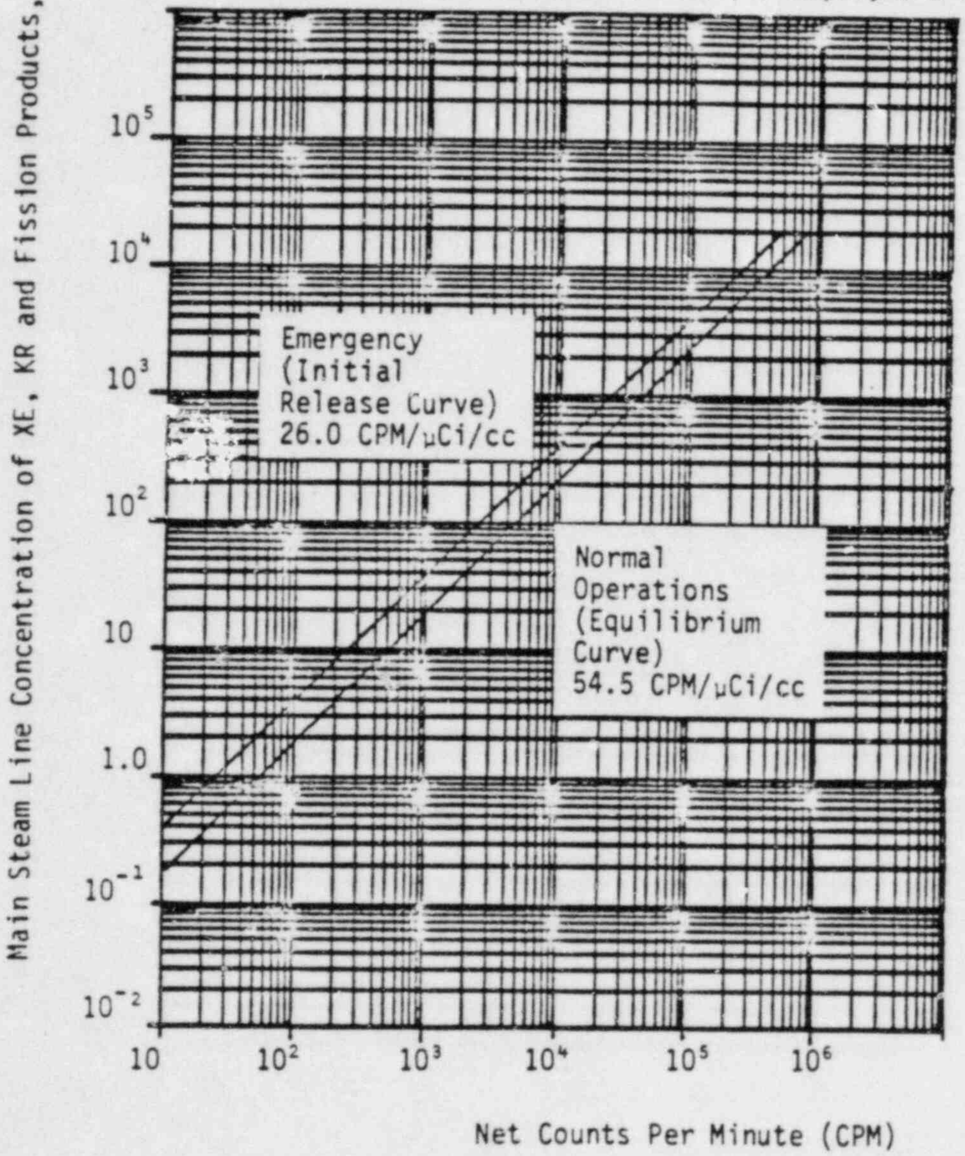
$\dot{Q}_{IODINE} = FR^1 \frac{cc}{sec} \times C_{IODINE} \frac{\mu Ci}{cc} \times 1 \times 10^{-6} = \_\_\_\_\_\_\_\_ \frac{Ci}{sec}$

$\dot{Q}_{PARTICULATE} = FR^1 \frac{cc}{sec} \times C_{PARTICULATE} \frac{\mu Ci}{cc} \ 1 \times 10^{-6} = \_\_\_\_\_\_\_\_ \frac{Ci}{sec}$

**Factor to convert gpm (water) to cc/sec (water)

APPENDIX 4
FIGURE A

STEAMLINE MONITORS RESPONSE CURVE*(RE-71,72,73 & 74)



*Isotopic Composition Based On Average Values from FSAR Tables 11.1-11, 12 and 17 for Normal Operations and for Emergency Conditions the Carryover Factors Applied to Normal Iodine Values are 0.13% Volatile Plus 0.25% Mechanical and only 0.25% Mechanical for Particulates.

APPENDIX 5

SUMMARY OF FIELD MONITORING FORMULAE THAT ARE USEFUL IN CLASSIFYING ACCIDENTS

1. Relationship Between Whole Body Dose Rate and Noble Gas Release Rate

   If a whole body dose rate measurement is taken in the environment, it can be related to the release rate using the equation:

   $$DR_{WB,L} = 9 \times 10^5 \times \bar{E}_\gamma \times \dot{Q}_{NG} \times (X/\dot{Q})_L$$

   Where: $DR_{WB,L}$ = Whole body dose rate at location L (mR/hr.)

   $\bar{E}_\gamma$ = average gamma energy (mev) (See Figure A) (default value - 0.1 mev)

   NOTE: Effective age is the time since fission products existed in equilibrium in the reactor core. Add the effective age given in the appropriate accident summary sheet to the time since the reactor was shutdown to use Figure A. If only the time since reactor shutdown is used, or if the default value is used, specify this when giving results.

   $\dot{Q}_{NG}$ = noble gas release rate (Ci/sec)

   $(X/\dot{Q})_L$ = dilution factor at downwind location L

   NOTE: This equation can also be used to calculate downwind dose rate if the release rate is known.

2. Relationship Between Thyroid Dose Rate and Iodine Concentration

   Assuming all iodine is I-131:

   $$DR_{THY,L} = 1.85 \times 10^6 \quad [X_{131}]_L$$

   Where: $DR_{THY,L}$ = Thyroid dose rate at location L (Rem/hr).

   $[X_{131}]_L$ = I-131 Concentration at Location L (μCi/cc or Ci/m^3)

APPENDIX 5 (Continued)

3. Relationship Between Thyroid Dose Rate and Iodine Release Rate

Assuming all iodine is I-131:

$$DR_{THY,L} = (1.85 \times 10^6)\ (\dot{Q}_I)\ (X/\dot{Q})_L$$

Where: $DR_{THY,L}$ = Thyroid dose rate at location L (Rem/hr).

$\dot{Q}_I$ = iodine release rate (Ci/sec)

$(X/\dot{Q})_L$ = dilution factor at location L (sec/m³)

4. Extrapolation of Dose Rates, Doses or Concentrations to Other Locations

If a dose or dose rate value is available at one location in the environment, it may be extrapolated to another location if the respective $(X/\dot{Q})$ values are known.

$$(DR)_A = \frac{(X/\dot{Q})_A\ (DR)_B}{(X/\dot{Q})_B}$$

or

$$(D)_A = \frac{(X/\dot{Q})_A\ (D)_B}{(X/\dot{Q})_B}$$

or

$$X_A = \frac{(X/\dot{Q})_A\ X_B}{(X/\dot{Q})_B}$$

Where:

DR = dose rate (μR/hr, mR/hr, R/hr)

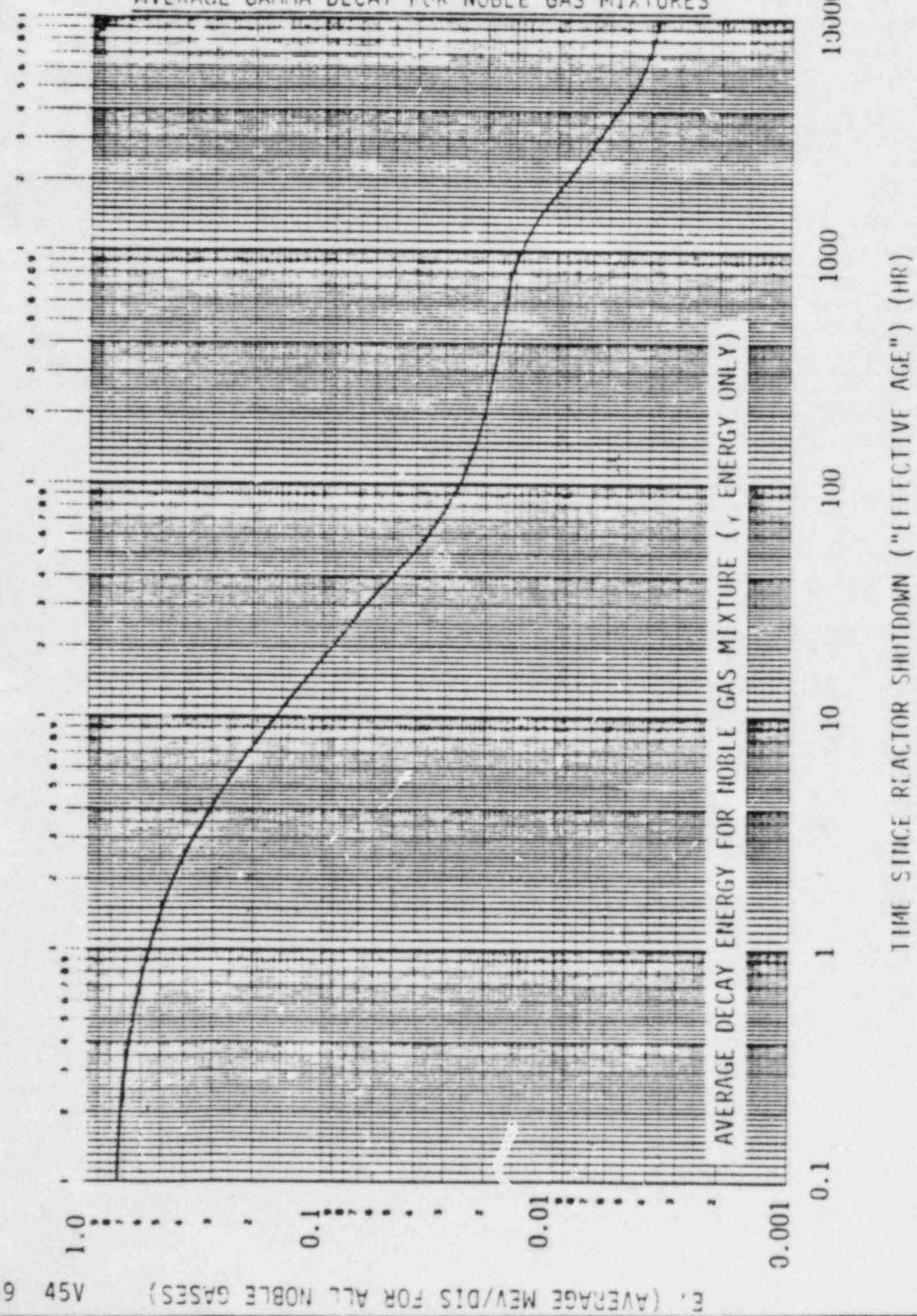
D = dose (μR, mR, R)

X = concentration (μCi/cc or Ci/m^3)

A,B = locations A and B

APPENDIX 5 (Continued)

FIGURE A
AVERAGE GAMMA DECAY FOR NOBLE GAS MIXTURES



APPENDIX 6

ACCIDENT SUMMARY SHEETS

This attachment contains summary sheets for the various postulated accidents which have been analyzed in the FSAR. THese sheets contain both the "design basis" and "expected" case variables which were assumed in the FSAR analyses. The sheets can be used to compare actual measurements with assumed numbers from the FSAR, in order to help evaluate how things are going in relation to predictions, or they can be used as a source of data to supply unavailable numbers in calculations which are performed at the time of the accident.

Two sets of data are included. The "design basis" case is expected to be highly conservative, where every variable is at a worst-case condition. The "expected" case is the best estimated prediction of what might actually occur. When FSAR values are used to make calculations or predictions at the time of the accident, the "design basis" values can be used to provide a quick upper limit result, but as soon as data becomes available which tends to confirm one case or the other, the one which best agrees with the data should be used.

The accident classifications identified in this attachment are based on the activity releases. Other emergency procedures may have different classifications which are based on the initiating event.

The summary sheets provided are:

A. 1A MAJOR LOCA
B. 1B MAJOR STEAM LINE BREAK
C. 1C MAJOR FEEDWATER LINE BREAK
D. 1D BLACKOUT (OR PLANT COOLDOWN WITH ATMOSPHERIC DUMP)
E. 1E SMALL LOCA
F. 1F TUBE RUPTURE
G. 1G LOCKED ROTOR
H. 1H FUEL HANDLING ACCIDENT IN FUEL HANDLING BUILDING
I. 1I FUEL HANDLING ACCIDENT IN CONTAINMENT
J. 1J ROD EJECTION ACCIDENT
K. 1K GAS DECAY TANK RUPTURE
L. 1L LIQUID HOLDUP TANK RUPTURE
M. 1M VCT RUPTURE

SUMMARY SHEET 1A
MAJOR LOCA

	PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
1.	Total Release to Containment Free Volume, Ci			
	a. Xe-133	2.03×10^8	1.36×10^6	
	b. Other Noble Gases	5.73×10^8	4.27×10^5	
	c. I-131	2.21×10^7	1.82×10^5	
	d. Other Iodine	1.90×10^8	2.73×10^5	
	e. Effective Age of Mixture (hr)	0	20	
	f. Release Assumption	100% of core N.G., 25% of core iodines	100% of gap N.G., 25% of gap iodines	
2.	Containment Spray Effectiveness			
	a. Removal half-life (hrs)	0.022	0.0075	
	b. Number of operable spray pumps	1	2	
3.	Containment Leak Rate (%/day)	0.1 for 1st day, 0.05 after 1st day	0.05 for 1st day, 0.025 after 1st day	

SUMMARY SHEET 1A (Continued)
MAJOR LOCA

4.	Total Release to Environs, First 2 Hours, Ci		
	a. Xe-133	16,840	56
	b. Other Noble Gases	25,930	21
	c. I-131	191	0.05
	d. Other Iodine	1,325	0.08
	e. Effective Age of Mixture	1	40
	f. Release Mechanism	Containment Leakage	Containment Leakage
5.	$(\chi/\dot{Q})$ CL (sec/m^3)		
	a. 800m (site boundary)	5.29×10^{-4}	5.29×10^{-5}
	b. 10000m (6 mi. LPZ)	2.20×20^{-5}	2.20×10^{-6}
6.	Whole Body Dose Results		
	a. Total 800m dose for 1st two hours (mR)	5,600	0.365
	b. Total 10000m dose for 30 days (mR)	567	0.06
7.	Thyroid Dose Results		
	a. Total 800m dose for 1st two hours (mR)	95,900	1.25
	b. Total 10000m dose for 30 days (mR)	17,670	0.9

SUMMARY SHEET 1A (Continued)
MAJOR LOCA

8. Accident Classification

(Based on above Dose):	General Emergency	Unusual Event
(Based on EP G-1):	Site Area Emergency	Site Area Emergency

9. Miscellaneous

a. Containment-free volume cc	7.36×10^{10}
b. RCS Coolant Mass (gm)	2.4×10^{8}

SUMMARY SHEET 1B
MAJOR STEAM LINE BREAK

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
1. Initial Conditions and Assumptions			
a. Primary Coolant Activity (μCi/gm)			
1) Xe-133	270	67.2	
2) I-131	2.6	0.65	
3) Other Iodine	7.9	2.0	
b. Secondary Water Activity (μCi/gm)			
1) I-131	0.015	0.44×10^{-4}	
2) Other Iodines	0.037	0.90×10^{-4}	
c. Assumed Fuel Defects (%)	1	0.2	
d. Primary to Secondary Leakage (gpm)	1	0.014	
e. Steam Release, 1st Two Hours (lbs)			
1) Failed Generator	97,000		
2) Other generator (atmospheric dump)	520,000		
f. Total Steam Release During 8-Hour Cooldown (lbs)	1,600,000		
g. Liquid Release Fraction for Iodine			
1) Failed Generator	0.1		
2) Other generators	0.01		

SUMMARY SHEET 1B (Continued)
MAJOR STEAM LINE BREAK

	PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
2.	Activity Release to Environs, First 2 Hours (Ci)			
	a. Xe-133	56.8	0.172	
	b. Other Noble Gases	5.2	0.016	
	c. I-131	0.157	0.00045	
	d. Other Iodines	0.047	0.0013	
	e. Effective Age of Mixture (hrs)	65	65	
3.	$(\chi/\dot{Q})$ CL (sec/m^3)			
	a. 800m (site boundary)	5.29×10^{-4}	5.29×10^{-5}	
	b. 10000m (6 mi. LPZ)	2.20×10^{-5}	2.20×10^{-6}	
4.	Whole Body Dose Results			
	a. Total 800m dose for 1st two hours (mR)	1.8	0.0006	
	b. Total 10000m dose for 30 days (mR)	0.32	0.0010	
5.	Thyroid Dose Results			
	a. Total 800m dose for 1st two hours (mR)	65	0.012	
	b. Total 10000m dose for 30 days (mR)	66	0.012	
6.	Accident Classification (Based on above Dose):	Alert	No Emergency	
	(Based on EP G-1):	Unusual Event	Unusual Event	

SUMMARY SHEET 1B (Continued)
MAJOR STEAM LINE BREAK

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
7. Miscellaneous			
a. Fluid Mass/Stm Gen (lbs)			
1) Water	95,100		
2) Steam	6,620		
b. Safety Valve and Steam Dump Valve Capacities (lb/hr/valve)			
1) S.G. safety valve	800,000		
2) 10% atmospheric dump	380,000		
3) 35% atmospheric dump	597,000		

SUMMARY SHEET 1C
MAJOR FEEDWATER LINE BREAK

The release from this accident comes from release of steam by safety valves and/or atomospheric steam dump of steam generator water during cooldown if the condenser is not available. The steam generator water is contaminated if there is tube leakage. The feedwater itself which is released has very little activity in it and is ignored. This accident is basically the same as a steam-line break and summary sheet 1B can be used. Note, however, that the steam release will be through relief valves and so the iodine liquid release fraction should be 0.01 for the entire release. This will reduce the thyroid dose somewhat from the steam-line break case.

SUMMARY SHEET 1D
BLACKOUT (PLANT COOLDOWN WITH ATMOSPHERIC DUMP)

The release from this accident comes from release of steam by safety valves and/or atmospheric steam dump of steam generator water is contaminated if there is tube leakage. This accident is basically the same as a steam-line break and summary sheet 1B can be used. Note, however, that the steam release will be through relief valves and so the iodine liquid release fraction should be 0.01 for the entire release. This will reduce the thyroid dose somewhat from the steam-line break case.

SUMMARY SHEET 1E
SMALL LOCA (RELEASE OF COOLANT TO CONTAINMENT)

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
1. Initial Coolant Activity (μCi/gm)			
a. Xe-133	270	45.7	
b. Other Noble Gases	30	5.6	
c. I-131	2.62	0.45	
d. Other Iodine	7.88	1.35	
e. Effective Age of Mixture (hr)	60	60	
f. Fuel Defects (%)	1	0.2	
2. Initial Release to Containment (Ci)			
a. Xe-133	65,430	16,280	
b. Other Noble Gases	7,950	1,980	
c. I-131	63	16	
d. Other Iodine	193	48	
e. Assumption	100% of Coolant N.G. activity +10% of coolant iodines	100% of Coolant N.G. Activity +10% of coolant iodines	
3. Containment Spray Effectiveness			
a. Removal Half-life (hrs)	0.022	0.0075	

SUMMARY SHEET 1E (Continued)
SMALL LOCA (RELEASE OF COOLANT TO CONTAINMENT)

	PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
	b. Number of operable spray pumps	1	2	
	c. Containment Leak Rate (%/day)	0.1 for 1st day, 0.05 after 1st day	0.05 for 1st day, 0.025 after 1st day	
4.	Containment Leak Rate (%/day)	0.1	0.05	
5.	$(\dot{\chi}/Q)$ CL (sec/m^3)			
	a. 800m (site boundary)	5.29×10^{-4}	5.29×10^{-5}	
	b. 10000m (6 mi. LPZ)	2.20×10^{-5}	2.20×10^{-6}	
6.	Whole Body Dose Results			
	a. Total 800m dose for 1st two hours (mR)	0.18	0.004	
	b. Total 10000m dose for 30 days (mR)	0.05	0.001	
7.	Thyroid Dose Results			
	a. Total 800m dose for 1st two hours (mR)	0.2	0.0009	
	b. Total 10000m dose for 30 days (mR)	0.03	0.0001	
8.	Accident Classification (Based on above Dose):	Unusual Event	No Emergency	
	(Based on EP G-1):	Site Area Emergency	Site Area Emergency	

SUMMARY SHEET 1E (Continued)
SMALL LOCA (RELEASE OF COOLANT TO CONTAINMENT)

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
9. Miscellaneous			
a. Containment-Free Volume (cc)	7.36×10^{10}		
b. RCS Coolant Mass (gm)	2.4×10^{8}		
c. Liquid Release Fraction for Iodine	0.1		

SUMMARY SHEET 1F
TUBE RUPTURE

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
1. Initial Conditions and Assumptions			
a. Primary Coolant Activity (μCi/gm)			
1) Xe-133	270	67.2	
2) I-131	2.6	0.65	
3) Other Iodine	7.9	2.0	
b. Secondary Water Activity (μCi/gm)			
1) I-131	0.015	0.44×10^{-4}	
2) Other Iodines	0.037	0.90×10^{-4}	
c. Assumed Fuel Defects (%)	1	0.2	
d. Primary to Secondary Leakage (gpm)	1	0.014	
e. Steam Release, 1st Two Hours (lbs)			
1) Failed generator	31,000		
2) Other generators (atmospheric dump)	380,000		
f. Total Steam Release During 8 hour Cooldown (lbs)	1,600,000		
g. Liquid Release Fraction for Iodine			
1) Failed generator	0.01		
2) Other generators	0.01		

SUMMARY SHEET 1F (Continued)
TUBE RUPTURE

	PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
2.	Total Release to Environs First 2 hours (Ci)			
	a. Xe-133	10,980	2,383	
	b. Other Noble Gases	1,067	234	
	c. I-131	0.75	0.14	
	d. Other Iodines	3.1	0.62	
	e. Effective Age of Mixture (hrs)	65	65	
3.	$(\chi/\dot{Q})$ CL (sec/m^3)			
	a. 800 m (site boundary)	5.29×10^{-4}	5.29×10^{-5}	
	b. 10000m (6 mi. LPZ)	2.20×10^{-5}	2.20×10^{-6}	
4.	Whole Body Dose Results			
	a. Total 800m dose for 1st two hours (mR)	360	7.7	
	b. Total 10000m dose for 30 days (mR)	15	0.3	
5.	Thyroid Dose Results			
	a. Total 800m dose for 1st two hours (mR)	340	4.3	
	b. Total 10000m dose for 30 days (mR)	15	0.2	
6.	Accident Classification (Based on above Dose):	Site Area Emergency	Alert	
	(Based on EP G-1):	Site Area Emergency	Site Area Emergency	

SUMMARY SHEET 1F (Continued)
TUBE RUPTURE

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
7. Miscellaneous			
a. Fluid Mass/Stem Gen. (lbs)			
1) Water	95,000		
2) Steam	6,620		
b. Safety Valve and Steam Dump Valve Capacities (lbs/hr/valve)			
1) S.G. safety valve	800,000		
2) 10% atmospheric dump	380,000		
3) 35% atmospheric dump	597,000		

SUMMARY SHEET 1G
LOCKED ROTOR ACCIDENT

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
1. Total Release to Environs, 1st Two Hours (Ci)			
a. Xe-133	97	0.73	
b. Other Noble Gases	19.6	0.21	
c. I-131	0.24	0.003	
d. Other Iodines	0.36	0.003	
e. Effective Age of Mixture	50	50	
f. Assumptions			
1) Coolant Activity	1% fuel defects +3% of gap activity	0.2% fuel defects +3% of gap activity	
2) Primary to Secondary Leakage (gpm)	1	0.014	
3) Secondary Steam Release, 1st Two Hours (lbs)	617,000	617,000	
4) Total Steam Release During 8 Hour Cooldown (lbs)	1,600,000	1,600,000	
2. $(\chi/\dot{Q})$ LL (sec/m^3)			
a. 800m (site boundary)	5.29×10^{-4}	5.29×10^{-5}	
b. 1000m (6 mi. LPZ)	2.20×10^{-5}	2.20×10^{-6}	

SUMMARY SHEET 1G (Continued)
LOCKED ROTOR ACCIDENT

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
3. Whole Body Dose Results			
a. Total 800m dose for 1st two hours (mR)	4.4	0.004	
b. Total 10000m dose for 30 days (mR)	0.5	0.0004	
4. Thyroid Dose Results			
a. Total 800m dose for 1st two hours (mR)	82	0.06	
b. Total 10000m dose for 30 days (mR)	27	0.02	
5. Accident Classification (Based on above Dose):	Alert	No Emergency	
(Based on EP G-1)	Alert	Alert	
6. Miscellaneous			
a. Fluid Mass/Stm Gen. (lbs)			
1) Water	95,100		
2) Steam	6,620		
b. Safety Valve and Steam Dump Valve Capacity (lbs/hr/valve)			
1) S.G. safety valve	800,000		
2) 10% atmospheric dump	380,000		
3) 35% atmospheric dump	597,000		
c. Liquid Release Fraction for Iodines	0.01		

SUMMARY SHEET 1H
FUEL HANDLING ACCIDENT IN FUEL HANDLING BLDG

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
1. Initial Conditions			
a. Radial Peaking Factor of Damaged Assembly	1.65	1.26	
b. Elapsed Time Since Reactor Shutdown (hrs)	100	100	
c. Type of Release to Pool	100% of assembly gap activity	100% of assembly gap activity	
d. Bundle Submergence (ft)	26	26	
e. Pool Decontamination Factor for Iodine	100	760	
f. Total Assembly Gap Activity at Time of Accident			
1) Xe-133	100,000	8,137	
2) Other Noble Gases	4,500	1,500	
3) I-131	52,670	5,282	
4) Other Iodines	7,000	220	
5) Effective Age of Mixture (hr)	600	600	
2. $(\chi/\dot{Q})$ CL (sec/m^3)			
a. 800m (site boundary)	5.29×10^{-4}	5.29×10^{-5}	
b. 1000m (6 mi. LPZ)	2.20×10^{-5}	2.20×10^{-6}	
3. Total Release to Environs, 1st Two Hours (Ci)			
a. Xe-133	100,400	523	
b. Other Noble Gases	4,100	101	

SUMMARY SHEET 1H (Continued)
FUEL HANDLING ACCIDENT IN FUEL HANDLING BLDG

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
c. I-131	80	0.005	
d. Other Iodines	10	0.0002	
e. Effective Age of Mixture (hrs)	600	600	
4. Whole Body Dose Results			
a. Total 800m dose for 1st two hours (mR)	2,450	1.5	
b. Total 10000m dose for 30 days (mR)	102	0.06	
5. Thyroid Dose Results			
a. Total 800m dose for 1st two hours (mR)	22,200	0.08	
b. Total 10000m dose for 30 days (mR)	923	0.003	
6. Accident Classification (Based on above dose):	General Emergency	Alert	
(Based on EP G-1):	Site Area Emergency	Site Area Emergency	
7. Miscellaneous			
a. Fuel Handling Building Volume (ft^3)	435,000		
b. Fuel Handling Building Exhaust Rate (cfm)	35,700	35,700	
c. Filter Cleanup Factor	0.10	0.01	

SUMMARY SHEET 11
FUEL HANDLING ACCIDENT IN CONTAINMENT

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
1. Initial Conditions			
a. Radial Peaking Factor of Damaged Assembly	1.65	1.26	
b. Elapsed Time Since Reactor Shutdown (hrs)	100	100	
c. Type of Release to Pool	100% of assembly gap activity	100% of assembly gap activity	
d. Bundle Submergence (ft)	26	26	
e. Pool Decontamination Factor for Iodine	100	760	
f. Total Assembly Gap Activity at Time of Accident (Ci)			
1) Xe133	100,000	8,137	
2) Other Noble Gases	4,500	1,500	
3) I-131	52,670	5,282	
4) Other Iodines	7,000	220	
5) Effective Age of Mixture (hrs)	600	600	
2. $(\chi/\dot{Q})$ CL (sec/m^3)			
a. 800m (site boundary)	5.29×10^{-4}	5.29×10^{-5}	
b. 1000m (6 mi. LPZ)	2.20×10^{-5}	2.20×10^{-6}	

SUMMARY SHEET II (Continued)
FUEL HANDLING ACCIDENT IN CONTAINMENT

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
3. Total Release to Environs, 1st Two Hours (Ci)			
a. Xe-133	12,460	38	
b. Other Noble Gases	557	7	
c. I-131	65	0.033	
d. Other Iodines	8.7	0.0013	
e. Effective Age of Mixture (hrs)	600	600	
4. Whole Body Dose Results			
a. Total 800m dose for 1st two hours (mR)	310	0.1	
b. Total 10000m dose for 30 days (mR)	13	0.004	
5. Thyroid Dose Results			
a. Total 800 m dose for 1st two hours (mR)	18.4×10^3	0.6	
b. Total 10000m dose for 30 days (mR)	0.76×10^3	0.03	
6. Accident Classification (Based on above Dose):	General Emergency	Alert	
(Based on EP G-1):	Site Area Emergency	Alert	

7. Miscellaneous Activity Release Mechanism

Activity released from cavity to containment atmosphere is confined directly above the cavity water level. It is picked up by the fan coolers and sent out through the containment purge.

SUMMARY SHEET 1J
ROD EJECTION ACCIDENT

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
1. Total Release to Containment Free Volume (Ci)			
a. Xe-133	2.01×10^5	1.52×10^5	
b. Other Noble Gases	6.82×10^4	6.22×10^4	
c. I-131	7.32×10^3	7.28×10^3	
d. Other Iodine	1.11×10^4	1.09×10^4	
e. Effective Age of Mixture (hrs)	40	40	
f. Release Assumption	Coolant activity (1% defects) plus 10% of core gap activity times a liquid release fraction of either 0.1 (for I) or 1.0 (for N.G.)	Coolant activity (0.2% defects) plus 10% of core gap activity times a liquid release fraction of either 0.1 (for I) or 1.0 (for N.G.)	
2. Containment Spray Effectiveness			
a. Removal half-life (hrs)	0.022	0.0075	
b. Number of operable spray pumps	1	2	
3. Containment Leak Rate (%/day)	0.1	0.05	
4. $(\chi/\dot{Q})$ CL (sec/m^3)			
a. 800m (site boundary)	5.29×10^{-4}	5.29×10^{-5}	
b. 1000m (6 mi. LPZ)	2.20×10^{-5}	2.20×10^{-6}	

SUMMARY SHEET 1J (Continued)
ROD EJECTION ACCIDENT

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
5. Total Release to Environs, 1st 2 Hours (Ci)			
a. Xe-133	11.2	5.6	
b. Other Noble Gases	4.1	2.0	
c. I-131	0.0098	0.002	
d. Other Iodine	0.015	0.002	
e. Effective Age of Mixture (hrs)	40	40	
f. Release Mechanism	Containment Leakage	Containment Leakage	
6. Whole Body Dose Results			
a. Total 800m dose for 1st two hours (mR)	0.73	0.04	
b. Total 1000m dose for 30 days (mR)	0.13	0.006	
7. Thyroid Dose Results			
a. Total 800m dose for 1st two hours (mR)	3.3	0.04	
b. Total 10000m dose for 30 days (mR)	0.14	0.002	
8. Accident Classification (Based on above Dose):	Unusual Event	No Emergency	
(Based on EP G-1):	Site Area Emergency	Site Area Emergency	
9. Miscellaneous			
a. Containment free volume (cc)	7.36×10^{10}		
b. RCS Coolant Mass (gm)	2.4×10^{8}		

SUMMARY SHEET 1K
GAS DECAY TANK RUPTURE

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
1. Total Release to Environs, 1st Two Hours (Ci)			
a. Xe-133	65,400	16,300	
b. Other Noble Gases	7,300	2,140	
2. $(\chi/\dot{Q})$ CL (sec/m^3)			
a. 800m (site boundary)	5.29×10^{-4}	5.29×10^{-5}	
b. 10000m (6 mi. LPZ)	2.20×10^{-5}	2.20×10^{-6}	
3. Whole Body Dose Results			
a. Total 800m dose for 1st two hours (mR)	2,010	44	
b. Total 10000m dose for 30 days (mR)	84	2	
NOTE: Thyroid doses are negligible			
4. Accident Classification (Based on above Dose):	General Emergency	Site Area Emergency	
(Based on EP G-1):	Alert	Alert	
5. Miscellaneous			
a. Tank Volume (cc)	2.18×10^{-7}		
b. Tank Press	100 psi		
c. Volume Released (cc)	1.48×10^{8}cc		

SUMMARY SHEET 1L
LIQUID HOLDUP TANK RUPTURE

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
1. Activity in Holdup Tank (Ci)			
a. Xe-133	51,000	10,200	
b. Other Noble Gases	4,710	930	
c. I-131	492	98.3	
d. Other Iodines	1,086	217	
e. Effective Age of Mixture (hrs)	60	60	
2. Cleanup Parameters			
a. Liquid Release Fraction for Iodines from Tank to Auxiliary Building Atmosphere	10^{-4}	10^{-4}	
b. Charcoal Filter Cleanup Factor	0.1	0.01	
c. Release Duration (hrs)	2	2	
3. Activity Release to Environs, 1st Two Hours (Ci)			
a. Xe-133	51,000	10,200	
b. Other Noble Gases	4,710	930	
c. I-131	0.00492	0.0098	
d. Other Iodines	0.01086	0.00217	

SUMMARY SHEET 1L (Continued)
LIQUID HOLDUP TANK RUPTURE

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
4. $(\chi/\dot{Q})$ CL (sec/m^3)			
a. 800m (site boundary)	5.29×10^{-4}	5.29×10^{-5}	
b. 10000m (6 mi. LPZ)	2.20×10^{-5}	2.20×10^{-6}	
5. Whole Body Dose Results			
a. Total 800m dose for 1st two hours (mR)	1,440	37	
b. Total 10000m dose for 30 days (mR)	60	1.6	
6. Thyroid Dose Results			
a. Total 800m dose for 1st two hours (mR)	1.93	0.003	
b. Total 10000m dose for 30 days (mR)	0.08	0.0001	
7. Accident Classification (Based on Dose):	Site Area Emergency	Site Area Emergency	
(Based on EP G-1):	Alert	Alert	
8. Miscellaneous			
a. Tank Volume (cc)		3.03×10^{8}	

SUMMARY SHEET 1M
VOLUME CONTROL TANK RUPTURE

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
1. Activity in VCT (Ci)			
a. Xe-133	3,330	828	
b. Other Noble Gases	198	42	
c. I-131	12.1	3.0	
d. Other Iodines	35	8.7	
e. Effective Age of Mixture (hrs)	60	60	
2. Cleanup Parameters			
a. Liquid Release Fraction for Iodines from Tank to Auxiliary Building Atmosphere	10^{-4}	10^{-4}	
b. Charcoal Filter Cleanup Factor	0.1	0.01	
c. Release Duration (hrs)	2	2	
3. Activity Release to Environs, 1st Two Hours (Ci)			
a. Xe-133	3,330	828	
b. Other Noble Gases	198	42	
c. I-131	0.00012	0.000003	
d. Other Iodines	0.00035	0.00009	

SUMMARY SHEET 1M (Continued)
VOLUME CONTROL TANK RUPTURE

PARAMETER	FSAR DBA	FSAR EXPECTED	ACTUAL
4. $(\chi/\dot{Q})$ CL (sec/m^3)			
a. 800m (site boundary)	5.29×10^{-4}	5.29×10^{-5}	
b. 1000m (6 mi. LPZ)	2.20×10^{-5}	2.20×10^{-5}	
5. Whole Body Dose Results			
a. Total 800m dose for 1st two hours (mR)	465	9.3	
b. Total 10000m dose for 30 days (mR)	19	0.4	
6. Thyroid Dose Results			
a. Total 800m dose for 1st two hours (mR)	0.03	0.00004	
b. Total 10000m dose for 30 days (mR)	0.001	0.000002	
7. Accident Classification (Based on Dose):	Site Area Emergency	Alert	
(Based on EP G-1):	Alert	Alert	
8. Miscellaneous			
a. Tank Volume (cc)	1.1×10^7		

69-10581 7/82 (100)

PACIFIC GAS AND ELECTRIC COMPANY
NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

INITIAL EMERGENCY NOTIFICATION FORM

Date_____ / / _____ Time__________ AM/PM Status #__________
(Form Completed) (Number Sequentially)

Person Authorizing Report____________________(DCPP Only)
Site Emergency Coordinator

Data Sheet Completed By____________________(DCPP Only)

Identify yourself, state the call is to provide initial notification of an emergency condition at Diablo Canyon Power Plant, and provide the following information:

---

1. Describe what happened:____________________

2. Unit Involved [A] 1 [B] 2

3. Time incident started__________AM/PM

4. Situation Involves
   [A] No Release [C] Imminent Release [E] Release has occured, but is stopped
   [B] Potential Release [D] Release is Occuring

5. Offsite Assistance
   Fire (Cal. Dept. of Forestry) [A] Has been requested
   Medical (SLO Ambulance/French Hospital) [B] Has been requested
   Law Enforcement (SLO County Sheriff) [C] Is/has been requested

6. Emergency Classification - Provide standard message or modify as required by the situation. Note any modification made.

Classification	Message (for SLO County/Calif. OES)
[A] Unusual Event	Notification of key emergency organization personnel is required at this level, but no further response is necessary.
[B] Alert	Notification of all emergency response organizations and activation of the EOC and other response centers is required. PGandE is activating the EOF.

DC0042 6V

69-10561 7/82 (100)

PACIFIC GAS AND ELECTRIC COMPANY
NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

	Classificaton	Message (for SLO County/Calif. OES)
[C]	Site Area Emergency (Consider protective actions [B] or [C])	Immediate mobilization of emergency response personnel is required. PGandE is activating the EOF.
[D]	General Emergency (Recommend protective action [D] or [E])	Immediate mobilization of emergency response personnel is required. PGandE is activating the EOF.

7. Affected sector (check one) - Wind Speed ____mps (x2.2) = ____mph

	WIND FROM DEGREES	WIND FROM DIRECTION	WIND TOWARD AFFECTED SECTOR	AFFECTED PAZ's (Basic EPZ)
[A]	349-11	N	S	
[B]	12-33	NNE	SSW	
[C]	34-56	NE	SW	
[D]	57-78	ENE	WSW	
[E]	79-101	E	W	
[F]	102-123	ESE	WNW	1,2
[G]	124-146	SE	NW	1,2
[H]	147-168	SSE	NNW	1,2,5,9
[I]	169-191	S	N	1,2,5,9
[J]	192-213	SSW	NNE	1,2,5,9
[K]	214-236	SW	NE	1,2,4,8
[L]	237-258	WSW	ENE	1,2,3,4,8
[M]	259-281	W	E	1,2,3,4,7,8,11
[N]	282-303	WNW	ESE	1,2,3,6,7,10,11,12
[O]	304-326	NW	SE	1,2,12
[P]	327-348	NNW	SSE	

8. Recommended General Public Protective Actions (Refer to Table 1 and Figure 1 of EP G-3)

[A] None

[B] Evacuation of the site, and PAZ 1.

[C] Evacuate transients (Montana de Oro visitors, agriculture workers, etc.) in the low population zone (PAZ's 1 and 2) starting with the affected sector and two adjacent sectors.

[D] Evacuate the low population zone (PAZ's 1 and 2)) starting with the affected sector and two adjacent sectors.
Alert the public in the basic emergency planning zone using the Early Warning System Sirens and EBS Broadcasts.

[E] Take actions specif·ed in [D] and shelter personnel in the affected sector and two adjacent sectors n the basic EPZ.

RETAIN THI. FORM FOR EVENT EVALUATION

PACIFIC GAS AND ELECTRIC COMPANY
DEPARTMENT OF NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

PART A: RADIOLOGICAL EMERGENCY STATUS FORM

Provide as much information as is available and appropriate at the time of the status report.

Date:___/___/___ Time:______________AM/PM Status Report #________________
(Form Completed) (Number Sequentially)

Person Authorizing Report:__________________________(DCPP only)
Site Emergency Coordinator

Person Transmitting Report:______________________Location____________(DCPP only)

TSC DIST: (9 copies)

1. Site Emergency Coordinator
2. Emergency Evaluation & Recovery Coord.
3. Emergency Liason Coordinator (2)
4. Emergency Maintenance Coord.
5. Emergency Operations Coordinator
6. Emergency Radiological Advisor
7. NRC Office
8. TSC File
9. TSC Status Board

EOF DIST: (10 copies)

1. Recovery Manager
2. UDAC
3. Advisor To The County
4. Radiological Emerg., R.M.
5. Operations and Analytical, R.M.
6. Engineering and Logistics, R.M.
7. Public Information, R.M.
8. Coporate Law Dept. Coord.
9. EOF Status File
10. EOF Emerg. Status Board

---

1. Emergency Classification: ___Unusual Event ___Alert ___Site Area Emergency ___General Emergency

2. Update on Incident: Date ___/___/___ Time Incident Began:___AM___PM

   a. Site Emergency Signal Sounded YES [ ] NO [ ]

   b. What Happened:

   ____

   ____

   ____

3. Radiological Release Information: (attach isotopic breakdown if available)

   a. Time Data Collected: ______________AM/PM Unit Involved ___1 ___2

   b. Release: ___Occurring ___Anticipated--When: ____________AM/PM

   c. Location of Release: ___Plant Vent ___Steam ___Surface ___Liquid Dch.____

   d. Estimated Duration of Release: ___Hours

PACIFIC GAS AND ELECTRIC COMPANY
DEPARTMENT OF NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

e. Release Monitored: by monitors # ____________________

f. Iodine: Est. Total Quantity__________Ci Release Rate__________Ci/sec,

g. Particulates: Est. Total Quantity__________Ci Release Rate__________Ci/sec,

h. Noble Gases: Est. Total Quantity__________Ci Release Rate__________Ci/sec,

i. Estimate of Surface Contamination: ____dpm/100cm^2 Where: __________
(attach form 69-10296 for out of plant contamination readings)

j. Unusual Radiation Levels in Plant: Where: __________ mR/hr: ____

k. Radiation Level at site boundary (downwind) __________ (sector) mR/hr: ______

l. Meteorological Date (Use 10m elevation on primary met tower or ' s gnate other Source____________________)

m. Wind Velocity: ______ m/secx2.2= _____ mph Direction (from): ________ deg.

n. Weather Conditions: ___Rain ___Clear ___Fog ___Cloudy

o. Stability:
____Class Sigma A (deg): _____ Delta T: ______________degrees C/m
(10m to 76m or _______)
X/Q 800m=__________E__________Mixing Depth__________m.

p. Projection Time ______:

CENTERLINE (EARS SECTOR ℄) DOSE PROJECTIONS (Circle Which)	PLUME ARRIVAL TIME	DOSE RATE mR /hr W.B.	DOSE RATE mR /hr THY	INTEGRATED DOSE mR W.B.	INTEGRATED DOSE mR THY	AFFECTED SECTOR
Site Boundary (800m)						
2 Miles (2-5)						
6 Miles (5-10)						
10 Miles (10-20)						
EARS PLUME CENTER DOSE	radius					

4. Recommended Emergency Actions/Protective Measures for SLO County or California Department Radiation Health (Provide only new recommendations):
____
____

5. Emergency Response Actions Underway by PGandE: ______________________________
____

6. Prognosis for Escalation or Termination of Accident: ______________________________
____

PACIFIC GAS AND ELECTRIC COMPANY
DEPARTMENT OF NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

PART B: MISCELLANEOUS EMERGENCY INFORMATION FORM

Provide as much information as is available and appropriate at the time of the status report.

Date: ___/___/___ Time: ________________ AM/PM (Report Completed) Status # ________________ (Number sequentially)

Person Authorizing Report: ____________________________ (DCPP only)
Site Emergency Coordinator

Person Preparing Report: ______________________ Location ____________ (DCPP only)

- -

Time Data Collected ________________ AM/PM

1. Personnel Injuries: How Many? ____________________________

   a. Type: ______________ Contamination: ___Yes ___No

   b. Injured Person Location: ___Plant ___Ambulance ___Hospital ____________ (which)

      ___Other ________________ (where)

   c. Ambulance requested ___Yes ___No, Location ______________.

2. Fires:

   a. Location: ______________ Time Reported: ____________ AM/PM

   b. Type:___ Electrical___ Fuel ________________________ (what kind)

   c. Contamination Present: ___Yes ___No

   d. Fire Assistance Requested: ___Yes ___No

   e. Fire Assistance Onsite: ___Yes ___No

3. Security/Safeguards:

   a. Bomb Threat: Search Conducted: ___Yes ___No

      Search Results: ____

      Site Evacuated: ___Yes ___No

   b. Intrusion: Insider: __________________ Outsider ______________

      Point of Intrusion: ______________ Extent of Intrusion: ____________

      Apparent Purpose: ____

PACIFIC GAS AND ELECTRIC COMPANY
DEPARTMENT OF NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

Part B: Miscellaneous Emergency Information Form

c. Strik. emonstrations: Size of Group: ____________________

Purpose: ____________________

d. Sabotage: Radiological: ___Yes ___No Arson: ___Yes ___No

Equipment/Property: ____________________

e. Extortion: Source (phone, letter, etc.): ____________________

Location of Letter: ____________________

Demands: ____________________

f. General: Firearms Involved: ___Yes ___No Violence: ___Yes ___No

Control of Facility Compromised or Threatened: ___Yes ___No

Stolen/Missing Material: ____________________

Agencies Notified (FBI, State Police, County Sheriff, etc.): ____________________

____
(Circle agencies onsite)

4. Press Information:

Location of Press Release: ___San Francisco/___San Luis Obispo

Other: ____________________
(where)

Time of Press Release: ____________AM/PM

News Media Interest: ___Yes ___No Local/National: ____________________

- -

Data Received By: ____________________
Date: ___/___/___ Time: ____________AM/PM

RETAIN THIS FORM FOR EVENT EVALUATION

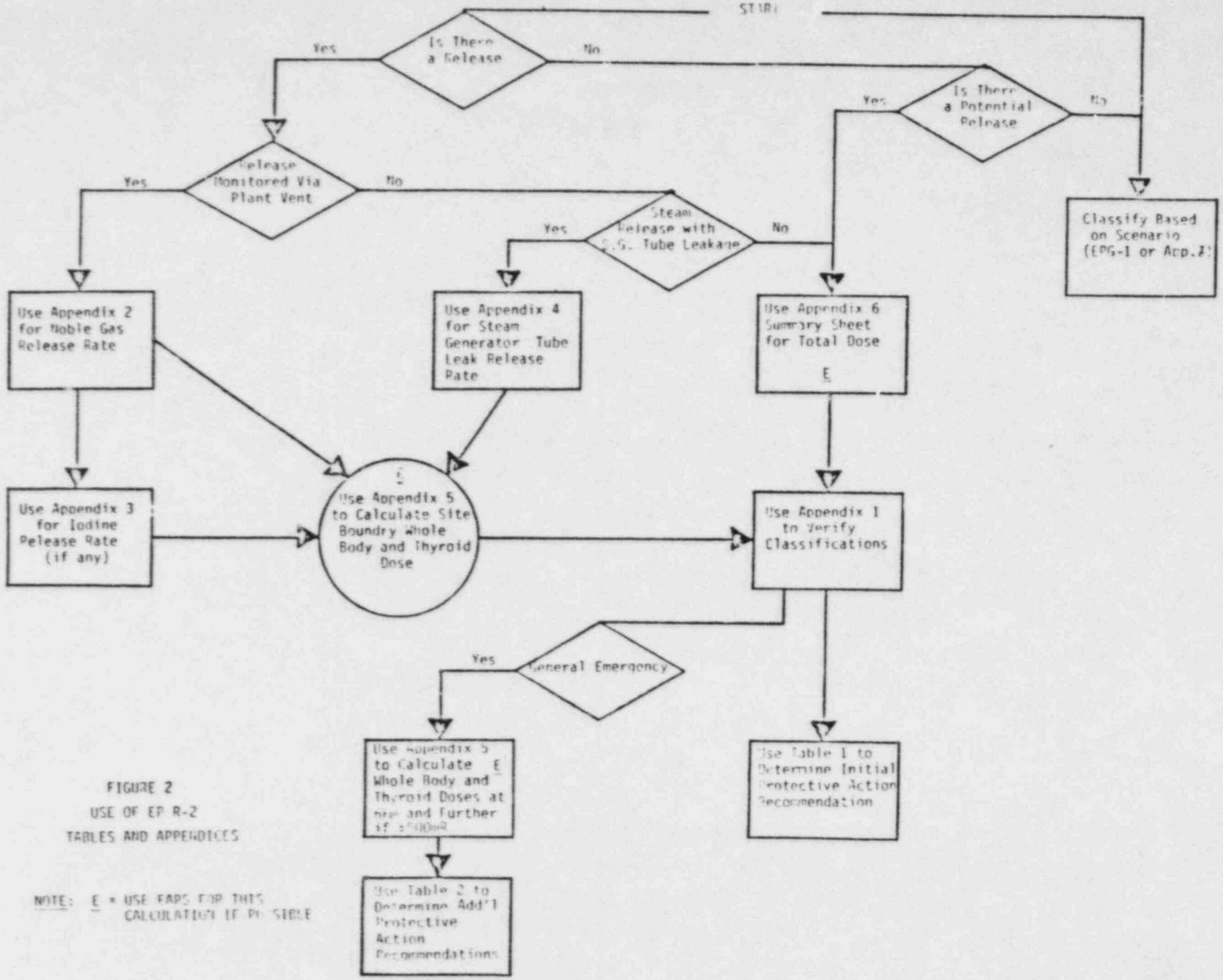
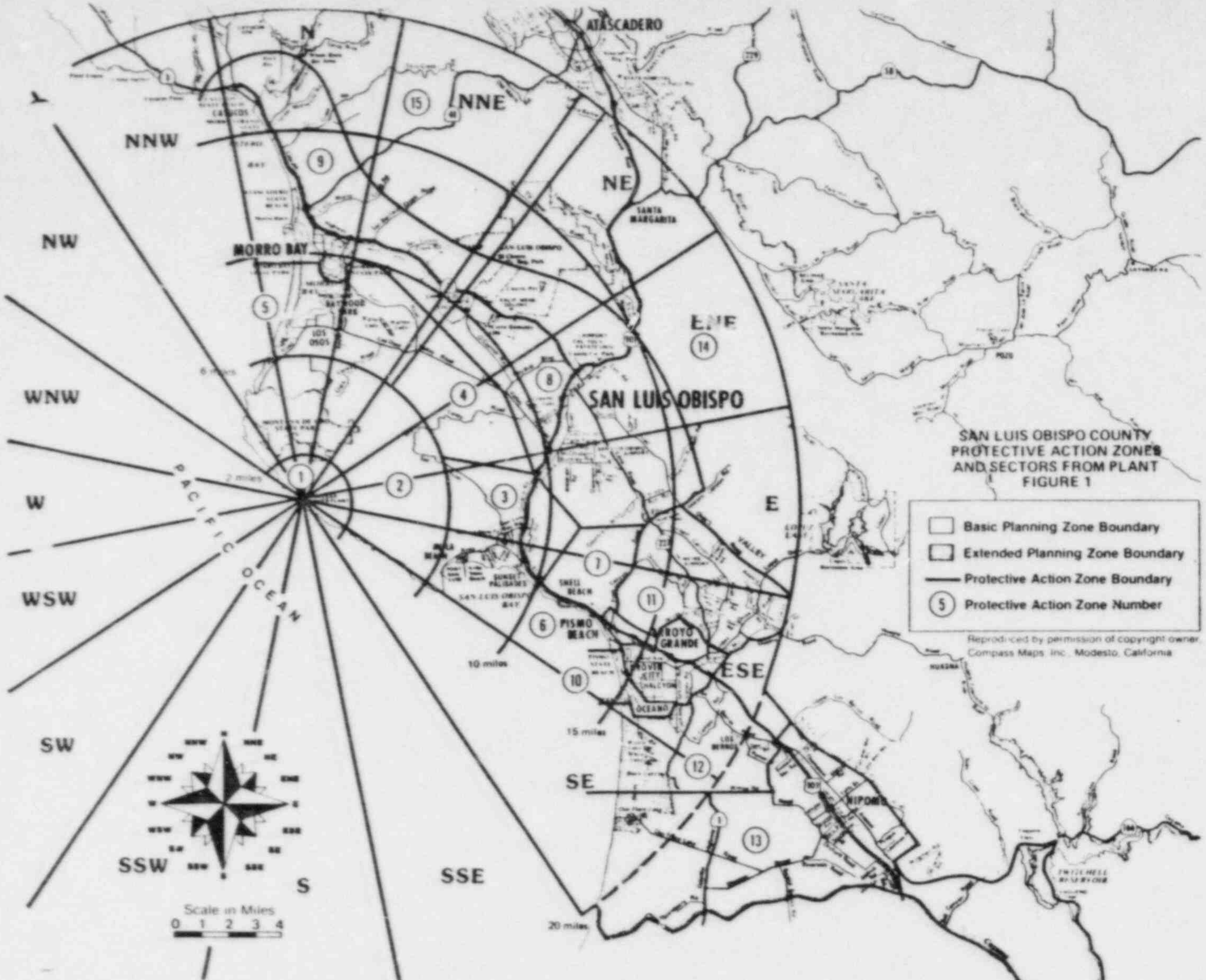


FIGURE 2
USE OF EP R-2
TABLES AND APPENDICES

NOTE: E = USE EARS FOR THIS CALCULATION IF POSSIBLE



SAN LUIS OBISPO COUNTY
PROTECTIVE ACTION ZONES
AND SECTORS FROM PLANT
FIGURE 1

List of Protective Action Zones

	Zone	Zone includes
1	2-mile	Identified residences, isolated hill areas
2	6-mile	Identified residences, plant access road, Montana De Oro State Park, isolated hill areas
3	Avila/San Luis Bay/ See Canyon/ Squire Canyon	Avila Beach, Port San Luis, Pirate's Cove San Luis Bay Estates, Avila Road and San Luis Bay Drive, See Canyon Road outside the 6-mile limit, Squire and Gragg Canyons
4	Prefumo Canyon/ Los Osos Valley	Prefumo Canyon Road outside the 6-mile limit, Los Osos Valley Road between Turri Road and Foothill
5	Baywood/Los Osos	Baywood Park, Los Osos, Turri Road, Los Osos Valley Road west of Turri Road, Clark Valley
6	City of Pismo Beach	City of Pismo Beach (including adjacent beaches)
7	Indian Knob/ Price Canyon	Price Canyon Road and isolated hill areas north of Pismo Beach
8	San Luis Obispo area	City of San Luis Obispo, Cal Poly, California Men's Colony, Camp San Luis Obispo, Cuesta College, O'Conner Way, Orcutt Road north of East Corral de Piedra Creek, Edna, Country Club, Crestmont Drive and Davenport Creek area
9	Morro Bay/Cayucos	Route 1 west of Cuesta College, Morro Bay Cayucos, Whale Rock Reservoir area
10	Five Cities (southern portion)	City of Arroyo Grande, City of Grover City, Oceano, Halcyon and Pismo State Beach
11	Orcutt Road/ Lopez Drive/ Route 227	Canyon area north of Five Cities (bounded by Price Canyon, Orcutt Road, Huasna Creek and northern limits of Arroyo Grande and Pismo Beach)
12	Nipomo north of Willow Road	Nipomo Mesa north of Willow Road, Cienega Valley, Pismo State Dunes Recreational Vehicle Area
13	Nipomo	Nipomo Mesa south of Willow Road, Nipomo Valley, Santa Maria Valley north of Santa Maria River
14	Cuesta Pass/ Santa Margarita	U.S. 101 north of San Luis Obispo, Santa Margarita, isolated hill areas north and east of San Luis Obispo within 20 miles of plant
15	Route 41/ Cypress Mountain Drive	Route 1 north of Cayucos, Cypress Mountain Drive, Route 41, isolated hill areas north and east of Cayucos/Morro Bay within 20 miles of plant

PGandE Letter No.: DCL-84-291

CURRENT

EMERGENCY PLAN

IMPLEMENTING PROCEDURES

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Volume 3B

0502d/0005K

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RB-15D	SPASS Gas Chromatographic Hydrogen Analysis	0
RB-15E	SPASS Liquid and Gas Sample Handling	0
RB-15F	SPASS Data Analysis	0
RB-15G	SPASS Sample Storage and Disposal	0
RB-16	SPASS Subsequent Sampling	0
RB-16A	SPASS Initial Actions During An Emergency (Not Intended to Meet The 3-Hour Time Limit)	0
RB-16B1	SPASS Diluted Liquid Sampling From Reactor Coolant (Not Intended to Meet The 3-Hour Time Limit)	0
RB-16B2	SPASS Undiluted Liquid Sampling From Reactor Coolant (Not Intended to Meet The 3-Hour Time Limit)	0
RB-16B3	SPASS Reactor Coolant Stripped Gas Sampling (Not Intended to Meet The 3-Hour Time Limit)	0
RB-16B4	SPASS Diluted Liquid Sampling From Radwaste (Not Intended to Meet The 3-Hour Time Limit)	0
RB-16B5	SPASS Undiluted Liquid Sampling From Radwaste (Not Intended to Meet The 3-Hour Time Limit)	0
RB-16C	SPASS Containment Air Sampling (Not Intended to Meet the 3-Hour Time Limit)	0
RB-16D	SPASS Gas Chromatographic Hydrogen Analysis (Not Intended to Meet the 3-Hour Time Limit)	0
RB-16E	SPASS Liquid and Gas Sample Handling (Not Intended to Meet The 3-Hour Time Limit)	0
RB-16F	SPASS Data Analysis (Not Intended to Meet The 3-Hour Time Limit)	0
RB-16G	SPASS Ion Chromatographic Chloride Analysis (Not Intended to Meet The 3-Hour Time Limit)	0
RB-16H	SPASS Ph/Conductivity Dissolved Oxygen (Not Intended to Meet The 3-Hour Time Limit)	0
RB-16I	SPASS Undiluted Containment Air Sampling (Not Intended to Meet The 3-Hour Time Limit)	0
RB-16J	SPASS Sample Storage and Disposal (Not Intended to Meet The 3-Hour Time Limit)	0

08/27/84

PG&E **Pacific Gas and Electric Company**

NUMBER EP EF-6
REVISION 3
DATE 07/06/84
PAGE 1 OF 63

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

TITLE: EMERGENCY PROCEDURE
OPERATING PROCEDURES FOR EARS 9845C
CONTROLLING STATIONS

APPROVED: R. C. Thornberry 8-1-84
PLANT MANAGER DATE

IMPORTANT TO SAFETY

SCOPE

This procedure provides startup instructions and operating flow diagrams for any HP-9845C station capable of functioning as a controlling station for the Emergency Assessment and Response System (EARS). These EARS stations include the Control Room (CR), Technical Support Center (TSC), and Emergency Operations Facility (EOF).

In addition a discussion of the terminology used, and a brief overview of some of the support software and data file contents and structure used in the EARS is included.

Startup and operating instructions for the EARS TSC HP-1000F computer are contained in procedure EP EF-8.

This procedure and changes thereto requires PSRC review.

CONTENTS

DISCUSSION

The purpose of the EARS is to assist the Company Emergency Response Organization and offsite authorities in quantifying offsite radiological consequences should radioactive isotopes be released during an accident at the DCPP. The system gathers data on meteorological parameters, onsite and offsite real time radiation monitor readings. It performs dispersion computations, disseminates information and displays data to various onsite and offsite stations. These stations include the CR, the TSC, the EOF, the Corporate Incident Response Center (CIRC), and the State Office of Emergency Services (OES) stations.

The CR, TSC, and EOF are all capable of being the controlling station; although only one can be the controller at any one time. Any station that is not functioning as the controller can receive calculational results from the EARAUT (EARS automatic) program via communication links. If the links are disrupted, EARS can function by means of the manual EARS program (EARMAN), using data obtained via voice communication with the controlling station operator.

This procedure provides the necessary information for CR, TSC, and EOF operators to start up the EARS computer hardware and run the three primary EARS programs (STATUS, EARAUT, EARMAN) on the HP-9845C desktop computer at the respective station.

The structures and contents of all EARS data files at the CR. TSC, and EOF EARS stations is given in Ref. 1.

PROCEDURE

1. EARS Hardware at Controlling Stations

   All HP hardware at the CR, TSC and EOF is covered by a service maintenance agreement with Hewlett-Packard, Inc. (see Appendix A for a complete list of hardware). In case of any hardware failure, contact the System Manager of the EARS and explain the problem to him. If the System Manager or his alternate cannot be contacted, the EARS operator may call Hewlett-Packard service [800]821-2446 directly during business hours (8 a.m. to 5 p.m., Monday thru Friday).

2. Start-Up Procedures

The following start-up procedures assume that all power to the computer hardware is off when the EARS operator arrives at an EARS station.

a. Set the power strip switch on. All of the equipment at each station is connected to one power strip which is located on the back of the desk console, except at the TSC-CC where it is attached to the console underneath the HP-9845C. This should turn everything on if the station was left in proper order, with all of the individual component switches set to the "ON" or "1" position. Check to see that all of the switches on all of the components are set to "ON" or "1" at this point.

b. Check to see that the 7906 disc drive RUN/STOP switch is set to "RUN". After about one minute the front panel of the 7906 should display 'DRIVE READY'.

c. Check to see that the HP-9845C computer power switch (on the right side of the computer) is set to "1". The CRT should beep and begin a self-test ("MEMORY TEST IN PROGRESS" message should appear on the CRT). When the self-test is completed, the "9845 READY FOR USE" message and a flashing cursor will appear on the CRT indicating the computer is ready for use.

d. After the entire system at this station is turned on, check the paper reserve in the HP-9845C internal printer. Instructions on how to load a new roll of thermal paper into the HP-9845C internal printer is given in Appendix B.

3. Shut-Down Procedures

a. Place the 7906 disc drive RUN/STOP switch to the STOP position, and wait for the 'DOOR UNLOCKED' light to appear on the front panel of the disc.

b. Turn the power strip switch to off position. This should turn off all of the equipment.

4. Power Failure

Should the power to the system be lost during operation, the system must be shut-down as described in section 3 before power is restored.

Any data in the computer memory is erased by power failure.

5. EARS Software and Flow Diagrams

There are three primary EARS programs stored on the HP-7906 disc drive (select code: C12): 1) "STATUS: for non-emergency (or idle) mode operations; 2) "EARAUT" automatic EARS program; and 3) "EARMAN" - manual EARS program for emergency mode operations.

There are two basic modes in which the EARAUT program can be operated: CONTROL and NON-CONTROL Only the CR and the TSC EARS stations at DCPP, and the EOF EARS station at the Sheriff's Office in San Luis Obispo can be operated in the CONTROL mode. Only one station can serve as the controller at any one time. Data is transmitted to all NON-CONTROL stations in fixed data strings containing information about the accident, instrument readings, calculated dose results, and messages.

Once the EARS station is activated, the operator should start running the STATUS program. If the emergency mode of EARS has already been established at another controlling station, EARAUT program will automatically be loaded from the disc and be run on the HP-9845C.

The flow diagrams following each program description are intended to give an EARS operator a general overview of the operator logic flow for each of the main EARS programs. The numbers in the flow diagrams reference other "KEY SETS" within the same program, whereas the letters reference specific entry points within the same or other programs.

a. STATUS

When EARS is not operated in the emergency mode, this program allows all HP-9845C stations to log onto the system for data polling purposes. As long as this station stays 'logged on' to the system, it can be 'scheduled' automatically to go into emergency mode by a CONTROL station when an emergency is declared.

When 'logged on', this program allows the operator to poll the HP-1000 at the TSC for meteorology (MET), plant radiation monitors (RMS), or pressurized ion chambers (PIC) data. It also allows the operator to determine the system network status, such as which stations are currently logged on the system, and when they are logged on or off. In addition, the site and area maps can be displayed and 'dumped' to the thermal printer on the HP-9845C.

Once logged on, the operator of one of the CONTROL stations can initiate the emergency mode of EARS by pressing the key under the CRT labeled 'START EARAUT'. This will load EARAUT and thereby begin the actual assessment of the emergency.

1) After the computer system at this station is up and running STATUS can be loaded and run by entering the following commands from the HP-9845C keyboard.

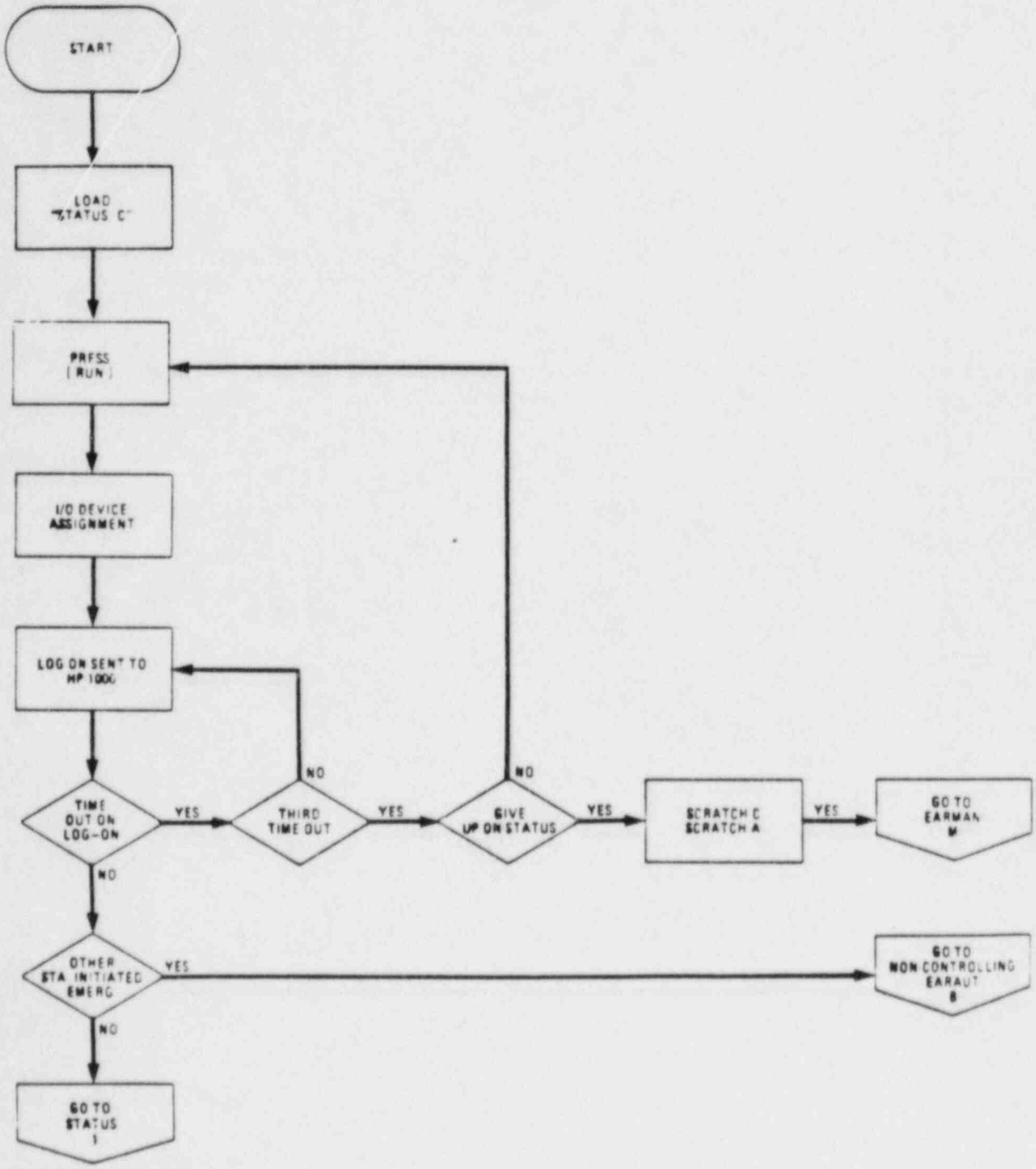
   a) Type in 'SCRATCH A', press [EXECUTE].

   b) Type in 'SCRATCH C', press [EXECUTE].

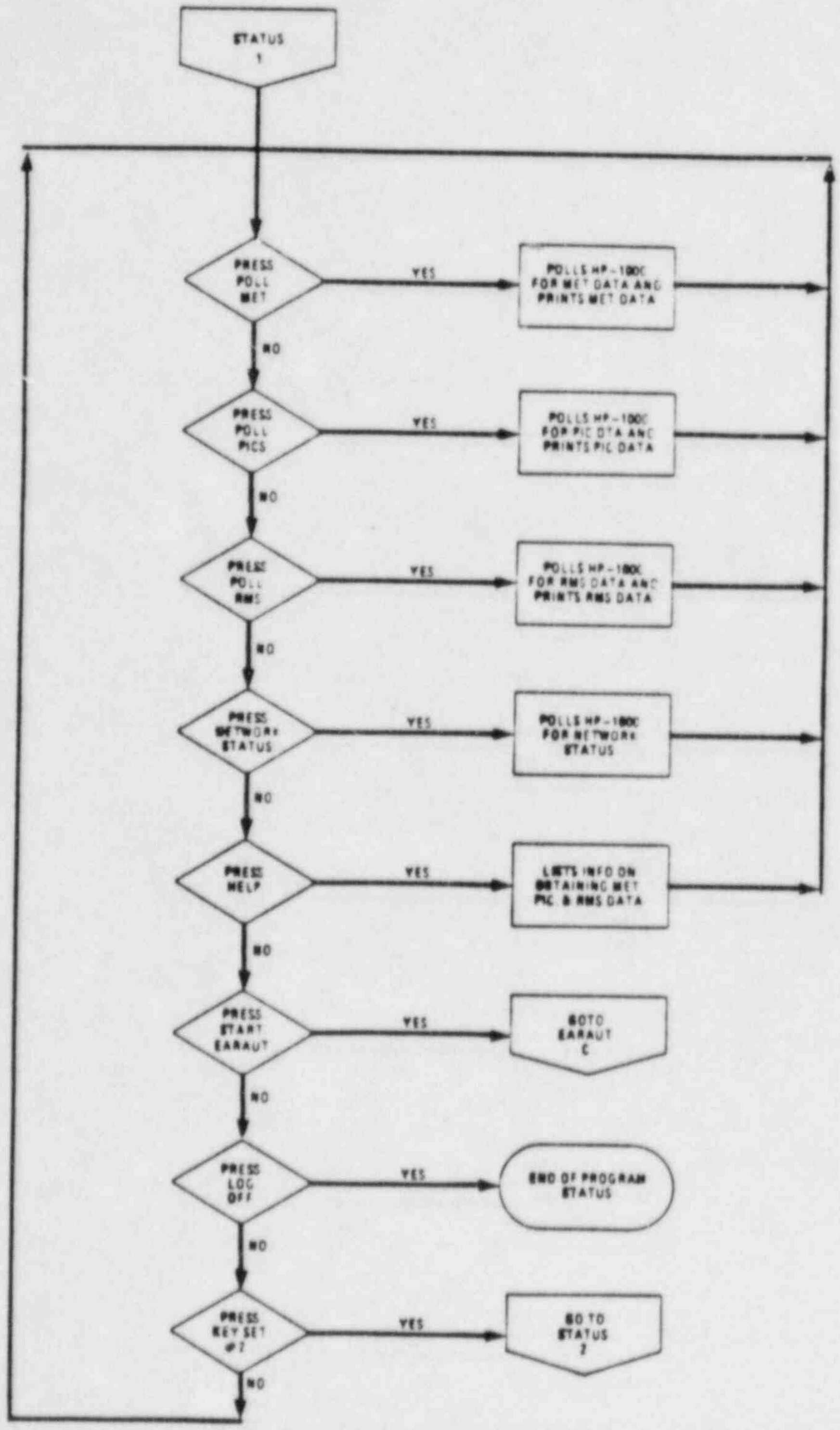
   c) Type 'LOAD "STATUS: C", 10' and press [EXECUTE] key.

2) The following three pages are flow diagrams for STATUS.

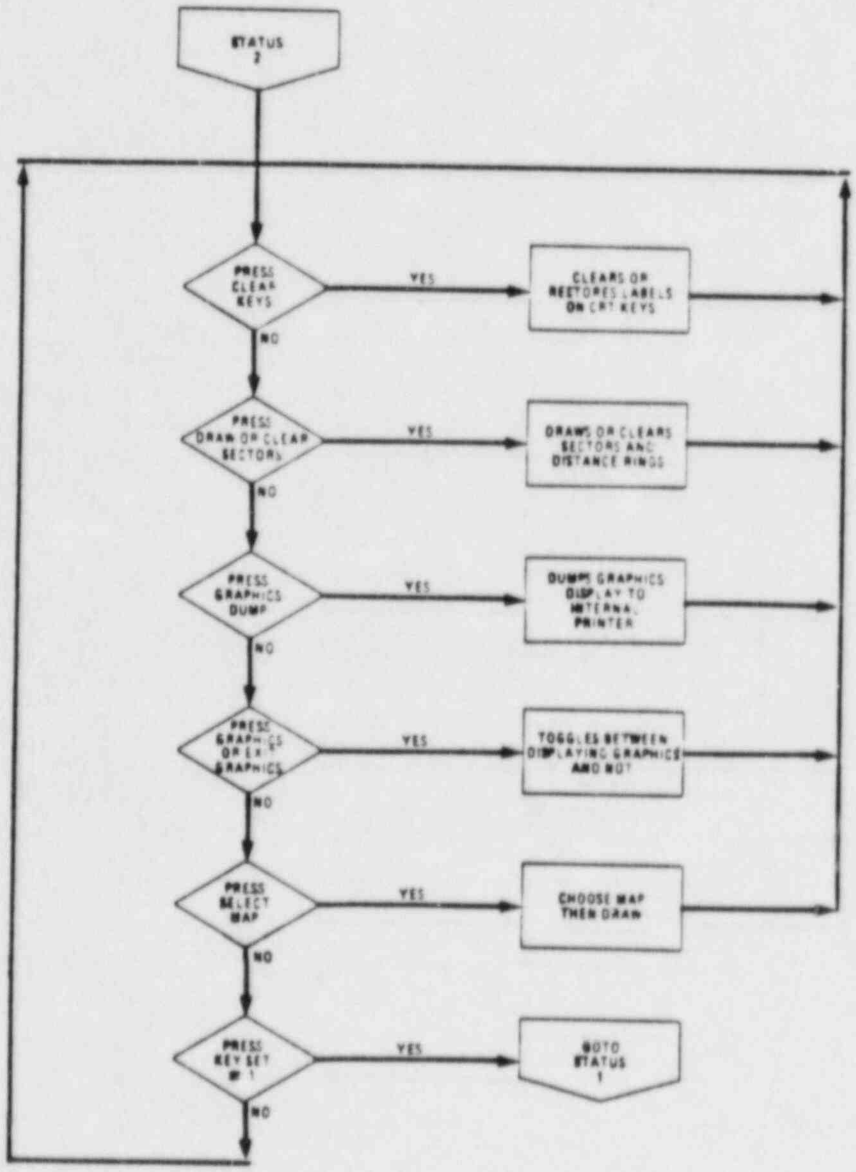
STATUS


START
LOAD
"%STATUS C"
PRESS
(RUN)
I/O DEVICE
ASSIGNMENT
LOG ON SENT TO
HP 1000
TIME
OUT ON
LOG-ON
YES
THIRD
TIME OUT
YES
GIVE
UP ON STATUS
YES
SCRATCH C
SCRATCH A
YES
GO TO
EARMAN
M
NO
NO
NO
OTHER
STA. INITIATED
EMERG
YES
GO TO
NON CONTROLLING
EARAUT
B
NO
GO TO
STATUS
1

STATUS KEY SET #1



STATUS KEY SET #2



b. EARAUT PROGRAM (Controller)

The EARS automatic (EARAUT) controller program consists of two subprograms: EARADC (Central processing program for Controlling stations), and EARrdc (Release rate calculation subprogram), in addition to the EARAUT main entry program. These subprograms are loaded in and out of the HP-9845C as needed.

EARAUT can be loaded and run as the CONTROLLING station either by pressing the 'START EARAUT' softkey in the STATUS program, or by manually loading the program from disc and running it. Should you load EARAUT with the intentions of becoming the CONTROLLER, but someone else has already assumed that function from another station, you will automatically be logged on as NON-CONTROLLER when running the program.

1. After the computer system at this station has been started up EARAUT can be loaded and run by entering the following commands from the HP-9845C keyboard.

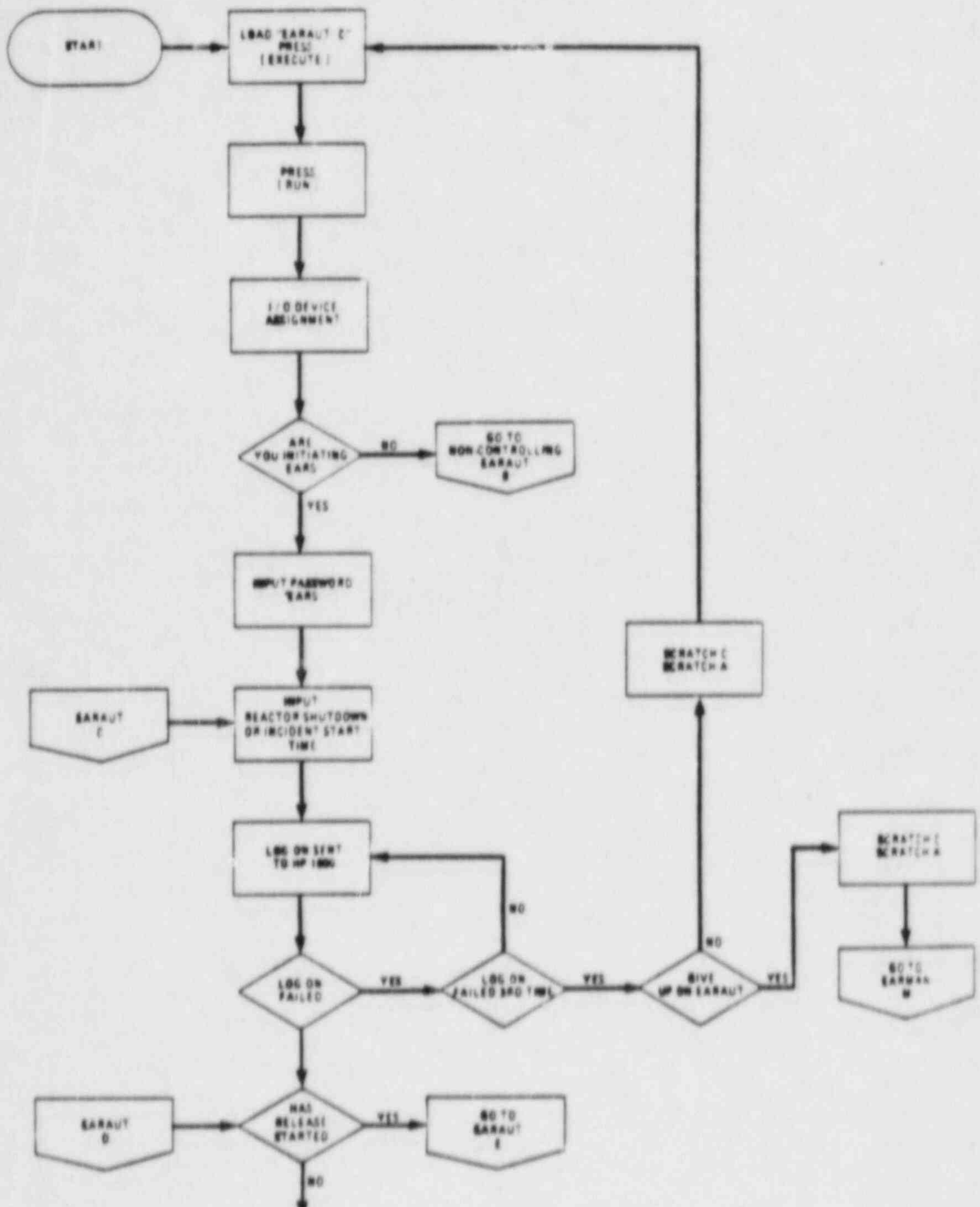
   a. Type in 'SCRATCH A', press [EXECUTE].

   b. Type in 'SCRATCH C', press [EXECUTE].

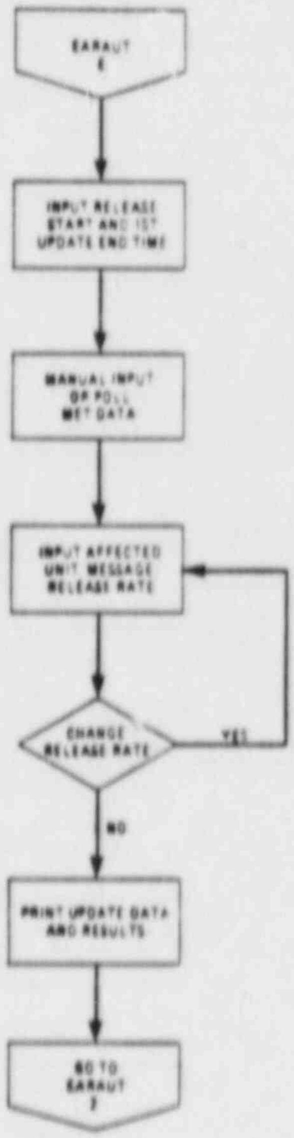
   c. Type 'LOAD "EARAUT: C", 10' and press the [EXECUTE] key.

2. The following eleven pages are flow diagrams for controlling EARAUT.

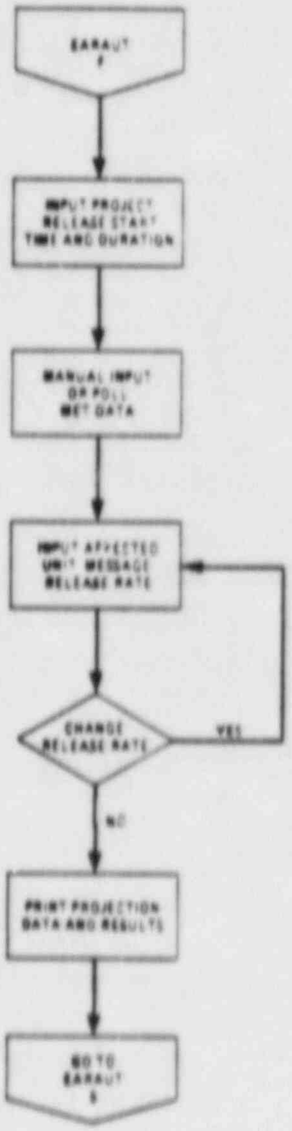
EARAUT FOR CONTROLLING STATIONS



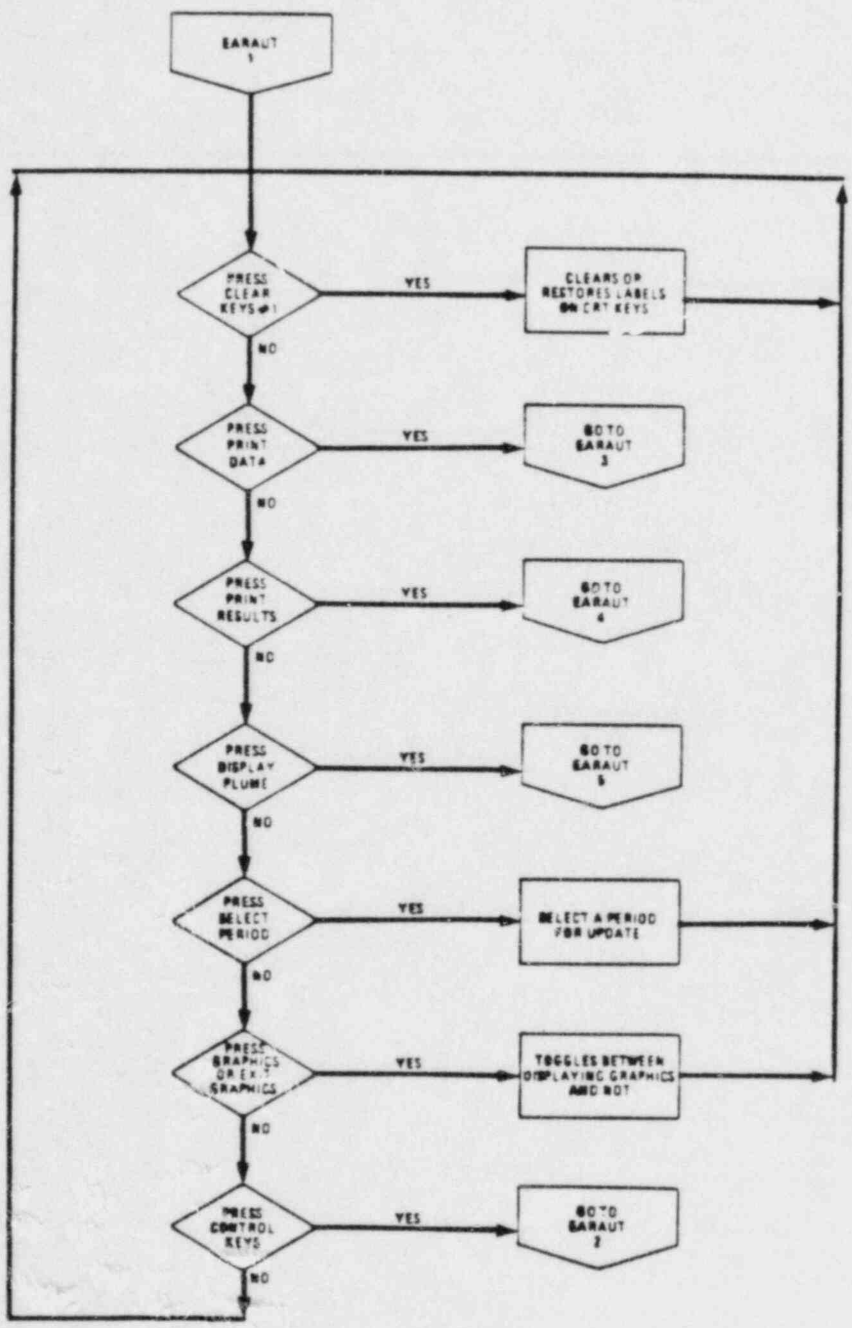
CONTROL EARAUT FIRST UPDATE



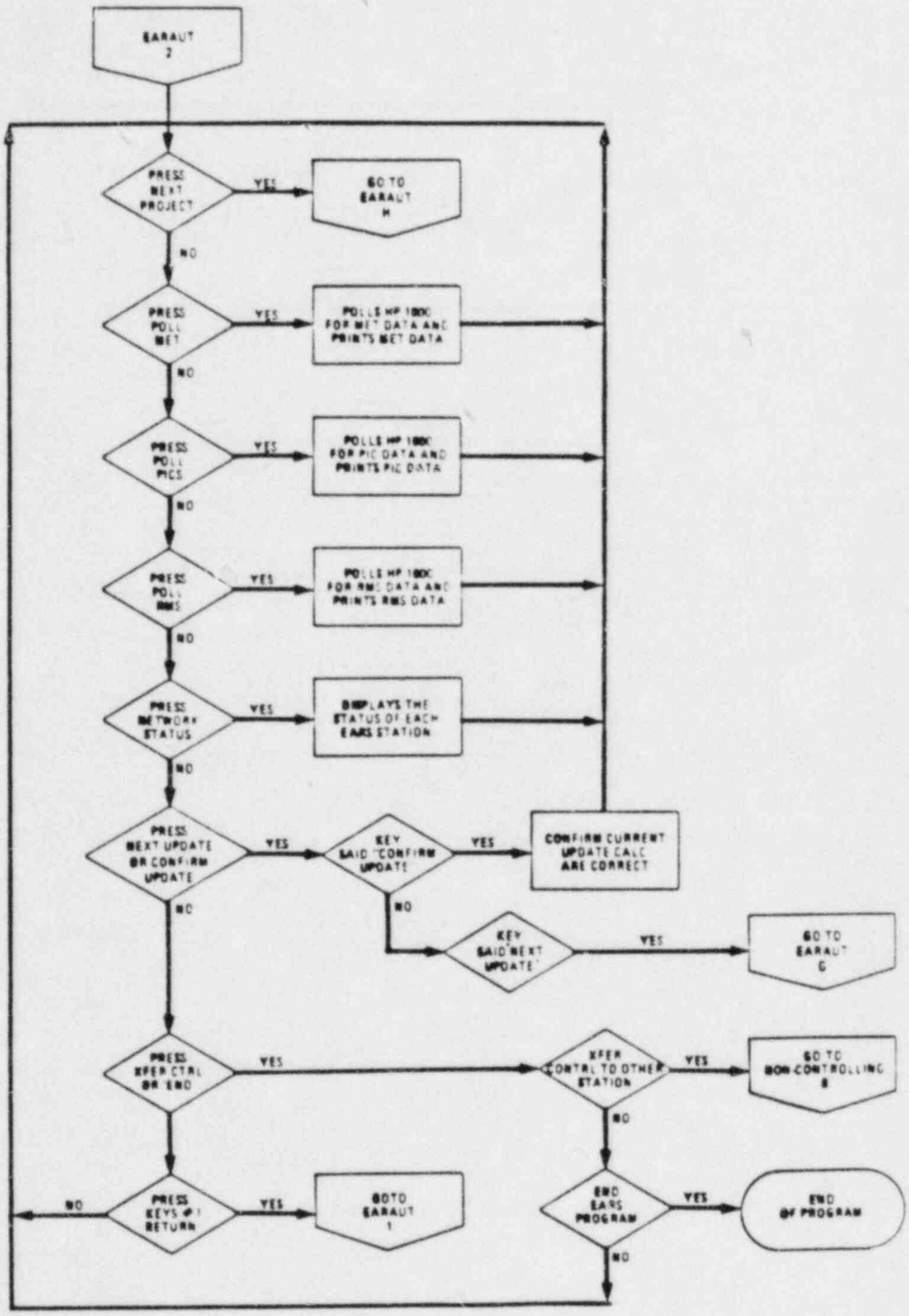
CONTROL EARAUT PROJECTION BEFORE FIRST UPDATE



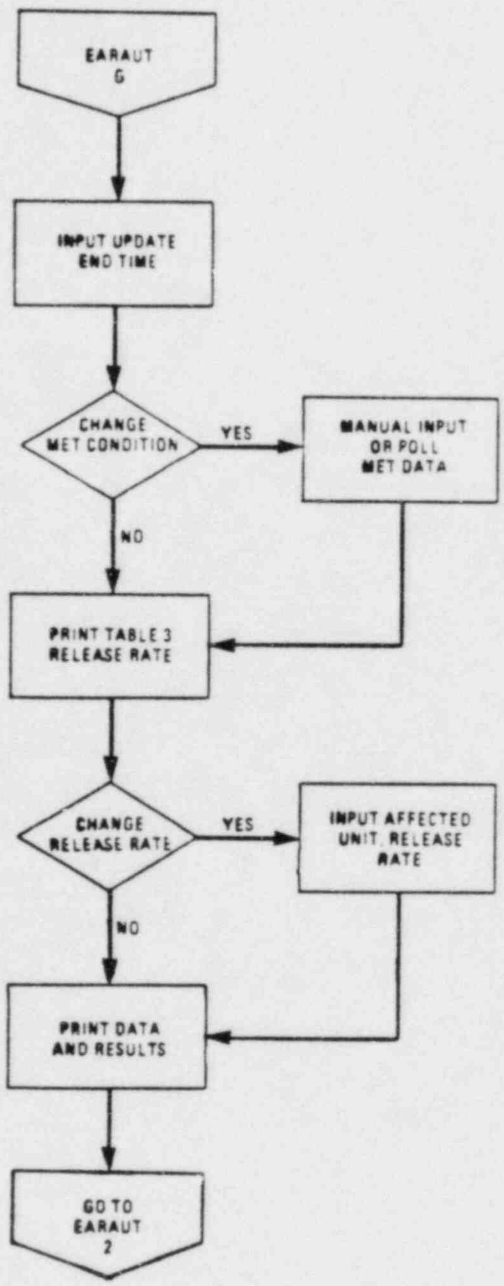
CONTROL EARAUT KEY SET #1



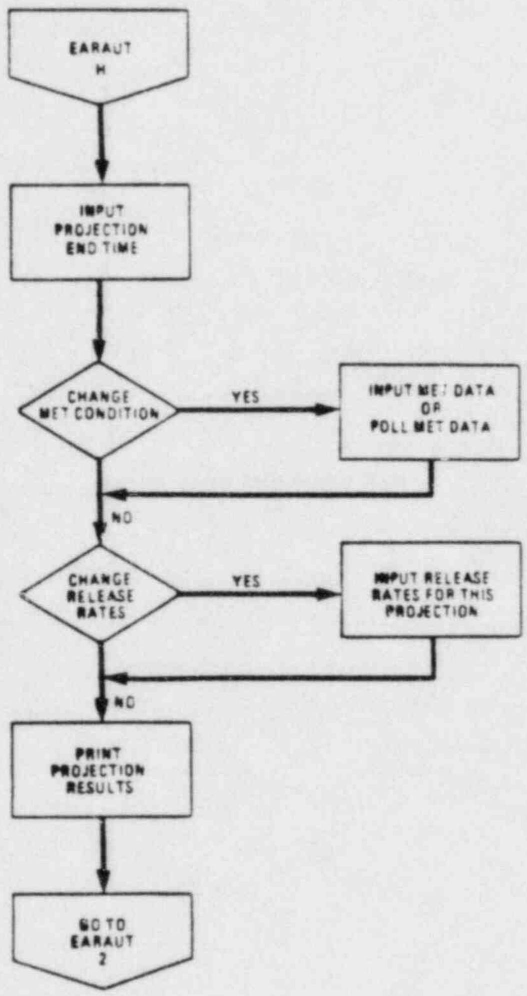
CONTROL EARAUT KEY SET #2



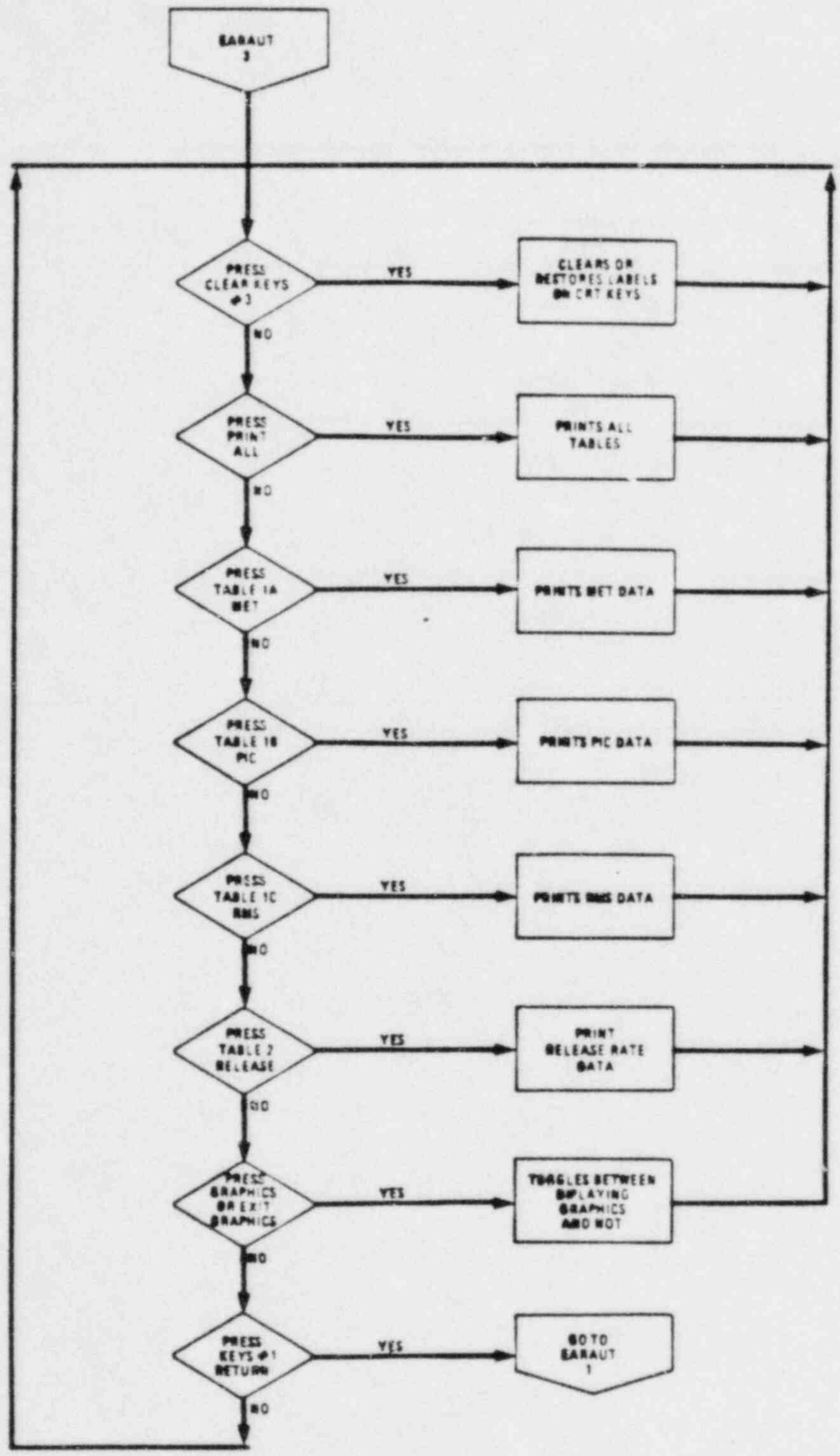
CONTROL EARAUT NEXT UPDATE



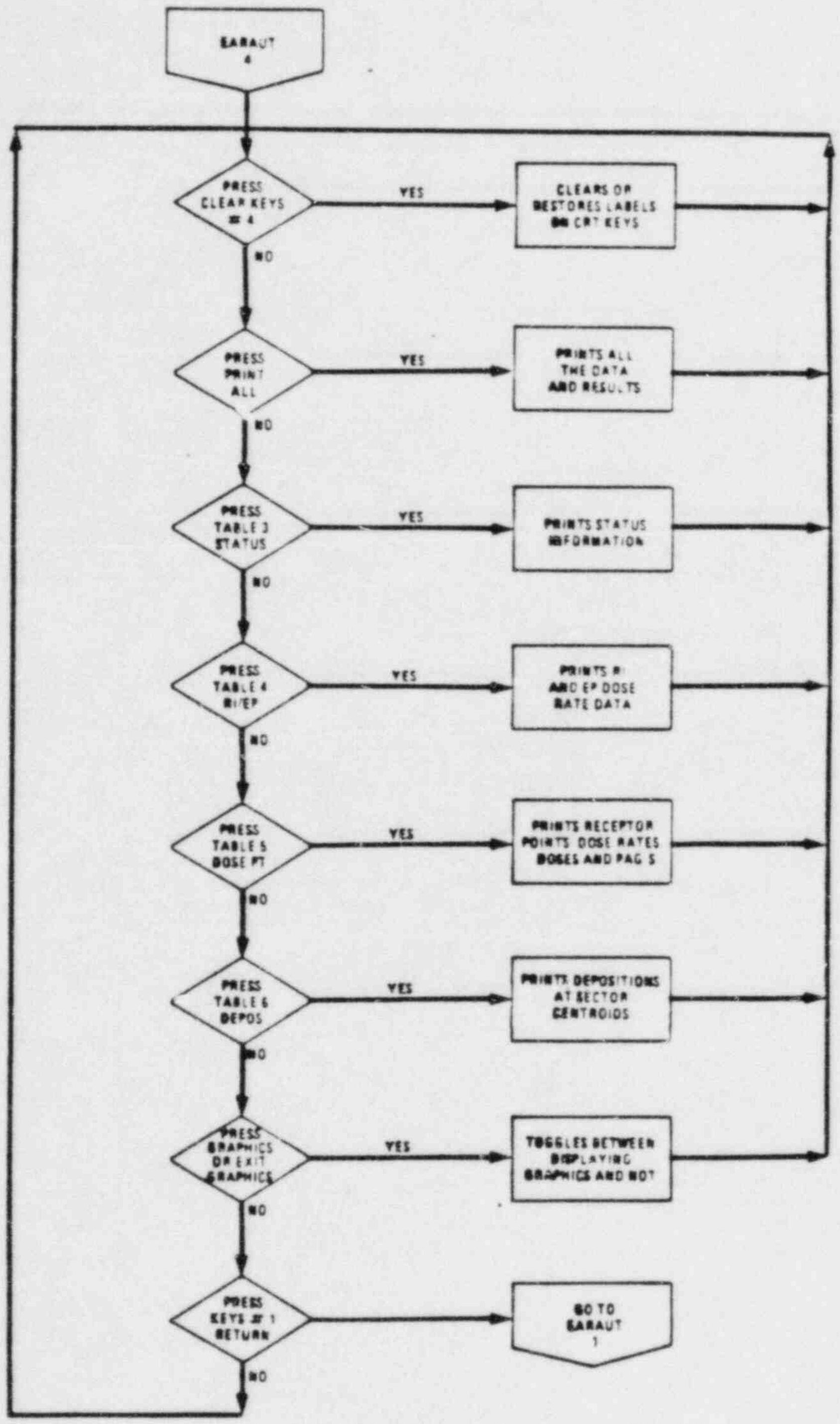
CONTROL EARAUT NEXT PROJECTION



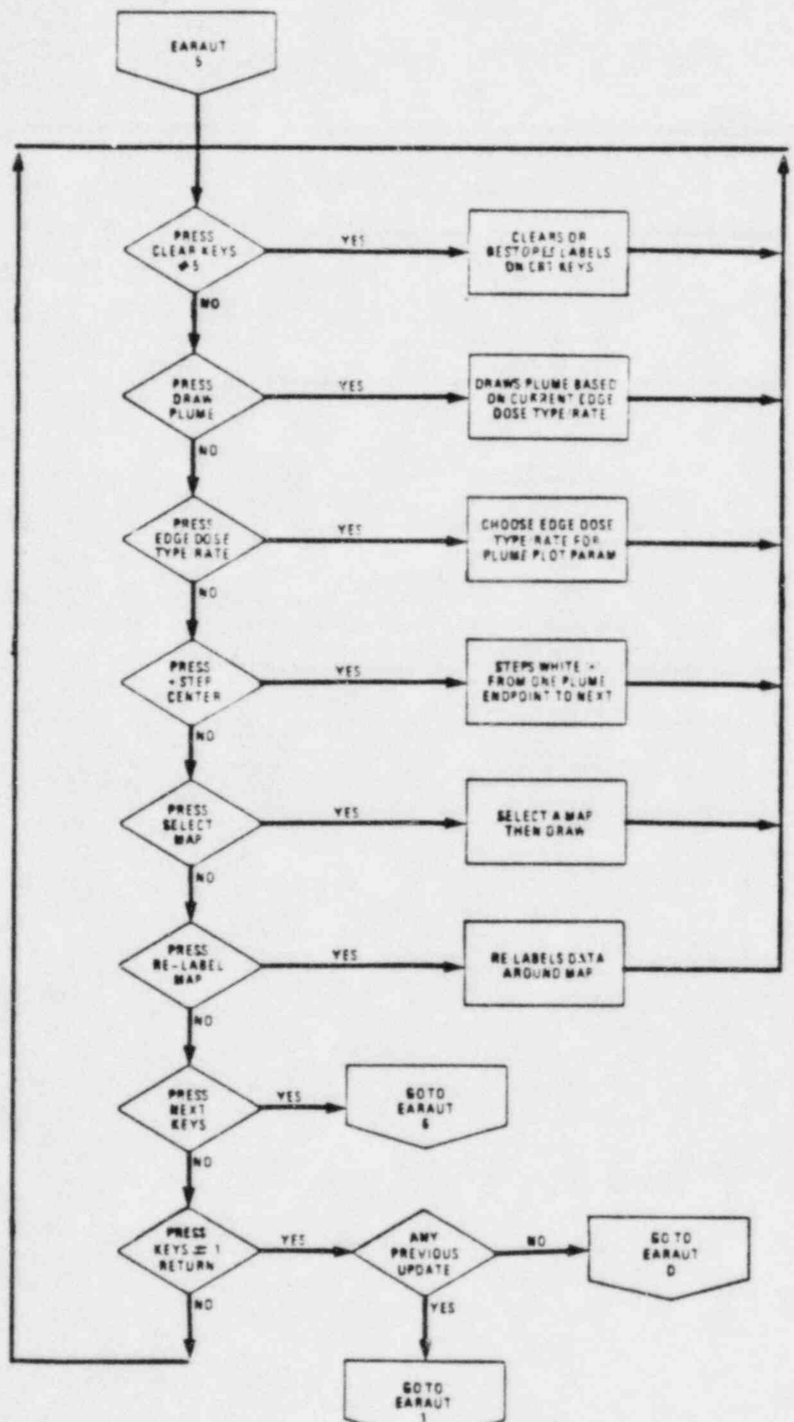
CONTROL EARAUT KEY SET #3



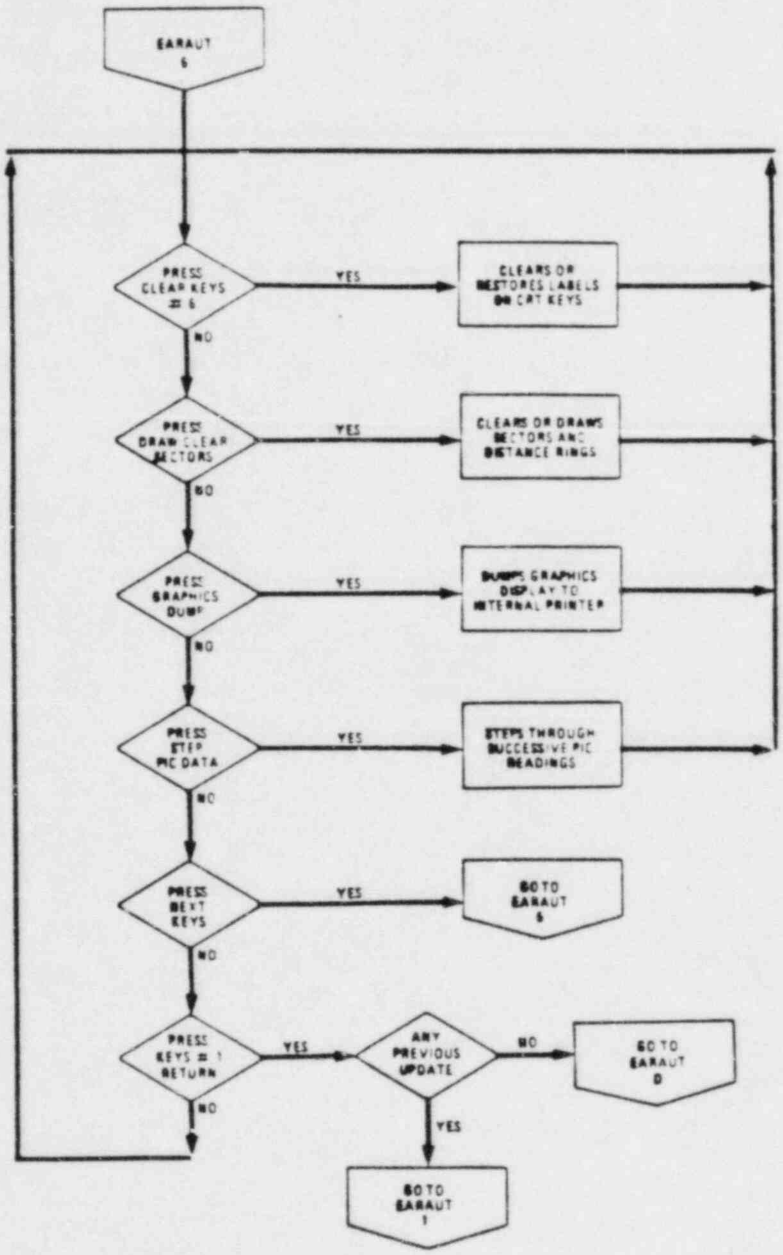
CONTROL EARAUT KEY SET #4



CONTROL EARAUT KEY SET #5



CONTROL EARAUT KEY SET #6



c. EARAUT PROGRAM (Non-Controller)

The EARS automatic (EARAUT) non-controller program consists of one subprogram: EARNDC (Central processing program for Non-Controlling stations), in addition to the EARAUT main entry program. These subprograms are loaded in and out of the HP-9845C as needed.

The function of EARAUT as a non-controller is to receive periodic updates of plume release parameters, and observe the resulting plume displays, as based on input from a EARS CONTROL station.

EARAUT (Non-controller) can be run in either one of two ways. The user can load the STATUS program and wait for one of the 'CONTROL' stations to log on as the 'CONTROLLER', or the user can load the EARAUT program and specify a non-controlling mode provided the controlling station is logged on.

1. After the computer system at this station has been started up EARAUT can be loaded and run independently of the 'STATUS' program by entering the following commands from the HP-9845C keyboard.

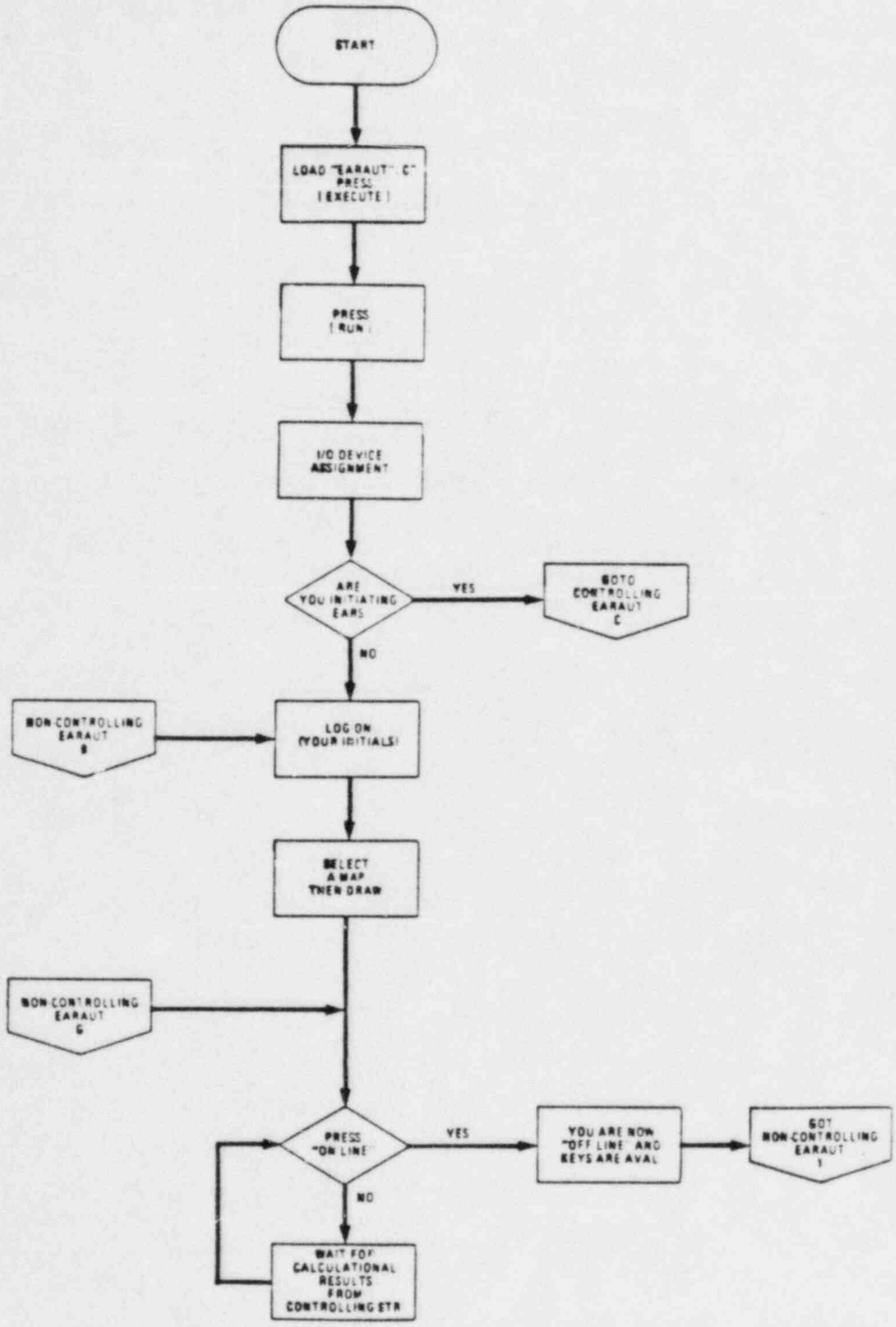
   a. Type in 'SCRATCH A', press [EXECUTE].

   b. Type in 'SCRATCH C', press [EXECUTE].

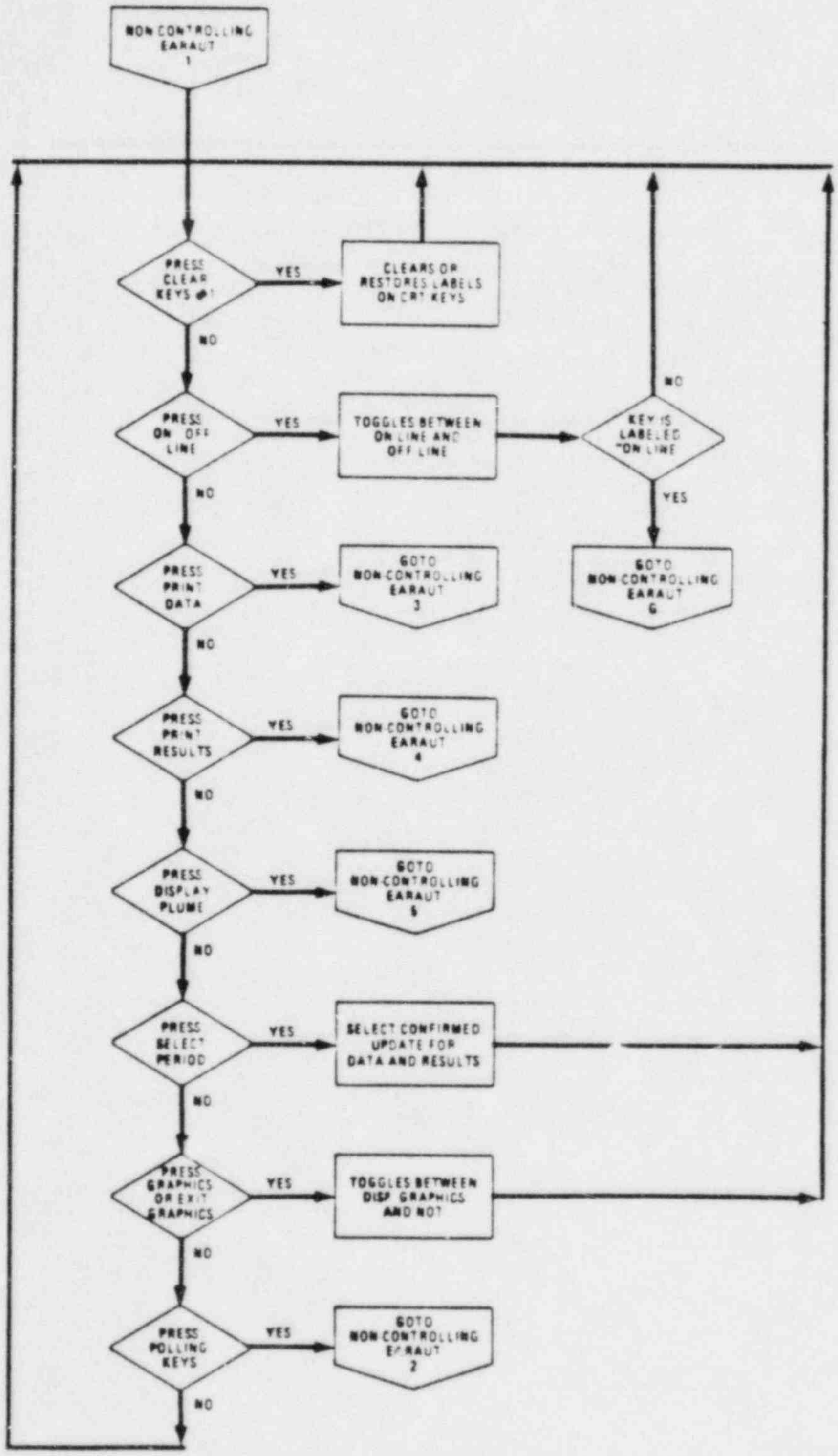
   c. Type in 'LOAD "EARAUT: C", 10' and press the [EXECUTE] key.

2. The following SEVEN pages are flow diagrams for non-controlling EARAUT.

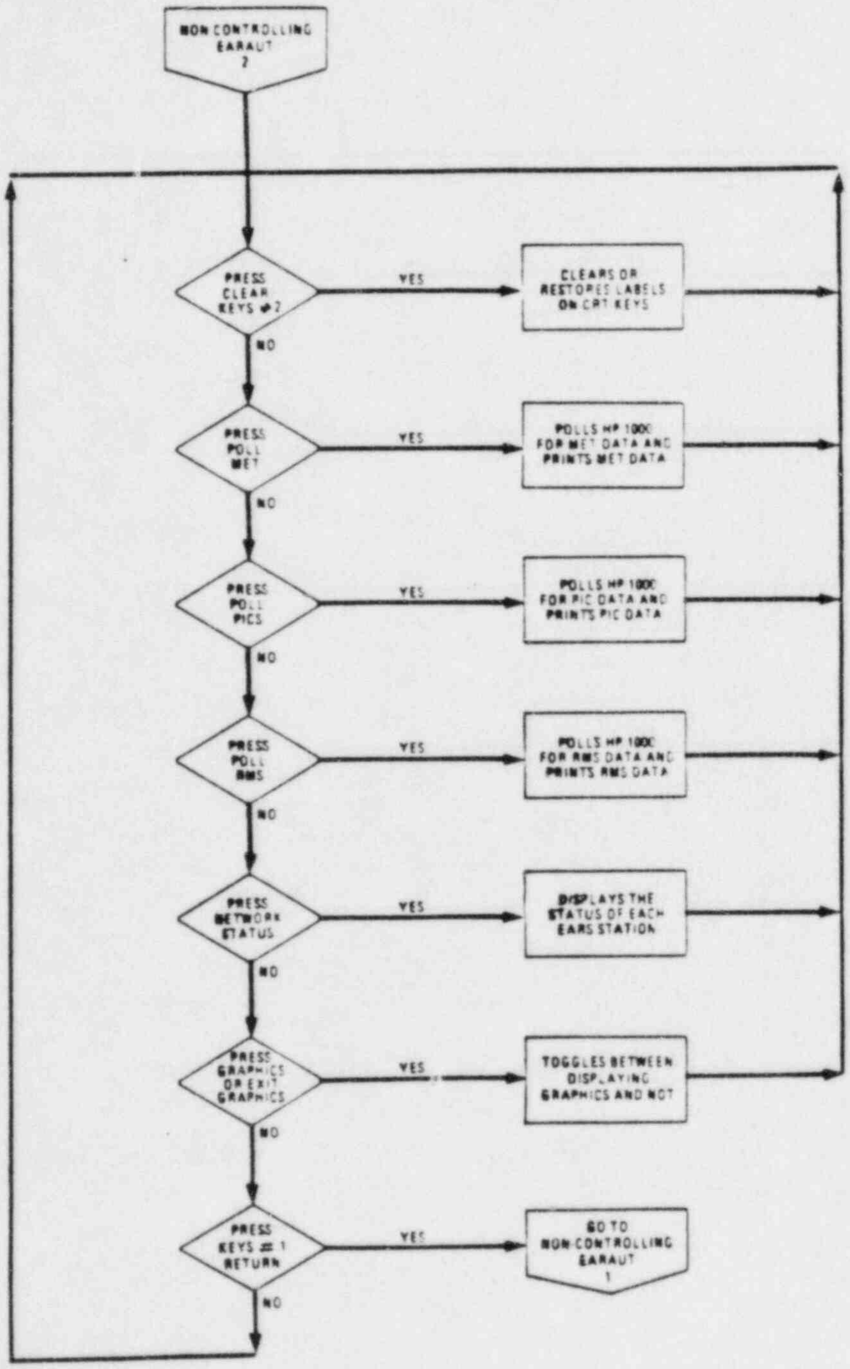
EARAUT FOR NON-CONTROL STATIONS



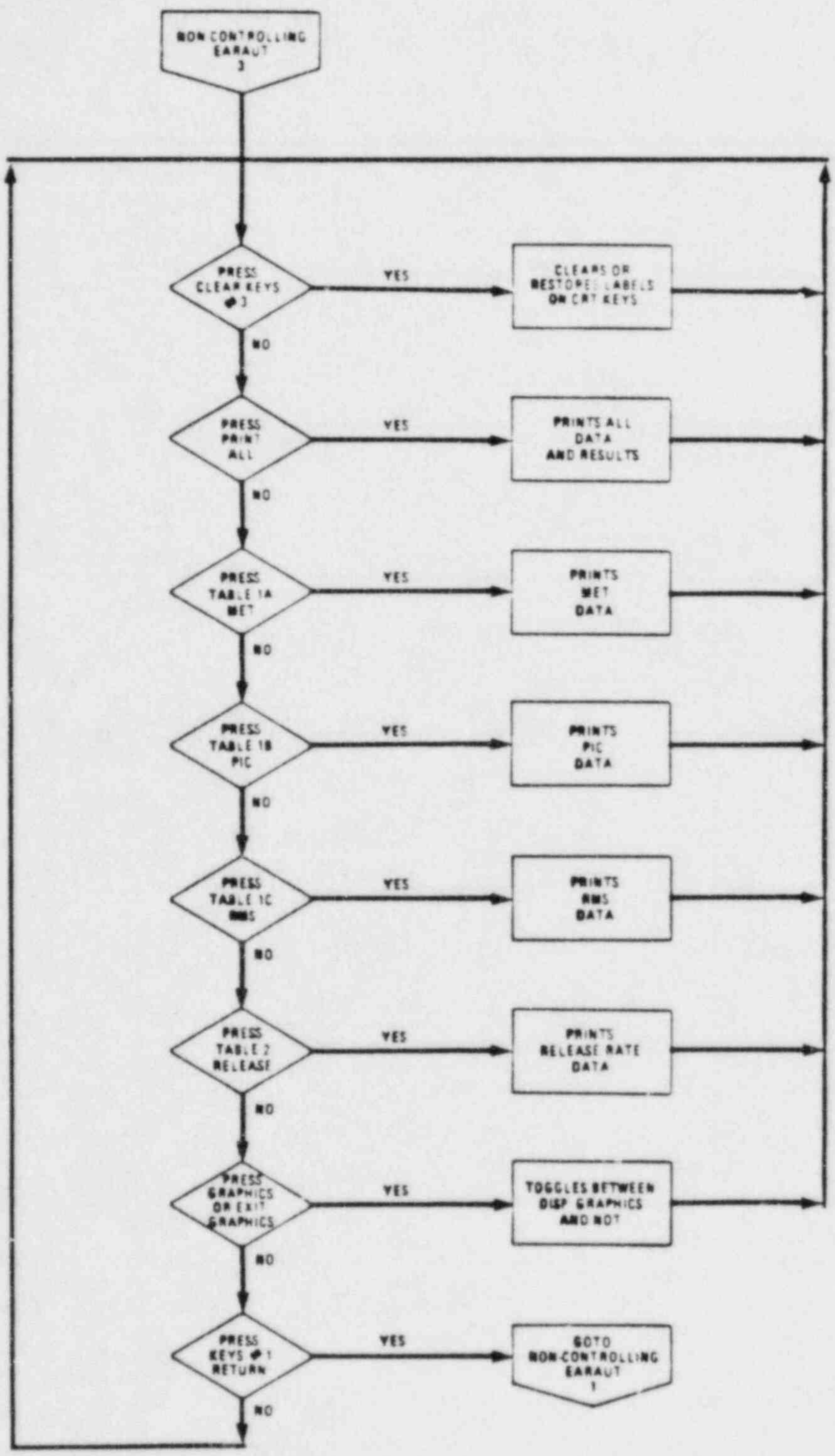
NON-CONTROL EARAUT KEY SET #1



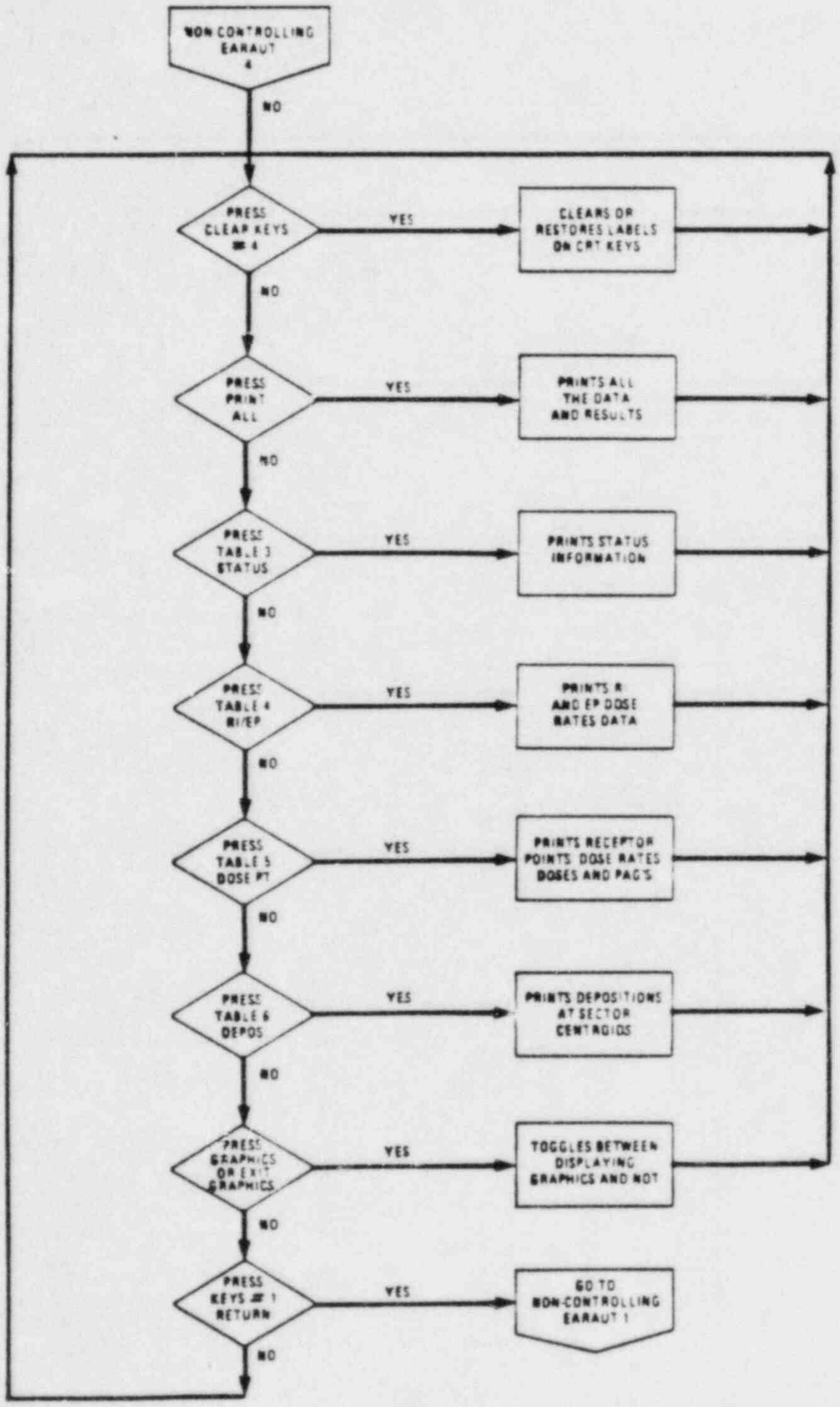
NON-CONTROL EARAUT KEY SET #2



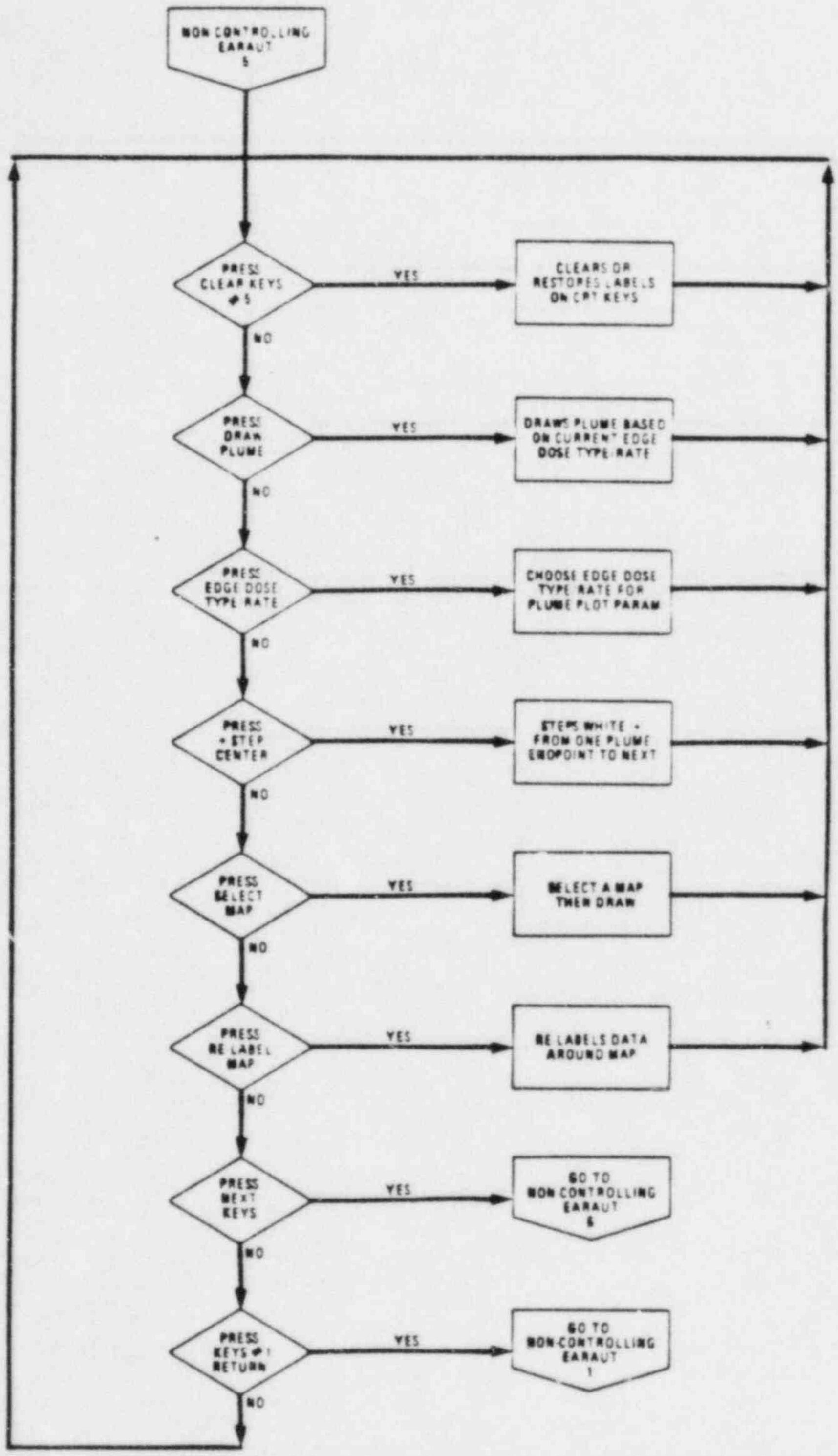
NON-CONTROL EARAUT KEY SET #3



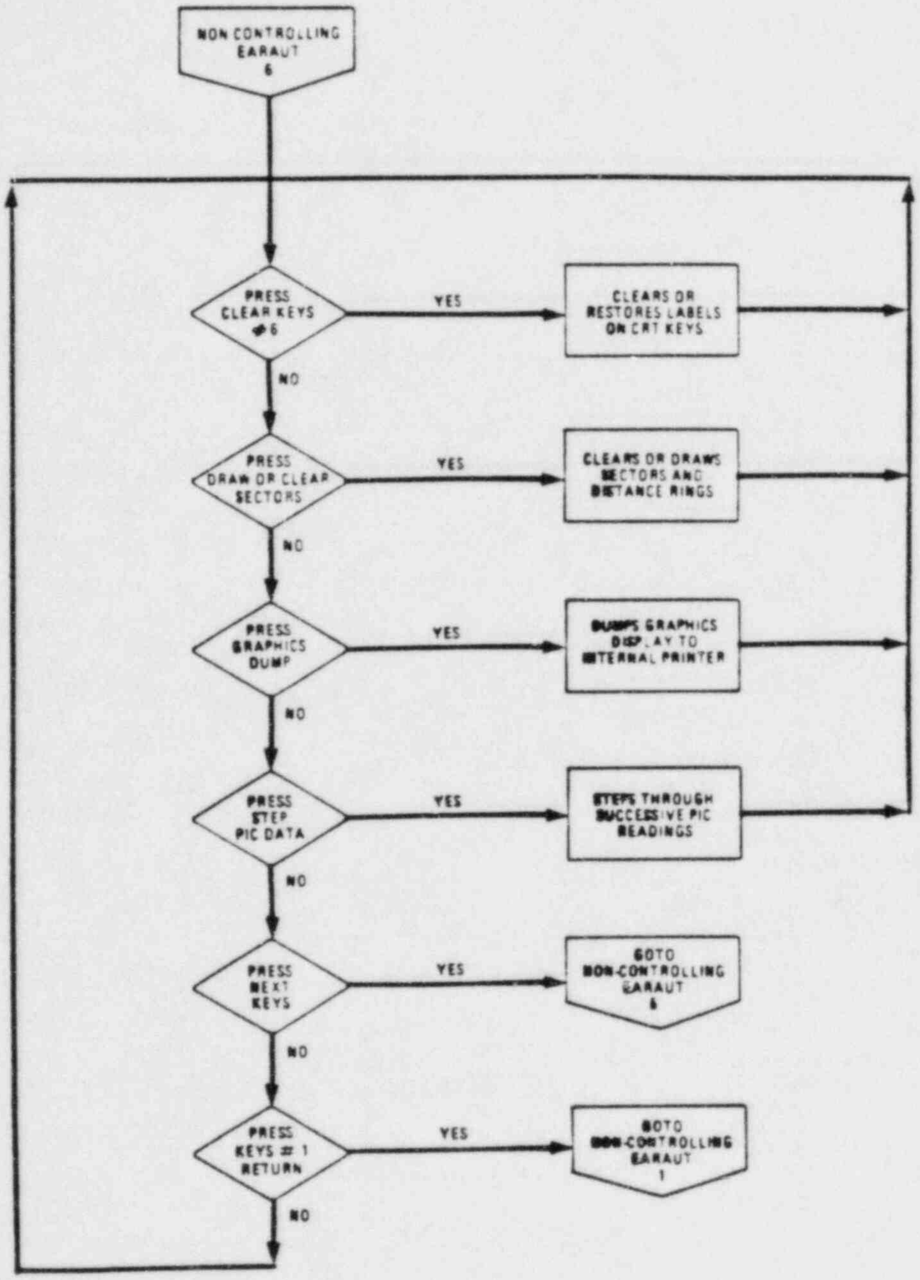
NON-CONTROL EARAUT KEY SET #4



EARAUT NON-CONTROL KEY SET #5



NON-CONTROL EARAUT KEY SET #6



d. EARMAN PROGRAMS

The EARS Manual (EARMAN) program is the manual version of the EARS programs. All of its functions are performed at the individual HP-9845C stations independent of the operation of the other stations and the HP-1000 at the TSC. Any data input such as MET data or release rate data is manually entered from the keyboard. In addition no data is transmitted to or from a station that is operating EARMAN. EARMAN consists of two separate subprograms: EARMDC (Core subprogram) and EARRDC (Release rate definition subprogram), in addition to the initial entry program EARMAN.

In the event of a hardware failure of the HP-1000 at the TSC and/or the loss of communications between various HP-9845C EARS stations and the HP-1000, EARMAN program can be initiated. Essential data can be obtained by telephone communication via PGandE or PT&T lines with EARS operators at the other 'CONTROLLING STATIONS' (CR, TSC, or EOF).

1. To load and run the EARMAN program type in the following commands from the keyboard.

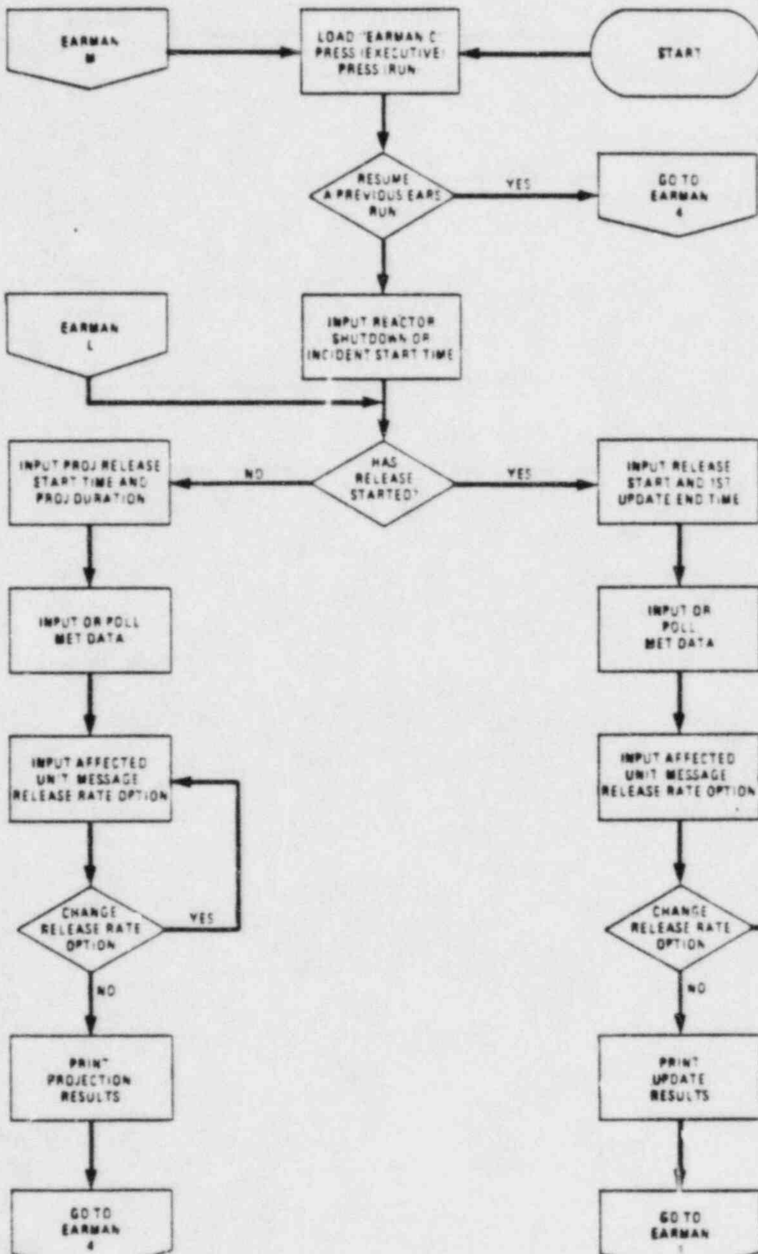
   a. Type in 'SCRATCH A', press [EXECUTE].

   b. Type in 'SCRATCH C', press [EXECUTE].

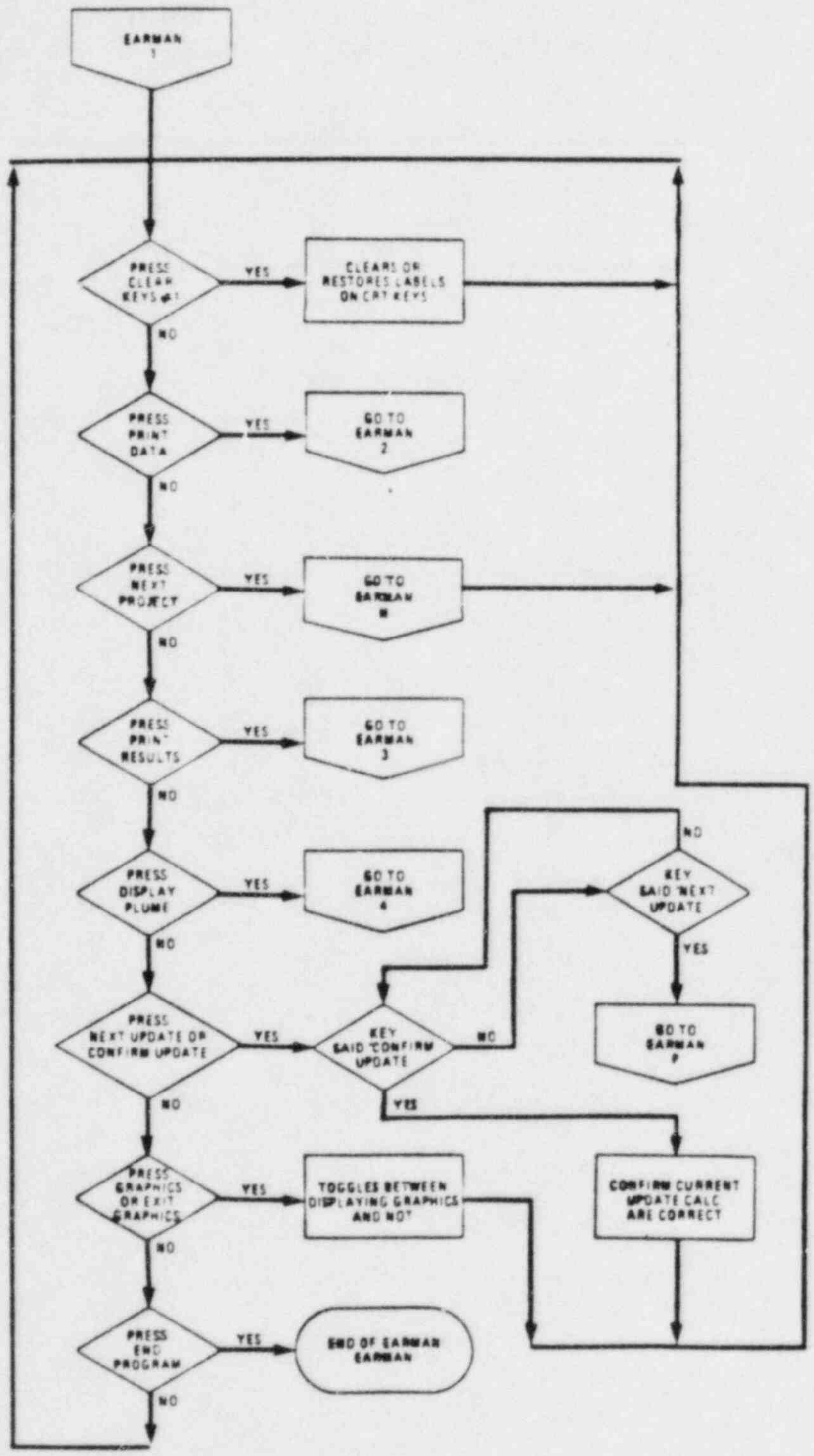
   c. Type in 'LOAD "EARMAN: C", 10', and press [EXECUTE].

2. The following nine pages are flow diagrams for EARMAN.

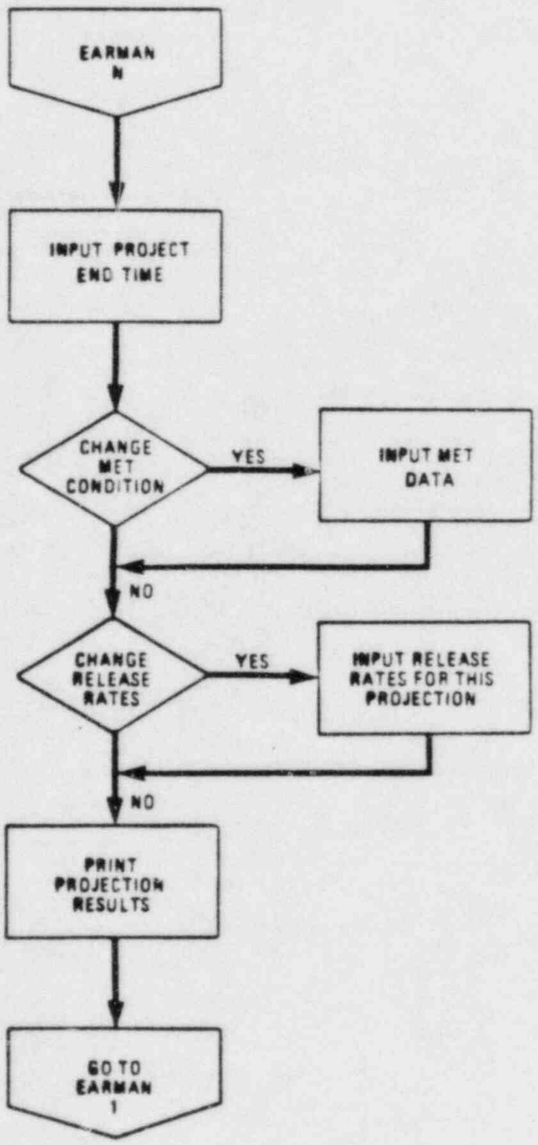
EARMAN


EARMAN
M
LOAD "EARMAN C"
PRESS (EXECUTIVE)
PRESS (RUN)
START
RESUME
A PREVIOUS EARS
RUN
YES
GO TO
EARMAN
4
EARMAN
L
INPUT REACTOR
SHUTDOWN OR
INCIDENT START TIME
HAS
RELEASE
STARTED?
NO
YES
INPUT PROJ RELEASE
START TIME AND
PROJ DURATION
INPUT RELEASE
START AND 1ST
UPDATE END TIME
INPUT OR POLL
MET DATA
INPUT OR
POLL
MET DATA
INPUT AFFECTED
UNIT MESSAGE
RELEASE RATE OPTION
INPUT AFFECTED
UNIT MESSAGE
RELEASE RATE OPTION
CHANGE
RELEASE RATE
OPTION
YES
NO
CHANGE
RELEASE RATE
OPTION
YES
NO
PRINT
PROJECTION
RESULTS
PRINT
UPDATE
RESULTS
GO TO
EARMAN
4
GO TO
EARMAN

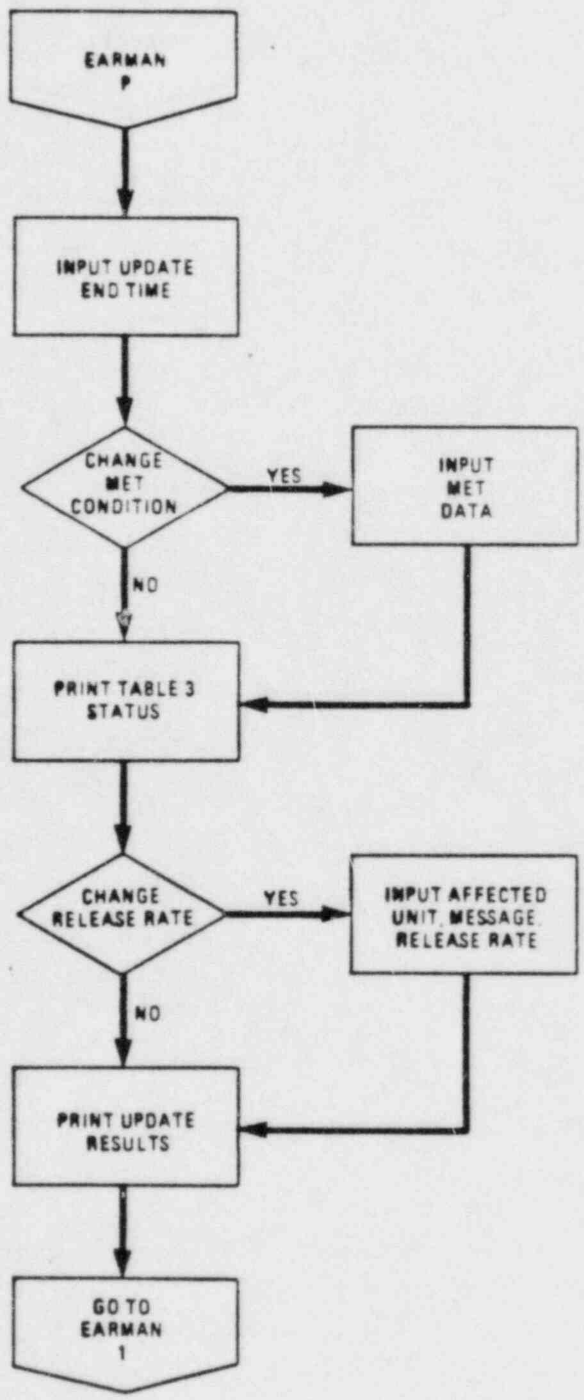
EARMAN KEY SET #1



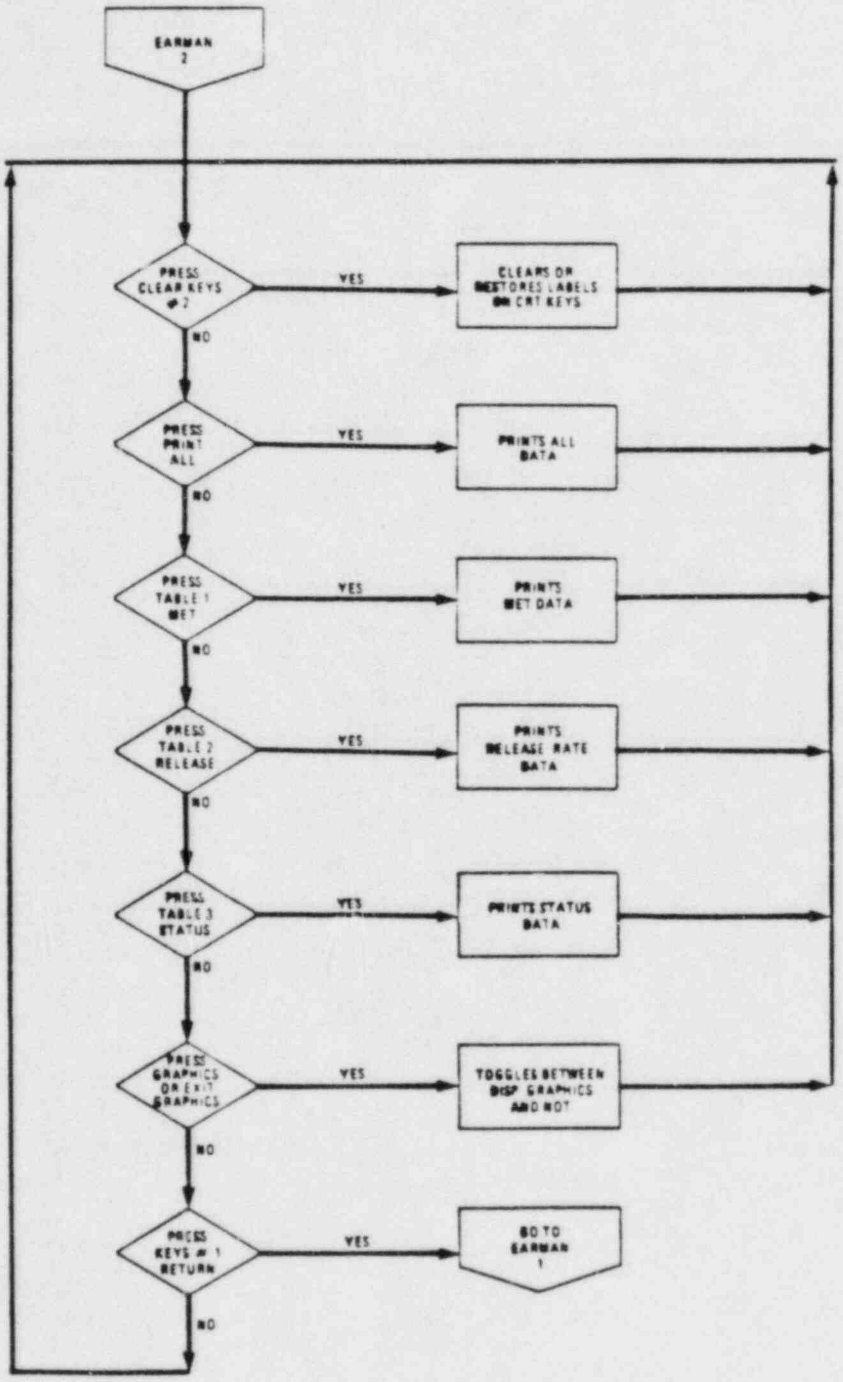
EARMAN NEXT PROJECTION



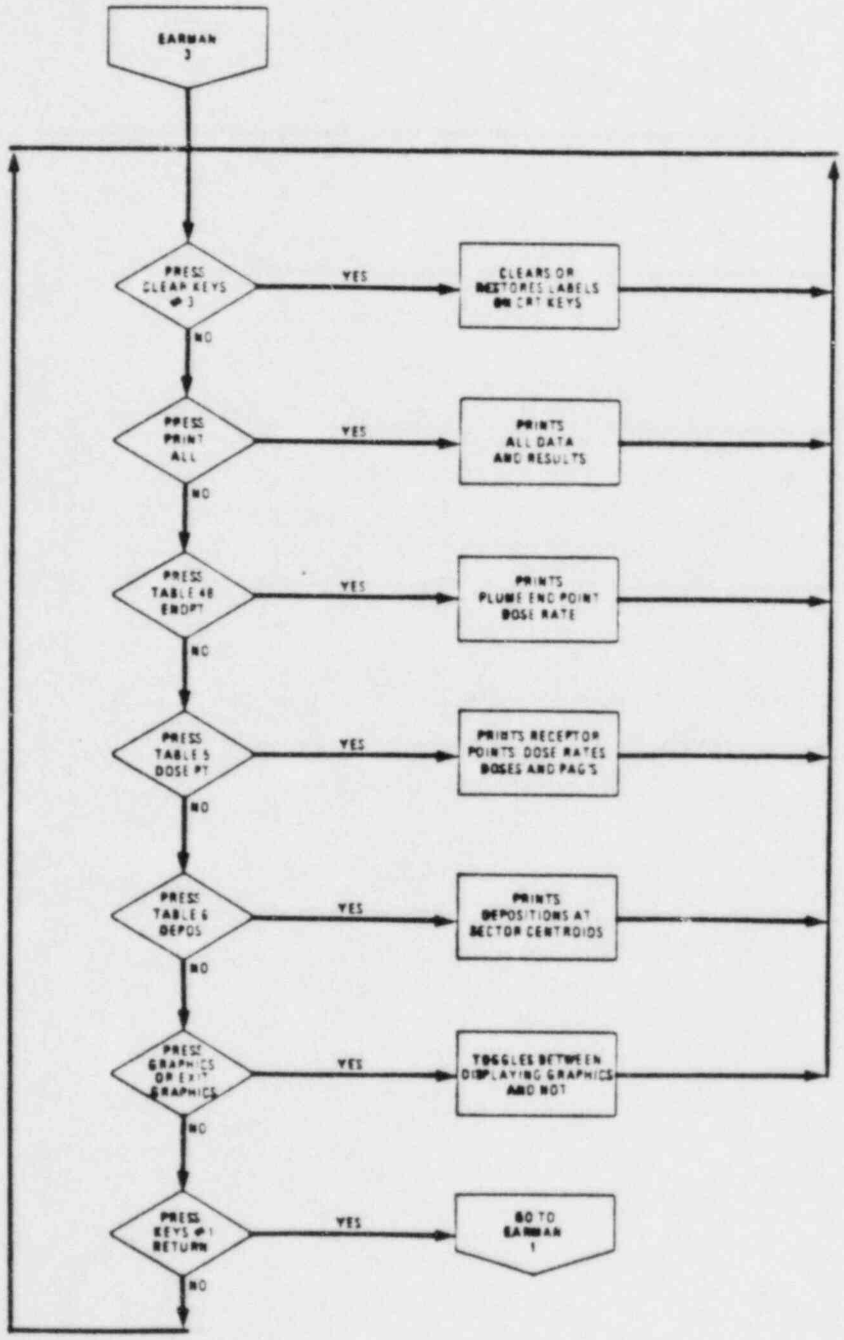
EARMAN NEXT UPDATE



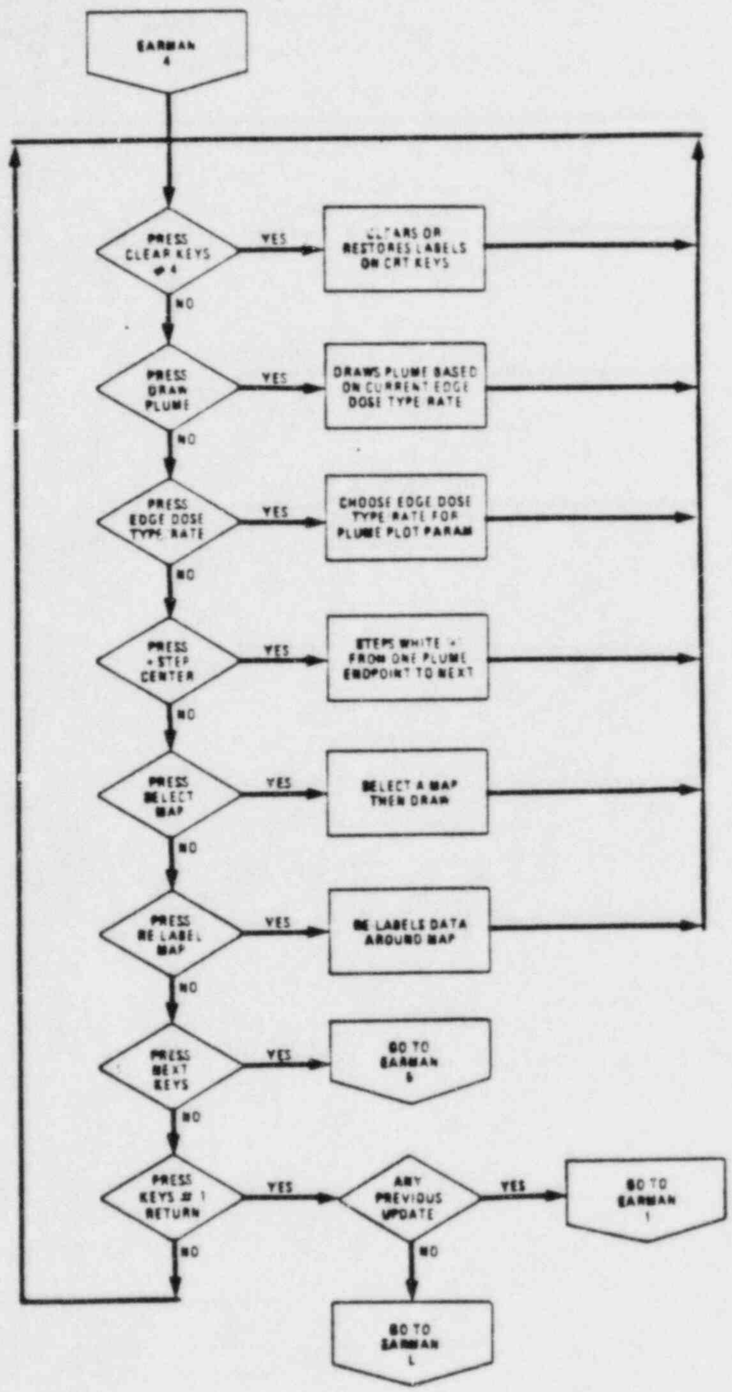
EARMAN KEY SET #2



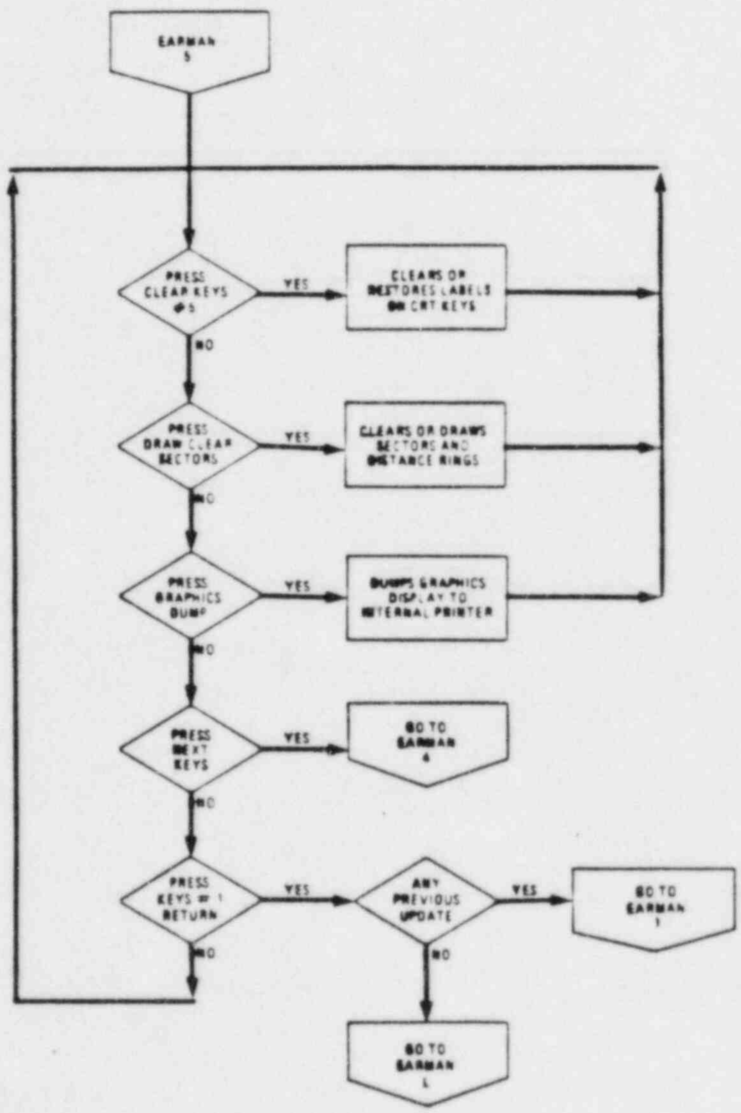
EARMAN KEY SET #3



EARMAN KEY SET #4



EARMAN KEY SET #5



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e. EARRDC/EARrdc PROGRAMS

The release rate definition program EARRDC/EARrdc is linked by the core program EARMDC/EARADC. Thirteen different release options are available in these programs. The logic for each option is outlined in the following fourteen pages of flow diagrams.

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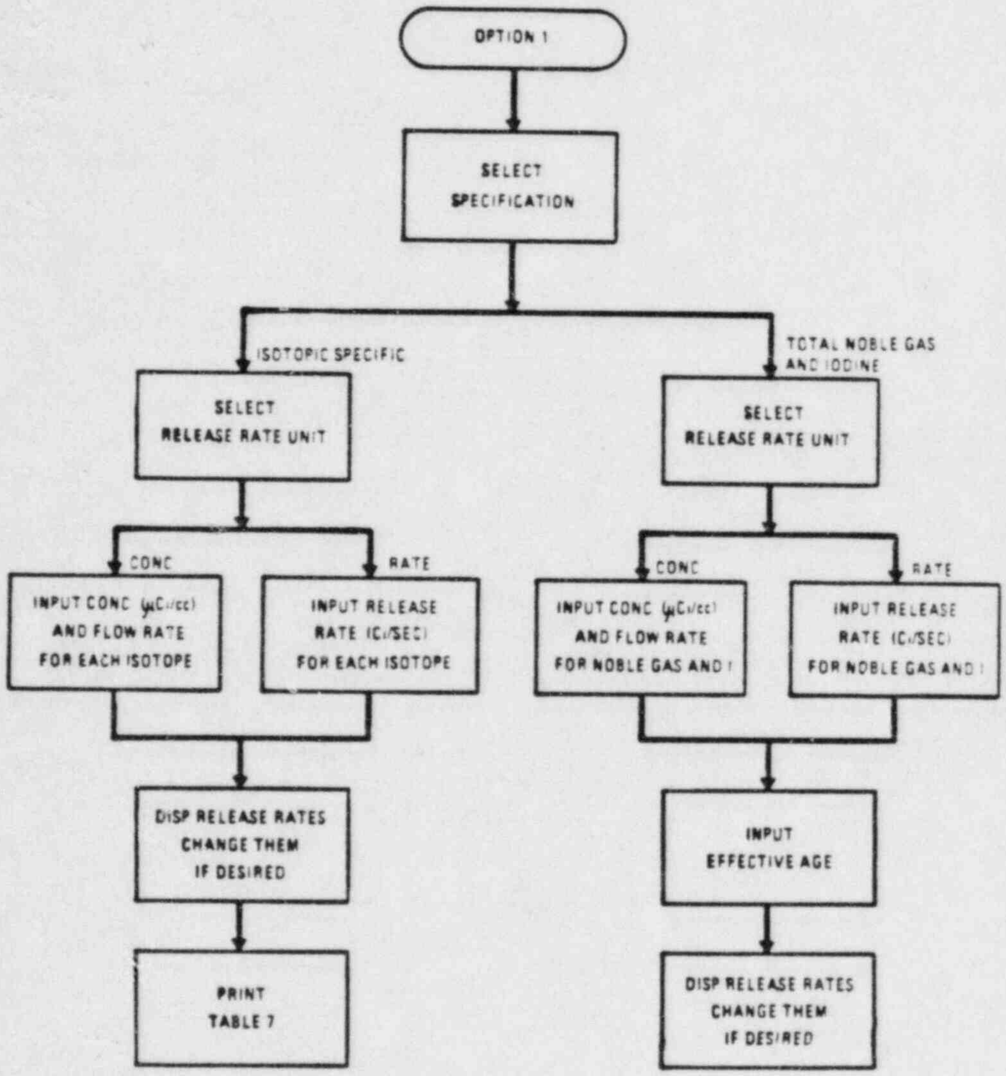
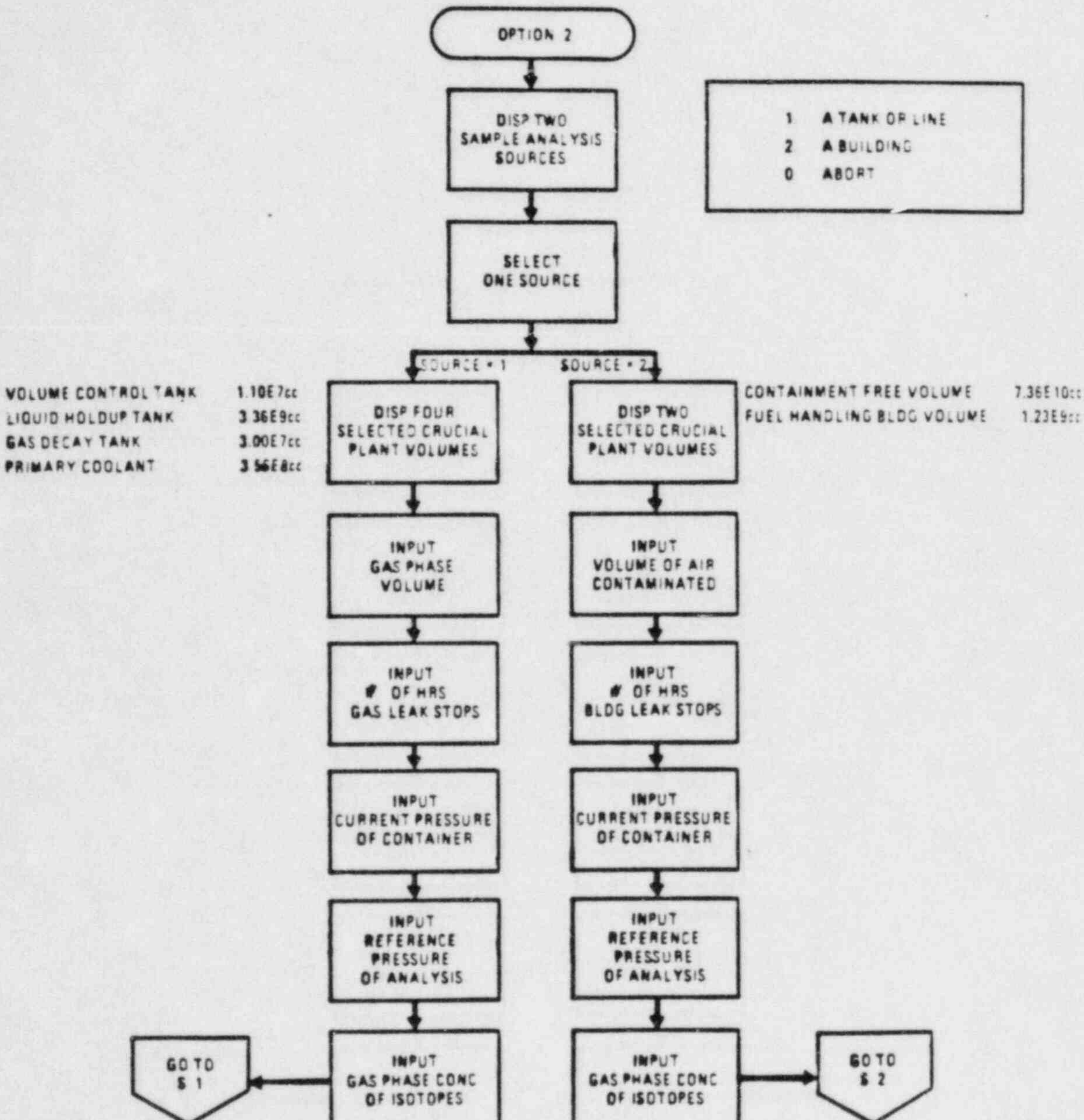
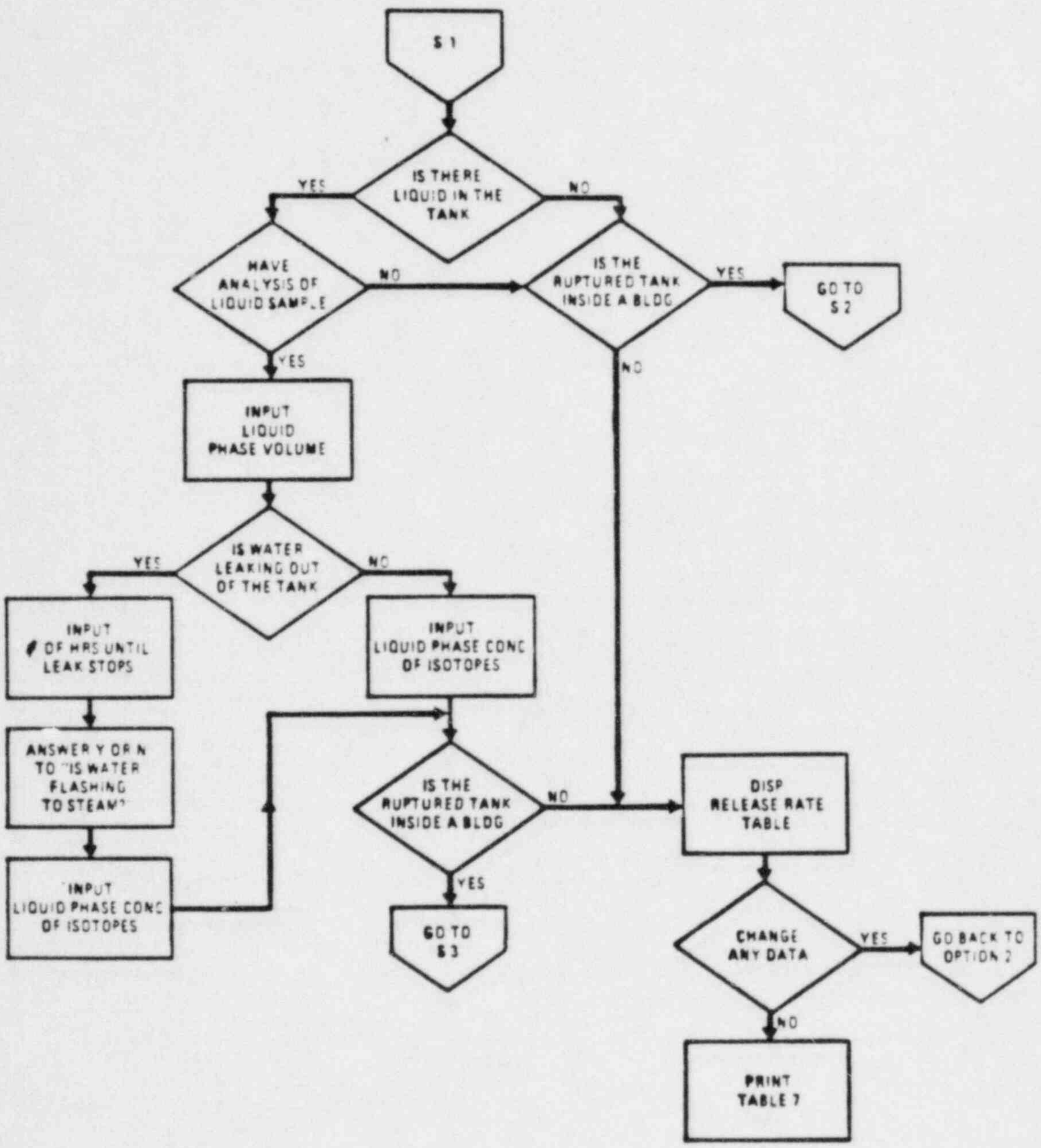
RELEASE RATES MANUAL SPECIFICATION



TANK / BLDG INVENTORY FROM SAMPLE ANALYSIS (1 OF 4)

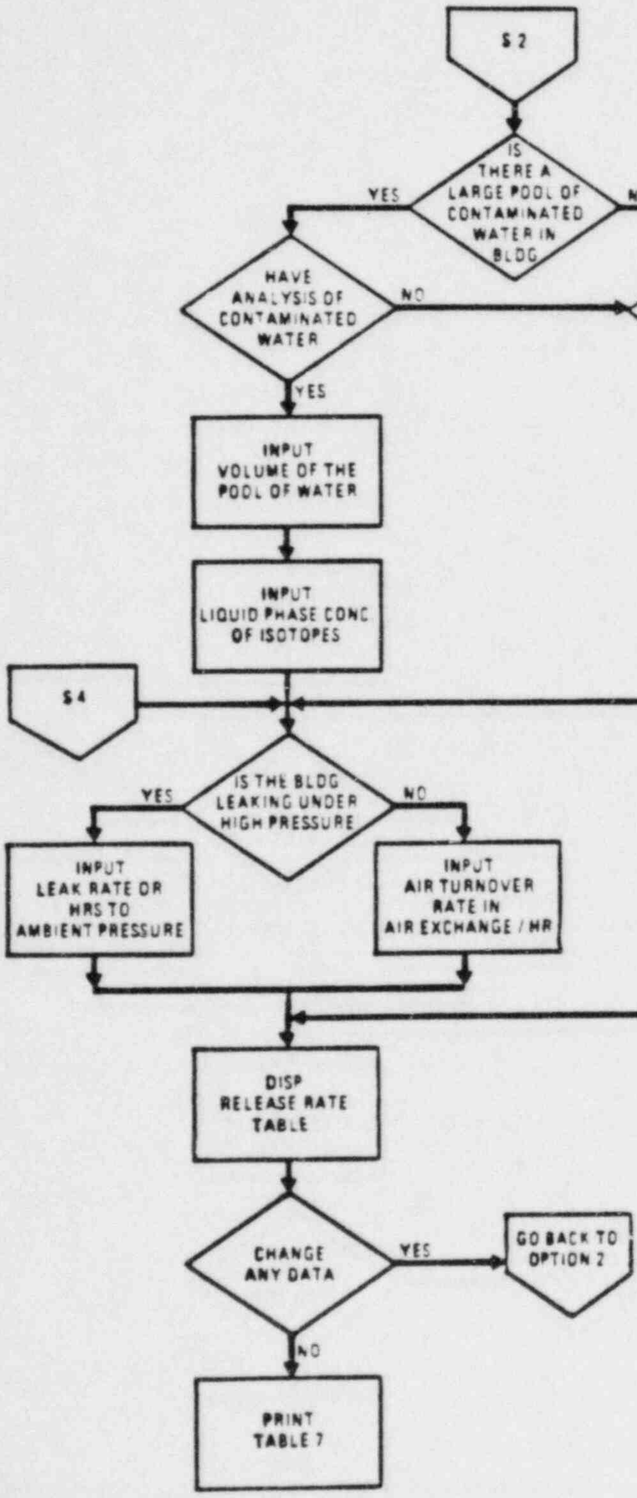


TANK / BLDG INVENTORY FROM SAMPLE ANALYSIS (2 OF 4)

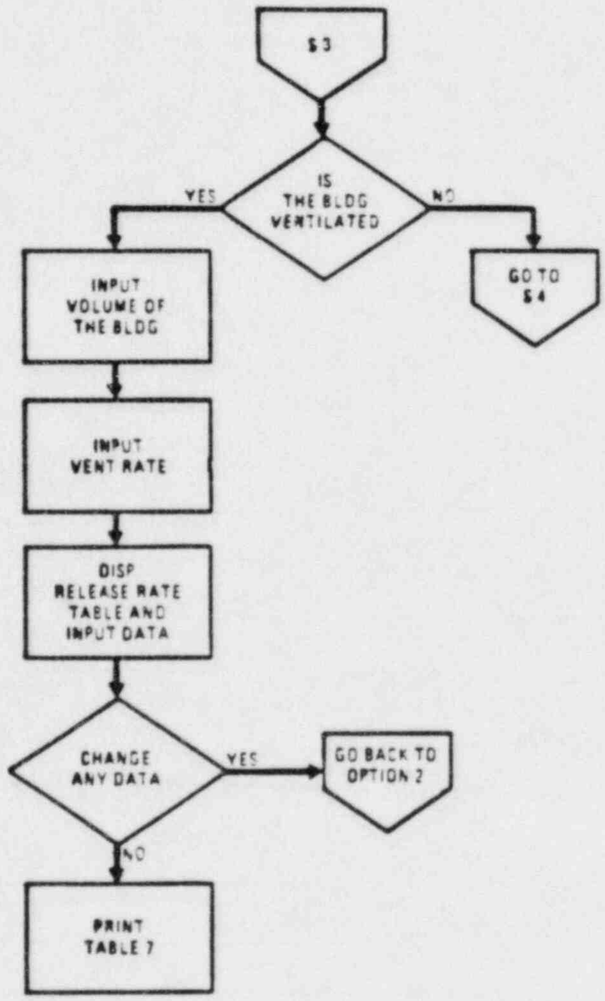


DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2	NUMBER EP EF-6 REVISION 3 DATE 07/06/84 PAGE 44 OF 63
TITLE OPERATING PROCEDURES FOR EARS 9845C CONTROLLING STATIONS	

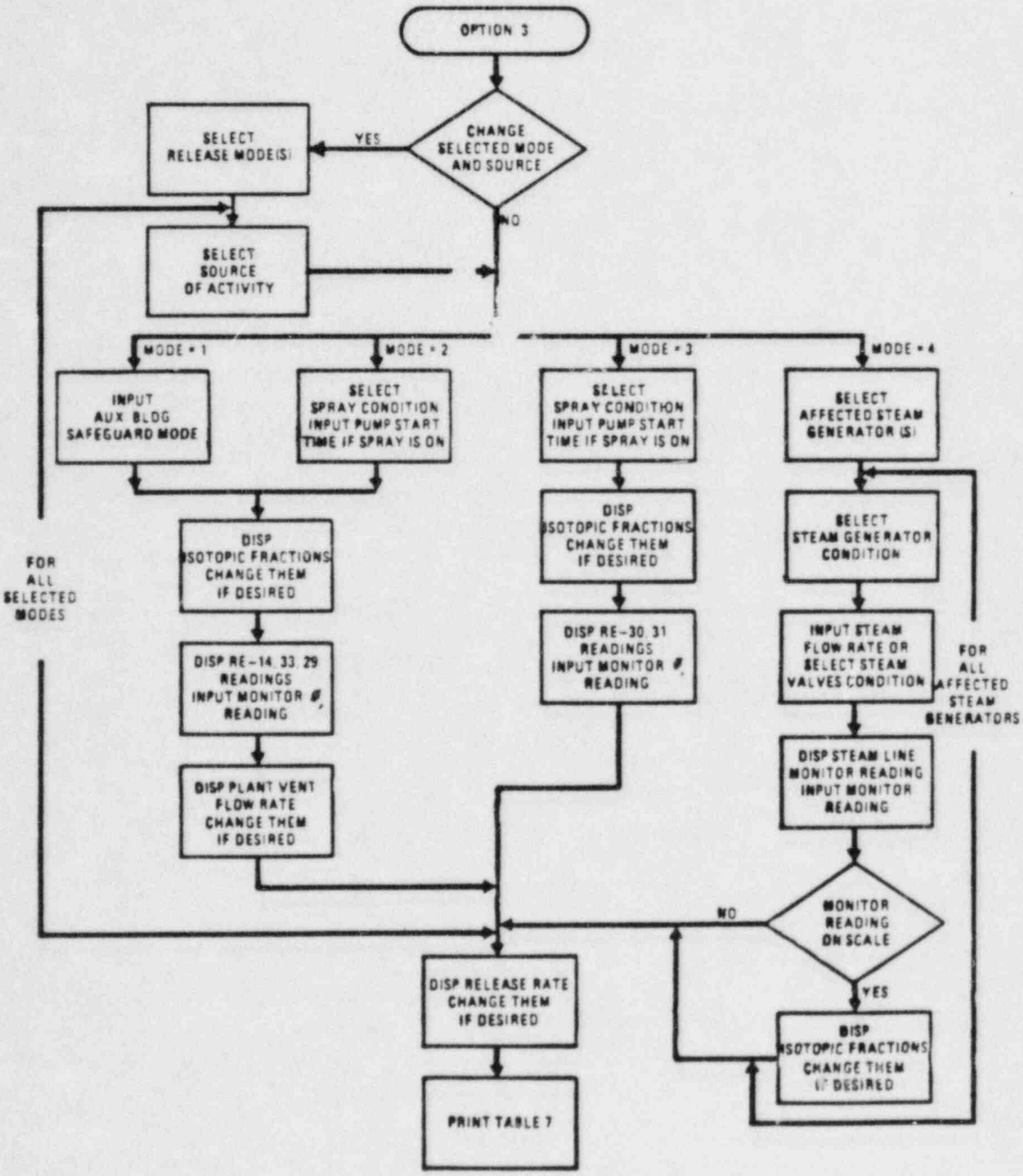
TANK / BLDG INVENTORY FROM SAMPLE ANALYSIS (3 OF 4)



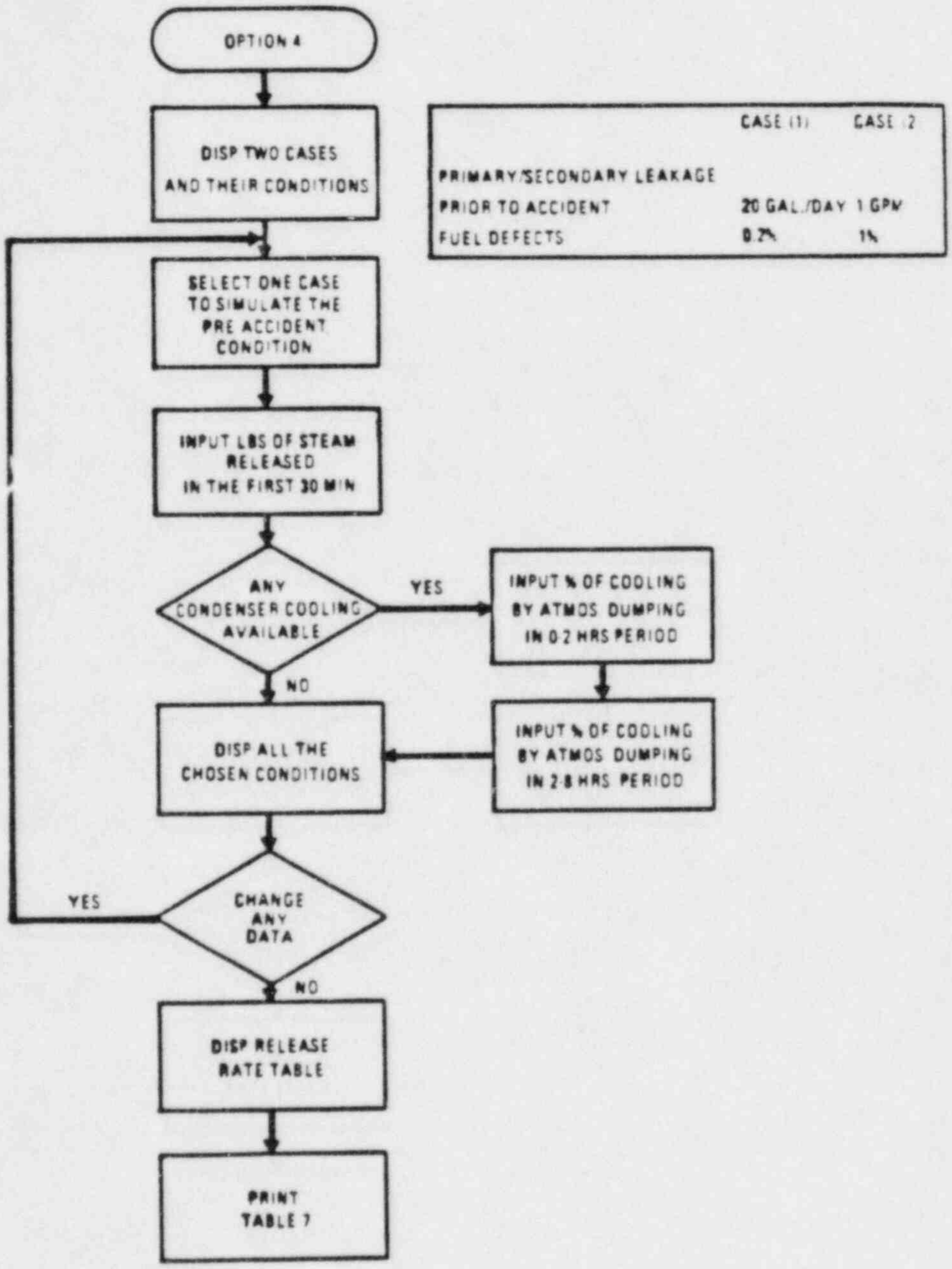
TANK / BLDG INVENTORY FROM SAMPLE ANALYSIS (4 OF 4)



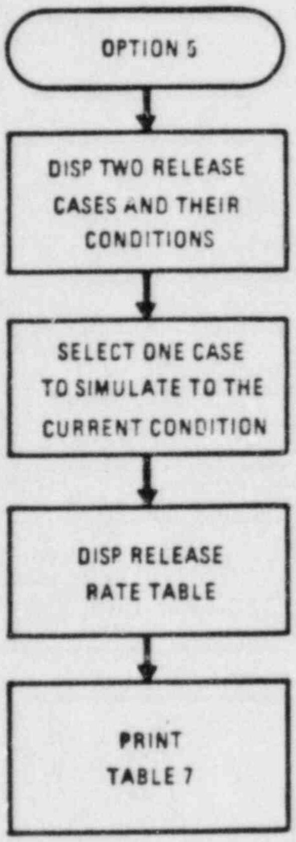
CONVERSION FROM RMS READINGS



STEAM GENERATOR TUBE RUPTURE

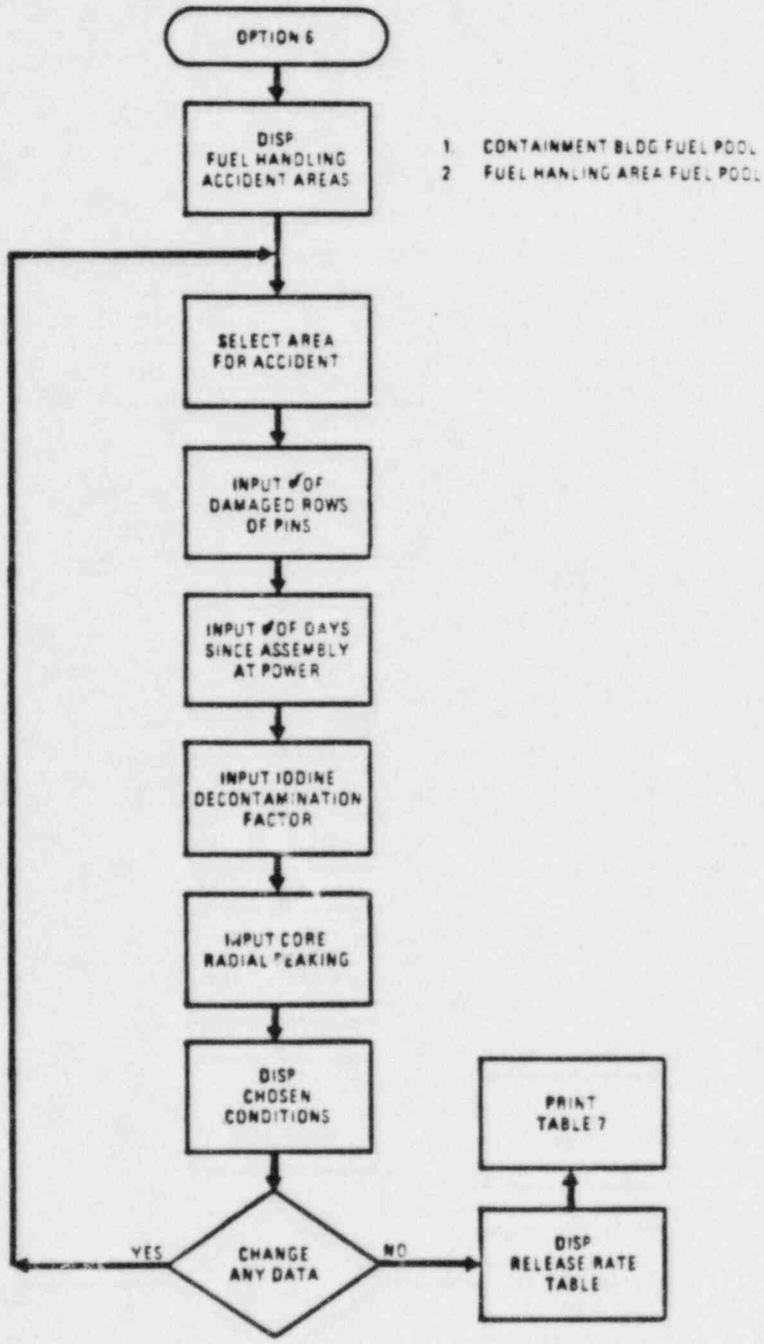


LOSS OF COOLANT ACCIDENT

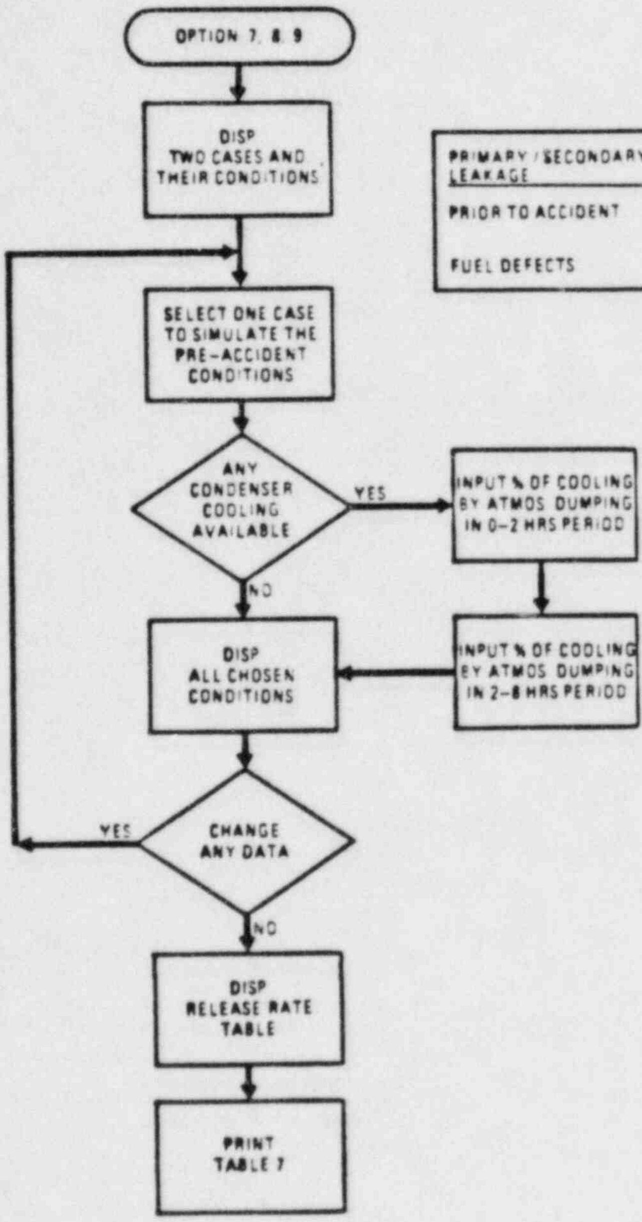


	CASE (1)	CASE (2)
FREE ACTIVITY IN CONTAINMENT:		
NOBLE GASES:	100% GAP	100% CORE
IODINES:	25% GAP	25% CORE
ANTICIPATED CONTAINMENT LEAK RATE:		
FIRST DAY:	0.05%/DAY	0.1%/DAY
LATER DAYS:	0.025%/DAY	0.05%/DAY

FUEL HANDLING ACCIDENT

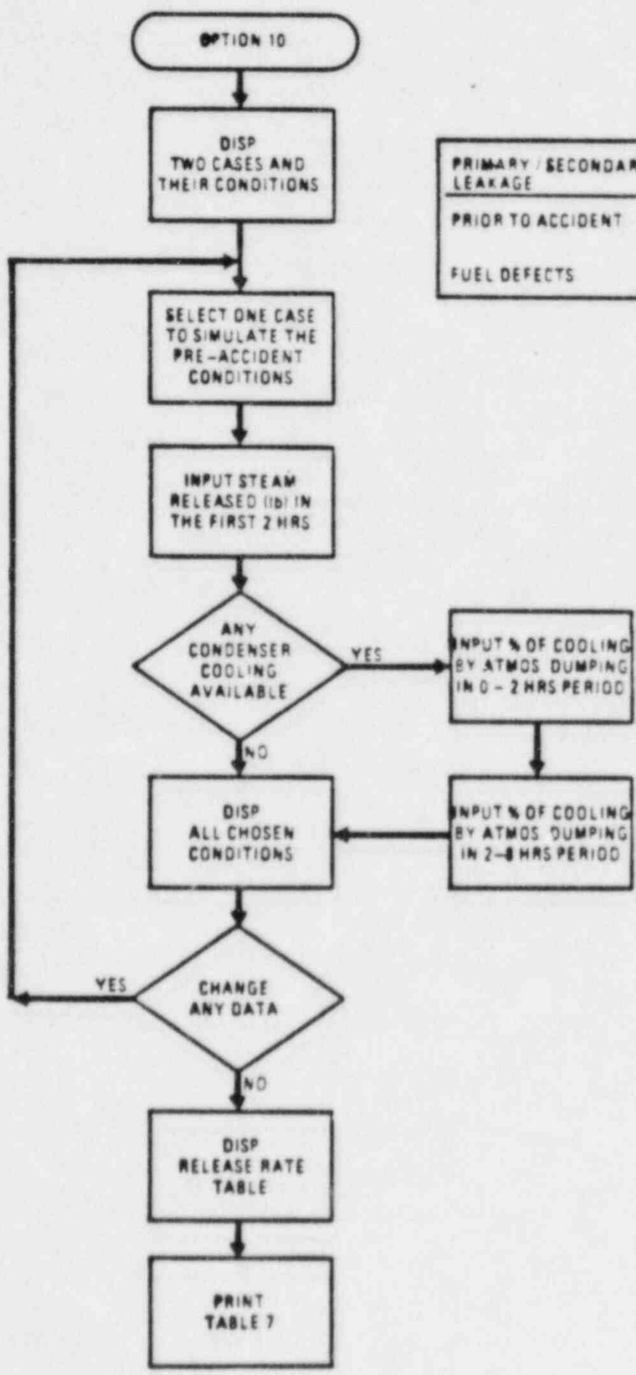


CONTROL ROD EJECTION ACCIDENT
LOCKED PUMP ROTOR ACCIDENT
LOSS OF OFFSITE POWER INCIDENT



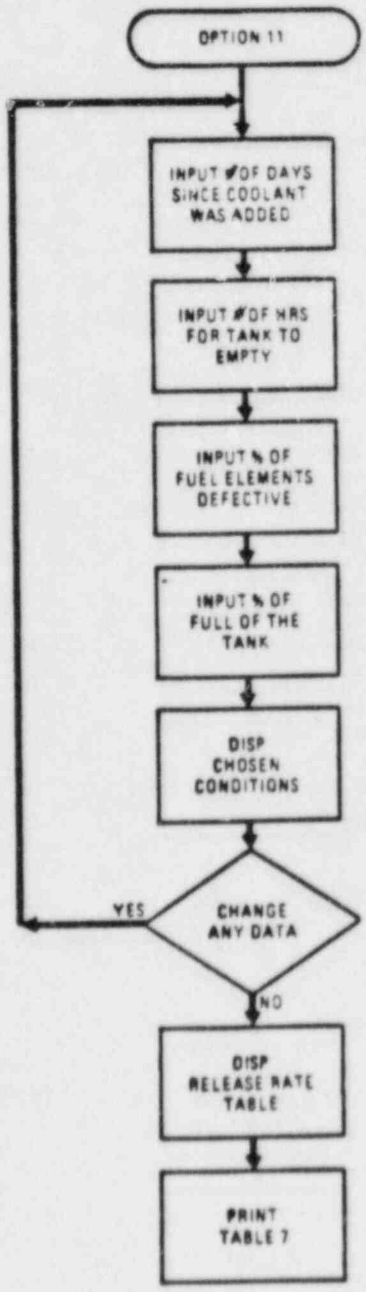
PRIMARY / SECONDARY LEAKAGE	CASE (1)	CASE (2)
PRIOR TO ACCIDENT	20 GAL /DAY	1 GPM
FUEL DEFECTS	0.2%	1%

STEAM LINE BREAK ACCIDENT

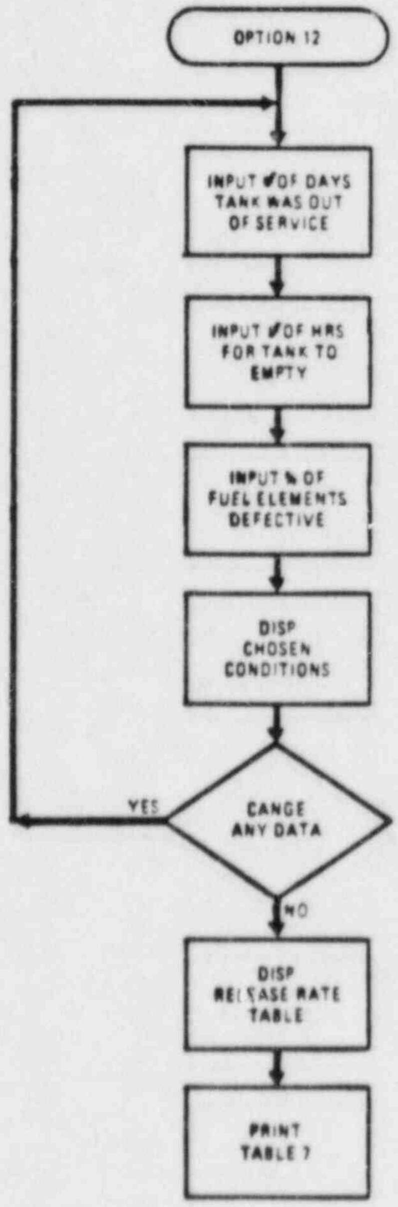


PRIMARY / SECONDARY LEAKAGE	CASE (1)	CASE (2)
PRIOR TO ACCIDENT	20 GAL/DAY	1 GPM
FUEL DEFECTS	0.2%	1%

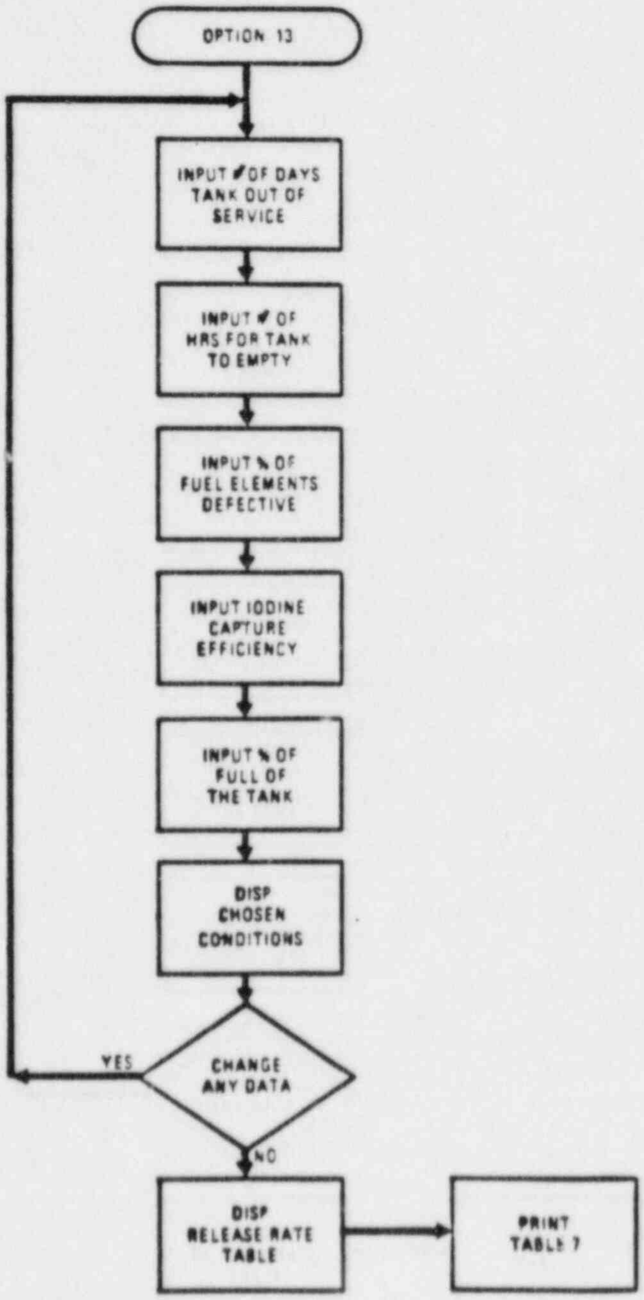
VOLUME CONTROL TANK RUPTURE



WASTE GAS DECAY TANK RUPTURE



LIQUID HOLDUP TANK RUPTURE



6. Terms Common to EARAUT and EARMAN

Meteorological Data Input

Meteorological data from the primary and the backup MET towers are sent to the HP-1000 computer at the TSC. Both STATUS and EARAUT programs can 'poll' the HP-1000 for MET data (averaged, previous or current), including wind direction, wind speed, sigma theta, lapse rate, precipitation, and mixing height (provided the data link between this station and the TSC exists).

During a drill run, MET data is read from the HP-1000 drill database.

If EARMAN program is run, the operator has to enter all MET data manually.

Release Estimate

The DCPP Emergency Procedure RB-9 (Ref. 2) is the technical basis for the EARS release rate calculations. The radionuclide distribution and release rate are determined in the EARS subprograms EARrdc or EARRDC, using one or more of the following techniques:

A. Plant vent monitors and vent flow indication.

B. Containment area monitors and derived release rate based on containment leak rate, etc.

C. Isotopic analyses of selected plant containers and systems performed prior to the accident.

D. Steam line monitors and steam flow rate meters.

E. Final Safety Analysis Report (FSAR)(Ref. 3) accident scenarios:

- -Steam Generator Tube Rupture Accident
- -Loss of Coolant Accident (LOCA)
- -Fuel Handling Accident
- -Control Rod Ejection Accident
- -Locked Pump Rotor Accident
- -Loss of Offsite Power Accident
- -Steam Line Break Accident
- -Volume Control Tank Rupture Accident
- -Waste Gas Decay Tank Rupture Accident
- -Liquid Holdup Tank Rupture Accident

When using the FSAR cases, the operator must exercise judgement as to whether the 'expected case' or the 'design basis' estimates are appropriate to adequately describe the accident. The DCPP Emergency Procedure RB-11 (Ref. 4) indicates that unless actual release data is available, the operator should initially choose the 'design basis' (more conservative) values in determining initial accident classification.

F. If none of the FSAR accident types is appropriate, the 'Manually Specified Release Rate' or 'Tank or Building Inventory' permits manual entry of radionuclide release data, either by isotope or as total noble gases and iodines.

P.A.G. Table

The Protective Action Guide (PAG) criteria used in the EARS programs are from Table 5.1 of Reference 5. They apply to the total cumulated dose (or dose commitment) from the time of release up to the time of interest. The criteria are:

1. No action needed if Whole Body dose <0.5 rem* and Thyroid dose <5 rem.

2. Sheltering recommended if Whole Body dose >= 0.5 rem* and Whole Body dose <5 rem, or Thyroid dose >=5 rem and Thyroid dose <25 rem.

3. Evacuation recommended if Whole Body dose >=5 Rem or Thyroid dose >= 25 rem.

Projections and Updates

It is possible to run unlimited number of class A 'dose projections' before the first update and between any two subsequent updates, and forty segmented Gaussian modeled, near 'real-time' dose updates. A 'projection' is a straight line Gaussian modeled dispersion and dose calculation which does NOT deposit activities but does take into account previously accumulated doses from updates. An 'update' is a complete set of segmented Gaussian modeled dispersion and dose calculations which disperses and deposits activities along the travelling direction.

In EARMAN operation, at the end of either projection or update calculations, a set of output tables is automatically printed.

*0.5 rem is the PAG criteria set by the State of California.

Edge Dose Rate

The edge dose rate is the plume exposure rate at the edge of the plume as displayed for the dose type (thyroid or immersion) selected. This is displayed on the right-side of the CRT graphics area. If the edge dose rate value chosen is greater than the plume center dose rate, message "Edge dose rate > Centerline dose rate" is displayed. When a new edge dose rate is chosen, a plume with this new dose rate will be drawn. This is to prevent confusion regarding the parameters selected and the particular plume displayed.

The edge dose rate is always in mrem/hr. The default value in the EARS is 0.1 mrem/hr. It can be changed by pressing the EDGE DOSE TYPE/RATE soft key and entering a new edge dose rate.

Dose Type

Two different dose types can be selected: thyroid or immersion. Whenever a new dose type is selected and a previous plume is already displayed, the new plume will be redrawn for the new dose type.

Radius and Plume Center

The value displayed as '+Radius' on the right-side of the CRT graphics area is the minimum distance in meters from the plume segment center (denoted by a small white cross on the graphics) to the edge of the plume for a given edge dose rate. This marker is used to indicate the 'centers' of the plume segments, starting from the earliest (generally the outermost segment) to the latest segment (generally the innermost or closest to the site). The plume center-line dose rate is indicated in mrem/hr under the '+Center Dose Rate' label on the right-side of the CRT graphics area.

Each time the STEP CENTER soft key is pressed, the white cross will move to the next plume segment center and the corresponding center-line dose rate and radius will change accordingly, cycling from the earliest segment to the latest.

Sector Element

The cumulative deposition data are listed for each of 96 'sector elements'.

A sector element is an area bounded by a division of the compass into 16 sectors (from number 1 centered on North to number 16 on NNW) with radial distances as 800 meters to 2 miles, 2 to 5 miles, 5 to 10 miles, 10 to 15 miles, and 15 to 20 miles.

Cumulative Deposition

The cumulative deposition listed as Ci/m**2 of 'Cs-137 equivalents' is the quantity of Cs-137 which would yield a direct radiation exposure rate from ground plane deposition equal to the decay-corrected sum of all deposition which has occurred for that period. Due to uncertainties involved in calculating both wet and dry deposition, this information is meant just to provide guidance to field survey teams as to where deposition is likely to have occurred. The values listed have relatively large uncertainties and should be used together with accurate field survey data in determining appropriate protective actions.

Output Tables

The EARS output is listed in tabular forms as:

Table 1 (EARMAN) or Table 1A (EARAUT or STATUS) - MET data (wind speed, wind direction, sigma theta, lapse rate, precipitation, stability classes, and mix height);

Table 1B (EARAUT or STATUS) - PIC data;

Table 1C (EARAUT or STATUS) - RMS data;

Table 2 - Release rate data in Ci/sec;

Table 3 - Emergency status data (projection or update duration, incident and release start times, accident type and any message);

Table 4 (EARMAN) - Plume segment radial intercept (RI) points dose rates and endpoints (EP) dose rates and doses data; A RI point is the intersection of a plume segment centerline with one of the radial rings: 800 m, 2, 5, 10, 15 or 20 miles.

Table 4A (EARAUT) - Plume segment radial intercept (RI) points dose rates data;

Table 4B (EARMAN or EARAUT) - Plume segment centerline endpoint (EP) dose rates data;

Table 5 (EARMAN or EARAUT) - Dose rates, doses and P.A.G.'s at specific locations;

Table 6 (EARMAN or EARAUT) - Deposition data by sector elements.

Table 7 (EARMAN) - Dose equivalent I-131 and Cs-137 release rates, total noble gas release rate and averaged energy released per disintegration.

7. EARS Support Software

The function of the EARS support programs is to initialize, edit or review the EARS data files. These programs include EAREDT, EARSED, EARSDP, EARKSP, EARKDC and EARDOC, and are all stored on the HP-7906 disc drive at the stations. These programs are not normally used during emergency conditions.

EAREDT - Data File Edit Program

The EAREDT program is used to setup, edit, or print the fixed data files used by the EARS for system parameters, isotope specific parameters, FSAR release rate data, site boundary locations, fixed PIC locations, RMS parameters, etc. This program can also duplicate from one msus to another all of the data files used by the EARS.

The data files accessed by this program are ERDSYS, ERNRMS, ERRTXY, ERDISO, ERBNDY, ERPLOC, ERNMAP, ERDMET, ERNSTN, ERNMAP, ERSRCE, ERMONI, ERELOC, ERDGRD and ERSTDC.

EARSED - Data String File Edit Program

The EARSED program allows the operator to access the data base to print, edit or initialize the projection and update string data stored on ERDSTA and ERDSTR, respectively. Rather than decoding the strings, this program edits or prints the ASCII characters of the string for each of the parameters. EARSED can also purge old data on ERDSTA or ERDSTR.

EARSDP - Calculational Parameters Plot Program

The EARSDP program allows the operator to print the immersion dose correction factors and to plot sigma y, sigma z and plume depletion curves used in the EARS calculations. Data files accessed by this program are ERDSIG, ERDDEP and ERDIMR.

EARKSP - Soft Key Functions Defining Program

The EARKSP program is used to create and edit the soft key labels used in EARAUT, EARMAN, and STATUS programs. Labels for the soft keys are stored in a string array that is read from a data file on the program mass sotrage media (7906 disc cartridge).

Data files EARSKY, EARACK, and EARKEY are used in program; STATUS, EARAUT, EARMAN, respectively.

EARKDC - Graphics Documentation Program

The EARKDC program is a documentation program used to describe the CRT screen layout and soft key functions of the EARMAN, EARAUT and STATUS programs.

EARDOC - File Documentation Program

The EARDOC is a documentation program that lists all types of data files in the HP-9845C software. For each data file or type of data file, the file name, size, contents and general purpose can be listed.

8. REFERENCES

1. "EARS User's Operating Manual for CIRC Station", Rev. 3, July, 1984.

2. PGandE: "DCPP Emergency Procedure RB-9 - Determination of Release Rates", Rev. 1, 1983.

3. PGandE: "DCPP Final Safety Analysis Report", Chapter 15.

4. PGandE: "DCPP Emergency Procedure RB-11 - Emergency Offsite Dose Calculations", Rev. 1, 1983.

5. EPA: "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents"; EPA-520/1-75-001, 1975.

APPENDIX A

EARS HARDWARE

The EARS computer hardware at CR, TSC, and EOF EARS stations includes:

MODEL	DESCRIPTION	FUNCTION
HP-9845C	Desktop Computer w/graphics ROM, I/O ROMs, Mass storage ROM, Assembly execution ROM	EARS graphics computer at this station
HP-7906MR	Disc Drive	Mass storage unit
HP-98041A	Disc Interface	Interface the 9845C with the 7906
HP-13037C	Disc Controller	Controls 7906 operation
HP-98036A	Serial Interface (select code 5 at TSC & CR) (select code 4 at EOF)	Interface the 9845C with the modem to the TSC

APPENDIX B

LOADING HP-9845C INTERNAL PRINTING PAPER

Printer paper is loaded by using the following procedure. To perform the following steps, the computer must be switched "ON".

1. Lift or remove the access cover on the top of the printer by pushing down on the raised surface at the rear of the door. The door can be removed by lifting up and pulling it toward you. It is reinstalled by placing it on the hinge pins and pushing until it snaps into place.

2. Remove and discard the paper core of any previous roll. If the remaining roll is small and a new roll is to be used, remove the old roll by:

   a. Unrolling and lifting it upwards until the roll is above the printer, then,

   b. Holding the roll firmly and pulling it upward and forward; the paper guide will tear the paper off.

3. If any paper remains in the printer mechanism, remove it by pressing the PAPER ADVANCE key until the paper stops moving.

4. Remove the first layer of paper from a new roll. Be sure the paper has a cleanly torn or cut edge, as paper with a ragged edge may not load properly. The corners can be folded back to form a point for easier loading.

5. Insert the new roll such that the free end is positioned as shown. Press the PAPER ADVANCE key until paper appears at the front of the printer, then close the access door.

PG&E **Pacific Gas and Electric Company**

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

NUMBER	EP RB-15
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EMERGENCY OPERATING PROCEDURE

SENTRY POST ACCIDENT SAMPLING SYSTEM

TITLE INITIAL SAMPLING EXERCISE AFTER AN ACCIDENT

APPROVED R. C. Thornberry 7-27-84

PLANT MANAGER DATE

IMPORTANT TO ENVIRONMENTAL QUALITY

SCOPE

Nureg 0737 requires samples to be taken and analyzed within 3 hours after the decision is made to take a sample. This procedure is designed to ensure safe and reliable methods to meet this requirement. The samples that will be collected and analyzed from this procedure are as follows:

1. For RC (Reactor Coolant) Samples:
   a. In-line pressurized flask with off-gasing for:
      1) Gas Chromatograph Analysis
      2) Diluted stripped gas samples for isotopic analysis
   b. Diluted RC samples for
      1) Boron analysis
      2) Isotopic Analysis
2. For CA (Containment Air) Samples:
   a. Diluted CA samples for isotopic analysis
   b. Gas Chromatograph Analysis

This general procedure is made up of 7 specific procedures detailing Sentry access/egress, the steps to obtain the required samples for the initial sample exercise following an accident and disposal or storage of samples. This procedure may be used again for subsequent sample exercises if the same information is required at a later time. For any other type of a sample, procedure EP RB-16 will give full details on the types of sample and the various analyses that can be performed as well as the specified procedures for obtaining samples.

This procedure and the procedure listed below, and changes thereto, require PSRC review.

PROCEDURE

1. Specific Procedures

The detailed instructions for performing the sampling outlined in the Scope of this procedure are covered in the following sub-procedures:

EP RB-15:A -- Sentry Lab Access/Egress and Initial Actions During an Emergency

This procedure details necessary steps for accessing and egressing the lab, Gas Chromatograph startup, initial system lineup, and annunciator testing prior to the first sample exercise during an accident.

EP RB-15:B -- Reactor Coolant Sampling

This procedure details the steps required for sampling any one of 5 different sample sources and obtaining a stripped gas sample and making available for gas chromatographic analysis.

EP RB-15:C -- Containment Air Sampling

This procedure details the steps required to make containment air available for gas chromatographic analysis and to dilute containment air for isotopic analysis.

EP RB-15:D -- Gas Chromatographic Hydrogen Analysis

This procedure details the steps required (1) to check the instrument calibration prior to sample analysis and then (2) to load and analyze a gas sample from the RC module of the LSP or from the CASP. Sample gas should be available at RC-V-15 before using this procedure.

EP RB-15:E -- Post-Accident RCS Liquid and Gas Sample Handling

This procedure details the steps required to prepare (1) a diluted liquid sample for boron analysis, (2) a diluted off-gas sample for isotopic analysis (3) a diluted liquid sample for isotopic analysis, and (4) a diluted containment air sample for isotopic analysis.

EP RB-15:F -- Data Analysis

This procedure provides a standard format to record data obtained in the EP RB-15 procedures.

EP RB-15:G -- Sample Storage and Disposal

This procedure provides a means for disposal of stripped gas samples and storage of RCS liquid samples.

REFERENCES

1. Sentry High Radiation Sampling System Operations and Maintenance Manual

2. EP RB-16

3. Nureg 0737

PG&E **Pacific Gas and Electric Company**

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

NUMBER	EP RB-15:A
REVISION	0
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TITLE EMERGENCY OPERATING PROCEDURE SENTRY POST-ACCIDENT SAMPLING SYSTEM -- INITIAL ACTIONS DURING AN EMERGENCY

APPROVED R. C. Thornberry 7-27-84

PLANT MANAGER DATE

IMPORTANT TO ENVIRONMENTAL QUALITY

PURPOSE

The purpose of this procedure is to define some of the actions taken when a decision is made by the Site Emergency Coordinator to obtain a post accident sample using the Post Accident Sample System (PASS).

This procedure guides, with consideration of plant emergency radiation hazards, the Sentry team to access and make operable the Sentry room. It also guides the team to withdraw from the Sentry room upon sample acquisition. This procedure and changes thereto requires PSRC approval.

DISCUSSION

This procedure ensures sample recovery with a minimum risk to personnel in a limited time frame.

The movable shield at the south entrance of the Sentry Room should normally block that access route. Therefore ingress and egress may be required across the RCA boundary. Performance of this procedure may require the transfer of radioactive samples to non-RCA's. For these reasons this procedure involves exemptions from certain routine RCA access requirements. Personnel implementing this procedure should be covered by an SWP during an accident, drill, or drill-like training. Routine use of the Sentry room is covered by the C&RP routine sampling RWP.

Particularly hazardous or unexpected conditions may occur in post accident situations. Direction by appropriate supervision may augment or supercede portions of this procedure because every possibility cannot be anticipated.

PREREQUISITES AND PRECAUTIONS

1. The Site Emergency Coordinator should pre-plan post-accident sampling with the Emergency Radiological Advisor and the Site Chemical and Radiation Protection Coordinator prior to ordering a plant entry (i.e., prior to deciding to collect a post-accident sample) when unusually hazardous radiation or contamination levels are known or suspected to exist.

2. A sufficient number of properly qualified personnel to complete the task should be available prior to making the post accident sample decision. This might include:

   a. Two people on the Sentry team; one of whom is a qualified C&RP Technician and the other an Unescorted Radiation Worker.

   b. A sample transporter qualified as a C&RP Technician.

   c. A count room qualified person in the TSC lab.

3. The Work Permit will specify protective equipment. Unless conditions warrant less stringent requirements, it is suggested that full PC's, SCBA's and accident dosimetry be worn.

4. The Sentry team will make a post-accident entry to the plant only when directed by supervision and when possessing a high range portable survey meter to permit surveying into areas of unknown radiological conditions.

5. The Sentry team should be informed of plant status as it pertains to significant hazards, both radiological and non-radiological, along access routes.

6. Exposure hazards, both airborne and direct radiation, in the Sentry room should be monitored remotely for pre-entry status and locally for tracking while sampling.

   a. Use the Eberline Control Terminal(s) in either Access Control or the cold machine shop to remotely address the SPING air monitor in the Sentry room, which can be read locally.

b. Area radiation monitor RE-48, in the Sentry room, can be read in the Control Room or locally.

7. Communications are vital during a plant emergency. Entry teams must be able to communicate with the Control Room and appropriate supervision.

8. C&RP Technicians have the AC4 N key required for access to areas and equipment related to this procedure and have security key cards to enter door #116. If the Sentry team does not possess either of these then take the applicable master keys located in the lock box in the R.P. office. The key to the 85' elev. post-accident equipment locker is number 37, located in the key cabinet in the R.P. office.

9. The containment isolation valves FCV-696, 697, 698, 699 and 700 are controlled from the Containment Isolation Valve Panel in the Sentry Room only. These switches require a key to operate. Keys are located in the Control Room, R.P. office, and in the Sentry room in a keybox with a breakable glass cover. These valves are to be opened only during an emergency or for testing.

10. It is important to conduct operations in an expeditious manner to provide timely vital plant status information.

PROCEDURE

1. Access to Sentry Room Area

The Diablo Canyon Shielding Review indicates that the following routes might minimize exposures.

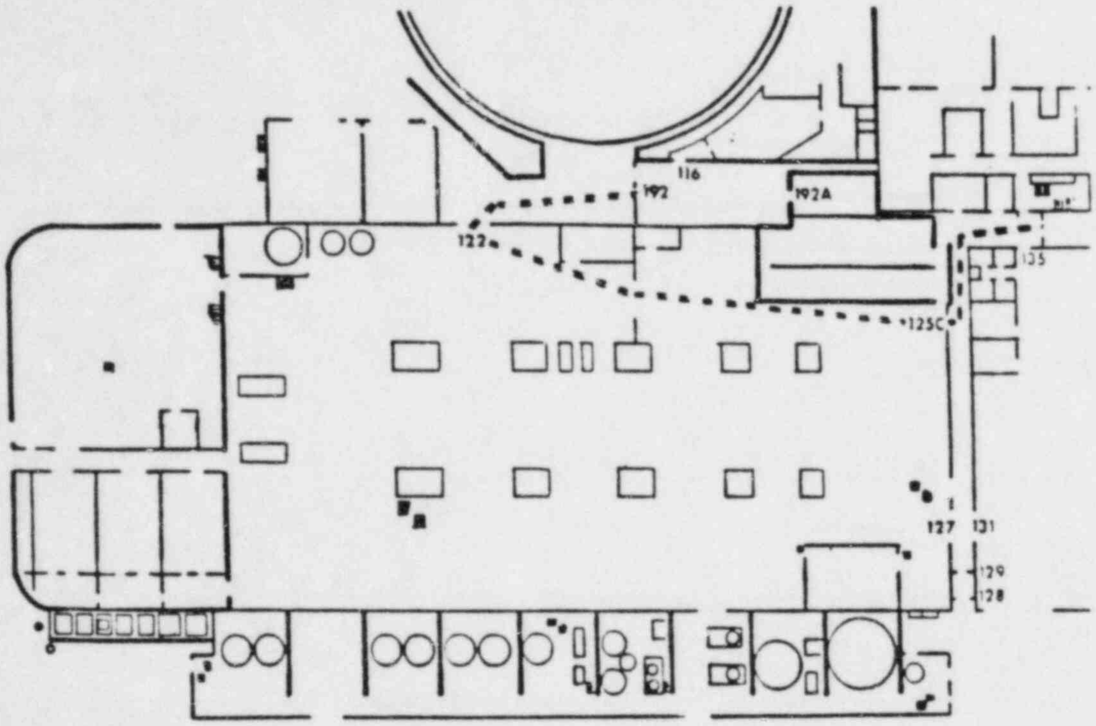
a. Via Turbine Building at 85' Elevation

Starting at the Cold Machine Shop proceed into the hallway to door #125C, proceed north to door #122 and exit building. From here turn south and enter door #192 to the Motor Repair Shop.

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

TITLE SENTRY POST-ACCIDENT SAMPLING SYSTEM
-- INITIAL ACTIONS DURING AN EMERGENCY

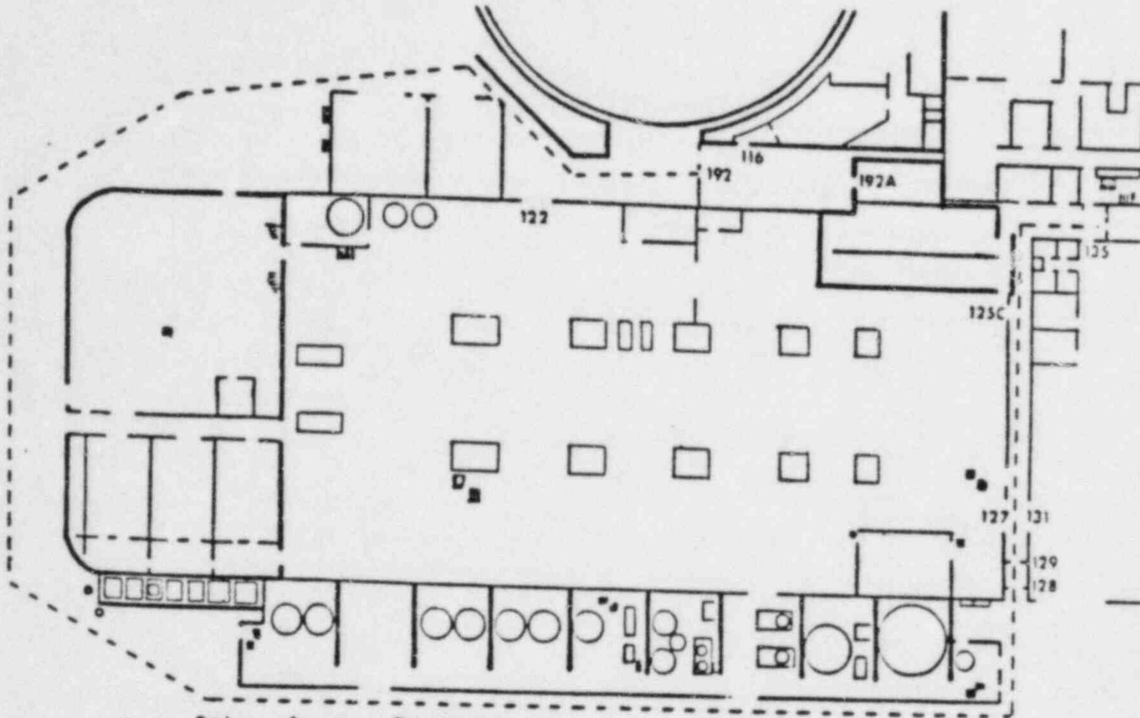
FIGURE 1



b. Around Turbine Building at 85' Elevation

Starting at the Cold Machine Shop proceed west to the outside via door #129, turn right and continue north around the Unit 1 Turbine Building looping around the transformers at the north end of the plant. Continue south to door #192 between containment and the Turbine Building. Enter the Motor Repair Shop via door #192.

FIGURE 2



c. Other Access Routes

The Figure 1 pathway is preferred. However an access route other than those above may be suggested by actual post accident conditions (e.g., fire, high energy line break, etc.). The final route selected should be directed by appropriate supervisory personnel.

2. Initial Set-up of Sentry Room Equipment

a. Gas Supply Cylinders Check

The gas supply cylinders for Sentry Room equipment are located along the east wall of the Motor Repair Shop. Proceed to the gas storage rack and verify the following:

1) The cylinder valves are fully open for all three cylinders.

2) The manifold valves are fully open for all three cylinders.

3) The argon regulator shows tank pressure of approximately 1000 psig and the regulator is set to 100 psig.

<u>NOTE</u>: If argon tank pressure is much less than 1000 psig, then the cylinder has to be changed with the spare cylinder located at the storage rack.

4) The 2000 ppm and 10% H_2 span gas cylinders should have at least 100 psig and both regulators should be set at 10 psig.

b. Emergency Ventilation System Line-up. (Optional. If proper ventilation is lined up proceed to step 2.c., Steel Shield Door Closure).

1) Climb the ladder to the cat walk and cross to enter the ventilation room. (AC4 N key required).

<u>NOTE</u>: Minimize the time that the vent room doors are open.

2) Proceed to breaker panel PPHRS, 52-12J-35 and check all breakers ON.

3) Proceed to the motor controllers for fans and heaters located to the left of the breaker panel and push the STOP and RESET pushbutton on each one.

4) EMER LEAD (IS-150) is the preferred system.

a) Open its supply and exhaust dampers and the supply and exhaust vent dampers (a total of 4 dampers) and close all other dampers.

b) Push the START pushbuttons on the motor controllers for the EMER LEAD supply fan, exhaust fan, and heater 29A, in that order.

5) EMER REDUN (IS-151) is to be used as a backup if EMER LEAD is inoperable.

a) Open its supply and exhaust dampers and the supply and exhaust vent dampers and close all other dampers.

b) Push the START pushbutton on the motor controllers for the EMER REDUN supply fan, exhaust fan and heater 29B, in that order.

6) Return to the Motor Repair Shop.

c. Steel Shield Door Closure. (Optional. If the shield door is closed proceed to step 2.d., Radiological Assessment.)

1) Proceed through door #192-A south of the Motor Repair Shop and visually check the shield door's winch cable. If the marked portion of the cable indicates the shield is closed return to the Motor Repair Shop and proceed with step d., Radiological Assessment below.

2) Quickly pass through the Motor Repair Shop and the Sentry room. Remove the cover plate from the door's pathway and return to the cable winch area.

3) Operate the winch until the marked portion of the cable visibly indicates the shield door is closed.

4) Return to the Motor Repair Shop.

d. Radiological Assessment of Sentry Room

1) Enter the Sentry room via door #116 (an RCA boundary) and the watertight door (AC4 N padlock).

2) Perform a general area radiation survey

a) Note high levels such as might exist at the south end of the room due to ECCS piping.

b) Note low level areas for sample screen surveying later.

3) Note the reading of RE-48 on the Process Control Panel (PCP). Recheck it intermittently.

4) Monitor airborne radioactivity using the SPING. If airborne levels permit the respirator, if worn, may be removed at this time. It should be donned anytime there is a potential for airborne contamination to be introduced into the room.

e. Proceed to the Ventilation Control Panel.

1) Check the alarms.

a) Press TEST and note the red alarm indicators flash while the audible alarm sounds.

b) Press SILENCE to stop the audible alarm.

c) Press ACK and note the flashing alarm indicators glow steadily.

d) Press RESET and note the red alarm indicators go out.

2) If the NORMAL VENT switch is on, turn it off.

3) If the EMER LEAD ventilation system is desired and is not operating depress in order the SUPPLY, EXHAUST, and HEATER pushbuttons.

4) Observe the appropriate indicating lights for proper operation of the desired ventilation line-up.

5) If necessary, return to step 2.b., Emergency Ventilation Line-up.

f. Containment Atmosphere Sample Line Heating

1) Proceed to the CCP and position the FUNCTION SELECT from OFF to SF1-3/GGD.

2) Observe the following:

a) The POWER ON indicator lights.

b) The flow monitor 20% and 100% flow lights turn on for approximately 25 seconds.

3) Press the PILOT LIGHT TEST pushbutton and note which lights are not functional.

4) Turn the HEAT TRACE POWER SWITCH to the ON position.

5) Place the temperature select switches for EHT 196 and EHT 197 to the <u>down</u> position marked 260°.

g. Rear Panel Access Rolling Shield Closure.

If the panel rolling shield is closed proceed to step 3., Electrical Line-up.

1) Perform this valve line-up check in the rear of the shielded panels:

CAP-V-13 CLOSED (above the GC) [ ]

CAP-V-31 OPEN (adjacent to the GC) [ ]

CAP-V-32 OPEN (adjacent to the GC) [ ]

CASP-V-1 OPEN (overhead on cont. atmos. supply line) [ ]

CASP-V-2 OPEN (lower part of CASP) [ ]

CASP-V-3 OPEN (mid part of CASP) [ ]

2) Get the come-a-long from the cabinet and attach one end to the pad eye on the east wall and the other to the pad eye on the door.

3) Operate the come-a-long until the rolling shield is blocking the doorway.

3. Electrical Line-up

Proceed to the breaker panel PYNMII, located left of the Vent Control Panel, and check positions of breakers as follows:

BKR #1	ON	[ ]	BKR #2	ON	[ ]
BKR #3	ON	[ ]	BKR #4	ON	[ ]
BKR #5	OFF	[ ]	BKR #6	ON	[ ]
BKR #7	ON	[ ]	BKR #8	ON	[ ]
BKR #9	ON	[ ]	BKR #10	OFF	[ ]
BKR #11	OFF	[ ]	BKR #12	ON	[ ]
			MAIN BKR	ON	[ ]

4. The Containment Atmosphere Hydrogen Analyzers

The two redundant analyzer systems' remote panels are between the PCP and the CMP. Beneath each panel are the switches for controlling the three sample line containment isolation valves. The reagent gas tank (oxygen) is against the south wall of the Sentry Room.

a. Initial Conditions of an Analyzer System

1) Main power switch at remote panel in STANDBY. [ ]

<u>NOTE</u>: If the power switch is OFF, then turn it to STANDBY and give the system six hours to warm up. If both systems have not been in STANDBY for at least six hours, or are otherwise inoperable, use the gas chromatograph, step 5, below. Record the time of switching from OFF to STANDBY ________ .

2) Solenoid operated sample line containment isolation valve switches CLOSED. (FCV-235, 236, 237, 238, 239, 240) [ ]

3) Oxygen gas tank connected and isolation valve closed. (Tank should be changed at 100 psig) [ ]

b. H_2 Analyzer System(s) Operation.

	CEL: 82	83
1) Turn the three sample line switches to the OPEN position. Observe the position indicating lights.	[ ]	[ ]
2) Open the oxygen tank isolation valve and adjust regulator to 27 ± 2 psig.	[ ]	[ ]
3) Turn the main power switch from STANDBY to ANALYZE.	[ ]	[ ]
4) Push the REMOTE SELECTOR pushbutton to gain control at this panel.	[ ]	[ ]
5) Turn the dual range switch to the 0-10% range.	[ ]	[ ]

6) Adjust the ZERO and SPAN potentiometers until they agree with their respective values indicatedon calibration stickers located under each potentiometer. [ ] [ ]

7) Turn the function selector switch to SAMPLE. [ ] [ ]
TIME(82)________ (83)________

8) If both CEL 82 and 83 are to be used, repeat steps 4.b.1) to 7) for the second system while waiting for the first system to stabilize, which takes approximately 6 minutes. [ ] [ ]

9) Proceed with step 6., Initial Valve Line Up, while waiting for stabilization. When 6 minutes have elapsed since switching to SAMPLE, continue with step 10) below. [ ] [ ]

10) Record the analyzer meter reading, the time read, and the scale used. [ ] [ ]

Meter Reading (%) ________
Time ________
Scale Used ________

NOTE: If the meter reads greater than 9%, the 0-20% scale should be used.

11) Inform the Control Room of which scale and CEL is used and ask the Control Room if the analyzer(s) are to remain in ANALYZE or be returned to STANDBY. [ ] [ ]

NOTE: Advise the Control Room of the reagent gas depletion and the limited lifetime of the sample pumps, which are located in the 100' El. GE area.

12) If directed to leave the analyzer(s) in ANALYZE proceed with step 5, CMP/CAP Power Up... [ ] [ ]

c. Standby

1) Turn the function selector to ZERO and purge the analyzer for 6 minutes. [ ] [ ]

2) Turn the main power switch to STANDBY. [ ] [ ]

3) Close the reagent tank isolation valve. [ ] [ ]

4) Turn the three sample line isolation valve switches to the CLOSED position. [ ] [ ]

5) Push Common Alarm to Reset [ ] [ ]

5. CMP/CAP Power Up/Gas Chromatograph Startup (Optional)

a. Check the three root valve handles next to the CAP down in the vertical position to allow Argon and the Span gases to the CAP. [ ]

b. Open or check open CAP-V-10 and adjust instrument air pressure to 80 ± 2 psig. [ ]

c. Open or check open CAP-V-14 and adjust argon pressure to 40 ± 1 psig. [ ]

d. At the CMP, turn the POWER switch to ON and ensure the red power light and the G.C.'s red colon are on. [ ]

e. On the G.C. front panel

1) Select attenuation factor of 250 (25 x 10). Place all function switches in the OFF (out) position. [ ]

2) Depress MAN and CLEAR switches. [ ]

3) Enter "00" initiating G.C. warmup. Time on __________

6. Initial Valve Lineup

a. Unlock the cabinet door and the drawer lock bar under the counter, if locked.

1) Locate a loaded filter assembly for the containment air sample.

2) Locate wrenches, labels, and bags.

b. Valve HCV-21, which is located next to the chemical sink, should be positioned to the TO CONTAINMENT position. [ ]

c. Sample cooler water valve should be turned until indicator shows OPEN [ ]

d. At the CASP [ ]

1) Install a loaded filter assembly into the containment air dilution system. [ ]

The tubing end with the blue dab of paint on it should be on the bottom. Tighten but do not damage the fittings. Retighten if leakage is noted later.

2) CASP cart/cask connection for pressure indication.

a) Engage and lock a cart/cask on its quick-disconnects. [ ]

b) OPEN the INLET and OUTLET valves and CLOSE the BYPASS valve on the engaged cart/cask. [ ]

c) Connect PI-1109 (an MBIS pressure monitor) to the engaged cart/cask. Plug it in and turn the selector switch to the proper cart/cask. Cart/Cask _________ [ ]

3) Check that PI-1116 is plugged in and turn it on. [ ]

4) Close or check closed CASP-V-17. [ ]

5) Align CASP-V-16 to the CASP-DV-1 position. [ ]

6) Align CASP-DV-1 to CASP-SF-5 position. [ ]

7) Install a new septum on CASP-SF-5. [ ]

e. At the CCP:

1) Adjust N_2 pressure regulator to 100 psig as indicated on CCP-G1. [ ]

<u>NOTE</u>: This pressure will drop to 80 psig when the eductor is on and Low N_2 PRESS alarm will sound.

2) All 11 of the CCP 3 position valve switches should be CLOSED:

AV-1	[ ]	SV-4.1	[ ]
SV-1.2	[ ]	SV-4.2	[ ]
SV-2.1	[ ]	SV-5	[ ]
SV-2.2	[ ]	AV-2	[ ]
SV-3.1	[ ]	SV-10	[ ]
SV-3.2	[ ]		

3) The EXERCISE STOP button should be in the IN position. Verify red light in knob is on. [ ]

4) Annunciator Test

a) Push and hold the TEST button and verify:

(1) the alarm sounds. [ ]

(2) all labeled windows flash except ISOLATE SAMPLE FLASK window which glows steady. [ ]

b) Release the TEST button and verify that the ISOLATE SAMPLE FLASK window goes off. [ ]

c) Push the ACK button and verify:

(1) the alarm is silenced. [ ]

(2) the 3 upper windows glow steady. [ ]

d) Push the RESET button and verify that all windows are off. [ ]

f. At the POST LOCA CNT ISOLATION PANEL all five key operated valve switches should be CLOSED.

g. At the CAP, valves should be positioned as follows:

CAP-V-12 (open) [ ]
Adjust nitrogen regulator until nitrogen
pressure gauge is 60 ± 2 psig. [ ]
CAP-V-7 (YSI OXYGEN ANAL.) [ ]
CAP-V-8 (open) [ ]
CAP-V-6 (OXYGEN CALIB. SOL'N) [ ]
CAP-V-5 (CLOSED) [ ]
CAP-V-2 (open) [ ]
CAP-V-1 (open) [ ]
CAP-V-29 (12 o'clock) [ ]
CAP-V-28 (12 o'clock) [ ]
CAP-V-27 (12 o'clock) [ ]
CAP-V-9 (closed) [ ]
CAP-V-15 (closed) [ ]
CAP-V-16 (closed) [ ]
CAP-V-26 (closed) [ ]
CAP-V-30 (9 o'clock) [ ]
CAP-V-25 (closed) [ ]
CAP-V-20 (closed [ ]
CAP-V-19 (closed) [ ]
CAP-V-18 (closed) [ ]
CAP-V-11 (open) [ ]

h. At the Demin Module of the LSP, valves should be positioned as follows:

DM-V-1.1	(closed)	[ ]
DM-V-1.2	(closed)	[ ]
DM-V-1.3	(closed)	[ ]
DM-V-3	(closed)	[ ]
DM-VREL-1.1	(closed)	[ ]
DM-VREL-1.2	(closed)	[ ]
DM-VREL-1.3	(closed)	[ ]

i. At the Open Grab Sample panel of the LSP, valves should be positioned as follows:

RW-V-6	(closed)	[ ]
DM-V-2.1	(closed)	[ ]
DM-V-2.2	(closed)	[ ]
MC-V-2.3	(closed)	[ ]
RC-V-17	(closed)	[ ]
RC-V-6.1	(closed)	[ ]
RC-V-6.2	(closed)	[ ]
RC-V-5.1	(closed)	[ ]
RC-V-5.2	(closed)	[ ]

j. At the RC Module of the LSP, valves should be positioned as follows:

RC-V-12	(12 o'clock)	[ ]
RC-V-15	(CLOSED)	[ ]
RC-V-14	(closed)	[ ]
RC-V-13	(9 o'clock)	[ ]
RC-V-10	(9 o'clock)	[ ]
RC-V-11	(CLOSED)	[ ]
RC-DV-2	(9 o'clock)	[ ]
RC-VREL-1	(closed)	[ ]

RC-VREL-2	(closed)	[ ]
RC-V-3	(closed)	[ ]
RC-V-7	(9 o'clock)	[ ]
RC-V-2	(closed)	[ ]
RC-V-1.1	(closed)	[ ]
RC-V-1.2	(closed)	[ ]
RC-V-1.3	(closed)	[ ]
RC-V-1.4	(closed)	[ ]
RC-V-1.5	(closed)	[ ]
RC-V-4	(closed)	[ ]
RC-V-8.1	(closed)	[ ]
RC-V-8.2	(closed)	[ ]
RC-V-16	(closed)	[ ]
RC-V-9	(CLOSED)	[ ]
RC-V-18	(6 o'clock)	[ ]
RC-V-19	(BYPASS)	[ ]
RC-V-20	(closed)	[ ]
RC-V-21	(closed)	[ ]
RC-DV-1	(BYPASS)	[ ]
RC-22	(TO WASTE)	[ ]

k. At the RW Module of the LSP, valves should be positioned as follows:

RW-V-9	(closed)	[ ]
RW-V-10	(closed)	[ ]
RW-DV-1	(BYPASS)	[ ]
RW-V-8	(BYPASS)	[ ]
RW-V-7	(BYPASS)	[ ]
RW-V-5	(6 o'clock)	[ ]
RW-V-4	(closed)	[ ]
RW-V-3	(closed)	[ ]

RW-V-1.1 (12 o'clock) [ ]
RW-V-1.2 (12 o'clock) [ ]
RW-V-1.3 (12 o'clock) [ ]
RW-V-2.1 (6 o'clock) [ ]
RW-V-2.2 (6 o'clock) [ ]
RW-V-2.3 (6 o'clock) [ ]

1. At the PROCESS CONTROL PANEL (PCP)

NOTE: Notify the Control Room when any valve alignments are changed.

1) Position or check the position of the following switches for valves:

FCV-9351A (CLOSE) [ ]
FCV-9351B (CLOSE) [ ]
FCV-9350B (CLOSE) [ ]
FCV-9350A (CLOSE) [ ]
FCV-9353A (CLOSE) [ ]
FCV-9353B (CLOSE) [ ]
FCV-692 (CLOSE) [ ]
FCV-693 (CLOSE) [ ]
FCV-694 (CLOSE) [ ]
FCV-1413 (CLOSE) [ ]
FCV-1416 (CLOSE) [ ]
FCV-1417 (CLOSE) [ ]
FCV-1418 (CLOSE) [ ]
FCV-1419 (CLOSE) [ ]
FCV-1412 (CLOSE) [ ]
FCV-1410 (CLOSE) [ ]
FCV-1411 (CLOSE) [ ]
FCV-1414 (CLOSE) [ ]

FCV-1415 (CLOSE) [ ]
FCV-1420 (CLOSE) [ ]
FCV-1421 (CLOSE) [ ]
FCV-1422 (CLOSE) [ ]
FCV-1423 (CLOSE) [ ]
FCV-1424 (CLOSE) [ ]
FCV-1425 (CLOSE) [ ]
FCV-624 (CLOSE) [ ]
FCV-1428 (POST LOCA SAMPLING) [ ]

2) Position switches for POST LOCA COLLECTION TANK TRANSFER PUMPS 1 and 2 to the STOP position. [ ]

3) Sample Source Valves

a) Determine which sample source isolation valves will have to be opened from the list below:

SAMPLE SOURCE	CONTAINMENT ISOLATION VALVES
Hot Legs Loops 1 and 4	FCV-9356A and FCV-9356B
Pressurizer Steam Space	FCV-9354A and FCV-9354B
Pressurizer Liquid Space	FCV-9355A and FCV-9355B
RHR Pumps Discharge	N/A
Volume Control Tank	N/A

b) Call the Control Room and have operations block open the appropriate containment isolation valves.

c) Open the corresponding remote plant isolation valve (RPIV), remote source isolation valve (RSIV), and remote flush isolation valve (RFIV) at the PCP (see attachment 1 for proper valve).

d) Allow remote sampling purging for at least 20 minutes before purging sample lines at panel (EP RB-15:B).

4) At the PCP

a) Push the TEST button and verify:

(1) the alarm sounds [ ]

(2) all labeled windows flash [ ]

b) Push the ACK button and verify:

(1) the alarm is silenced [ ]

(2) all labeled windows glow steady [ ]

c) Push the RESET button and verify that all windows are off. [ ]

9. Sampling may now commence.

PACIFIC GAS AND ELECTRIC COMPANY
DEPARTMENT OF NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

TITLE: VALVES FOR OBTAINING SAMPLES FROM REACTOR COOLANT

ATTACHMENT 1

SAMPLE SOURCE	REMOTE PLANT ISOLATION VALVE (RPIV)	REMOTE SOURCE ISOLATION VALVE (RSIV)	REMOVE FLUSH ISOLATION VALVE (RFIV)	LSP SAMPLE SOURCE VALVE (SSV)
RC Hot Leg 1	FCV-9351 A	FCV-692	FCV-1416	RC-V-1.1
RC Hot Leg 4	FCV-9351 B	FCV-692	FCV-1416	RC-V-1.1
PZR Liquid	FCV-9350 B	FCV-693	FCV-1417	RC-V-1.2
PZR Steam	FCV-9350 A	FCV-694	FCV-1418	RC-V-1.3
RHR Pump 1-1 Discharge	FCV-9353 A	FCV-1413	FCV-1419	RC-V-1.4
RHR Pump 1-2 Discharge	FCV-9353 A	FCV-1413	FCV-1419	RC-V-1.4
VCT Liquid	N/A	FCV-1412	FCV-1420	RC-V-1.5

PG&E **Pacific Gas and Electric Company**

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

NUMBER EP RB-15:B
REVISION 0
DATE 7/16/84
PAGE 1 OF 11

TITLE EMERGENCY PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM REACTOR
COOLANT SAMPLING (STRIPPED-GAS AND DILUTED RCS)

APPROVED R. C. Thornberry 7-27-84
PLANT MANAGER DATE

IMPORTANT TO ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of this procedure is to detail the steps required to sample liquid and to strip gas from the reactor coolant. This procedure will further detail the steps required to prepare a sample for H_2 analysis. This procedure requires operations at the LSP, CAP, and CMP panels. A complete flush of the modules will be done after the sample has been processed and system will be returned to initial lineup status.

PREREQUISITES

1. System was initially lined up as described in procedure EP RB-15:A.

2. Verify that the following annunciator windows are off on the PCP:

   a. REACTOR COOLANT SAMPLE COOLING WATER LOW FLOW

   b. REACTOR COOLANT SAMPLE COOLING WATER LOW PRESS

   c. REACTOR COOLANT SAMPLE COOLING WATER HIGH TEMP

   d. REACTOR COOLANT PURGE HIGH TEMP

   e. REACTOR COOLANT SAMPLE WATER HIGH TEMP

   f. LIQUID SAMPLE PANEL HIGH PLENUM PRESS

   g. CHEM ANALYSIS PANEL HIGH PLENUM PRESS

3. The following equipment must be available and operational:

   a. Meter-long reach rod

   b. Hand operated vacuum pump

c. Gas bottle griptong

d. Sample cart/cask

e. A pre-labeled 60 ml sample bottle with a new septum and 14 cc gas sample bottle.

NOTE: The labels should have the sample source, date, estimated time of the sample, and the initials of the person taking the sample. (From this point estimate 2C minutes)

4. The gas chromatograph must be in a standby mode with a valid calibration.

Assign one LSP operator to EP RB-15:D to prepare the GC.

PRECAUTIONS

1. See EP RB-15:A for details.

2. This sampling involves processing of water that will be highly radioactive. Precautions should be taken to prevent skin contact or ingestion.

3. Time in a radiation field should be limited to that necessary to perform the required operations. During purge and flush period, it may not be necessary to stand near the panels and consideration should be given to moving to a low dose area.

4. A dose rate instrument should be on and periodic monitoring is suggested during purge and sampling exercises.

5. The LSP operator must verify that the gas chromatograph is ready to receive a gas sample before opening valve RC-V-15. Valve RC-V-15 must be closed after filling all G.C. sample loops and prior to performing diluted gas sampling and final flushing operations.

PROCEDURE

1. Verify RC-DV-1 is turned to BYPASS. Fill reservoir RC-R-1 with demin water:

   a. Open RC-V-20 and RC-V-21 [ ]

   b. Adjust reservoir RC-R-1 until the water level in graduated cylinder RC-C-1 is over 100 mls. [ ]

   c. Close RC-V-21 and RC-V-20 [ ]

2. Verify that the following valves are closed:

   RC-V-1.1 through 1.5 [ ]
   RC-V-4 [ ]

3. Insert the needle of the hand operated vacuum pump into the septum of the prelabeled 60 ml sample bottle: [ ]

   a. Evacuate to the maximum vacuum achievable with the hand pump. The vacuum must be at least 15" of Hg. [ ]

   b. Keep the pump connected to the bottle for 3 minutes to assure that the bottle retains the vacuum. [ ]

4. Turn on the switch to light the diluted bottle fill station. [ ]

5. Remove the bottle from the vacuum pump and place bottle on the cart/cask assembly cavity piston. [ ]

   a. Turn the direction valve for the hydraulic piston to the down position and lower the bottle into the cask cavity. [ ]

   b. Close and open the cask to verify that the cover is working properly. [ ]

   c. Position the cart/cask under the diluted reactor coolant fill station needle and set the brake. [ ]

   d. Turn the direction valve for the hydraulic piston to the up position and raise the bottle onto the needle. [ ]

6. At the PCP verify that the sample cooler water flow, temperature, and pressure annunciator lights are off. [ ]

7. Open the following valves:

   RC-V-9 [ ]
   RC-V-8.2 [ ]
   RC-V-10 [ ]

8. Drying Expansion Vessel

   CAUTION: Adhere to directions for clockwise and counterclockwise movement of valves.

   a. Turn RC-V-11 clockwise to 3 o'clock position. [ ]

   b. Pull open RC-VREL-2. When there is a sharp increase in pressure indicated on RC-G-3, release RC-VREL-2. [ ]

   c. Adjust RC-VREL-2 until RC-G-3 indicates approximately 20 psig. Dry RC-EV-1 with argon for 1 minute. [ ]

   d. Turn RC-V-11 counterclockwise to the 9 o'clock position to permit RC-EV-1 to vent, then close RC-V-9. [ ]

9. Gas Extraction and Line Evacuation

   a. Install the prelabeled, diluted gas sample bottle on the front panel needle. [ ]

   b. Open RC-V-13 and then open RC-V-12 and evacuate until RC-G-2.1 and RC-G-2.2 indicate a minimum of 22" of Hg. [ ]

   c. Turn RC-DV-2 to the 6 o'clock position and continue the evacuation until RC-G-2.2 indicates the same reading as RC-G-2.1 or a minimum of 22" of Hg. [ ]

d. Close in order:

RC-V-13 [ ]
RC-V-10 [ ]
RC-V-12 [ ]

Wait for a minimum 2 minutes to verify vacuum is holding. [ ]

Record the vacuum on RC-G-2.1 __________" of Hg. [ ]

e. Turn RC-V-11 clockwise to the CLOSED position. [ ]

f. Turn RC-DV-2 to the 9 o'clock position. [ ]

g. Open RC-V-14 and verify the pressure on RC-G-2.2 is approximately 1 psig. [ ]

10. Reactor Coolant Sample Line Purge

a. Open RC-V-8.1. [ ]

b. Open RC-SV-1 and RC-SV-2 by turning breaker #10 to ON. [ ]

NOTE: The sample source valves are labeled RC-V-1.1 through RC-V-1.5. Throughout this procedure, the form RC-V-1.X will be used to indicate the source valve to be operated. The sample source used for sampling will have been given at a briefing by the Site Chem and Rad Protection Coordinator.

NOTE: Upon implementation of the next step, sample will be flowing into the back of the LSP. The meter-long reach rod should be used to operate valves and a dose rate survey should be done to monitor radiation levels.

c. Close remote flush isolation valve (RFIV). [ ]

d. Open the sample source valve RC-V-1.X (see Attachment 1 for proper valve). [ ]

e. Open RC-V-3. [ ]

f. Slowly open RC-VREL-1 until RC-FI-1 indicates 100% flow. Purge for 5 minutes. [ ]

g. Slowly close RC-VREL-1 until RC-FI-1 indicates 36%. Continue the purge for 1 minute. [ ]

h. Close RC-V-3. [ ]

11. Reactor Coolant Sampling

a. Open RC-V-2. [ ]

b. Adjust RC-VREL-2 until RC-FI-2 indicates 100% flow. Purge for 3 minutes. [ ]

c. Close RC-V-8.2 [ ]

d. Close RC-V-8.1 [ ]

e. Turn RC-DV-1 to SAMPLE. [ ]

f. Close RC-V-1.X. [ ]

g. Call the control room and have operations close the containment isolation valves opened earlier (if necessary). [ ]

12. Initial Flushing

a. At the PCP, perform the following:

1) Close the remote source isolation valve. [ ]

2) Close the remote plant isolation valve. [ ]

3) Open the remote flush isolation valve (see Attachment 1 for the proper valve). [ ]

b. Open in order valves RC-V-7 and RC-V-4 [ ]

c. Adjust RC-VREL-2 until RC-FI-2 indicates 100% flow. Flush with demin water for 3 minutes. [ ]

d. Close RC-V-7 [ ]

e. Open RC-V-3. [ ]

f. Adjust RC-VREL-1 until RC-FI-1 indicates 80-90% flow. Flush with demin water for 1 minutes. [ ]

g. Close RC-V-3. [ ]

h. Open RC-V-1.X. Flush with demin water for 5 minutes. [ ]

i. Close RC-V-1.X. [ ]

13. Liquid Sample Dilution

a. Crack open RC-V-21, and add 23 mls of water from RC-C-1 to the sample bottle, then close RC-V-21. [ ]

b. Turn the RC-DV-1 to BYPASS. [ ]

c. Place the direction valve for the hydraulic piston in the down position and lower the sample into the cask. [ ]

d. Close the cask. [ ]

14. Sample Cask/Cart Removal

a. Release brake and remove the cart/cask from the sample station and place in temporary hold area. [ ]

b. Perform a radiation and contamination survey on the cart/cask assembly. [ ]

c. Turn off the diluted fill station light. [ ]

15. Gas Stripping Operation

a. Open RC-V-9, wait approximately 5 seconds, and close RC-V-9. [ ]

b. Open RC-V-16. [ ]

c. Snap open RC-V-9 and wait for 1 minute. [ ]

d. Close RC-V-16 and then close RC-V-9. [ ]

e. Turn RC-V-11 counterclockwise to the 9 o'clock position. The pressure reading is normally between 8 and 10 psig. Record the reading on RC-G-2.1

RC-G-2.1 ____ psig

NOTE: The sample is now ready for analysis in the Gas Chromatograph.

NOTE: The GC operator should be at step 4.f. of EP RB-15:D.

f. Stop here and analyze the sample according to EP RB-15:D. Direct the G.C. operator to align RC-V-15 to "LSP to GAS CHROMAT". [ ]

NOTE: Do not proceed to the next step until the G.C. operator directs this operation.

16. Diluted Gas Sampling

a. Turn RC-DV-2 to the 6 o'clock position and wait until the pressure on RC-G-2.2 returns to 1 psig. [ ]

b. Turn RC-DV-2 to the 9 o'clock position. [ ]

c. Close RC-V-14. [ ]

d. Remove the griptong containing the diluted gas sample [ ]

17. Final Flushing

a. Verify RC-V-15 is in the CLOSED position. [ ]

b. Turn RC-V-11 counterclockwise to the 6 o'clock position. [ ]

c. Open the following valves:

RC-V-9 [ ]
RC-V-7 [ ]
RC-V-8.1 [ ]

d. Adjust RC-VREL-2 until RC-FI-2 indicates 100% flow. Flush with demin water for 1 minute. [ ]

e. Open RC-V-8.2. [ ]

f. Close RC-V-9 and RC-V-7. [ ]

g. Adjust RC-VREL-2 until RC-FI-2 indicates 100% flow. Flush with demin water for 3 minutes. [ ]

h. Close RC-V-8.1. [ ]

i. Turn RC-V-11 counterclockwise to the 3 o'clock position. [ ]

j. Open RC-V-9. [ ]

k. Pull open RC-VREL-2. [ ]

1) When there is a sharp increase in pressure indicated on RC-G-3, release RC-VREL-2. [ ]

2) Adjust RC-VREL-2 until RC-G-3 indicates 20 psig. [ ]

3) Flush with argon for 3 minutes. [ ]

l. Close RC-V-9. [ ]

m. Open RC-V-10. [ ]

n. Turn RC-V-11 counterclockwise to the 9 o'clock position and allow RC-EV-1 to vent. [ ]

o. Close RC-V-10. [ ]

p. Turn RC-V-11 clockwise to CLOSED. [ ]

q. Open RC-V-8.1. [ ]

r. Adjust RC-VREL-2 until RC-FI-2 indicates 100% flow. [ ]

Flush with demin water for 1 minute. [ ]

s. Close RC-V-2. [ ]

t. Open RC-V-1.X and flush with demin water for 5 minutes. [ ]

u. Close RC-V-1.X. [ ]

v. Terminate flushing by closing the following valves. [ ]

RC-V-8.1 [ ]
RC-V-8.2 [ ]
RC-VREL-1 [ ]
RC-VREL-2 [ ]
RC-V-4 [ ]

18. At the PCP, close the remote flush isolation valve. [ ]

19. At breaker panel PYNMII, place breaker #10 to the OFF position. [ ]

20. Close sample cooler water. [ ]

21. Call the Site Chem and Rad Protection Coordinator and inform him that the diluted reactor coolant sample and the off-gas sample are ready for transfer/analysis. [ ]

22. Sample transfer. [ ]

a. Transfer the diluted off-gas sample to the TSC. [ ]

b. Using procedure EP RB-15:E, aliquot and analyze the diluted liquid sample for boron. [ ]

23. Process the data according to procedure EP RB-15:F. [ ]

REFERENCES

1. Sentry Equipment Corp. High Radiation Sampling System Operating and Maintenance Manual.

ATTACHMENTS

1. Valves for Obtaining Samples from Reactor Coolant.

PACIFIC GAS AND ELECTRIC COMPANY
DEPARTMENT OF NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

TITLE: VALVES FOR OBTAINING SAMPLES FROM REACTOR COOLANT

ATTACHMENT 1

SAMPLE SOURCE	REMOTE PLANT ISOLATION VALVE (RPIV)	REMOTE SOURCE ISOLATION VALVE (RSIV)	REMOVE FLUSH ISOLATION VALVE (RFIV)	LSP SAMPLE SOURCE VALVE (SSV)
RC Hot Leg 1	FCV-9351 A	FCV-692	FCV-1416	RC-V-1.1
RC Hot Leg 4	FCV-9351 B	FCV-692	FCV-1416	RC-V-1.1
PZR Liquid	FCV-9350 B	FCV-693	FCV-1417	RC-V-1.2
PZR Steam	FCV-9350 A	FCV-694	FCV-1418	RC-V-1.3
RHR Pump 1-1 Discharge	FCV-9353 A	FCV-1413	FCV-1419	RC-V-1.4
RHR Pump 1-2 Discharge	FCV-9353 A	FCV-1413	FCV-1419	RC-V-1.4
VCT Liquid	N/A	FCV-1412	FCV-1420	RC-V-1.5

EMERGENCY PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM
TITLE: CONTAINMENT AIR SAMPLING

APPROVED: R. C. Thornberry 7-27-84
PLANT MANAGER DATE

IMPORTANT TO
ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of this procedure is to detail the steps required to make containment air available for gas chromatography and to dilute a containment air sample for isotopic analysis of noble gases, particulates, and radionuclides. This procedure will also detail the steps for a complete system flush and return to the initial valve line up.

After purging containment air through the G.C. and loading the diluter valve, this procedure will direct sampling personnel to EP RB-15:D, for gas analysis and to procedure EP RB-15:E, for preparation of the diluted containment air sample for isotopic analysis.

The containment isolation valves FCV-698, FCV-699 and FCV-700 are controlled from the Containment Isolation Valve Panel in the Sentry Room only. These switches require redundant keys to operate. Copies of the keys are located in the Control Room , Radiation Protection Office, and in the Sentry Room in a key box with a breakable glass cover. These valves should be opened only during an emergency or for testing.

PREREQUISITES

1. System was initially lined up as described in procedure EP RB-15:A.

2. Verify that the following annunciator windows are off on the PCP

   a. LIQUID SAMPLE PANEL HIGH PLENUM PRESS

   b. CHEMICAL ANALYSIS PANEL HIGH PLENUM PRESS

   c. CONTAINMENT AIR SAMPLE PANEL HIGH PLENUM PRESS

3. The following equipment must be available and operational:

   a. Meter-long reach rod

   b. A gas tight 5cc locking syringe

   c. A 14cc gas vial with a new septum installed

   d. Bags, tape, and labels

   e. Four channel MBIS Pressure Monitor (CASP-PI-1109)

   f. Two crescent wrenches

   g. Spare filter assemblies

PRECAUTIONS

1. This sampling involves processing of containment air that may be highly radioactive. Precautions should be taken to prevent releases to the sampling environment.

2. Time in a radiation field should be limited to that necessary to perform the required operations. During purge and flush periods, it may not be necessary to stand near the panels and consideration should be given to moving to a low dose rate area.

3. A dose rate instrument should be on and periodic monitoring is suggested during purge and sampling exercises.

PROCEDURE

1. Sample Flask Evacuation

   NOTE: Ensure that a loaded filter assembly is installed.

   a. Close outlet valve of the engaged cart/cask. [ ]

   b. Verify that any unused CASP ports located at the base of the CASP have been capped. [ ]

   c. At the CCP, place the switch for CCP-AV-1 to OPEN. [ ]

      NOTE: This allows containment pressure to be monitored on CASP-PI-1109.

d. Change the positions of the following valves:

CASP-DV-1 to Containment Supply [ ]

CASP-V-16 to CASP-SF-5 [ ]

e. Contact the Control Room and request permission to open FCV-700, the sample return containment isolation valve. In succeeding steps FCV-698 and 699 and will be operated also. Inquire whether the Control Room wants to be notified every time each valve is operated or only when sampling is completed and containment isolation valves are closed. Also obtain and record containment temperature and pressure from the Control Room.

(________°F + 460) x 5/9 = _______°K = Tc

________psig.

f. Evacuate CASP-SF-5 by opening the following valves:

FCV-700 (key operated) [ ]

CASP-V-17 [ ]

CCP-AV-2 [ ]

CCP-SV-10 [ ]

g. When CASP-SF-5 pressure is as low as apparently achievable as indicated on CASP-PI-1116, align CASP-V-16 to CASP-DV-1. If vacuum is not held, replace the filter assembly or septum and repeat steps c. through f. [ ]

2. Sample Purge

a. Open containment isolation valves FCV-699 and FCV-698 at the Containment Isolation Valve Panel and notify the Control Room, if requested. [ ]

b. Containment air is now being purged through the sample panel back to containment. Purge for 5 minutes. [ ]

c. At the CCP, close CCP-SV-10 and record containment air pressure as indicated on CASP-PI-1109.

CASP-PI-1109 ______ psig

d. Sample Purge through the G.C.

1) At the LSP, align RC-V-15 to CASP TO GAS CHROMAT position. [ ]

2) At the G.C. control panel do the following:

(a) Depress MAN [ ]

(b) Press CLEAR [ ]

(c) Depress SAMP switch and verify red sample light is on. [ ]

(d) Select loop No. 1 [ ]

(e) Enter "23" to purge sample from CASP to the G.C. purge for 2 minutes. [ ]

(f) Enter "24" to terminate the purge. [ ]

(g) Release SAMP switch to OFF position. [ ]

3) At the LSP, align RC-V-15 to CLOSED. [ ]

<u>NOTE</u>: The sample is now ready for analysis with the G.C.

e. Record the temperature indicated on THT 196.

________°C + 273 = ________°K = Ts

f. Record Sample Time ________.

3. Sample Dilution

   a. Align CASP-DV-1 to CASP-SF-5. N_2 will flush the sample aliquot into CASP-SF-5 through the removable filter assembly. [ ]

   b. When the pressure in CASP-SF-5 as indicated on CASP-PI-1116 is 14.70 psia, or as high as achievable, whichever is first, close CASP-V-17. [ ]

   NOTE: The G.C. operator should be at Section 4.f. of EP RB-15:D. When directed by the G.C. operator, align RC-V-15 to the CASP TO GAS CHROMAT. position.

   NOTE: Do not proceed with the next step until the G.C. operator directs this operation.

4. Initial Flushing

   a. If the G.C. was used for containment H_2 analysis then perform the following steps, otherwise skip to step b.

      1) At the LSP, align RC-V-15 to CASP TO GAS CHROMAT position. [ ]

      2) At the G.C. control panel, enter "13" to start argon flush of sample line back to CASP. Flush for 2 minutes. [ ]

      3) Terminate argon flush by entering "14" at the G.C. control panel. [ ]

      4) At the LSP, align RC-V-15 to CLOSED position. [ ]

   b. Align CASP-V-16 to CASP-SF-5 [ ]

   c. Open CCP-SV-10 and flush removable filter assembly for 1 minute. [ ]

   d. Close containment isolation valve FCV-699. [ ]

   e. Open CCP SV-5. [ ]

f. Change the positions of the following valves:

Align CASP-DV-1 to Containment Supply [ ]

Align CASP-V-16 to CASP-DV-1 [ ]

g. At the CCP, close CCP-AV-2 and CCP-SV-5. [ ]

h. Open containment isolation valve FCV-699 and flush line with nitrogen for 2 minutes. Notify the Control Room that this valve was opened, if requested to earlier. [ ]

i. Close CCP-SV-10 and CCP-AV-1. [ ]

5. Sample Handling

a. Survey the removable filter assembly and CASP-SF-5 to determine contact dose rates. [ ]

NOTE: Under worst case conditions, the contact dose rate of the filter, using a teletector, will be about 165 mR/hr. The contact dose rate at centerline of CASP-SF-5 will be about 44 mR/hr.

b. Position the exhaust duct as close as possible to the removable filter assembly. [ ]

c. Using the crescent wrenches, disconnect the filter assembly from the system, then separate the assembly into two halves and place the two halves in a bag, seal, and survey. [ ]

1) Place a prewritten label on the bag. The label should have the name of the sample, dose rate, time containment air pressure, and the initials of the sampler. [ ]

2) Store the sample to minimize exposure from it. [ ]

d. Install a new filter assembly into the system making sure the connections are tight. [ ]

e. Partially evacuate a septum sealed 14cc gas vial by withdrawing 2cc from it using a syringe. [ ]

f. Flush a 5 ml gas tight syringe by inserting its needle into the septum of CASP-SF-5, withdrawing 1cc and injecting it again. [ ]

g. Using the flushed syringe withdraw a 2cc sample aliquot from CASP-SF-5. [ ]

h. Inject the syringe contents into the evacuated 14cc gas vial. [ ]

i. Place the gas vial into a bag, seal and survey it. [ ]

j. Place a prewritten label on the bag. The label shall have the name of the sample, dose rate, time, cont. air pressure, volume of 1 ml and the initials of the sampler. [ ]

k. Store the sample to minimize exposure from it. [ ]

6. Final Flushing

a. Align CASP-V-16 to CASP-SF-5. [ ]

b. Open the following valves:

CCP-AV-2 [ ]

CCP-SV-10 [ ]

CASP-V-17 [ ]

c. Evacuate CASP-SF-5 until vacuum is as low as achievable as indicated on CASP-PI-1116 [ ]

d. Close CCP-AV-2 and allow N_2 to fill CASP-SF-5. [ ]

e. Repeat steps 18.b. through d. above once more. [ ]

f. Close CCP-SV-10. [ ]

g. Open the OUTLET valve on the engaged cart/cask. [ ]

h. Open CCP-SV-10. [ ]

i. Open CCP-SV-1.2 and allow N_2 to flush the line for 2 minutes. [ ]

7. Terminate flushing by closing the following valves:

CCP-SV-10 [ ]

CCP-SV-1.2 [ ]

CCP-AV-1 [ ]

8. Change the positions of the following valves:

CASP-V-16 to CASP-DV-1 [ ]

CASP-DV-1 to CASP-SF-5 [ ]

9. Turn OFF and disconnect the CASP-PI-1109, MBIS Pressure Monitor connected to the cart/cask. [ ]

10. At the Containment Isolation Valve Panel CLOSE the following valves and notify the Control Room that they are closed:

FCV-698 [ ]

FCV-699 [ ]

FCV-700 [ ]

11. At the CMP, turn the power switch to OFF if it was ON and at the CCP turn the FUNCTION SELECT switch to OFF and deenergize the heat tracing. [ ]

12. Process the data according to procedure EP RB-15:F. [ ]

REFERENCES

1. NUREG 0737

2. Diablo Canyon Shielding Review.

Pacific Gas and Electric Company

NUMBER EP RB-15:D
REVISION 0
DATE 7/17/84
PAGE 1 OF 6

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

TITLE EMERGENCY OPERATING PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM
-- GAS CHROMATOGRAPHIC HYDROGEN ANALYSIS

APPROVED R. C. Thornberry — PLANT MANAGER 7-27-84 DATE

IMPORTANT TO
ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of this procedure is to detail the steps required to determine the dissolved hydrogen concentration in reactor coolant and the percent hydrogen concentration in containment air by gas chromatography. This procedure will detail hydrogen analysis from RC-V-15 on the LSP to the Gas Chromatograph. The sample gas for analysis should be prepared according to any of the following procedures:

EP RB-15:B
EP RB-15:C

PREREQUISITES

1. The Gas Chromatograph (G.C.) should be in the ON or STANDBY condition for a minimum of 30 minutes before sample analysis.

2. The gas sample for analysis should be available at the LSP for transfer to the G.C.

3. Carrier gas (Ar) should be available with cylinder outlet pressure 1000 psig.

PRECAUTIONS

1. Monitoring with a dose rate instrument should be done during the transfer of sample to the G.C.

   If the carrier gas cylinder empties while the G.C. is in use, the thermal conductivity detector (TCD) protection device will turn off the current to the TCD.

PROCEDURE

1. Analysis Program

   a. Release all pushbuttons and depress the CLEAR button. [ ]

   b. Check that the following program is in memory by entering the two digit STEP number and verify that the TIME and CODE numbers are as shown below. Do this for each STEP. If the memory is correct, proceed to Step 2, Platen Stabilization. [ ]

STEP	TIME	CODE
01	00:01	03
02	00:02	25
03	00:30	01
04	01:15	00

   c. If the program is not correct, enter the program as follows:

      1) Depress ENTER and CLEAR [ ]

      2) Enter the above program into memory by entering the two digit pairs in the sequence shown above. [ ]

      NOTE: If an entry error is made, depress CLEAR to blank display and re-enter the entire line.

      3) Release ENTER, depress CLEAR and repeat step 1.b. [ ]

2. Platen Stabilization

   a. Depress MAN and CLEAR [ ]

   b. Check to see if the G.C. has stabilized by doing the following:

      1) Select attenuation factor of 250 (25 x 10) [ ]

      2) Enter "01" and then "35" to display set point of platen temp and record for a minimum of 30 seconds. [ ]

3) Enter "45" to display actual platen temperature and record for a minimum of 30 seconds. [ ]

NOTE: Stabilization is complete when platen set-point and actual temperature are within 1/2 grid marking of each other as indicated on the G.C. chart recorder only.

4) Enter "00" and mark chart recorder on the G.C. with date, time, and initials. [ ]

3. Calibration Verification

NOTE: If analysis is required on a second sample source, then the G.C. calibration verification is not needed again. Proceed to Step 4, Sample Analysis.

NOTE: Only 1 span gas is needed to verify calibration. The following steps describe the use of either gas. Perform this step only if directed by supervision.

a. Enter "23" to evacuate the G.C. Continue evacuation until the red HI VACUUM light is on. [ ]

b. Enter "24" to terminate evacuation of the G.C. [ ]

c. Select attenuation factor of 500 (5 x 100) for the 10% H_2 source or 5 (5 x 1) for the 2000 ppm H_2 source. [ ]

d. Depress CAL-1 switch for 10% H_2 source, or CAL-2 switch for 2000 ppm H_2 source, and wait 10 seconds after amber LOW VACUUM light is on. [ ]

e. Release CAL-1 or CAL-2 switch and wait 10 seconds. [ ]

f. Start the L&N recorder. [ ]

g. Depress AUTO switch to on (in) and press CLEAR. Wait until the G.C. display clock has timed to a minimum of 3 minutes. During this time interval, identify the L&N recorder trace with the date/time, gas used, loop number, attenuation factor and operator initials. [ ]

h. Release AUTO switch to off (out) position. Press CLEAR and enter "00". [ ]

i. Stop the L&N recorder. [ ]

j. Calculate the hydrogen peak height as follows:

peak height = (Trace peak height - baseline) x attenuation

peak height = ____

k. Compare the peak height calculated against the value shown on the concentration versus peak height curve for the same attenuation factor and calibration gas. The values should be within ± 10 percent of each other. [ ]

4. Sample Analysis

a. Depress SAMP switch and verify red sample light is on. [ ]

b. Select loop No. 1. [ ]

c. Enter "23" to evacuate the G.C. until the red HI VACUUM light is on. [ ]

1) Cycle loop selector through loops 2, 3, and 4, pausing at each loop and evacuating until the HI VACUUM light is on. [ ]

2) Cycle a minimum of 3 times through loops 1, 2, 3, and 4, pausing at each loop. [ ]

3) Select loop number 1. [ ]

d. Enter "24" to terminate evacuation. [ ]

e. Select attenuation factor of 500 (5 x 100). [ ]

NOTE: Before proceeding consult with the LSP operator to assure that a gas sample is available at RC-V-15.

f. When the appropriate gas sample is available at RC-V-15 align RC-V-15 to one of the following positions:

1) LSP TO GAS CHROMAT. for reactor coolant off-gas sample. [ ]

2) CASP TO GAS CHROMAT. for containment air sample. [ ]

g. Cycle loop selector through loops 1, 2, 3, and 4, pausing at each loop. Cycle 3 times. [ ]

1) Select loop 1 [ ]

h. Align RC-V-15 to the CLOSED position. [ ]

NOTE: If the analysis applies to containment air, proceed to step "j".

i. Record the pressure on RC-G-2.1 on the data sheet, EP RB-15:F.

Reading: __________psig

NOTE: The pressure is normally between 5 and 7 psig.

NOTE: Notify the main LSP operator when RC-V-15 is closed.

j. Start the L&N recorder, wait 5 seconds. [ ]

k. Depress AUTO to on (in) position and press CLEAR. [ ]

1) Wait until the G.C. display clock has timed to a minimum of 3 minutes. During this time interval identify the recorder trace with sample name, date/time, loop number, attenuation factor and operator initials. [ ]

l. Release AUTO switch to off (out) position. Press CLEAR and enter "00". [ ]

m. Stop the L&N recorder. [ ]

n. Calculate the net peak height and determine the hydrogen concentration from the appropriate calibration curve. [ ]

peak height = __________mm

o. Record the net peak height on the recorder trace. Repeat the analysis and select the next loop and appropriate attenuation factor (5 x 1, 25 x 1, 1 x 100, or 5 x 100) as required. Repeat steps j. through o. as necessary to obtain satisfactory data. [ ]

p. Purge the G.C. residual gas as follows:

1) Enter "23" and evacuate the G.C. until the red HI VACUUM light is on. [ ]

2) Cycle through each loop and evacuate until the red HI VACUUM light is on. [ ]

3) Enter "13" to initiate argon purge. [ ]

4) Cycle loop selector through loops 1, 2, 3, and 4, pausing at each loop. Cycle 3 times. [ ]

5) Enter "14" to terminate the purge. [ ]

6) Enter "24" to terminate the evacuation. [ ]

7) Enter "00". [ ]

8) Release SAMP switch to off position. [ ]

q. After final use of G.C.

1) Shutdown the instrument by turning off the power. [ ]

2) Secure the gas supplies for the GC.

a) CLOSE the 3 root valves next to the CAP. [ ]

b) CLOSE CAP-V-10 [ ]

c) CLOSE CAP-V-14 [ ]

r. Return to the referencing procedure.

NOTE: For stripped-gas, this is EP RB-15:B, step 17. For Containment Air, this is EP RB-15:C, step 4.

s. Record the net peak height from step n. on the appropriate data sheet.

REFERENCES

1. Sentry Equipment Corp. High Radiation Sampling System Operating and Maintenance Manual.

PG&E **Pacific Gas and Electric Company**

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

NUMBER EP RB-15:E

REVISION 0

DATE 7/17/84

TITLE: EMERGENCY PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM
RCS LIQUID AND GAS SAMPLE HANDLING

APPROVED: R. C. Thornberry 7-27-84
PLANT MANAGER DATE

IMPORTANT TO ENVIRONMENTAL QUALITY

SCOPE

This procedure provides guidance for safely handling post accident liquid samples obtained from the Reactor Coolant System (RCS) using the SENTRY PASS. The diluted liquid sample from the RCS is aliquotted. The aliquot may be used for boron or for γ-assay. Further dilutions for γ-assay are done in the hot cell. Likewise, steps for preparation of diluted containment air samples for counting are also detailed. This procedure and changes thereto require PSRC review.

DISCUSSION

Based on worst-case post accident assumptions regarding sample radioactivity content, special precautions may be required for handling RCS and containment air sample acquired using the Sentry PASS. Sample aliquots are transferred by precision pipets to a dilution vial for radiological counting or an appropriate reaction flask for chemical analysis. These flasks may be kept inside the hot cell throughout the procedure to minimize personnel exposures and also to contain the airborne radioactivity generated within the hot cell area. Control of airborne activity is accomplished by use of an overhead ventilation duct which creates a slightly negative pressure inside the enclosure. After all sample manipulations are completed, the radioactive waste solutions may be flushed down the Sentry Room sink via the receiver funnel drain valve and, if necessary, the inside surfaces of the hot cell may be sprayed down to reduce the contamination levels within the sample handling area.

PREREQUISITES AND PRECAUTIONS

1. Personnel assigned to conduct this procedure should be familiar with the considerations of handling highly radioactive liquid and gas samples and shall be experienced with the analytical chemistry techniques employed in this procedure. Also, any individual performing this procedure should be capable of:

a. Making does rate measurements with portable survey instruments.

b. Assessing response and basic trends of continuous air monitoring equipment.

c. Taking actions based on items 1.a and 1.b.

2. Unless conditions are known to warrant less stringent precautions, complete protective clothing and accident dosimetry (including high range and extremity dosimeters) will be required. Lapel air samplers are also recommended. Full respiratory protection equipment (SCBA) may also be necessary.

3. To minimize time spent in hot sample handling, ensure availability of the required equipment for performing applicable portions of this procedure. This includes sample vessels, pipets, handling tools, reagents, etc. A comprehensive listing of these supplies is provided in a check list format in Appendix 1 to this procedure to facilitate the review.

4. When the liquid sample is handled, there is a possibility that local radiation levels and airborne radioactivity could increase. Since the sample is to be contained within the hot cell, the increases should not be too high; however, as precautionary measure, all individuals within the Sentry Room should have functioning respirators. Monitoring should be performed using survey instruments (for dose rates) and any available CAM system (for airborne) for early identification of potential problems.

5. This procedure is designed to permit all sample handling to be performed by the use of tongs or other remote handling devices. Unless the samples are surveyed and known not to present a significant source of exposure to the fingers, hands or other extremities, no sample manipulations involving direct hand contact should be attempted.

PROCEDURE

1. Preparation of Sample Enclosure and Sink Area

This section covers the preliminary steps required before performing actual liquid sample manipulations. It is important that all required handling equipment and reagents to be employed are available prior to handling the liquid sample in order to minimize time spent working around hot samples within the hot cell.

a. Initial Survey of Sample Enclosure and Sink Area

1) Perform a radiation survey of the hot cell area to verify that no highly radioactive sample material remains inside or around the enclosure from a previous use. If an indication of radioactive sample materials is found, these materials should be promptly disposed of as set forth below under "Clean-Up" in Section 6 of this procedure.

2) Visually inspect the inside of the hot cell for unwanted material and for cleanliness. If material remains, remove and store or discard it, whichever is appropriate.

b. Acquisition of Required Supplies

Assemble the necessary supplies, equipment, etc. to perform the required steps. A listing of these supplies is presented in Appendix 1 to this procedure for the following preparation and analysis categories.

1) General Equipment Requirements (Sections 1, 2, and 6)

2) Dilution of Liquid Sample for Radiological Counting (Section 3)

3) Chemical Analysis for Boron Levels (Section 4)

4) Dilution of Off-gas for Isotopic Analysis (Section 5)

5) Containment Air Fractionation Supplies

c. Preparation of Hot Cell Area for Use

1) Open the access door to the hot cell

2) Close the receiver funnel drain valve.

3) Fill the receiver funnel with demin water.

4) Open receiver funnel drain valve and verify liquid drains in an unrestricted manner.

NOTE: If flow is obstructed, it may be necessary to blow out the drain line. This line must drain freely prior to using the hot cell for analyses. A squeeze bulb or Oxford pipet with plastic tip may be used to force flow.

5) Carefully position shielded sample holder brick for use in conjunction with pipet operations.

6) If a liquid sample for radiological analysis is to be diluted pursuant to Section 3 of this procedure, install an uncapped, clean 20 cc liquid scintillation vial into its appropriate sample port within the sample holder brick. Leave the cap and sealing tape outside the hot cell for later use.

7) If a Boron analysis is to be performed (pursuant to Section 4), install two 50 ml Erlenmeyer flasks into their appropriate sample ports within the sample holder brick. Leave rubber stopper caps (one for each 50 ml flask) outside the hot cell for later use.

8) If a Boron analysis is to be performed, install a clean, uncapped, prewiped 1 cm path length photocell into the appropriate sample port within the sample holder brick. Keep the cap plug available outside the hot cell for later use.

NOTE: Be careful not to scratch the transmission surfaces nor to deposit extraneous material (e.g. - powder or lint) especially from gloves.

9) Check that a RO-7-BM probe, or appropriate range probe, is installed in the mount above the receiving funnel. The probe should be 5 inches above the base of the hot

cell. The attached cable should run through the vent chimney and fit in the slot provided for it. Connect the cable to the RO-7 and turn the detector on.

10) Place the power cord for the magnetic stirrer, if used, along the same path as the cable mentioned above.

11) Verify air flow (a piece of paper is suggested) into the elephant trunk vent shroud.

12) Connect ventilation shroud to the chimney on top of cover switch.

13) Prepare remaining equipment, materials, reagents, etc. required for the planned sample manipulations and analyses.

2. Obtaining a Liquid Sample from the cart/cask

a. Move the cart/cask to the sink area and set the brake.

b. Uncover the sample vial by rolling the radiation shield away from the sample cavity.

c. Place an RO-2A over the funnel in the hot cell and determine the ambient background response of the RO-2A. Note the reading and then remove the RO-2A.

RO-2A Reading:_______________mR/hr (ambient background)

1) Transfer the bottle containing the diluted reactor coolant to the hot cell and remove the lid.

2) Close the cask and move it away.

3) Close the access door to the hot cell.

e. Measure the radiation level with the RO-7 and record the reading.

__________________mR/hr (ambient background plus sample)

f. Calculate the net sample reading by subtacting the value of step 2.c. from the value of step 2.e.

____ ______________mR/hr (step 2.e.)

____________________mR/hr (step 2.c.)

____________________mR/hr (net sample reading)

3. Dilution and Preparation of Liquid Sample for Radioassay

This step involves selection and dilution of a sample aliquot to obtain a counting geometry of 10 mls liquid in a 20 ml vial. The sample volume is based on the exposure rate recorded in Step 2.f.

a. Select the appropriate pipet tip size and pipet volume as follows:

Pipet	Approx. Step 2.g. Reading	Check
5 ml	< 1.6 mR/hr	[ ]
1 ml	> 1.6 mR/hr but ≤ 16 mR/hr	[ ]
100 µl	> 16 mR/hr but ≤ 160 mR/hr	[ ]
10 µl	> 160 mR/hr	[ ]

b. Open the access door on top of shielded sample enclosure.

c. Using the pipet volume setting chosen in Step 3.a. above, obtain this volume of RCS liquid sample from the receiver funnel, keeping hands as far away as possible from the "hot" sample liquid.

d. Slowly discharge the aliquot into the empty 20 cc liquid scintillation vial previously placed within the shield brick. Discard the pipet tip.

<u>NOTE</u>: Dispose of materials that have contacted highly contaminated mediums separately from those that have not.

e. Using the appropriate pipette and tip, add sufficient demin water to the 20 cc vial to bring the total liquid volume to 10 ml. Add 10 mls to the 10μl or 100μl aliquot.

f. Remove the diluted sample from the hot cell with tongs.

g. Cap the vial. Wipe it and seal it with tape.

h. Screen survey the vial to verify countability ($\leq$ 5 mR/hr contact).

i. Label and bag the vial noting the dilution, the aliquot volume used, and the radiation level measured.

j. Set the sample aside for transport to the TSC or counting room.

k. If a chemical analysis for Boron is to be performed, proceed below to Section 4. If no chemical analysis is to be performed, proceed below to Section 6 to clean up and secure the hot cell for later use.

4. Analysis of Liquid Sample for Boron

This section is a version of CAP C-17 "BORON COLORMETRIC", modified to permit the application to highly radioactive samples. Sample manipulations are performed primarily within the hot cell.

It is assumed that the reagents, equipment and supplies required for this procedure (which are itemized in Appendix 1) are assembled for use as specified in Section 1.b.

a. Pipet 5.00 ml of the standard boric acid solution into a 100 ml volumetric flask and dilute to the mark with demin water. The concentration of boron in this flask is 1/20 of the actual concentration of the standard solution (approximately 10 ppm). Note the actual concentration in the flask and run this standard as a check on the calibration curve.

b. Pipet 2 ml of the 10 ppm boron standard solution into a 50 ml Erlenmeyer flask. Pipet 2 ml of demin water into a second 50 ml Erlenmeyer flask. (Both these flasks should be outside the hot cell.)

c. Open the access door on top of the hot cell.

d. Pipet a 2 ml aliquot of the RCS liquid sample solution from the receiver flask into one of the 50 ml Erlenmeyer flasks within the hot cell. (The other flask may be reserved as a back-up vessel or if desired, it may be used to prepare a duplicate "hot" sample.

NOTE: Open hot cell access lid whenever something is added to a flask. Close it immediately afterwards.

e. Pipet 10 µl of concentrated HCl to each flask stopper and swirl. Allow flasks to cool (~ 2 minutes).

f. Add 10.0 ml of concentrated H_2SO_4 into each flask, stopper and swirl. Allow flasks to cool room temperature (~ 15 minutes).

g. Add 10.0 ml of carminic acid solution into each flask. Stopper again and, using tongs, swirl to mix well.

h. Turn on the spectrophotometer and allow it to warm up. Absorbance should be read 45 to 60 minutes after carminic acid is added. Note the time. __________

i. Being careful to avoid direct hand contact with the cuvettes, between approximately 40 and 55 minutes after the carminic add, transfer solutions to clean, prewiped 1 cm cuvettes and carefully cap them. This may be accomplished using a 5 ml pipet set for 4 ml, and, in the case of the "hot" sample the capping and cuvette transfer must be performed using tongs.

j. Set the spectrophotometer to a wavelength of 585 nm and adjust the blank for 0% absorbance.

k. Read the boron standard to verify agreement with calibration graph within ±5%. If this agreement is not obtained continue the analysis but inform supervision immediately.

l. Read the absorbance of the sample(s). Record results and return the samples to the hot cell.

_____________(Absorbance RCS)

Calibration Graph (Standard Curve)

ppm Boron RCS (diluted) = ____________________ppm

Record this on the data sheet in EP RB-15:F, Section (4)

m. Notify the Site Chemistry and Radiation Protection Coordinator of results of sample analysis.

n. Turn the spectrophotometer off and proceed to Section 5 below.

5. Dilution and Preparation of Off-gas for Isotopic Analysis

NOTE: Perform steps below only if sample vial dose rate is >5 mR/hr.

a. Obtain a clean 14 cc gas sample vial with a septum installed and using a 5 ml gas tight syringe, withdraw 1 cc of air from the vial and discharge the air from the syringe.

b. Insert the syringe into the off-gas sample vial and remove 1cc. Shut the valve on the syringe before removing the vial.

c. Insert the syringe into the counting vial; open the valve on the syringe and inject the contents into the vial.

d. Survey the newly prepared vial; if the dose rate is >5 mR/hr, repeat steps a. through e. above, diluting into new clean 14 cc gas sample vials until the sample vial is less than 5 mR/hr, keeping track of the number of dilutions.

e. Place a label on the counting vial repeating the information as found on the original vial. Calculate the new dilution factor by multiplying all dilutions together. Each dilution 15:1. Record this information on the data sheet.

f. Inquire from supervision whether the original sample vials should be discarded or stored for future use and perform as directed.

6. Cleaning and Securing the Hot Cell

a. Cleaning

1) Disposal of Radioactive Sample Residues

During these actions, the radiation levels in the sink area and airborne concentrations within the Sentry Room may become higher since the sample materials are being discharged via the sink.

a) Turn on sink drain faucet to provide a slow, steady stream.

b) Open receiver funnel drain valve to empty the liquid resides down the drain.

c) Flush the drain lines with about 20 ml flushes using demin water twice, followed by two caustic flushes and two more demin water flushes.

d) Open the access port on top of the hot cell. Remove sample caps using tongs and, using the remote handling device, empty out the contents of the flasks remaining in the enclosure down the receiver flask drain. (Be careful not to overfill the receiver flask drain).

e) Flush out the sample flasks and wash off all contaminated handling tools with demin water, caustic or acid wash solutions (as appropriate), followed by a demin water rinse.

f) Perform a general washdown of the hot cell to remove contamination. Close the access port when finished inside the hot cell.

g) Store sample flasks, vessels, etc. as "dirty" materials -- not to be used again unless thoroughly cleaned and inspected.

2) Disposal or Storage of Chemicals, etc.

a) Dispose of waste chemicals, materials, etc. in a similar fashion as above for the radioactive vessels. (Of course the precautions regarding radioactivity should not apply).

b) Chemicals, reagents and other supplies not consumed or compromised during the sample analyses may be stored for later use. These may be stored in the cabinet space adjacent to the sink area.

b. Securing Equipment

1) Valves

a) Verify the sample receiver funnel within the shielded sample enclosure is valved shut after the lines have been thoroughly flushed and surveyed clean.

b) Verify that the sink water flow is secured off.

2) Ventilation

   a) If the hot cell and all survey/access ports are secured, the ventilation flow via the overhead duct may be turned off, provided there is no other requirement for this system.

3) When ready to do so, transfer samples to the TSC or counting room for counting.

4) Turn all ventilation OFF when leaving the Sentry Room unless the Sentry Room will be used in the near future.

5) When exiting through the Motor Repair Shop, note the pressures of the gas supply bottles.

   Argon ______________psig

   Cal Gas 1 ______________psig

   Cal Gas 2 ______________psig

6) Close the bottle isolation valves for the Sentry supply gasses.

APPENDIX 1

CHECKLIST OF REQUIRED EQUIPMENT AND SUPPLIES

PERSONNEL PROTECTION AND EVALUATION (PRIOR TO PLANT ENTRY)	CHECK
Exposure rate survey equipment; 1 device/individual, including:	
1 teletector for Sentry Room use (as a minimum)	[ ]
Balance comprised of teletectors, RO-2A's or equivalent devices	
SCBA respirators; 1 device/individual	[ ]
SCBA spare breathing air bottles; 3 bottles/individual (in Sentry Room)	[ ]
Full set of protective clothing with duct tape; 1 set/individual	[ ]
Heavy rubber gloves (or two pair regular rubber gloves); 1 set per individual	[ ]
Normal and accident range dosimeters (pencil dosimeters and TLD's); 1 set/individual	[ ]
Extremity dosimeters for hands; 1 set/individual	[ ]
Lapel air samplers (recommended); 1 sampler/individual	[ ]
Voice communication amplifier (compatible with mask); 1 unit/individual	[ ]

GENERAL SAMPLE HANDLING AND MANIPULATIONS (Sections 1, 2, and 6)	
Fully operable hot cell (located in Sentry Room)	[ ]
Sample shield brick (with pre-bored holes)	[ ]
Long extension tongs: 14-16" in length, (2 pairs)	[ ]
RO-7 w/RO-7-BM probe and 5' cable	[ ]
Acid cleaning solution (1 gallon)	[ ]
Caustic cleaning solution (1 gallon)	[ ]
Demin water jug (5 gallons)	[ ]
Suction bulb	[ ]
Rubber hose (5' long with trigger spray nozzle and tap hook-up)	[ ]

APPENDIX 1 (Continued)

GENERAL SAMPLE HANDLING AND MANIPULATIONS (Sections 1, 2, and 6) (Continued)

30 ml beakers (3)	[ ]
Paper towels or equivalent (1 box)	[ ]
Alcohol (1 liter)	[ ]

RADIOACTIVE SAMPLE DILUTION SUPPLIES (SECTION 3)	CHECK
20 ml liquid scintillation vial w/cap (1)	[ ]
Sealing tape for 20 ml liquid scintillation vial (1 roll)	[ ]
Labels for 20 ml liquid scintillation vial (1 box)	[ ]
Small plastic bags; sealable (1 dozen)	[ ]
10 µl pipet w/tip	[ ]
1 ml pipet w/tip	[ ]
Adjustable 0-5 ml pipet w/tip	[ ]
Shielded syringe (calibrated for 5 cc volume)	[ ]
Spare syringe cylinder	[ ]

BORON SAMPLE ANALYSIS SUPPLIES (SECTION 4)

50 ml Erlenmeyer flasks w/rubber stoppers (4 sets)	[ ]
1 cm path length spectrophotometer cells w/caps (3 sets)	[ ]
Dri-wipes for spectrophotometer cells (1 box)	[ ]
Rinse/soak bath for 1 cm path length spectrophotometer cells	[ ]
100 ml volumetric flask	[ ]

[1]Reagents must be stored in boron free containers; use plastic

APPENDIX 1 (Continued)

BORON SAMPLE ANALYSIS SUPPLIES (SECTION 4) (Continued)

Adjustable 0-5 ml pipets (2) w/tips (1)	[ ]
10 µl pipet w/tips (3)	[ ]
Spectrophotometer unit	[ ]
Dilute nitric acid, HNO_3 (bath)	[ ]
Carminic acid solution[1], Stability: 1 week (30 ml/analysis)	[ ]
Hydrochloric acid[1], HCl, concentrated (30 ml/analysis)	[ ]
Sulfuric acid[1], H_2SO_4, concentrated (30 ml/analysis)	[ ]
Standard boric acid solution[1], 200 ppm B, Stability: Restandardize monthly (5 ml/analysis)	

DILUTION OF OFF-GAS FOR ISOTOPIC ANALYSIS (SECTION 5)	CHECK
14 cc gas sample vials w/septums installed (2)	[ ]
5 cc gas tight syringe/needle	[ ]
Labels for 14 cc gas vials	[ ]
Small plastic bags; sealable	[ ]
Sealing tape	[ ]

CONTAINMENT AIR FRACTIONATION SUPPLIES

Spare U-tube filter assembly	[ ]

PG&E **Pacific Gas and Electric Company**

NUMBER EP RB-15:F
REVISION 0
DATE 7/17/84
PAG 1 OF 1

DEPARTMENT OF NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

TITLE: EMERGENCY PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM
-- DATA ANALYSIS

APPROVED: R. C. Thornberry 7-27-84
PLANT MANAGER DATE

IMPORTANT TO ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of this procedure is to provide a means to assemble the data generated from the various EP RB-15 sub-procedures into a concise form.

PROCEDURE

1. RCS stripped gas data are to be processed on Section (1) of form 69-9393.

2. Hydrogen data from Containment atmosphere analysis by the in situ Hydrogen Analyzer System are to be processed on Section (2) a) of form 69-9393.

3. Hydrogen data by Sentry Gas Chromatographic analysis are to be processed on Section (2) b) of form 69-9393.

4. Containment Air Isotopic Data are to be processed on Section (3) of form 69-9393.

5. Analytical data for boron is to be processed on Section (4) of form 69-9393.

6. Depressurized liquid isotopic data are to be processed on Section (5) of form 69-9393.

7. After filling in the pertinent sections of form 69-9393, acquire approval signatures from the Chemistry and Radiation Protection Foreman and the Chemistry and Radiation Protection Engineer.

8. Attach all pertinent chemistry and radiochemistry data to this form.

9. Deliver the completed form to the Site Chemistry and Radiation Protection Coordinator for disposition.

PACIFIC GAS AND ELECTRIC COMPANY
DEPARTMENT OF NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

TITLE: POST ACCIDENT RCS AND CONTAINMENT AIR SAMPLE DATA SHEET (EP RB-15:F)

DATE ____________________ DAY ______________

ANALYST INITIALS __________

(1)

RCS Off-Gas Data (GAMMA ASSAY)

P_1 = Pressure Recorded on RC-G-2.1 (EP RB-15:B, step 15.e.) ________psig

P_2 = Pressure Recorded on RC-G-2.1 (EP RB-15:D, step 4.i.) ________psig

Calculate the Gas Dilution Factor (DF):

$$DF_1 = \frac{V_1(P_1 + 14.7)}{V_2(P_2 + 14.7)} = \frac{A_1}{A_2}, \text{ where}$$

A_1 = Initial activity isolated in sample line up to RC-V-15 before GC Analysis

V_1 = System Volume (RC-EV-1 and lines to RC-V-15) = 360 cc

P_1 = Pressure Recorded Above

A_2 = Final Activity after GC analysis, the time at which the off-gas sample is collected

V_2 = Volume of RC-DV-2 = 0.023 CC

P_2 = Pressure recorded above

DF_1 = ___

Initial Counting Vial Dilution Factor = 11 = DF_2 11

NOTE: When the syringe is first injected into the 10 cc Sentry sample bottle and then the plunger is withdrawn to 1 cc, (provided the syringe is still inserted in the 10 cc bottle) the total volume is 11 cc. If the sample is homogeneous, then the true Dilution Faction = 11, not 10.

Subsequent dilution factor for 1cc →14cc results in a multiplication factor of 15 for each dilution = DF_3 (Use 1 if no subsequent dilutions are needed) ___

NOTE: The same argument based in the previous note applies here. The DF = 15, not 14.

Total dilution factor is $DF_1 \times DF_2 \times DF_3$ = ___

TITLE: POST ACCIDENT RCS AND CONTAINMENT AIR SAMPLE DATA SHEET (EP RB-15:F)

DATE ____________________ DAY ____________________

ANALYST INITIALS __________

(2)a) Hydrogen Concentration in Containment Air (15:A)

OPTION 1: Hydrogen Analyzer System

	CEL-82	CEL-83
Time switched from OFF to STANDBY (N/A if in STANDBY mode before this date) (15:A Step 4.a.1)	______	______
Scale Used (10% or 20%) Step 10)	______	______
Meter Reading (%) Step 10)	______	______
Time Step 10)	______	______
Analyst's Initials	______	______

TITLE: POST ACCIDENT RCS AND CONTAINMENT AIR SAMPLE DATA SHEET (EP RB-15:F)

DATE ____________________ DAY ____________________

ANALYST INITIALS __________

(2)b) Hydrogen Concentration in Containment Air (15:D)

OPTION 2: Hydrogen by Gas Chromatograph

Loop Used (1,2,3, or 4) __________

Sample Time __________

Standard Calibration Reference Pressure* (from Calibration Sheet) __________ (Psia)

Peak Height, H (EP RB-15:D, Step 4.n.) __________ (mm)

Peak Height Correction Factor†, CF, (From Calibration Sheet) __________

Corrected Peak Height, H_c ($H_c = H \times CF$) __________ (mm)

% H_2 (From Standard Calibration Curve) __________ %

Analyst's Initials ________________

* To convert to absolute pressure (Psia):

for pressure ≥ 0: 14.7 + pressure reading (Psig)

for pressure <0: $14.7 - \left(\dfrac{\text{vacuum reading in inches Hg}}{2.03}\right)$

† Correction Factor for Peak Height:

$$\frac{\text{Peak Height at Standard Calibration Pressure}}{\text{Peak Height at Sampling Pressure}}$$

(3) Containment Air Isotopic Analysis

Containment Temperature, Tc (EP RB-15:C, Step 1.e.) __________°K

Sample Temperature, Ts (EP RB-15:C, Step 2.d.) __________°K

Sample Collection Time ______________

Sampling Technician ________________________

Containment Noble Gas

Fractional Yield = $Tc/(43{,}400 \times Ts) = Y_{ng}$ __________

Noble Gas Activity = ____________ µCi/cc

Containment Air Iodine

Fractional Yield = Tc/Ts = ______________ Y_{IP}

Iodine and Particulate Activity = ______________ µCi/cc

Counted By ___________________

Where: Y_{IP} and Y_{NG} are fractional yields entered into the analysis program.

TITLE: POST ACCIDENT RCS AND CONTAINMENT AIR SAMPLE DATA SHEET (EP RB-15:F)

(4) Chemical Analysis

Boron

Concentration from analyses, B ________________PPM

SYSTEM DILUTION FACTOR, DF, Usually 1000 ______________

Corrected Concentration, C.C., (BxDF) ________________PPM

Supplemental Dilution Factor, S.D.F., (1 if, no
other chemistry dilutions are performed ___________

Final Corrected Concentration (C.C.xS.D.F.) ___________PPM

TITLE: POST ACCIDENT LIQUID SAMPLE DATA SHEET IPLSS DATA EP RB-15:G

(5) Liquid Isotopic Analysis (15:E Step 3)

Volume Sample Used

5ml [ ]
1ml [ ]
100µl [ ]
10µl [ ]

Initial Dilution Factor __________(DF_1)

Additional Sample Dilution Factor (DF)

(use 1 if there is no additional DF) __________(DF_2)

($DF_1 \times DF_2$) __________(DF_3)

Fractional Yield to be entered into Isotopic Program $1/DF_3$ __________(Y_2)

Reviewed by __________________ Foreman __________________ Chemistry and Radiation Protection

TITLE EMERGENCY PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM
-- SAMPLE STORAGE AND DISPOSAL

APPROVED R. C. Thornberry 7-27-84
PLANT MANAGER DATE

IMPORTANT TO
ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of this procedure is to provide a means for disposal of stripped-gas samples and storage of RCS liquid samples.

PRECAUTIONS

1. Same as EP RB-15:A.

PREREQUISITES

1. Modified GE-8300 transfer cask.

2. Gas bottle Griptong.

3. 10 cc gas sample bottle.

PROCEDURE

1. Disposal of Reactor Coolant Stripped-Gas Samples

   a. At the LSP

      1) Close or check closed valves.
      RC-V-1.1 through RC-V-1.5 [ ]

      2) Verify that RC-G-4 indicates approximately
      100 psig Ar. [ ]

   b. At the PCP

      1) Close or check closed

      FCV-9351A, FCV-9351-B [ ]
      FCV-9350A, FCV-9350-B [ ]
      FCV-9353A [ ]

FCV-692, FCV-693, FCV-694 [ ]
FCV-1412, FCV-1413 [ ]
FCV-1416, FCV-1417, FCV-1418 [ ]
FCV-1419, FCV-1420 [ ]

c. Align the following valves:

RC-V-10 (closed) [ ]
RC-V-15 (closed) [ ]
RC-V-14 (closed) [ ]
RC-V-11 (CLOSED) [ ]
RC-V-13 (closed) [ ]
RC-V-12 (closed) [ ]
RC-DV-2 (9 o'clock) [ ]

d. Bottle Evacuation

1) With the griptong, install the diluted gas sample bottle on the front panel needle. [ ]

2) Open RC-V-13. [ ]

3) Open RC-V-12 and evacuate until RC-G-2.2 indicates a minimum vacuum of 22 inches mercury. [ ]

4) Turn RC-DV-2 to the 6 o'clock position and continue the evacuation until a minimum vacuum of 22 inches of mercury is indicated on RC-G-2.2 [ ]

5) Close in order RC-V-13 and RC-V-12. [ ]

6) Open RC-V-14 and allow the bottle to pressurize to approximately 1 psig as indicated on RC-G-2.2. [ ]

7) Close RC-V-14. [ ]

8) Open RC-V-13 and RC-V-12 and evacuate until RC-G-2.2 indicates a minimum vacuum of 22 inches mercury. [ ]

9) Close in order RC-V-13 and RC-V-12. [ ]

10) Open RC-V-14 and allow the bottle to pressurize to approximately 1 psig as indicated on RC-G-2.2. [ ]

11) Close RC-V-14. [ ]

12) Repeat steps 8 through 11 three times to remove all radioactive gases. [ ]

e. Bottle Disposal

1) Remove the griptong from the panel. [ ]

2) Perform a radioactive survey of the bottle and dispose accordingly. [ ]

2. Access and Removal of Diluted RCS Liquid Sample Bottle

a. Open the Sentry cart/cask. [ ]

b. Align the modified GE-8300 transfer cask over the Sentry cart/cask cavity. [ ]

c. Withdraw the tungsten shield at the base of the transfer cask. [ ]

d. Slowly lower the sample bottle access mechanism until the latch grasps the sample bottle. [ ]

e. Slowly raise the sample bottle into the cavity of the transfer cask. [ ]

f. Close the tungsten shield at the base of the transfer cask. [ ]

g. With two persons (one at each arm of the transfer cask), carefully move the bottle to the storage location. [ ]

h. Place the transfer cask on the sample bottle storage platform. [ ]

i. Withdraw the tungsten shield at the base of the transfer cask. [ ]

j. Slowly lower the sample bottle to the platform and continue the downward movement until the sample bottle is released. [ ]

k. Raise the bottle access mechanism and close the tungsten shield. [ ]

TITLE EMERGENCY OPERATING PROCEDURE
SENTRY POST ACCIDENT SAMPLING SYSTEM
SUBSEQUENT SAMPLING

APPROVED R. C. Thornberry 7-31-84
PLANT MANAGER DATE

IMPORTANT TO
ENVIRONMENTAL QUALITY

SCOPE

These procedures are provided to insure safe and reliable instructions for sampling the reactor coolant, radwaste, and containment atmosphere in a post-LOCA situation. The samples which can be collected at this point during emergency conditions are: Reactor Coolant (RC) Hot Legs 1 and 4, Pressurizer (PZR) Liquid, Pressurizer Steam, RHR Pumps Discharge (Pumps 1-1 and 1-2), VCT Liquid, Reactor Cavity Sump, Equipment Drain Receiver, Floor Drain Receiver, and Containment Atmosphere. The samples which can be obtained and analyses which can be performed during an emergency condition are:

1. For RC (Reactor Coolant) Samples:

   a. In-Line Pressurized Flask with Off-Gasing for Gas Chromatograph Analysis.

   b. Remote collection of Undiluted RC Samples in a Shielded Cart/Cask Assembly for Transport Off-Site.

   c. Dilute RC Samples (Diluted 1-1,000) for On-Site Analysis (Boron).

   d. In-Line Chemical Analyses on Undiluted RC Samples for pH, Conductivity, Chloride, Dissolved Oxygen.

   e. Diluted Stripped Gas Samples

2. For RW (Radwaste) Samples:

   a. Remote Collection of Undiluted RW Samples in a Shielded Cart/Cask Assembly for Transport Off-Site.

   b. Dilute RW Samples (Diluted 1-1,000) for On-site Analysis (Boron).

3. For CA (Containment Air) Samples:

   a. Remote Collection of Undiluted S. nples.

   b. In-Line Gas Chromatographic Analysis.

   c. Dilution with Subsequent Sample acquisition by syringe.

These procedures also include complete module flushing after obtaining samples.

This procedure and the procedures listed below, and changes thereto require PSRC review.

NOTE: This procedure does not apply to the initial sample exercise designed to meet the 3-hour time requirement for sample acquisition.

PROCEDURE

1. Specific Procedures

   The detailed instructions for performing the sampling outlined in the Scope of this procedure are covered in the following sub-procedures:

   EP RB-16:A -- Sentry Lab Access/Egress and Initial Actions

   This procedure details necessary steps for accessing and egressing the lab, Gas Chromatograph startup, initial system lineup, and annunciator testing prior to the first sample exercise during an accident.

   EP RB-16:B1 -- Diluted Liquid Sampling from Reactor Coolant

   This procedure details the steps required to obtain a diluted liquid sample from reactor coolant sources.

   EP RB-16:B2 -- Undiluted Liquid Sampling from Reactor Coolant

   This procedure details the steps required to obtain an undiluted liquid sample from reactor coolant.

EP RB-16:B3 -- Reactor Coolant Stripped Gas Sampling For Radioassay and Gas Chromatographic Analysis

This procedure details the steps required to obtain a stripped gas sample from reactor coolant sources and make it available for gas chromatographic analysis.

EP RB-16:B4 -- Diluted Liquid Sampling from Radwaste

This procedure details the steps required to obtain a diluted sample from radwaste sources.

EP RB-16:B5 -- Undiluted Liquid Sampling from Radwaste

This procedure details the steps required to obtain an undiluted liquid sample from radwaste sources.

EP RB-16:C -- Containment Air Sampling

This procedure details the steps required to make containment air available for gas chromatograph analysis and to dilute containment air for isotopic analysis.

EP RB-16:D -- Gas Chromatographic Hydrogen Analysis Stripped Gas or Containment Air

This procedure details the steps required to analyze a stripped-gas or containment air sample by gas chromatography.

EP RB-16:E -- Post Accident RCS Liquid and Gas Sample Handling

This procedure details the steps required to prepare (1) a diluted liquid sample for boron analysis, (2) a diluted off-gas sample for γ-assay, (3) a diluted liquid sample for γ-assay and (4) a diluted containment air sample for γ-assay.

EP RB-16:F -- Data Analysis

This procedure provides a standard format to record data obtained in the EP RB-16 procedures.

EP RB-16:G -- Ion Chromatographic Chloride Analysis

This procedure details the steps required to measure the chloride concentrations from the sample sources available at the Reactor Coolant module of the LSP.

EP RB-16:H -- pH/Conductivity/YSI Dissolved Oxygen Analysis

This procedure details the steps required to perform pH/conductivity and YSI Dissolved oxygen analysis on a reactor coolant sample.

EP RB-16:I -- Undiluted Containment Air Sampling

This procedure details the steps required to obtain an undiluted containment air sample in a cart/cask for gross isotopic analysis.

EP RB-16:J -- Sample Storage and Disposal

This procedure details the steps required to dispose stripped-gas samples and to store RCS liquid samples.

REFERENCES

1. Sentry High Radiation Sampling System Operations and Maintenance Manual

2. NUREG 0737

PG&E **Pacific Gas and Electric Company**

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

NUMBER EP RB-16:A
REVISION 0
DATE 7/14/84

TITLE EMERGENCY OPERATING PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM
-- INITIAL ACTIONS DURING AN EMERGENCY
(NOT INTENDED TO MEET THE 3-HOUR TIME LIMIT)

APPROVED R. C. Thornberry 7-31-84
PLANT MANAGER DATE

IMPORTANT TO ENVIRONMENTAL QUALITY

PURPOSE

The purpose of this procedure is to define some of the actions taken when a decision is made by the Site Emergency Coordinator to obtain a post accident sample using the Post Accident Sample System (PASS).

This procedure guides, with consideration of plant emergency radiation hazards, the Sentry team to access and make operable the Sentry room. It also guides the team to withdraw from the Sentry room upon sample acquisition. This procedure and changes thereto requires PSRC approval.

DISCUSSION

This procedure ensures sample recovery with a minimum risk to personnel in a limited time frame.

The movable shield at the south entrance of the Sentry Room should normally block that access route. Therefore ingress and egress may be required across the RCA boundary. Performance of this procedure may require the transfer of radioactive samples to non-RCA's. For these reasons this procedure involves exemptions from certain routine RCA access requirements. Personnel implementing this procedure should be covered by an SWP during an accident, drill, or drill-like training. Routine use of the Sentry room is covered by the C&RP routine sampling RWP.

Particularly hazardous or unexpected conditions may occur in post accident situations. Direction by appropriate supervision may augment or supercede portions of this procedure because every possibility cannot be anticipated.

PREREQUISITES AND PRECAUTIONS

1. The Site Emergency Coordinator should pre-plan post-accident sampling with the Emergency Radiological Advisor and the Site Chemical and Radiation Protection Coordinator prior to ordering a plant entry (i.e., prior to deciding to collect a post-accident sample) when unusually hazardous radiation or contamination levels are known or suspected to exist.

2. A sufficient number of properly qualified personnel to complete the task should be available prior to making the post accident sample decision. This might include:

   a. Two people on the Sentry team; one of whom is a qualified C&RP Technician and the other an Unescorted Radiation Worker.

   b. A sample transporter qualified as a C&RP Technician.

   c. A count room qualified person in the TSC lab.

3. The Work Permit will specify protective equipment. Unless conditions warrant less stringent requirements, it is suggested that full PC's, SCBA's and accident dosimetry be worn.

4. The Sentry team will make a post-accident entry to the plant only when directed by supervision and when possessing a high range portable survey meter to permit surveying into areas of unknown radiological conditions.

5. The Sentry team should be informed of plant status as it pertains to significant hazards, both radiological and non-radiological, along access routes.

6. Exposure hazards, both airborne and direct radiation, in the Sentry room should be monitored remotely for pre-entry status and locally for tracking while sampling.

   a. Use the Eberline Control Terminal(s) in either Access Control or the cold machine shop to remotely address the SPING air monitor in the Sentry room, which can be read locally.

b. Area radiation monitor RE-48, in the Sentry room, can be read in the Control Room or locally.

7. Communications are vital during a plant emergency. Entry teams must be able to communicate with the Control Room and appropriate supervision.

8. C&RP Technicians have the AC4 N key required for access to areas and equipment related to this procedure and have security key cards to enter door #116. If the Sentry team does not possess either of these then take the applicable master keys located in the lock box in the R.P. office. The key to the 85' elev. post-accident equipment locker is number 37, located in the key cabinet in the R.P. office.

9. The containment isolation valves FCV-696, 697, 698, 699 and 700 are controlled from the Containment Isolation Valve Panel in the Sentry Room only. These switches require a key to operate. Keys are located in the Control Room, R.P. office, and in the Sentry room in a keybox with a breakable glass cover. These valves are to be opened only during an emergency or for testing.

10. It is important to conduct operations in an expeditious manner to provide timely vital plant status information.

PROCEDURE

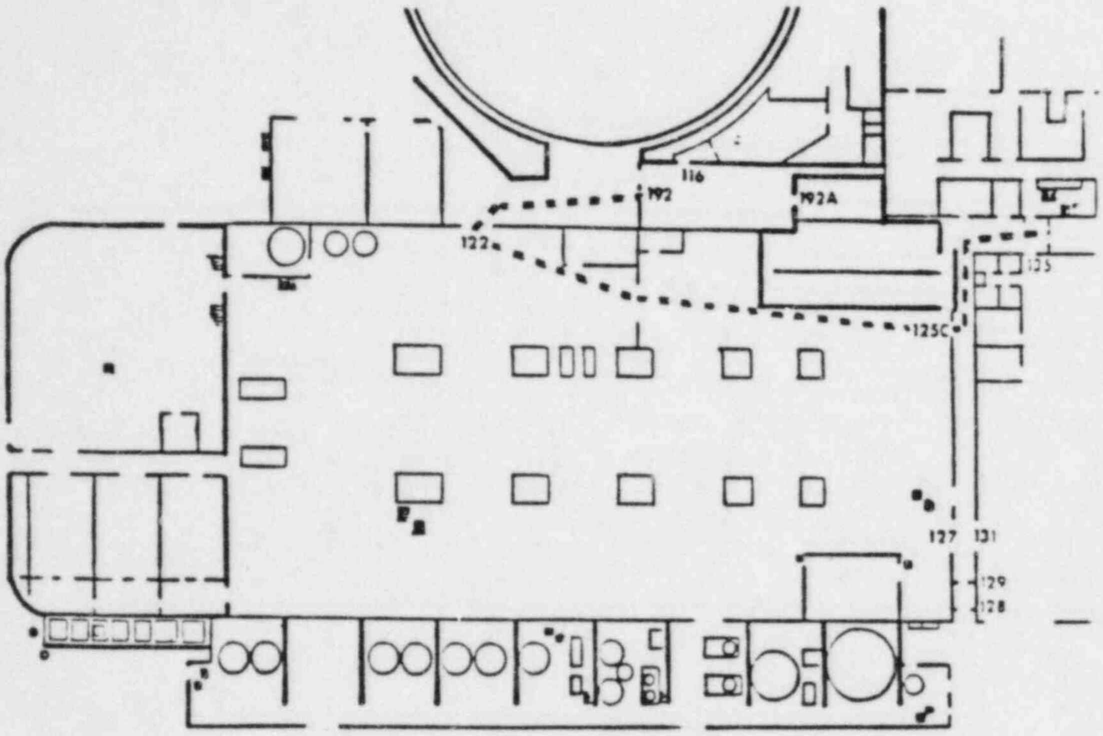
1. Access to Sentry Room Area

The Diablo Canyon Shielding Review indicates that the following routes might minimize exposures.

a. Via Turbine Building at 85' Elevation

Starting at the Cold Machine Shop proceed into the hallway to door #125C, proceed north to door #122 and exit building. From here turn south and enter door #192 to the Motor Repair Shop.

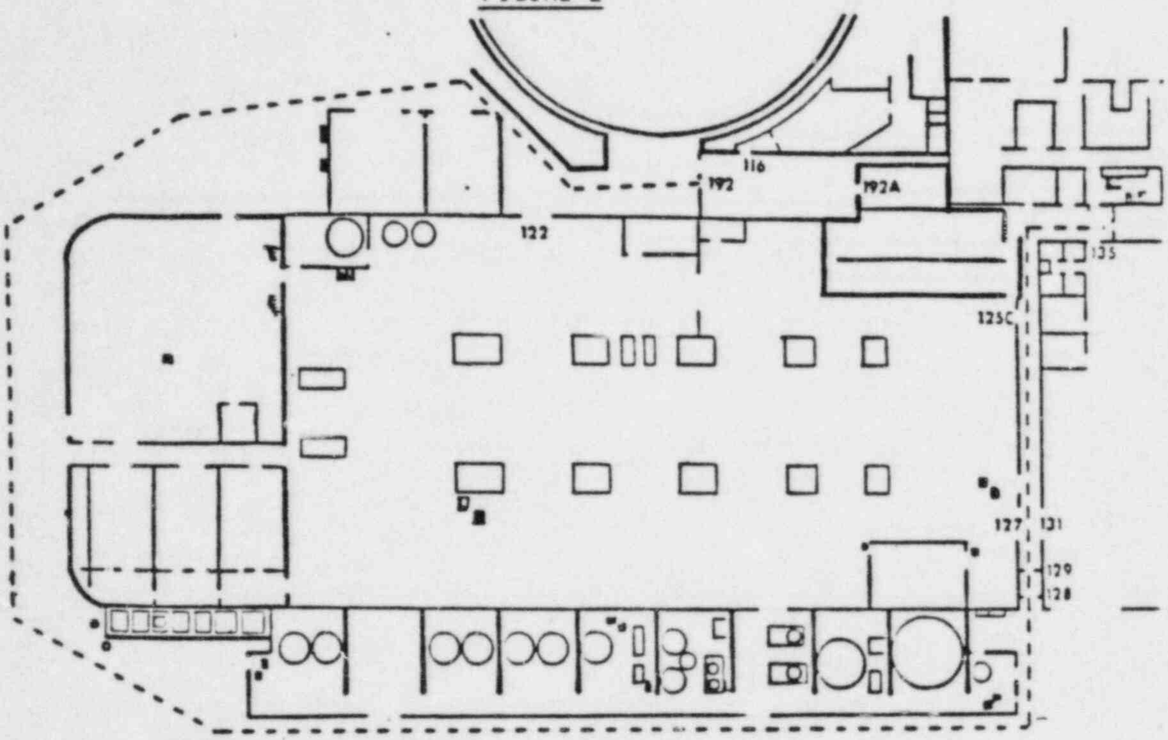
FIGURE 1



b. Around Turbine Building at 85' Elevation

Starting at the Cold Machine Shop proceed west to the outside via door #129, turn right and continue north around the Unit 1 Turbine Building looping around the transformers at the north end of the plant. Continue south to door #192 between containment and the Turbine Building. Enter the Motor Repair Shop via door #192.

FIGURE 2



c. Other Access Routes

The Figure 1 pathway is preferred. However an access route other than those above may be suggested by actual post accident conditions (e.g., fire, high energy line break, etc.). The final route selected should be directed by appropriate supervisory personnel.

2. Initial Set-up of Sentry Room Equipment

a. Gas Supply Cylinders Check

The gas supply cylinders for Sentry Room equipment are located along the east wall of the Motor Repair Shop. Proceed to the gas storage rack and verify the following:

1) The cylinder valves are fully open for all three cylinders.

2) The manifold valves are fully open for all three cylinders.

3) The argon regulator shows tank pressure of approximately 1000 psig and the regulator is set to 100 psig.

NOTE: If argon tank pressure is much less than 1000 psig, then the cylinder has to be changed with the spare cylinder located at the storage rack.

4) The 2000 ppm and 10% H_2 span gas cylinders should have at least 100 psig and both regulators should be set at 10 psig.

b. Emergency Ventilation System Line-up. (Optional. If proper ventilation is lined up proceed to step 2.c., Steel Shield Door Closure).

1) Climb the ladder to the cat walk and cross to enter the ventilation room. (AC4 N key required).

NOTE: Minimize the time that the vent room doors are open.

2) Proceed to breaker panel PPHRS, 52-12J-35 and check all breakers ON.

3) Proceed to the motor controllers for fans and heaters located to the left of the breaker panel and push the STOP and RESET pushbutton on each one.

4) EMER LEAD (IS-150) is the preferred system.

a) Open its supply and exhaust dampers and the supply and exhaust vent dampers (a total of 4 dampers) and close all other dampers.

b) Push the START pushbuttons on the motor controllers for the EMER LEAD supply fan, exhaust fan, and heater 29A, in that order.

5) EMER REDUN (IS-151) is to be used as a backup if EMER LEAD is inoperable.

a) Open its supply and exhaust dampers and the supply and exhaust vent dampers and close all other dampers.

b) Push the START pushbutton on the motor controllers for the EMER REDUN supply fan, exhaust fan and heater 29B, in that order.

6) Return to the Motor Repair Shop.

c. Steel Shield Door Closure. (Optional. If the shield door is closed proceed to step 2.d., Radiological Assessment.)

1) Proceed through door #192-A south of the Motor Repair Shop and visually check the shield door's winch cable. If the marked portion of the cable indicates the shield is closed return to the Motor Repair Shop and proceed with step d., Radiological Assessment below.

2) Quickly pass through the Motor Repair Shop and the Sentry room. Remove the cover plate from the door's pathway and return to the cable winch area.

3) Operate the winch until the marked portion of the cable visibly indicates the shield door is closed.

4) Return to the Motor Repair Shop.

d. Radiological Assessment of Sentry Room

1) Enter the Sentry room via door #116 (an RCA boundary) and the watertight door (AC4 N padlock).

2) Perform a general area radiation survey

a) Note high levels such as might exist at the south end of the room due to ECCS piping.

b) Note low level areas for sample screen surveying later.

3) Note the reading of RE-48 on the Process Control Panel (PCP). Recheck it intermittently.

4) Monitor airborne radioactivity using the SPING. If airborne levels permit the respirator, if worn, may be removed at this time. It should be donned anytime there is a potential for airborne contamination to be introduced into the room.

e. Proceed to the Ventilation Control Panel.

1) Check the alarms.

a) Press TEST and note the red alarm indicators flash while the audible alarm sounds.

b) Press SILENCE to stop the audible alarm.

c) Press ACK and note the flashing alarm indicators glow steadily.

d) Press RESET and note the red alarm indicators go out.

2) If the NORMAL VENT switch is on, turn it off.

3) If the EMER LEAD ventilation system is desired and is not operating depress in order the SUPPLY, EXHAUST, and HEATER pushbuttons.

4) Observe the appropriate indicating lights for proper operation of the desired ventilation line-up.

5) If necessary, return to step 2.b., Emergency Ventilation Line-up.

f. Containment Atmosphere Sample Line Heating

1) Proceed to the CCP and position the FUNCTION SELECT from OFF to SF1-3/GGD.

2) Observe the following:

a) The POWER ON indicator lights.

b) The flow monitor 20% and 100% flow lights turn on for approximately 25 seconds.

3) Press the PILOT LIGHT TEST pushbutton and note which lights are not functional.

4) Turn the HEAT TRACE POWER SWITCH to the ON position.

5) Place the temperature select switches for EHT 196 and EHT 197 to the down position marked 260°.

g. Rear Panel Access Rolling Shield Closure.

If the panel rolling shield is closed proceed to step 3., Electrical Line-up.

1) Perform this valve line-up check in the rear of the shielded panels:

CAP-V-13 CLOSED (above the GC) [ ]

CAP-V-31 OPEN (adjacent to the GC) [ ]

CAP-V-32 OPEN (adjacent to the GC) [ ]

CASP-V-1 OPEN (overhead on cont. atmos. supply line) [ ]

CASP-V-2 OPEN (lower part of CASP) [ ]

CASP-V-3 OPEN (mid part of CASP) [ ]

2) Get the come-a-long from the cabinet and attach one end to the pad eye on the east wall and the other to the pad eye on the door.

3) Operate the come-a-long until the rolling shield is blocking the doorway.

3. Electrical Line-up

Proceed to the breaker panel PYNMII, located left of the Vent Control Panel, and check positions of breakers as follows:

BKR #1	- ON	[ ]	BKR #2	- ON	[ ]
BKR #3	- ON	[ ]	BKR #4	- ON	[ ]
BKR #5	- OFF	[ ]	BKR #6	- ON	[ ]
BKR #7	- ON	[ ]	BKR #8	- ON	[ ]
BKR #9	- ON	[ ]	BKR #10	- OFF	[ ]
BKR #11	- OFF	[ ]	BKR #12	- ON	[ ]
			MAIN BKR	- ON	[ ]

4. The Containment Atmosphere Hydrogen Analyzers

The two redundant analyzer systems' remote panels are between the PCP and the CMP. Beneath each panel are the switches for controlling the three sample line containment isolation valves. The reagent gas tank (oxygen) is against the south wall of the Sentry Room.

a. Initial Conditions of an Analyzer System

1) Main power switch at remote panel in STANDBY. [ ]

<u>NOTE</u>: If the power switch is OFF, then turn it to STANDBY and give the system six hours to warm up. If both systems have not been in STANDBY for at least six hours, or are otherwise inoperable, use the gas chromatograph, step 5, below. Record the time of switching from OFF to STANDBY ________ .

2) Solenoid operated sample line containment isolation valve switches CLOSED. (FCV-235, 236, 237, 238, 239, 240) [ ]

3) Oxygen gas tank connected and isolation valve closed. (Tank should be changed at 100 psig) [ ]

b. H_2 Analyzer System(s) Operation.

CEL: 82 83

1) Turn the three sample line switches to the OPEN position. Observe the position indicating lights. [ ] [ ]

2) Open the oxygen tank isolation valve and adjust regulator to 27 ± 2 psig. [ ] [ ]

3) Turn the main power switch from STANDBY to ANALYZE. [ ] [ ]

4) Push the REMOTE SELECTOR [illegible] to gain control at this [illegible] [ ] [ ]

5) Turn the dual range switch to the 0-10% range. [ ] [ ]

6) Adjust the ZERO and SPAN potentiometers until they agree with their respective values indicated on calibration stickers located under each potentiometer. [ ] [ ]

7) Turn the function selector switch to SAMPLE. [ ] [ ]
TIME(82) ________ (83) ________

8) If both CEL 82 and 83 are to be used, repeat steps 4.b.1) to 7) for the second system while waiting for the first system to stabilize, which takes approximately 6 minutes. [ ] [ ]

9) Proceed with step 6., Initial Valve Line Up, while waiting for stabilization. When 6 minutes have elapsed since switching to SAMPLE, continue with step 10) below. [ ] [ ]

10) Record the analyzer meter reading, the time read, and the scale used. [ ] [ ]

Meter Reading (%) ________
Time ________
Scale Used ________

NOTE: If the meter reads greater than 9%, the 0-20% scale should be used.

11) Inform the Control Room of which scale and CEL is used and ask the Control Room if the analyzer(s) are to remain in ANALYZE or be returned to STANDBY. [ ] [ ]

NOTE: Advise the Control Room of the reagent gas depletion and the limited lifetime of the sample pumps, which are located in the 100' El. GE area.

12) If directed to leave the analyzer(s) in ANALYZE proceed with step 5, CMP/CAP Power Up... [ ] [ ]

c. Standby

1) Turn the function selector to ZERO and purge the analyzer for 6 minutes. [ ] [ ]

2) Turn the main power switch to STANDBY. [ ] [ ]

3) Close the reagent tank isolation valve. [ ] [ ]

4) Turn the three sample line isolation valve switches to the CLOSED position. [ ] [ ]

5) Push Common Alarm to Reset [ ] [ ]

5. CMP/CAP Power Up/Gas Chromatograph Startup (Optional)

a. Check the three root valve handles next to the CAP down in the vertical position to allow Argon and the Span gases to the CAP. [ ]

b. Open or check open CAP-V-10 and adjust instrument air pressure to 80 ± 2 psig. [ ]

c. Open or check open CAP-V-14 and adjust argon pressure to 40 ± 1 psig. [ ]

d. At the CMP, turn the POWER switch to ON and ensure the red power light and the G.C.'s red colon are on. [ ]

e. On the G.C. front panel

1) Select attenuation factor of 250 (25 x 10). Place all function switches in the OFF (out) position. [ ]

2) Depress MAN and CLEAR switches. [ ]

3) Enter "00" initiating G.C. warmup. Time on ___________

6. Initial Valve Lineup

a. Unlock the cabinet door and the drawer lock bar under the counter, if locked.

1) Locate a loaded filter assembly for the containment air sample.

2) Locate wrenches, labels, and bags.

b. Valve HCV-21, which is located next to the chemical sink, should be positioned to the TO CONTAINMENT position. [ ]

c. Sample cooler water valve should be turned until indicator shows OPEN [ ]

d. At the CASP [ ]

1) Install a loaded filter assembly into the containment air dilution system. [ ]

The tubing end with the blue dab of paint on it should be on the bottom. Tighten but do not damage the fittings. Retighten if leakage is noted later.

2) CASP cart/cask connection for pressure indication.

a) Engage and lock a cart/cask on its quick-disconnects. [ ]

b) OPEN the INLET and OUTLET valves and CLOSE the BYPASS valve on the engaged cart/cask. [ ]

c) Connect PI-1109 (an MBIS pressure monitor) to the engaged cart/cask. Plug it in and turn the selector switch to the proper cart/cask. Cart/Cask __________ [ ]

3) Check that PI-1116 is plugged in and turn it on. [ ]

4) Close or check closed CASP-V-17. [ ]

5) Align CASP-V-16 to the CASP-DV-1 position. [ ]

6) Align CASP-DV-1 to CASP-SF-5 position. [ ]

7) Install a new septum on CASP-SF-5. [ ]

e. At the CCP:

1) Adjust N_2 pressure regulator to 100 psig as indicated on CCP-G1. [ ]

NOTE: This pressure will drop to 80 psig when the eductor is on and Low N_2 PRESS alarm will sound.

2) All 11 of the CCP 3 position valve switches should be CLOSED:

AV-1	[ ]	SV-4.1	[ ]
SV-1.2	[ ]	SV-4.2	[ ]
SV-2.1	[ ]	SV-5	[ ]
SV-2.2	[ ]	AV-2	[ ]
SV-3.1	[ ]	SV-10	[ ]
SV-3.2	[ ]		

3) The EXERCISE STOP button should be in the IN position. Verify red light in knob is on. [ ]

4) Annunciator Test

a) Push and hold the TEST button and verify:

(1) the alarm sounds. [ ]

(2) all labeled windows flash except ISOLATE SAMPLE FLASK window which glows steady. [ ]

b) Release the TEST button and verify that the ISOLATE SAMPLE FLASK window goes off. [ ]

c) Push the ACK button and verify:

(1) the alarm is silenced. [ ]

(2) the 3 upper windows glow steady. [ ]

d) Push the RESET button and verify that all windows are off. [ ]

f. At the POST LOCA CNT ISOLATION PANEL all five key operated valve switches should be CLOSED:

g. At the CAP, valves should be positioned as follows:

CAP-V-12 (open) [ ]

Adjust nitrogen regulator until nitrogen pressure gauge is 60 ± 2 psig. [ ]

CAP-V-7 (YSI OXYGEN ANAL.) [ ]

CAP-V-8 (open) [ ]

CAP-V-6 (OXYGEN CALIB. SOL'N) [ ]

CAP-V-5 (CLOSED) [ ]

CAP-V-2 (open) [ ]

CAP-V-1 (open) [ ]

CAP-V-29 (12 o'clock) [ ]

CAP-V-28 (12 o'clock) [ ]

CAP-V-27 (12 o'clock) [ ]

CAP-V-9 (closed) [ ]

CAP-V-15 (closed) [ ]

CAP-V-16 (closed) [ ]

CAP-V-26 (closed) [ ]

CAP-V-30 (9 o'clock) [ ]

CAP-V-25 (closed) [ ]

CAP-V-20 (closed [ ]

CAP-V-19 (closed) [ ]

CAP-V-18 (closed) [ ]

CAP-V-11 (open) [ ]

h. At the Demin Module of the LSP, valves should be positioned as follows:

DM-V-1.1 (closed) [ ]

DM-V-1.2 (closed) [ ]

DM-V-1.3 (closed) [ ]

DM-V-3 (closed) [ ]

DM-VREL-1.1 (closed) [ ]

DM-VREL-1.2 (closed) [ ]

DM-VREL-1.3 (closed) [ ]

i. At the Open Grab Sample panel of the LSP, valves should be positioned as follows:

RW-V-6 (closed) [ ]

DM-V-2.1 (closed) [ ]

DM-V-2.2 (closed) [ ]

DM-V-2.3 (closed) [ ]

RC-V-17 (closed) [ ]

RC-V-6.1 (closed) [ ]

RC-V-6.2 (closed) [ ]

RC-V-5.1 (closed) [ ]

RC-V-5.2 (closed) [ ]

j. At the RC Module of the LSP, valves should be positioned as follows:

RC-V-12 (12 o'clock) [ ]

RC-V-15 (CLOSED) [ ]

RC-V-14 (closed) [ ]

RC-V-13 (9 o'clock) [ ]

RC-V-10 (9 o'clock) [ ]

RC-V-11 (CLOSED) [ ]

RC-DV-2 (9 o'clock) [ ]

RC-VREL-1 (closed) [ ]

RC-VREL-2	(closed)	[ ]
RC-V-3	(closed)	[ ]
RC-V-7	(9 o'clock)	[ ]
RC-V-2	(closed)	[ ]
RC-V-1.1	(closed)	[ ]
RC-V-1.2	(closed)	[ ]
RC-V-1.3	(closed)	[ ]
RC-V-1.4	(closed)	[ ]
RC-V-1.5	(closed)	[ ]
RC-V-4	(closed)	[ ]
RC-V-8.1	(closed)	[ ]
RC-V-8.2	(closed)	[ ]
RC-V-16	(closed)	[ ]
RC-V-9	(CLOSED)	[ ]
RC-V-18	(6 o'clock)	[ ]
RC-V-19	(BYPASS)	[ ]
RC-V-20	(closed)	[ ]
RC-V-21	(closed)	[ ]
RC-DV-1	(BYPASS)	[ ]
RC-22	(TO WASTE)	[ ]

k. At the RW Module of the LSP, valves should be positioned as follows:

RW-V-9	(closed)	[ ]
RW-V-10	(closed)	[ ]
RW-DV-1	(BYPASS)	[ ]
RW-V-8	(BYPASS)	[ ]
RW-V-7	(BYPASS)	[ ]
RW-V-5	(6 o'clock)	[ ]
RW-V-4	(closed)	[ ]
RW-V-3	(closed)	[ ]

RW-V-1.1 (12 o'clock) [ ]
RW-V-1.2 (12 o'clock) [ ]
RW-V-1.3 (12 o'clock) [ ]
RW-V-2.1 (6 o'clock) [ ]
RW-V-2.2 (6 o'clock) [ ]
RW-V-2.3 (6 o'clock) [ ]
RW-V-1.4 through RW-V-1.10 (closed) [ ]
RW-V-2.4 through RW-V-2.10 (closed) [ ]

1. At the PROCESS CONTROL PANEL (PCP)

NOTE: Notify the Control Room when any valve alignments are changed.

1) Position or check the position of the following switches for valves:

FCV-9351A (CLOSE) [ ]
FCV-9351B (CLOSE) [ ]
FCV-9350B (CLOSE) [ ]
FCV-9350A (CLOSE) [ ]
FCV-9353A (CLOSE) [ ]
FCV-9353B (CLOSE) [ ]
FCV-692 (CLOSE) [ ]
FCV-693 (CLOSE) [ ]
FCV-694 (CLOSE) [ ]
FCV-1413 (CLOSE) [ ]
FCV-1416 (CLOSE) [ ]
FCV-1417 (CLOSE) [ ]
FCV-1418 (CLOSE) [ ]
FCV-1419 (CLOSE) [ ]
FCV-1412 (CLOSE) [ ]
FCV-1410 (CLOSE) [ ]
FCV-1411 (CLOSE) [ ]
FCV-1414 (CLOSE) [ ]

FCV-1415 (CLOSE) [ ]

FCV-1420 (CLOSE) [ ]

FCV-1421 (CLOSE) [ ]

FCV-1422 (CLOSE) [ ]

FCV-1423 (CLOSE) [ ]

FCV-1424 (CLOSE) [ ]

FCV-1425 (CLOSE) [ ]

FCV-624 (CLOSE) [ ]

FCV-1428 (POST LOCA SAMPLING) [ ]

2) Position switches for POST LOCA COLLECTION TANK TRANSFER PUMPS 1 and 2 to the STOP position. [ ]

3) Sample Source Valves

a) Determine which sample source isolation valves will have to be opened from the list below:

SAMPLE SOURCE	CONTAINMENT ISOLATION VALVES
Hot Legs Loops 1 and 4	FCV-9356A and FCV-9356B
Pressurizer Steam Space	FCV-9354A and FCV-9354B
Pressurizer Liquid Space	FCV-9355A and FCV-9355B
RHR Pumps Discharge	N/A
Volume Control Tank	N/A

b) Call the Control Room and have operations block open the appropriate containment isolation valves.

If sampling the reactor cavity sump, notify the control room to turn on the reactor cavity sump pumps, then open containment isolat .n valves FCV 500 and 501 for one minute. Close isolation valves FCV 500 and 501 and open valves FCV 696 and 697. Containment isolation valves FCV 696 and 697 are key operated valve switches controlled in the Sentry Room at the POST LOCA CNT ISOLATION PANEL.

c) Open the corresponding remote plant isolation valve (RPIV), remote source isolation valve (RSIV), and remote flush isolation valve (RFIV) at the PCP (see attachment 1 for proper valve).

d) Allow remote sampling purging for at least 20 minutes before purging sample lines at panel (EP RB-15:II).

4) At the PCP

a) Push the TEST button and verify:

(1) the alarm sounds [ ]

(2) all labeled windows flash [ ]

b) Push the ACK button and verify:

(1) the alarm is silenced [ ]

(2) all labeled windows glow steady [ ]

c) Push the RESET button and verify that all windows are off. [ ]

9. Monitor Startup and O_2 Calibration Tank Recirculation (CAP)

NOTE: This section may be unnecessary. If so, skip to the next section.

a. Dissolved O_2 Calibration Tank Recirculation

1) If calibration has been performed within one week, proceed to step b. [ ]

2) Observe that the level in the oxygen calibration tank CAP-CAL-4 is about 1" below top of sightglass. If water must be added to the tank, check closed CAP-V-18, open CAP-V-11 and CAP-V-24 and fill the tank. Close CAP-V-24. [ ]

3) Open fully CAP-V-17. [ ]

4) Turn the O_2 CALIB. SYSTEM pump to ON position. Indicator lights for the pump should light on both the CAP and CMP. [ ]

5) Recirculate the water for at least 1 hour. [ ]

Time on ______________

6) Continue to recirculate until the actual calibration is performed. [ ]

b. pH Monitor (CMP)

NOTE: This section may be unnecessary. If so, skip to the next section.

1) Make sure the pH buffer tanks are over half full with pH7 and pH4 or 10 buffers at the CAP. [ ]

NOTE: To fill vent tank pressure, remove pipe cap on top of sight glass and fill with appropriate buffer. Be sure to install pipe cap and then repressurize tank.

2) Place internal S-1 toggle switch to ON (up) position. [ ]

3) Switch S-3 to the OFF position. [ ]

4) With a small screwdriver, adjust R-3 standardize control for full downward and upward deflection and then reset to a reading of 7.0. [ ]

5) Switch S-3 to the ON position. [ ]

c. Conductivity Monitor (CMP)

NOTE: This section may be unnecessary. If so, skip to the next section.

1) Observe that the meter reading is on zero when the selector switch is on ZERO. [ ]

2) Turn the selector switch to CHECK. The meter indicator should move to CHECK on the meter scale. [ ]

NOTE: If it does not move to CHECK, consult the Site Emergency Coordinator for directions.

3) Switch the selector switch to MEASURE. The monitor is now ready for operation. [ ]

4) Energize for 30 minutes.

Time on ____________

d. YSI Dissolved Oxygen Analyzer (CMP)

NOTE: This section may be unnecessary. If so, skip to next section.

1) Turn POWER switch to ON. [ ]

2) Turn O_2 FILTER to OFF. [ ]

3) Turn O_2 RANGE to 0-20 ppm. [ ]

4) Turn PEN INPUT to ZERO. [ ]

5) Turn CHART SPEED to RAPID. [ ]

6) Adjust the PEN ZERO control until the pen traces a line on the 0-20 chart scale at 0. [ ]

7) Turn CHART SPEED to 10. [ ]

8) Turn PEN INPUT to $-O_2$. [ ]

9) Energize for 30 minutes.

Time on ____________

e. Ion Chromatograph Startup

NOTE: This section may be unnecessary. If so, skip to next section.

1) Verify that the level of chloride calibration standard (2000 ppm B as boric acid and 1 ppm chloride) is at least half full in CAL-3. [ ]

2) Verify that air bubbles are not visible in the sight glass. [ ]

NOTE: If air bubbles are present, check the pumps and vent; venting is required when eluent containers are filled.

3) Verify that the following reagents are available.

0.0015 M Sodium Bicarbonate ($NaHCO_3$) [ ]

0.006 M Sodium Carbonate ($Na_2CO_3 \cdot 10H_2O$) [ ]

1N Sulfuric Acid (H_2SO_4) [ ]

Deionized Water Rinse [ ]

4) If an, of the reagents listed in step 3 is not available or has not been prepared within the last 30 days, refer to Attachment 2 for details of reagent preparation. [ ]

5) Place the POWER and AIR switches to ON position. [ ]

6) Place LOAD/INJECT switch in the LOAD position. [ ]

7) Place the E-2 switch in the UP position. [ ]

8) Place the SEPARATOR switch in the SEP-1 position. [ ]

9) Place the SUPPRESSOR switch in the SUP-1/RGN-2 position. [ ]

NOTE: The following are performed at the conductivity meter on the CAP:

10) Set MODE switch to ZERO and verify needle points to 0. [ ]

NOTE: If not at ZERO, adjust to ZERO with the screw below the meter face.

11) Set MODE switch to CAL and verify needle swings full scale. [ ]

NOTE: If adjustment is necessary, adjust using the screw at the top of the circuit board (the one labeled METER).

12) Set MODE switch to LIN. [ ]

13) Set the µMHO FULL SCALE switch to 30. [ ]

14) Check if eluent pump setting is 40 percent. [ ]

15) Turn the eluent pump switch to ON position. [ ]

16) Turn GAUGE switch to ON position. Normal operating pressure is 200 psig. [ ]

17) Allow system to warm up and stabilize for 30 minutes.

Time on ____________

10. Sampling may now commence.

REFERENCES

1. Sentry Equipment Corp. High Radiation Sampling Systems Operations and Maintenance Manual.

ATTACHMENTS

1. Valves for Obtaining Samples

2. Reagent Preparation

PACIFIC GAS AND ELECTRIC COMPANY
DEPARTMENT OF NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

TITLE: VALVES FOR OBTAINING SAMPLES

ATTACHMENT 1

SAMPLE SOURCE	REMOTE PLANT ISOLATION VALVE (RPIV)	REMOTE SOURCE ISOLATION VALVE (RSIV)	REMOVE FLUSH ISOLATION VALVE (RFIV)	LSP SAMPLE SOURCE VALVE (SSV)
RC Hot Leg 1	FCV-9351 A	FCV-692	FCV-1416	RC-V-1.1
RC Hot Leg 4	FCV-9351 B	FCV-692	FCV-1416	RC-V-1.1
PZR Liquid	FCV-9350 B	FCV-693	FCV-1417	RC-V-1.2
PZR Steam	FCV-9350 A	FCV-694	FCV-1418	RC-V-1.3
RHR Pump 1-1 Discharge	FCV-9353 A	FCV-1413	FCV-1419	RC-V-1.4
RHR Pump 1-2 Discharge	FCV-9353 A	FCV-1413	FCV-1419	RC-V-1.4
VCT Liquid	N/A	FCV-1412	FCV-1420	RC-V-1.5
Reactor Cavity Sump	FCV-696-Inside CNT FCV-697-Outside CNT	N/A	FCV-1423	RC-V- .1
Equipment Drain RCVR	N/A	FCV-1414	FCV-1424	RW-V-2.3
Floor Drain RCVR	N/A	FCV-1415	FCV-1425	RW-V-2.2

TITLE: REAGENT PREPARATION

ATTACHMENT 2

NOTE: Reagents must have a shelf life of 30 days. Reagents must be made using demin water with a conductance of less than 1 μmho.

1. 0.0015 M Sodium Bicarbonate ($NaHCO_3$)

   Dissolve 2.5200g sodium bicarbonate in 20 liters demin water. Transfer the solution of a 4 liter collapsible container provided in the ion chromatograph. Remove excess air from the container by opening the top valve and squeezing the container until overflow occurs. Label the container including initials and date. Connect to line E-2 in the reagent storage facility of the ion chromatograph. Open the container valve and vent pump inlet lines.

2. 0.006 M Sodium Carbonate ($Na_2CO_3 . 10H_2 O$)

   Dissolve 6.87 grams of Sodium Carbonate in 4 liters of demin water. Transfer the solution to a 4 liter collapsable container, remove excess air, and label container with initials and date. Connect to line E-1 in the reagent storage facility of the ion chromatograph. Open the container valve and vent pump inlet lines.

3. 1N $H_2 SO_4$

   Add with stirring 120 ml of concentrated sulfuric acid to 4 liters of demin water and cool. Transfer the solution of a 4 liter collapsable container, remove excess air, and label container with initials and date. Connect it to the line REGEN SYSTEM-1. Open the container valve and vent pump inlet lines.

4. Demineralized Water Rinse

   Fill a four (4) liter collapsable container with demin water. Remove excess air from the bottle and label. Connect it to the water line in the reagent storage facility. Open the container valve and vent pump inlet lines.

PG&E **Pacific Gas and Electric Company**

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

NUMBER EP RB-16:B1
REVISION 0
DATE 7/18/84
PAGE 1 OF 8

TITLE EMERGENCY OPERATING PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM --
DILUTED LIQUID SAMPLING FROM REACTOR COOLANT
(NOT INTENDED TO MEET THE 3-HOUR TIME LIMIT)

APPROVED R. C. Thornberry PLANT MANAGER 7-31-84 DATE

IMPORTANT TO ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of this procedure is to detail the steps required to obtain a diluted liquid sample from the reactor coolant. A complete flush of the modules will be done after the sample has been processed and system will be returned to initial lineup status.

PREREQUISITES

1. System was initially lined up as described in procedure EP RB-16:A.

2. Verify that the following annunciator windows are off on the PCP:

   a. REACTOR COOLANT SAMPLE COOLING WATER LOW FLOW

   b. REACTOR COOLANT SAMPLE COOLING WATER LOW PRESS

   c. REACTOR COOLANT SAMPLE COOLING WATER HIGH TEMP

   d. REACTOR COOLANT PURGE HIGH TEMP

   e. REACTOR COOLANT SAMPLE WATER HIGH TEMP

   f. LIQUID SAMPLE PANEL HIGH PLENUM PRESS

   g. CHEM ANALYSIS PANEL HIGH PLENUM PRESS

3. The following equipment must be available and operational:

   a. Meter-long reach rod

   b. Hand operated vacuum pump

c. Sample cart/cask with the 60ml lift rod assembly.

d. A pre-labeled 60 ml sample bottle with a new septum.

NOTE: The label should have the sample source, date, estimated time of the sample, and the initials of the person taking the sample. (From this point estimate 20 minutes)

4. The gas chromatograph must be in a standby mode with a valid calibration.

Assign one LSP operator to EP RB-16:D to prepare the GC.

PRECAUTIONS

1. See EP RB-16:A for details.

2. This sampling involves processing of water that will be highly radioactive. Precautions should be taken to prevent skin contact or ingestion.

3. Time in a radiation field should be limited to that necessary to perform the required operations. During purge and flush period, it may not be necessary to stand near the panels and consideration should be given to moving to a low dose area.

4. A dose rate instrument should be on and periodic monitoring is suggested during purge and sampling exercises.

5. The LSP operator must verify that the gas chromatograph is ready to receive a gas sample before opening valve RC-V-15. Valve RC-V-15 must be closed after filling all G.C. sample loops and prior to performing diluted gas sampling and final flushing operations.

PROCEDURE

1. Perform all actions specified in EP RB-16:A.

2. Verify RC-DV-1 is turned to BYPASS. Fill reservoir RC-R-1 with demin water:

a. Open RC-V-20 and RC-V-21 [ ]

b. Adjust reservoir RC-R-1 until the water level in graduated cylinder RC-C-1 is over 100 mls. [ ]

c. Close RC-V-21 and RC-V-20 [ ]

3. Verify that the following valves are closed:

RC-V-1.1 through 1.5 [ ]
RC-V-4 [ ]

4. Insert the needle of the hand operated vacuum pump into the septum of the prelabeled 60 ml sample bottle: [ ]

a. Evacuate to the maximum vacuum achievable with the hand pump. The vacuum must be at least 15" of Hg. [ ]

b. Keep the pump connected to the bottle for 3 minutes to assure that the bottle retains the vacuum. [ ]

5. Turn on the switch to light the diluted bottle fill station. [ ]

6. Remove the bottle from the vacuum pump and place bottle on the cart/cask assembly cavity piston. [ ]

a. Turn the direction valve for the hydraulic piston to the down position and lower the bottle into the cask cavity. [ ]

b. Close and open the cask to verify that the cover is working properly. [ ]

c. Position the cart/cask under the diluted reactor coolant fill station needle and set the brake. [ ]

d. Turn the direction valve for the hydraulic piston to the up position and raise the bottle onto the needle. [ ]

7. At the PCP verify that the sample cooler water flow, temperature, and pressure annunciator lights are off. [ ]

8. Open the following valves:

   RC-V-9 [ ]
   RC-V-8.2 [ ]
   RC-V-10 [ ]

9. Reactor Coolant Sample Line Purge

   a. Open RC-V-8.1. [ ]

   b. Open RC-SV-1 and RC-SV-2 by turning breaker #10 to ON. [ ]

   NOTE: The sample source valves are labeled RC-V-1.1 through RC-V-1.5. Throughout this procedure, the form RC-V-1.X will be used to indicate the source valve to be operated. The sample source used for sampling will have been given at a briefing by the Site Chem and Rad Protection Coordinator.

   NOTE: Upon implementation of the next step, sample will be flowing into the back of the LSP. The meter-long reach rod should be used to operate valves and a dose rate survey should be done to monitor radiation levels.

   c. Close remote flush isolation valve (RFIV). [ ]

   d. Open the sample source valve RC-V-1.X (see Attachment 1 for proper valve). [ ]

   e. Open RC-V-3. [ ]

   f. Slowly open RC-VREL-1 until RC-FI-1 indicates 100% flow. Purge for 5 minutes. [ ]

   g. Slowly close RC-VREL-1 until RC-FI-1 indicates 36%. Continue the purge for 1 minute. [ ]

h. Close RC-V-3. [ ]

10. Reactor Coolant Sampling

a. Open RC-V-2. [ ]

b. Adjust RC-VREL-2 until RC-FI-2 indicates 100% flow. Purge for 3 minutes. [ ]

c. Close RC-V-8.2 [ ]

d. Close RC-V-8.1 [ ]

e. Turn RC-DV-1 to SAMPLE. [ ]

f. Close RC-V-1.X. [ ]

g. Call the control room and have operations close the containment isolation valves opened in Step 12.c. (if applicable). [ ]

11. Initial Flushing

a. At the PCP, perform the following:

1) Close the remote source isolation valve. [ ]

2) Close the remote plant isolation valve. [ ]

3) Open the remote flush isolation valve (see Attachment 1 for the proper valve). [ ]

b. Open in order valves RC-V-7 and RC-V-4 [ ]

c. Adjust RC-VREL-2 until RC-FI-2 indicates 100% flow. Flush with demin water for 3 minutes. [ ]

d. Close RC-V-7 [ ]

e. Open RC-V-3. [ ]

f. Adjust RC-VREL-1 until RC-FI-1 indicates 80-90% flow. Flush with demin water for 1 minutes. [ ]

g. Close RC-V-3. [ ]

h. Open RC-V-1.X. Flush with demin water for 5 minutes. [ ]

i. Close RC-V-1.X. [ ]

12. Liquid Sample Dilution

a. Crack open RC-V-21, and add 23 mls of water from RC-C-1 to the sample bottle, then close RC-V-21. [ ]

b. Turn the RC-DV-1 to BYPASS. [ ]

c. Place the direction valve for the hydraulic piston in the down position and lower the sample into the cask. [ ]

d. Close the cask. [ ]

13. Sample Cask/Cart Removal

a. Release brake and remove the cart/cask from the sample station and place in temporary hold area. [ ]

b. Perform a radiation and contamination survey on the cart/cask assembly. [ ]

c. Turn off the diluted fill station light. [ ]

14. Final Flushing

a. Verify RC-V-15 is in the CLOSED position. [ ]

b. Turn RC-V-11 counterclockwise to the 6 o'clock position. [ ]

c. Open the following valves:

RC-V-9 [ ]
RC-V-7 [ ]
RC-V-8.1 [ ]

d. Adjust RC-VREL-2 until RC-FI_2 indicates 100% flow. Flush with demin water for 1 minute. [ ]

e. Open RC-V-8.2. [ ]

f. Close RC-V-9 and RC-V-7. [ ]

g. Adjust RC-VREL-2 until RC-FI-2 indicates 100% flow. Flush with demin water for 3 minutes. [ ]

h. Close RC-V-8.1. [ ]

i. Turn RC-V-11 counterclockwise to the 3 o'clock position. [ ]

j. Open RC-V-9. [ ]

k. Pull open RC-VREL-2. [ ]

1) When there is a sharp increase in pressure indicated on RC-G-3, release RC-VREL-2. [ ]

2) Adjust RC-VREL-2 until RC-G-3 indicates 20 psig. [ ]

3) Flush with argon for 3 minutes. [ ]

l. Close RC-V-9. [ ]

m. Open RC-V-10. [ ]

n. Turn RC-V-11 counterclockwise to the 9 o'clock position and allow RC-EV-1 to vent. [ ]

o. Close RC-V-10. [ ]

p. Turn RC-V-11 clockwise to CLOSED. [ ]

q. Open RC-V-8.1. [ ]

r. Adjust RC-VREL-2 until RC-FI-2 indicates 100% flow. [ ]

Flush with demin water for 1 minute. [ ]

s. Close RC-V-2. [ ]

t. Open RC-V-1.X and flush with demin water for 5 minutes. [ ]

u. Close RC-V-1.X. [ ]

v. Terminate flushing by closing the following valves. [ ]

RC-V-8.1 [ ]
RC-V-8.2 [ ]
RC-VREL-1 [ ]
RC-VREL-2 [ ]
RC-V-4 [ ]

15. At the FCP, close the remote flush isolation valve. [ ]

16. At breaker panel PYNM11, place breaker #10 to the OFF position. [ ]

17. Close sample cooler water. [ ]

18. Call the Site Chem and Rad Protection Coordinator and inform him that the diluted reactor coolant sample is ready for transfer/analysis. [ ]

Using procedure EP RB-16:E, aliquot and analyze the diluted liquid sample for boron. [ ]

20. Process the data according to procedure EP RB-16:F. [ ]

<u>REFERENCES</u>

1. Sentry Equipment Corp. High Radiation Sampling System Operating and Maintenance Manual.

<u>ATTACHMENTS</u>

1. Valves for Obtaining Samples from Reactor Coolant.

PACIFIC GAS AND ELECTRIC COMPANY
DEPARTMENT OF NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

TITLE: VALVES FOR OBTAINING SAMPLES FROM REACTOR COOLANT

ATTACHMENT 1

SAMPLE SOURCE	REMOTE PLANT ISOLATION VALVE (RPIV)	REMOTE SOURCE ISOLATION VALVE (RSIV)	REMOVE FLUSH ISOLATION VALVE (RFIV)	LSP SAMPLE SOURCE VALVE (SSV)
RC Hot Leg 1	FCV-9351 A	FCV-692	FCV-1416	RC-V-1.1
RC Hot Leg 4	FCV-9351 B	FCV-692	FCV-1416	RC-V-1.1
PZR Liquid	FCV-9350 B	FCV-693	FCV-1417	RC-V-1.2
PZR Steam	FCV-9350 A	FCV-694	FCV-1418	RC-V-1.3
RHR Pump 1-1 Discharge	FCV-9353 A	FCV-1413	FCV-1419	RC-V-1.4
RHR Pump 1-2 Discharge	FCV-9353 A	FCV-1413	FCV-1419	RC-V-1.4
VCT Liquid	N/A	FCV-1412	FCV-1420	RC-V-1.5

PG&E **Pacific Gas and Electric Company**

NUMBER EP RB-16:B2
REVISION 0
DATE 7/18/84
PAGE 1 OF 6

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

TITLE EMERGENCY OPERATING PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM --
UNDILUTED LIQUID SAMPLING FROM REACTOR COOLANT
(NOT INTENDED TO MEET THE 3-HOUR TIME LIMIT)

APPROVED R. C. Thornberry 7-31-84
PLANT MANAGER DATE

IMPORTANT TO
ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of this procedure is to detail the steps required to obtain an undiluted liquid sample during accident conditions and complete module flushing.

PREREQUISITES

1. System was initially lined up as described in procedure EP RB-16:A.

2. Verify that the following annunciator windows are off on the PCP:

   a. REACTOR COOLANT SAMPLE COOLING WATER LOW FLOW

   b. REACTOR COOLANT SAMPLE COOLING WATER LOW PRESS

   c. REACTOR COOLANT SAMPLE COOLING WATER HIGH TEMP

   d. REACTOR COOLANT PURGE HIGH TEMP

   e. REACTOR COOLANT SAMPLE HIGH TEMP

   f. LIQUID SAMPLE PANEL HIGH PLENUM PRESS

3. The following equipment must be available and operational:

   a. Meter-long reach rod

   b. Needle flush tool with demin water in a sample bottle and a new septum

   c. Sample cart/cask with the 15 ml lift rod assembly

d. A prelabeled 15 ml sample bottle with a new septum

1) The label should have the sample source, date, estimated time of sample, and the initials of the person taking the sample. (from this point estimate 19 minutes)

PRECAUTIONS

1. This sampling involves processing of water that will be highly radioactive. Precautions should be taken to prevent skin contact or ingestion.

2. Time in a radiation field should be limited to that necessary to perform the required operations. During purge and flush periods it may not be necessary to stand near the panels and consideration should be given to moving to a low dose rate area.

3. A dose rate instrument should be on and periodic monitoring is suggested during purge and sampling exercises.

PROCEDURE

1. Turn on the switch to light the undiluted bottle fill station. [ ]

2. Place the bottle on the cart/cask assembly cavity piston. [ ]

a. Turn the direction valve for the hydraulic piston in the down position and lower the bottle into the cask cavity. [ ]

b. Close and open the cask to verify that the cover is working properly. [ ]

c. Position the cart/cask under the undiluted reactor coolant fill station needles and set the brake. [ ]

d. Turn the direction valve for the hydraulic piston in the up position and raise the bottle onto the needles. [ ]

3. Reactor Coolant Sample Line Purge

a. Open RC-V-8.1. [ ]

b. Open RC-SV-1 and RC-SV-2 by turning breaker #10 to ON. [ ]

NOTE: The sample source valves are labeled RC-V-1.1 through RC-V-1.5. Throughout this procedure, the form RC-V-1.X will be used to indicate the source valve to be operated. The sample source used for sampling will have been given at a briefing by the Site Chem and Rad Protection Coordinator.

NOTE: Upon implementation of the next step, sample will be flowing into the back of the LSP. The meter-long reach rod should be used to operate valves and a dose rate survey should be done to monitor radiation levels.

c. Close remote flush isolation valve (RFIV). [ ]

d. Open the sample source valve RC-V-1.X (see Attachment 1 for proper valve). [ ]

e. Open RC-V-3. [ ]

f. Slowly open RC-VREL-1 until RC-FI-1 indicates 100% flow. Purge for 5 minutes. [ ]

g. Slowly close RC-VREL-1 until RC-FI-1 indicates 36%. Continue the purge for 1 minute. [ ]

h. Close RC-V-3. [ ]

4. Sampling

a. Open RC-V-7 [ ]

b. Slowly open RC-VREL-2 until RC-FI-2 indicates 100% flow. Purge for 3 minutes. [ ]

c. Turn RC-V-19 to SAMPLE. [ ]

CAUTION: Do not exceed 20 psig on RC-G-3.

d. Adjust RC-VREL-2 until RC-G-3 indicates 20 psig or RC-FI-2 indicates 100% flow. Purge for 2 minutes. [ ]

e. Close RC-V-7 [ ]

f. Let RC-G-3 return to 0 psig and wait 30 seconds to allow the bottle to depressurize. [ ]

g. Turn RC-V-19 to BYPASS [ ]

h. Close RC-V-1.X [ ]

i. Call the control room and have operations close the containment isolation valves opened earlier. [ ]

5. Sample Cart/Cask Removal

a. Turn the direction valve for the cart/cask hydraulic piston to the down position and slowly lower the bottle into the cask. [ ]

b. Close the cask. Release brake and remove the cart/cask from the sample station and away from the LSP. [ ]

c. Install and secure the auxiliary shield. [ ]

d. Install and secure the needle flush tool onto the undiluted reactor coolant fill station needles. [ ]

6. Initial Flushing

a. At the PCP, perform the following:

1) Close the remote source isolation valve. [ ]

2) Close the remote plant isolation valve. [ ]

3) Open the remote flush isolation valve (see Attachment 1 for proper valve.) [ ]

b. Open RC-V-7 and RC-V-4. [ ]

c. Adjust RC-VREL-2 until RC-FI-2 indicates 100% flow. Flush with demin water for 3 minutes. [ ]

d. Close RC-V-7. [ ]

e. Open RC-V-3. [ ]

f. Adjust RC-VREL-1 until RC-FI-1 indicates 80-90% flow. Flush with demin water for 1 minute. [ ]

g. Close RC-V-3. [ ]

h. Open RC-V-1.X and flush with demin water for 5 minutes. [ ]

i. Close RC-V-1.X. [ ]

7. Final Flushing

a. Open RC-V-8.1 and RC-V-8.2. [ ]

b. Adjust RC-VREL-2 until RC-FI-2 indicates 100% flow. Flush with demin water for 1 minute. [ ]

c. Turn RC-V-19 to SAMPLE. [ ]

CAUTION: Do not exceed 20 psig on RC-G-3.

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d. Adjust RC-VREL-2 until RC-G-3 indicates 20 psig or RC-FI-2 indicates 100% flow. Flush with demin water for 2 minutes. [ ]

e. Close RC-V-2 [ ]

f. Let RC-G-3 return to 0 psig and wait 30 seconds to allow bottle to depressurize. [ ]

g. Turn RC-V-19 to BYPASS [ ]

h. Terminate flushing by closing the following valves:

RC-V-8.2 [ ]
RC-V-8.1 [ ]
RC-V-4 [ ]
RC-VREL-1 [ ]
RC-VREL-2 [ ]

8. Turn off the undiluted fill station light. [ ]

9. At the PCP, close the remote flush isolation valve. [ ]

10. Remove the needle flush tool and survey the bottle for disposal. [ ]

11. At breaker panel PYNM11, place BKR #10 to the OFF position. [ ]

12. Perform a radiation and contamination survey on the cart/cask assembly. Handlethe sample according to procedure EP RB-16:J. [ ]

REFERENCES

1. Sentry Equipment Corp. High Radiation Sampling System Operating and Maintenance Manual.

ATTACHMENTS

1. Valves for Obtaining Samples from Reactor Coolant.

TITLE: VALVES FOR OBTAINING SAMPLES FROM REACTOR COOLANT

ATTACHMENT 1

SAMPLE SOURCE	REMOTE PLANT ISOLATION VALVE (RPIV)	REMOTE SOURCE ISOLATION VALVE (RSIV)	REMOTE FLUSH ISOLATION VALVE (RFIV)	LSP SAMPLE SOURCE VALVE (SSV)
RC Hot Leg 1	9351 A	FCV-692	FCV-1416	RC-V-1.1
RC Hot Leg 4	9351 B	FCV-692	FCV-1416	RC-V-1.1
PZR Liquid	9350 B	FCV-693	FCV-1417	RC-V-1.2
PZR Steam	9350 A	FCV-694	FCV-1418	RC-V-1.3
RHR Pump 1-1 Discharge	9353 A	FCV-1413	FCV-1419	RC-V-1.4
RHR Pump 1-2 Discharge	9353 B	FCV-1413	FCV-1419	RC-V-1.4
VCT Liquid		FCV-1412	FCV-1420	RC-V-1.5

PG&E **Pacific Gas and Electric Company**

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

TITLE EMERGENCY OPERATING PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM
-- REACTOR COOLANT STRIPPED GAS SAMPLING
(NOT INTENDED TO MEET THE 3-HOUR TIME LIMIT)

APPROVED R. C. Thornberry 7-31-84
PLANT MANAGER DATE

IMPORTANT TO ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of this procedure is to detail the steps required to strip gas from the reactor coolant, collect a diluted stripped gas isotopic sample, and route gas to the CAP for hydrogen analysis. This procedure requires operations at the LSP, CAP and CMP panels.

PREREQUISITES

1. System was initially lined up as described in procedure EP RB 16:A.

2. Verify that the following annunciator windows are off on the PCP:

   a. REACTOR COOLANT SAMPLE COOLING WATER LOW FLOW

   b. REACTOR COOLANT SAMPLE COOLING WATER LOW PRESS

   c. REACTOR COOLANT SAMPLE COOLING WATER HIGH TEMP

   d. REACTOR COOLANT PURGE HIGH TEMP

   e. REACTOR COOLANT SAMPLE HIGH TEMP

   f. LIQUID SAMPLE PANEL HIGH PLENUM PRESS

   g. CHEM ANALYSIS PANEL HIGH PLENUM PRESS

3. The following equipment must be available and operational:

   a. Meter-long reach rod

   b. Gas bottle griptong

   c. Hand operated Vacuum Pump

   d. A pre-labeled 14cc gas sample bottle with a new septum installed

NOTE: The label should have the sample source, date, estimated time of sample, and the initials of person taking sample. (from this point estimate 20 minutes).

4. The gas chromatograph must be in a standby mode with a valid calibration.

   Assign one LSP operator to EP RB-16:D to prepare the G.C.

PRECAUTIONS

1. See EP RP-16 for details.

2. This sampling involves processing of water that will be highly radioactive. Precautions should be taken to prevent skin contact or ingestion.

3. Time in a radiation field should be limited to that necessary to perform the required operations. During purge and flush periods, it may not be necessary to stand near the panels and consideration should be given to moving to a low dose area.

4. A dose rate instrument should be on and periodic monitoring is suggested during purge and sampling exercises.

5. The LSP operator must verify that the gas chromatograph is ready to receive a gas sample before opening valve RC-V-15. Valve RC-V-15 must be closed after filling all G.C. sample loops and prior to performing diluted gas sampling and final flushing operations.

PROCEDURE

1. Perform all actions specified in EP RB-16:A.

2. Install and secure the needle flush tool at the undiluted reactor coolant needles of the RC module. [ ]

3. Open RC-SV-1 and RC-SV-2 by placing BKR #10 to the ON position at breaker panel PYNM11. [ ]

3. Open the following valves:

   RC-V-9 [ ]
   RC-V-8.2 [ ]
   RC-V-10 [ ]

4. Drying Expansion Vessel

CAUTION: Adhere to directions for clockwise and counterclockwise movement of valves.

a. Turn RC-V-11 clockwise to the 3 o'clock position. [ ]

b. Pull open RC-VREL-2. When there is a sharp increase in pressure indicated on RC-G-3, release RC-VREL-2. [ ]

c. Adjust RC-VREL-2 until RC-G-3 indicates approximately 20 psig. Dry RC-EV-1 with argon for a 1 minute. [ ]

d. Turn RC-V-11 counterclockwise to the 9 o'clock position to permit RC-EV-1 to vent, then close RC-V-9. [ ]

5. Gas Extraction Vessel and Line Evacuation

a. Install the prelabeled, diluted gas sample bottle on the front panel needle with the gas bottle griptong. [ ]

b. Open RC-V-13 and then open RC-V-12 and evacuate until RC-G-2.1 and RC-G-2.2 indicate a minimum of 22" of Hg. [ ]

c. Turn RC-DV-2 to the 6 o'clock position and continue the evacuation until RC-G-2.2 indicates the same reading as RC-G-2.1 or a minimum of 22" of Hg. [ ]

d. Close in order:

RC-V-13 [ ]
RC-V-10 [ ]
RC-V-12 [ ]

1) Record the vacuum on RC-G-2.1. Wait for a minimum of 2 minutes and verify vacuum is holding.

RC-G-2.1 ____" of Hg

e. Turn RC-V-11 clockwise to the CLOSED position. [ ]

f. Turn RC-DV-2 to the 9 o'clock position. [ ]

g. Open RC-V-14 and verify the pressure on RC-G-2.2 is approximately 1 psig. [ ]

6. Reactor Coolant Sample Line Purge

   a. Open RC-V-8.1. [ ]

   b. Open RC-SV-1 and RC-SV-2 by turning breaker #10 to ON. [ ]

   NOTE: The sample source valves are labeled RC-V-1.1 through RC-V-1.5. Throughout this procedure, the form RC-V-1.X will be used to indicate the source valve to be operated. The sample source used for sampling will have been given at a briefing by the Site Chem and Rad Protection Coordinator.

   NOTE: Upon implementation of the next step, sample will be flowing into the back of the LSP. The meter-long reach rod should be used to operate valves and a dose rate survey should be done to monitor radiation levels.

   c. Close remote flush isolation valve (RFIV). [ ]

   d. Open the sample source valve RC-V-1.X (see Attachment 1 for proper valve). [ ]

   e. Open RC-V-3. [ ]

   f. Slowly open RC-VREL-1 until RC-FI-1 indicates 100% flow. Purge for 5 minutes. [ ]

   g. Slowly close RC-VREL-1 until RC-FI-1 indicates 36%. Continue the purge for 1 minute. [ ]

   h. Close RC-V-3. [ ]

7. Reactor Coolant Sampling

   a. Open RC-V-2. [ ]

   b. Adjust RC-VREL-2 until RC-FI-2 indicates 100% flow. Purge for 3 minutes. [ ]

   c. Close RC-V-8.2 [ ]

d. Close RC-V-8.1 [ ]

e. Turn RC-DV-1 to SAMPLE. [ ]

f. Close RC-V-1.X. [ ]

g. Call the control room and have operations close the containment isolation valves opened earlier. [ ]

8. Initial Flushing

a. At the PCP, perform the following:

1) Close the remote source isolation valve. [ ]

2) Close the remote plant isolation valve. [ ]

3) Open the remote flush isolation valve (see Attachment 1 for the proper valve). [ ]

b. Open in order valves RC-V-7 and RC-V-4 [ ]

c. Adjust RC-VREL-2 until RC-FI-2 indicates 100% flow. Flush with demin water for 3 minutes. [ ]

d. Close RC-V-7 [ ]

e. Open RC-V-3. [ ]

f. Adjust RC-VREL-1 until RC-FI-1 indicates 80-90% flow. Flush with demin water for 1 minutes. [ ]

g. Close RC-V-3. [ ]

h. Open RC-V-1.X. Flush with demin water for 5 minutes. [ ]

i. Close RC-V-1.X. [ ]

9. Gas Stripping Operation

a. Open RC-V-9, wait approximately 5 seconds, and close RC-V-9. [ ]

b. Open RC-V-16. [ ]

c. Snap open RC-V-9 and wait for 1 minute. [ ]

d. Close RC-V-16 and then close RC-V-9. [ ]

e. Turn RC-V-11 counterclockwise to the 9 o'clock position. The pressure reading is normally between 8 and 10 psig. Record the reading on RC-G-2.1

RC-G-2.1 ____ psig

NOTE: The sample is now ready for analysis in the Gas Chromatograph.

NOTE: The GC operator should be at step 4.f. of EP RB-16:D.

f. Stop here and analyze the sample according to EP RB-15:IV. Direct the G.C. operator to align RC-V-5 to "LSP to GAS CHROMAT". [ ]

NOTE: Do not proceed to the next step until the G.C. operator directs this operation.

10. Diluted Gas Sampling

a. Turn RC-DV-2 to the 6 o'clock position and wait until the pressure on RC-G-2.2 returns to 1 psig. [ ]

b. Turn RC-DV-2 to the 9 o'clock position. [ ]

c. Close RC-V-14. [ ]

d. Remove the griptong containing the diluted gas sample [ ]

e. Process offgas sample according to EP RB-16:E [ ]

11. Final Flushing

a. Verify RC-V-15 is in the CLOSED position. [ ]

b. Turn RC-V-11 counterclockwise to the 6 o'clock position. [ ]

c. Open the following valves:

RC-V-9 [ ]
RC-V-7 [ ]
RC-V-8.1 [ ]

d. Adjust RC-VREL-2 until RC-FI_2 indicates 100% flow. Flush with demin water for 1 minute. [ ]

e. Open RC-V-8.2. [ ]

f. Close RC-V-9 and RC-V-7. [ ]

g. Adjust RC-VREL-2 until RC-FI-2 indicates 100% flow. Flush with demin water for 3 minutes. [ ]

h. Close RC-V-8.1. [ ]

i. Turn RC-V-11 counterclockwise to the 3 o'clock position. [ ]

j. Open RC-V-9. [ ]

k. Pull open RC-VREL-2. [ ]

1) When there is a sharp increase in pressure indicated on RC-G-3, release RC-VREL-2. [ ]

2) Adjust RC-VREL-2 until RC-G-3 indicates 20 psig. [ ]

3) Flush with argon for 3 minutes. [ ]

l. Close RC-V-9. [ ]

m. Open RC-V-10. [ ]

n. Turn RC-V-11 counterclockwise to the 9 o'clock position and allow RC-EV-1 to vent. [ ]

o. Close RC-V-10. [ ]

p. Turn RC-V-11 clockwise to CLOSED. [ ]

q. Open RC-V-8.1. [ ]

r. Adjust RC-VREL-2 until RC-FI-2 indicates 100% flow. [ ]

Flush with demin water for 1 minute. [ ]

s. Close RC-V-2. [ ]

t. Open RC-V-1.X and flush with demin water for 5 minutes. [ ]

u. Close RC-V-1.X. [ ]

v. Terminate flushing by closing the following valves. [ ]

RC-V-8.1 [ ]
RC-V-8.2 [ ]
RC-VREL-1 [ ]
RC-VREL-2 [ ]
RC-V-4 [ ]

12. At the PCP, close the remote flush isolation valve. [ ]

13. At breaker panel PYNM11, place breaker #10 to the OFF position. [ ]

14. Close sample cooler water. [ ]

15. Call the Site Chem and Rad Protection Coordinator and inform him that the diluted reactor coolant sample and the off-gas sample are ready for transfer/analysis. [ ]

16. Sample transfer. [ ]

a. Transfer the diluted gas sample to the TSC. [ ]

b. Using procedure EP RB-16:E, aliquot and analyze the diluted liquid sample for boron. [ ]

17. Process the data according to procedure EP RB-16:F. [ ]

REFERENCES

1. Sentry Equipment Corp. High Radiation Sampling System Operating and Maintenance Manual.

ATTACHMENTS

1. Valves for Obtaining Samples from Reactor Coolant.

PACIFIC GAS AND ELECTRIC COMPANY
DEPARTMENT OF NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

TITLE: VALVES FOR OBTAINING SAMPLES FROM REACTOR COOLANT

ATTACHMENT 1

SAMPLE SOURCE	REMOTE PLANT ISOLATION VALVE (RPIV)	REMOTE SOURCE ISOLATION VALVE (RSIV)	REMOVE FLUSH ISOLATION VALVE (RFIV)	LSP SAMPLE SOURCE VALVE (SSV)
RC Hot Leg 1	FCV-9351 A	FCV-692	FCV-1416	RC-V-1.1
RC Hot Leg 4	FCV-9351 B	FCV-692	FCV-1416	RC-V-1.1
PZR Liquid	FCV-9350 B	FCV-693	FCV-1417	RC-V-1.2
PZR Steam	FCV-9350 A	FCV-694	FCV-1418	RC-V-1.3
RHR Pump 1-1 Discharge	FCV-9353 A	FCV-1413	FCV-1419	RC-V-1.4
RHR Pump 1-2 Discharge	FCV-9353 A	FCV-1413	FCV-1419	RC-V-1.4
VCT Liquid	N/A	FCV-1412	FCV-1420	RC-V-1.5

PG&E **Pacific Gas and Electric Company**

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

NUMBER	EP RB-16:B4
REVISION	0
DATE	7/19/84
PAGE	1 OF 5

TITLE EMERGENCY OPERATING PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM
-- DILUTED LIQUID SAMPLING FROM RADWASTE
(NOT INTENDED TO MEET THE 3-HOUR LIMIT)

APPROVED R. C. Thornberry 7-31-84
PLANT MANAGER DATE

IMPORTANT TO
ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of this procedure is to detail the steps required to obtain a diluted liquid sample during accident conditions and complete module flushing.

The containment isolation valves FCV-696 and FCV-697 are controlled from the Containment Isolation Valve Panel in the Sentry Room only. These switches require a key to operate. A copy of the key is located in the control room; Radiation Protection Office, and in the Sentry Room in a key box with a breakable glass cover. These valves are to be opened only during an emergency or for testing.

PREREQUISITES

1. System was initially lined up as described in procedure EP RB-16:A.

2. Verify that the following annunciator windows are off on the PCP:

   a. RADWASTE SAMPLE COOLING WATER LOW FLOW

   b. RADWASTE SAMPLE COOLING WATER LOW PRESS

   c. RADWASTE SAMPLE COOLING WATER HIGH TEMP

   d. RADWASTE HIGH TEMP

   e. LIQUID SAMPLE PANEL HIGH PLENUM PRESS

3. The following equipment must be available and operational:

   a. Meter-long reach rod

   b. Hand operated vacuum pump

   c. Sample cart/cask with 60 ml lift rod assembly

d. A prelabeled 60 ml sample bottle with a new septum

1) The label should have the sample source, date, estimated time of sample, and the initials of the person taking the sample (from this point estimate 17 minutes).

PRECAUTIONS

1. This sampling involves processing of water that will be highly radioactive. Precaution should be taken to prevent skin contact or ingestion.

2. Time in a radiation field should be limited to that necessary to perform the required operations. During purge and flush periods, it may not be necessary to stand near the panels and consideration should be given to moving to a low dose rate area.

3. A dose rate instrument should be on and periodic monitoring is suggested during purge and sampling exercises.

PROCEDURE

1. Verify RW-DV-1 is turned to BYPASS. Fill reservoir RW-R-1 with demin water. [ ]

   a. Open RW-V-10 and RW-V-9 [ ]

   b. Adjust reservoir RW-R-1 until the water level in graduated cylinder RW-C-1 is 125 mls. [ ]

   c. Close RW-V-9 and RW-V-10. [ ]

2. Insert the needle of the hand operated vacuum pump into the septum of the prelabeled 60 ml sample bottle: [ ]

   a. Evacuate to the maximum vacuum achievable with the pump. The vacuum must be at least 15" of Hg. [ ]

   b. Keep the pump connected to the bottle for 1 minute to assure that the bottle retains the vacuum. [ ]

3. Turn on the switch to light the diluted bottle fill station. [ ]

4. Remove the bottle from the vacuum pump and place the bottle on the cart/cask assembly cavity piston. [ ]

    a. Turn the direction valve for the hydraulic piston to one down position and lower the bottle into the cask cavity. [ ]

    b. Close and open the cask to verify that the cover is working properly. [ ]

    c. Position the cart/cask under the diluted radwaste fill station needle and set the brake. [ ]

    d. Turn the direction valve for the hydraulic piston to the up position and raise the bottle onto the needle. [ ]

5. Open RW-SV-1 by placing BKR #10 to the ON position at breaker panel PYNM11. [ ]

6. Align RW-V-8 to the 9 o'clock position. [ ]

7. Sample Purging

    a. Close the remote flush isolation valve at the PCP. [ ]

    NOTE: The sample source valves are labeled RW-V-2.1 thru RW-V-2.3. Throughout this procedure, the form RW-V-2.X will be used to indicate the source valve to be operated. The sample source used for sampling will have been given at the briefing by the Site Chem and Rad Protection Coordinator.

    b. Open the sample source valve RW-V-2.X (see Attachment 1 for proper valve). [ ]

    c. Slowly open RW-V-4 until RW-FI-1 indicates 100% flow. Purge to waste for 6 minutes. [ ]

8. Sampling

   a. Turn RW-V-8 to BYPASS. [ ]

   b. Close RW-V-2.X [ ]

   c. Close FCV-696 and FCV-697 if opened in step 7.a. and notify the control room when closed. [ ]

9. Initial Flushing

   a. At the PCP, close the remote source isolation valve if applicable. [ ]

   b. Fully open RW-V-4 [ ]

   c. Slowly open RW-V-3 until RW-FI-1 indicates 30% flow. Flush with demin water for 2 minutes. [ ]

   d. Close RW-V-4 [ ]

   e. Open RW-V-2.X. [ ]

   f. Slowly open RW-V-4 until RW-FI-1 indicates 30% flow. Flush with demin water for 3 minutes. [ ]

   g. Close RW-V-2.X and RW-V-4 [ ]

   h. At the PCP, open the remote flush isolation valve (see Attachment 1 for proper valve). Flush with demin water for 6 minutes. [ ]

   i. Close the remote flush isolation valve at the PCP. [ ]

10. Sample Dilution

   a. Turn RW-DV-1 to SAMPLE [ ]

   b. Crack open RW-V-9 and add 23 mls of water from RW-C-1 to the sample bottle, then close RW-V-9. Record the volume added. _____mls

   c. Turn RW-DV-1 to BYPASS. [ ]

d. Place the direction valve for the hydraulic piston in the down position and slowly lower the bottle into the cask. [ ]

e. Close the cask. [ ]

11. Final Flushing

a. Turn RW-V-8 to the 9 o'clock position. [ ]

b. Slowly open RW-V-4 until RW-FI-1 indicates 100% flow. Flush with demin water for 2 minutes. [ ]

c. Turn RW-V-8 to BYPASS. [ ]

d. Terminate flushing by closing the following valves:

RW-V-4 [ ]

RW-V-3 [ ]

12. At breaker panel PYNMII, place BKR #10 to the OFF position. [ ]

13. Sample Cask/Cart Removal

a. Release the brake and remove the cart/cask from the sample station. [ ]

b. Perform a radiation and contamination survey on the cart/cask assembly and transfer the sample according to EP RB-16:E or 16:J. [ ]

14. Turn off the diluted fill station light. [ ]

REFERENCES

1. Sentry Equipment Corp. High Radiation Sampling System Operating and Maintenance Manual.

ATTACHMENTS

1. Valves for Obtaining Samples from Radwaste.

TITLE: VALVES FOR OBTAINING SAMPLES FROM RADWASTE

ATTACHMENT 1

SAMPLE SOURCE	CONTAINMENT ISOLATION VALVES	REMOTE SOURCE ISOLATION VALVE	REMOTE FLUSH ISOLATION VALVE	LSP SAMPLE SOURCE VALVE
Rx Cavity Sump	FCV-696 FCV-697	Not Applicable	FCV-1423	RW-V-2.1
Floor Drn Recvr	Not Applicable	FCV-1415	FCV-1425	RW-V-2.2
Equip Drn Recvr	Not Applicable	FCV-1414	FCV-1424	RW-V-2.3

PG&E **Pacific Gas and Electric Company**

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

NUMBER EP RB-16:B5
REVISION 0
DATE 7/19/84

TITLE EMERGENCY OPERATING PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM
-- UNDILUTED LIQUID SAMPLING FROM RADWASTE
(NOT INTENDED TO MEET THE 3-HOUR LIMIT)

APPROVED R. C. Thornberry 7-31-84
PLANT MANAGER DATE

IMPORTANT TO
ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of the procedure is to detail the steps required to obtain an undiluted radwaste liquid sample during accident conditions and complete module flushing.

PREREQUISITES

1. System was initially lined up as described in procedure EP RB-16:A.

2. Verify that the following annunciator windows are off on the PCP:

   a. RADWASTE SAMPLE COOLING WATER LOW FLOW

   b. RADWASTE SAMPLE COOLING WATER LOW PRESS

   c. RADWASTE SAMPLE COOLING WATER HIGH TEMP

   d. RADWASTE HIGH TEMP

   e. LIQUID SAMPLE PANEL HIGH PLENUM PRESS

3. The following equipment must be available and operational:

   a. Meter-long reach rod

   b. Needle flush tool with demin water in a 15 ml sample bottle and a new septum.

   c. Sample cart/cask with the 15 ml lift rod assembly.

   d. A prelabeled 15 ml sample source, date, estimated time of sample, and the initials of the person taking the sample (from this point estimate 16 minutes).

PRECAUTIONS

1. This sampling involves processing of water that will be highly radioactive. Precautions should be taken to prevent skin contact or ingestion.

2. Time in a radiation field should be limited to that necessary to perform the required operations. During purge and flush periods, it may not be necessary to stand near the panels and consideration should be given to moving to a low dose rate area.

3. A dose rate instrument should be on and periodic monitoring is suggested during purge and sampling exercises.

PROCEDURE

1. Turn on the switch to light the undiluted fill station. [ ]

2. Place the bottle on the cart/cask assembly cavity piston [ ]

   a. Turn the direction valve for the hydraulic piston in the down position and lower the bottle into the cask cavity. [ ]

   b. Close and open the cask to verify that the cover is working properly. [ ]

   c. Position the cart/cask under the undiluted radwaste fill stations needles and set the brake. [ ]

   d. Turn the direction valve for the hydraulic piston to the up position and raise the bottle onto the needles. [ ]

3. Open RW-SV-1 by placing BKR #10 to the ON position at breaker panel PYNM11. [ ]

4. Sample purging

   a. Close the remote flush isolation valve at the PCP (see Attachment 1 for proper valve). [ ]

   NOTE: The sample source valves are labeled RW-V-2.1 thru RW-V-2.3. Throughout this procedure, the form RW-V-2.X will be used to indicate the source valve to be operated. The sample source used for sampling will have been given at the briefing by the site Chem and Rad Protection Coordinator.

   b. Open the sample source valve RW-V-2.X (see Attachment 1 for proper valve). [ ]

   c. Slowly open RW-V-4 until RW-FI-1 indicates 100% flow. Purge to waste for 6 minutes. [ ]

5. Sampling

   a. Adjust RW-V-4 until RW-G-1 indicates 20 psig or less. [ ]

   CAUTION: Do not exceed 20 psig on RW-G-1in these steps.

   b. Turn RW-V-7 to SAMPLE. [ ]

   c. Adjust RW-V-4 until RW-G-1 indicates 20 psig or RW-FI-1 indicates 40% flow. Purge for 1 minute. [ ]

   d. Close RW-V-2.X. [ ]

   e. Let RW-G-1 return to 0 psig and wait 30 seconds to allow bottle to depressurize. [ ]

   f. Turn RW-V-7 to BYPASS. [ ]

   g. Close FCV-696 and FCV-697 if opened in step 4.a. and notify control room when closed. [ ]

6. Sample Cart/Cask Removal

   a. Turn the direction valve for the cart cask hydraulic piston to the down position and slowly lower the bottle into the cask. [ ]

b. Close the cask. Release the brake and remove the cart/cask from the sampling station and away from the LSP. [ ]

c. Install and secure the auxiliary shield. [ ]

d. Install and secure the needle flush tool onto the undiluted radwaste fill station needles. [ ]

7. Initial flushing

a. At the PCP, close the sample source isolation valve. (See Attachment 1) [ ]

b. Close RW-V-2.X (See Attachment 1) [ ]

c. Fully open RW-V-4. [ ]

d. Slowly open RW-V-3 until RW-FI-1 indicates 30% flow. Flush with demin water for 3 minutes. [ ]

e. Close RW-V-4. [ ]

f. Open RW-V-2.X. [ ]

g. Slowly open RW-V-4 until RW-FI-1 indicates 30% flow. Flush with demin water for 3 minutes. [ ]

h. Close RW-V-2.X and RW-V-4. [ ]

i. At the PCP, open the remote flush isolation valve (see Attachment 1 for proper valve). Flush with demin water for 6 minutes. [ ]

j. Close the remote flush isolation valve at the PCP. [ ]

8. Final Flushing

a. Turn RW-V-7 to SAMPLE [ ]

<u>CAUTION</u>: Do not exceed 20 psig on RW-G-1 in this step.

---

b. Slowly open RW-V-4 until RW-G-1 indicates 20 psig or RW-FI-1 indicates 30% flow. Purge for 2 minutes. [ ]

c. Close RW-V-4 and let RW-G-1 return to 0 psig. Wait 30 seconds to allow the bottle to depressurize. [ ]

d. Turn RW-V-7 to BYPASS. [ ]

e. Terminate flushing by closing RW-V-3. [ ]

9. Turn off the undiluted fill station light. [ ]

10. At breaker panel PYNM11, place BKR #10 to the OFF position. [ ]

11. Remove the needle flush tool and survey bottle for disposal. [ ]

12. Perform a radiation and contamination survey on the cart /cask assembly and move the sample according to procedure EP RB-16:J. [ ]

REFERENCES

1. Sentry Equipment Corp. High Radiation Sampling System Operating and Maintenance Manual.

ATTACHMENTS

1. Valves for Obtaining Samples from Radwaste.

TITLE: VALVES FOR OBTAINING SAMPLES FROM RADWASTE

ATTACHMENT 1

SAMPLE SOURCE	CONTAINMENT ISOLATION VALVES	REMOTE SOURCE ISOLATION VALVE	REMOTE FLUSH ISOLATION VALVE	LSP SAMPLE SOURCE VALVE
Rx Cavity Sump	FCV-696 FCV-697	Not Applicable	FCV-1423	RW-V-2.1
Floor Drn Recvr	Not Applicable	FCV-1415	FCV-1425	RW-V-2.2
Equip Drn Recvr	Not Applicable	FCV-1414	FCV-1424	RW-V-2.3

PG&E **Pacific Gas and Electric Company**

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

NUMBER EP RB-16:C
REVISION 0
DATE 7/16/84

TITLE EMERGENCY PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM
CONTAINMENT AIR SAMPLING
(NOT INTENDED TO MEET THE 3-HOUR TIME LIMIT)

APPROVED R. C. Thornberry 7-31-84
PLANT MANAGER DATE

IMPORTANT TO ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of this procedure is to detail the steps required to make containment air available for gas chromatography and to dilute a containment air sample for isotopic analysis of noble gases, particulates, and radionuclides. This procedure will also detail the steps for a complete system flush and return to the initial valve line up.

After purging containment air through the G.C. and loading the diluter valve, this procedure will direct sampling personnel to EP RB-16:D, for gas analysis and to procedure EP RB-16:E, for preparation of the diluted containment air sample for isotopic analysis.

The containment isolation valves FCV-698, FCV-699 and FCV-700 are controlled from the Containment Isolation Valve Panel in the Sentry Room only. These switches require redundant keys to operate. Copies of the keys are located in the Control Room , Radiation Protection Office, and in the Sentry Room in a key box with a breakable glass cover. These valves should be opened only during an emergency or for testing.

PREREQUISITES

1. System was initially lined up as described in procedure EP RB-16:A.

2. Verify that the following annunciator windows are off on the PCP

   a. LIQUID SAMPLE PANEL HIGH PLENUM PRESS

   b. CHEMICAL ANALYSIS PANEL HIGH PLENUM PRESS

   c. CONTAINMENT AIR SAMPLE PANEL HIGH PLENUM PRESS

3. The following equipment must be available and operational:

   a. Meter-long reach rod

   b. A gas tight 5cc locking syringe

   c. A 14cc gas vial with a new septum installed

   d. Bags, tape, and labels

   e. Four channel MBIS Pressure Monitor (CASP-PI-1109)

   f. Two crescent wrenches

   g. Spare filter assemblies

PRECAUTIONS

1. This sampling involves processing of containment air that may be highly radioactive. Precautions should be taken to prevent releases to the sampling environment.

2. Time in a radiation field should be limited to that necessary to perform the required operations. During purge and flush periods, it may not be necessary to stand near the panels and consideration should be given to moving to a low dose rate area.

3. A dose rate instrument should be on and periodic monitoring is suggested during purge and sampling exercises.

PROCEDURE

1. Sample Flask Evacuation

   NOTE: Ensure that a loaded filter assembly is installed.

   a. Close outlet valve of the engaged cart/cask. [ ]

   b. Verify that any unused CASP ports located at the base of the CASP have been capped. [ ]

   c. At the CCP, place the switch for CCP-AV-1 to OPEN. [ ]

      NOTE: This allows containment pressure to be monitored on CASP-PI-1109.

d. Change the positions of the following valves:

CASP-DV-1 to Containment Supply	[ ]
CASP-V-16 to CASP-SF-5	[ ]

e. Contact the Control Room and request permission to open FCV-700, the sample return containment isolation valve. In succeeding steps FCV-698 and 699 will be operated also. Inquire whether the Control Room wants to be notified every time each valve is operated or only when sampling is completed and containment isolation valves are closed. Also obtain and record containment temperature and pressure from the Control Room.

(________°F + 460) x 5/9 = _______°K = Tc

________psig.

f. Evacuate CASP-SF-5 by opening the following valves:

FCV-700 (key operated)	[ ]
CASP-V-17	[ ]
CCP-AV-2	[ ]
CCP-SV-10	[ ]

g. When CASP-SF-5 pressure is as low as apparently achievable as indicated on CASP-PI-1116, align CASP-V-16 to CASP-DV-1. If vacuum is not held, replace the filter assembly or septum and repeat steps c. through f. [ ]

2. Sample Purge

a. Open containment isolation valves FCV-699 and FCV-698 at the Containment Isolation Valve Panel and notify the Control Room, if requested. [ ]

b. Containment air is now being purged through the sample panel back to containment. Purge for 5 minutes. [ ]

c. At the CCP, close CCP-SV-10 and record containment air pressure as indicated on CASP-PI-1109.

CASP-PI-1109 ______ psig

d. Sample Purge Through the G.C.

1) At the LSP, align RC-V-15 to CASP TO GAS CHROMAT position. [ ]

2) At the G.C. control panel do the following:

(a) Depress MAN [ ]

(b) Press CLEAR [ ]

(c) Depress SAMP switch and verify red sample light is on. [ ]

(d) Select loop No. 1 [ ]

(e) Enter "23" to purge sample from CASP to the G.C. Purge for 2 minutes. [ ]

(f) Enter "24" to terminate the purge. [ ]

(g) Release SAMP switch to OFF position. [ ]

NOTE: The sample is now ready for analysis with the G.C.

e. Record the temperature indicated on THT 196.

___ ___°C + 273 = ________°K = Ts

f. Record Sample Time ________.

3. Sample Dilution

a. Align CASP-DV-1 to CASP-SF-5. N_2 will flush the sample aliquot into CASP-SF-5 through the removable filter assembly. [ ]

b. When the pressure in CASP-SF-5 as indicated on CASP-PI-1116 is 14.70 psia, or as high as achievable, whichever is first, close CASP-V-17. [ ]

NOTE: The G.C.. operator should be at Section 4.f. of EP RB-16:D. When directed by the G.C. operator, align RC-V-15 to the CASP TO GAS CHROMAT. position.

NOTE: Do not proceed with the next step until the G.C. operator directs this operation.

4. Initial Flushing

a. If the G.C. was used for containment H_2 analysis, then perform the following steps, otherwise, skip to step b.

1) At the LSP, align RC-V-15 to CASP TO GAS CHROMAT position. [ ]

2) At the G.C. control panel, enter "13" to start argon flush of sample line back to CASP. Flush for 2 minutes. [ ]

3) Terminate argon flush by entering "14" at the G.C. control panel. [ ]

4) At the LSP, align RC-V-15 to CLOSED position. [ ]

b. Align CASP-V-16 to CASP-SF-5 [ ]

c. Open CCP-SV-10 and flush removable filter assembly for 1 minute. [ ]

d. Close containment isolation valve FCV-699. [ ]

e. Open CCP SV-5. [ ]

f. Change the positions of the following valves:

Align CASP-DV-1 to Containment Supply [ ]

Align CASP-V-16 to CASP-DV-1 [ ]

g. At the CCP, close CCP-AV-2 and CCP-SV-5. [ ]

h. Open containment isolation valve FCV-699 and flush line with nitrogen for 2 minutes. Notify the Control Room that this valve was opened, if requested to earlier. [ ]

i. Close CCP-SV-10 and CCP-AV-1. [ ]

5. Sample Handling

a. Survey the removable filter assembly and CASP-SF-5 to determine contact dose rates. [ ]

<u>NOTE</u>: Under worst case conditions, the contact dose rate of the filter, using a teletector, will be about 165 mR/hr. The contact dose rate at centerline of CASP-SF-5 will be about 44 mR/hr.

b. Position the exhaust duct as close as possible to the removable filter assembly. [ ]

c. Using the crescent wrenches, disconnect the filter assembly from the system, then separate the assembly into two halves and place the two halves in a bag, seal, and survey. [ ]

1) Place a prewritten label on the bag. The label should have the name of the sample, dose rate, time containment air pressure, and the initials of the sampler. [ ]

2) Store the sample to minimize exposure from it. [ ]

d. Install a new filter assembly into the system making sure the connections are tight. [ ]

e. Partially evacuate a septum sealed 14cc gas vial by withdrawing 2cc from it using a syringe. [ ]

f. Flush a 5 ml gas tight syringe by inserting its needle into the septum of CASP-SF-5, withdrawing 1cc and injecting it again. [ ]

g. Using the flushed syringe withdraw a 2cc sample aliquot from CASP-SF-5. [ ]

h. Inject the syringe contents into the evacuated 14cc gas vial. [ ]

i. Place the gas vial into a bag, seal and survey it. [ ]

j. Place a prewritten label on the bag. The label shall have the name of the sample, dose rate, time, cont. air pressure, volume of 1 ml and the initials of the sampler. [ ]

k. Store the sample to minimize exposure from it. [ ]

6. Final Flushing

a. Align CASP-V-16 to CASP-SF-5. [ ]

b. Open the following valves:

CCP-AV-2 [ ]

CCP-SV-10 [ ]

CASP-V-17 [ ]

c. Evacuate CASP-SF-5 until vacuum is as low as achievable as indicated on CASP-PI-1116 [ ]

d. Close CCP-AV-2 and allow N_2 to fill CASP-SF-5. [ ]

e. Repeat steps 18.b. through d. above once more. [ ]

f. Close CCP-SV-10. [ ]

g. Open the OUTLET valve on the engaged cart/cask. [ ]

h. Open CCP-SV-10. [ ]

i. Open CCP-SV-1.2 and allow N_2 to flush the line for 2 minutes. [ ]

7. Terminate flushing by closing the following valves:

   CCP-SV-10 [ ]

   CCP-SV-1.2 [ ]

   CCP-AV-1 [ ]

8. Change the positions of the following valves:

   CASP-V-16 to CASP-DV-1 [ ]

   CASP-DV-1 to CASP-SF-5 [ ]

9. Turn OFF and disconnect the CASP-PI-1109, MBIS Pressure Monitor connected to the cart/cask. [ ]

10. At the Containment Isolation Valve Panel CLOSE the following valves and notify the Control Room that they are closed:

    FCV-698 [ ]

    FCV-699 [ ]

    FCV-700 [ ]

11. At the CMP, turn the power switch to OFF if it was ON and at the CCP turn the FUNCTION SELECT switch to OFF and deenergize the heat tracing. [ ]

12. Process the data according to procedure EP RB-15:VI. [ ]

REFERENCES

1. NUREG 0737

2. Diablo Canyon Shielding Review.

NUMBER	EP RB-16:D
REVISION	0
DATE	7/19/84
PAGE	1 OF 6

PG&E Pacific Gas and Electric Company

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

TITLE EMERGENCY OPERATING PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM
-- GAS CHROMATOGRAPHIC HYDROGEN ANALYSIS
(NOT INTENDED TO MEET THE 3-HOUR LIMIT)

APPROVED R. C. Thornberry 7-31-84
PLANT MANAGER DATE

IMPORTANT TO
ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of this procedure is to detail the steps required to determine the dissolved hydrogen concentration in reactor coolant and the percent hydrogen concentration in containment air by gas chromatography. This procedure will detail hydrogen analysis from RC-V-15 on the LSP to the Gas Chromatograph. The sample gas for analysis should be prepared according to any of the following procedures:

EP RB-16:B
EP RB-16:C

PREREQUISITES

1. The Gas Chromatograph (G.C.) should be in the ON or STANDBY condition for a minimum of 30 minutes before sample analysis.

2. The gas sample for analysis should be available at the LSP for transfer to the G.C.

3. Carrier gas (Ar) should be available with cylinder outlet pressure > 1000 psig.

PRECAUTIONS

1. Monitoring with a dose rate instrument should be done during the transfer of sample to the G.C.

2. If the carrier gas cylinder empties while the G.C. is in use, the thermal conductivity detector (TCD) protection device will turn off the current to the TCD.

PROCEDURE

1. Analysis Program

   a. Release all pushbuttons and depress the CLEAR button. [ ]

   b. Check that the following program is in memory by entering the two digit STEP number and verify that the TIME and CODE numbers are as shown below. Do this for each STEP. If the memory is correct, proceed to Step 2, Platen Stabilization. [ ]

STEP	TIME	CODE
01	00:01	03
02	00:02	25
03	00:30	01
04	01:15	00

   c. If the program is not correct, enter the program as follows:

      1) Depress ENTER and CLEAR [ ]

      2) Enter the above program into memory by entering the two digit pairs in the sequence shown above. [ ]

      NOTE: If an entry error is made, depress CLEAR to blank display and re-enter the entire line.

      3) Release ENTER, depress CLEAR and repeat step 1.b. [ ]

2. Platen Stabilization

   a. Depress MAN and CLEAR [ ]

   b. Check to see if the G.C. has stabilized by doing the following:

      1) Select attenuation factor of 250 (25 x 10) [ ]

      2) Enter "01" and then "35" to display set point of platen temp and record for a minimum of 30 seconds. [ ]

3) Enter "45" to display actual platen temperature and record for a minimum of 30 seconds. [ ]

NOTE: Stabilization is complete when platen set-point and actual temperature are within 1/2 grid marking of each other as indicated on the G.C. chart recorder only.

4) Enter "00" and mark chart recorder on the G.C. with date, time, and initials. [ ]

3. Calibration Verification

NOTE: If analysis is required on a second sample source, then the G.C. calibration verification is not needed again. Proceed to Step 4, Sample Analysis.

NOTE: Only 1 span gas is needed to verify calibration. The following steps describe the use of either gas. Perform this step only if directed by supervision.

a. Enter "23" to evacuate the G.C. Continue evacuation until the red HI VACUUM light is on. [ ]

b. Enter "24" to terminate evacuation of the G.C. [ ]

c. Select attenuation factor of 500 (5 x 100) for the 10% H_2 source or 5 (5 x 1) for the 2000 ppm H_2 source. [ ]

d. Depress CAL-1 switch for 10% H_2 source, or CAL-2 switch for 2000 ppm H_2 source, and wait 10 seconds after amber LOW VACUUM light is on. [ ]

e. Release CAL-1 or CAL-2 switch and wait 10 seconds. [ ]

f. Start the L&N recorder. [ ]

g. Depress AUTO switch to on (in) and press CLEAR. Wait until the G.C. display clock has timed to a minimum of 3 minutes. During this time interval, identify the L&N recorder trace with the date/time, gas used, loop number, attenuation factor and operator initials. [ ]

h. Release AUTO switch to off (out) position. Press CLEAR and enter "00". [ ]

i. Stop the L&N recorder. [ ]

j. Calculate the hydrogen peak height as follows:

peak height = (Trace peak height - baseline) x attenuation

peak height = ____

k. Compare the peak height calculated against the value shown on the concentration versus peak height curve for the same attenuation factor and calibration gas. The values should be within ± 10 percent of each other. [ ]

4. Sample Analysis

a. Depress SAMP switch and verify red sample light is on. [ ]

b. Select loop No. 1. [ ]

c. Enter "23" to evacuate the G.C. until the red HI VACUUM light is on. [ ]

1) Cycle loop selector through loops 2, 3, and 4, pausing at each loop and evacuating until the HI VACUUM light is on. [ ]

2) Cycle a minimum of 3 times through loops 1, 2, 3, and 4, pausing at each loop. [ ]

3) Select loop number 1. [ ]

d. Enter "24" to terminate evacuation. [ ]

e. Select attenuation factor of 500 (5 x 100). [ ]

NOTE: Before proceeding consult with the LSP operator to assure that a gas sample is available at RC-V-15.

f. When the appropriate gas sample is available at RC-V-15 align RC-V-15 to one of the following positions:

1) LSP TO GAS CHROMAT. for reactor coolant off-gas sample. [ ]

2) CASP TO GAS CHROMAT. for containment air sample. [ ]

g. Cycle loop selector through loops 1, 2, 3, and 4, pausing at each loop. Cycle 3 times. [ ]

1) Select loop 1 [ ]

h. Align RC-V-15 to the CLOSED position. [ ]

NOTE: If the analysis applies to containment air, proceed to step "j".

i. Record the pressure on RC-G-2.1 on the data sheet, EP RB-16:F.

Reading: __________psig

NOTE: The pressure is normally between 5 and 7 psig.

NOTE: Notify the main LSP operator when RC-V-15 is closed.

j. Start the L&N recorder, wait 5 seconds. [ ]

k. Depress AUTO to on (in) position and press CLEAR. [ ]

1) Wait until the G.C. display clock has timed to a minimum of 3 minutes. During this time interval identify the recorder trace with sample name, date/time, loop number, attenuation factor and operator initials. [ ]

l. Release AUTO switch to off (out) position. Press CLEAR and enter "00". [ ]

m. Stop the L&N recorder. [ ]

n. Calculate the net peak height and determine the hydrogen concentration from the appropriate calibration curve. [ ]

peak height = __________mm

o. Record the net peak height on the recorder trace. Repeat the analysis and select the next loop and appropriate attenuation factor (5 x 1, 25 x 1, 1 x 100, or 5 x 100) as required. Repeat steps j. through o. as necessary to obtain satisfactory data. [ ]

p. Purge the G.C. residual gas as follows:

1) Enter "23" and evacuate the G.C. until the red HI VACUUM light is on. [ ]

2) Cycle through each loop and evacuate until the red HI VACUUM light is on. [ ]

3) Enter "13" to initiate argon purge. [ ]

4) Cycle loop selector through loops 1, 2, 3, and 4, pausing at each loop. Cycle 3 times. [ ]

5) Enter "14" to terminate the purge. [ ]

6) Enter "24" to terminate the evacuation. [ ]

7) Enter "00". [ ]

8) Release SAMP switch to off position. [ ]

q. After final use of G.C.

1) Shutdown the instrument by turning off the power. [ ]

2) Secure the gas supplies for the GC.

a) CLOSE the 3 root valves next to the CAP. [ ]

b) CLOSE CAP-V-10 [ ]

c) CLOSE CAP-V-14 [ ]

r. Return to the referencing procedure.

NOTE: For stripped-gas, this is EP RB-15:II, step 17. For Containment Air, this is EP RB-15:III, step 5.

s. Record the net peak height from step n. on the appropriate data sheet.

REFERENCES

1. Sentry Equipment Corp. High Radiation Sampling System Operating and Maintenance Manual.

PG&E **Pacific Gas and Electric Company**

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

NUMBER EP RB-16:E
REVISION 0
DATE 7/17/84

EMERGENCY PROCEDURE

TITLE SENTRY POST-ACCIDENT SAMPLING SYSTEM LIQUID AND GAS SAMPLE HANDLING (NOT INTENDED TO MEET THE 3-HOUR TIME LIMIT)

APPROVED R. C. Thornberry 7-31-84
PLANT MANAGER DATE

IMPORTANT TO ENVIRONMENTAL QUALITY

SCOPE

This procedure provides guidance for safely handling post accident liquid samples obtained from the Reactor Coolant System (RCS) using the SENTRY PASS. The diluted liquid sample from the RCS is aliquotted. The aliquot may be used for boron or for γ-assay. Further dilutions for γ-assay are done in the hot cell. Likewise, steps for preparation of diluted containment air samples for counting are also detailed. This procedure and changes thereto require PSRC review.

DISCUSSION

Based on worst-case post accident assumptions regarding sample radioactivity content, special precautions may be required for handling liquid and containment air sample acquired using the Sentry PASS. Sample aliquots are transferred by precision pipets to a dilution vial for radiological counting or an appropriate reaction flask for chemical analysis. These flasks may be kept inside the hot cell throughout the procedure to minimize personnel exposures and also to contain the airborne radioactivity generated within the hot cell area. Control of airborne activity is accomplished by use of an overhead ventilation duct which creates a slightly negative pressure inside the enclosure. After all sample manipulations are completed, the radioactive waste solutions may be flushed down the Sentry Room sink via the receiver funnel drain valve and, if necessary, the inside surfaces of the hot cell may be sprayed down to reduce the contamination levels within the sample handling area.

PREREQUISITES AND PRECAUTIONS

1. Personnel assigned to conduct this procedure should be familiar with the considerations of handling highly radioactive liquid and gas samples and shall be experienced with the analytical chemistry techniques employed in this procedure. Also, any individual performing this procedure should be capable of:

a. Making does rate measurements with portable survey instruments.

b. Assessing response and basic trends of continuous air monitoring equipment.

c. Taking actions based on items 1.a and 1.b.

2. Unless conditions are known to warrant less stringent precautions, complete protective clothing and accident dosimetry (including high range and extremity dosimeters) will be required. Lapel air samplers are also recommended. Full respiratory protection equipment (SCBA) may also be necessary.

3. To minimize time spent in hot sample handling, ensure availability of the required equipment for performing applicable portions of this procedure. This includes sample vessels, pipets, handling tools, reagents, etc. A comprehensive listing of these supplies is provided in a check list format in Appendix 1 to this procedure to facilitate the review.

4. When the liquid sample is handled, there is a possibility that local radiation levels and airborne radioactivity could increase. Since the sample is to be contained within the hot cell, the increases should not be too high; however, as precautionary measure, all individuals within the Sentry Room should have functioning respirators. Monitoring should be performed using survey instruments (for dose rates) and any available CAM system (for airborne) for early identification of potential problems.

5. This procedure is designed to permit all sample handling to be performed by the use of tongs or other remote handling devices. Unless the samples are surveyed and <u>known</u> not to present a significant source of exposure to the fingers, hands or other extremities, no sample manipulations involving <u>direct</u> hand contact should be attempted.

<u>PROCEDURE</u>

1. Preparation of Sample Enclosure and Sink Area

This section covers the preliminary steps required before performing actual liquid sample manipulations. It is important that all required handling equipment and reagents to be employed are available prior to handling the liquid sample in order to minimize time spent working around hot samples within the hot cell.

a. Initial Survey of Sample Enclosure and Sink Area

1) Perform a radiation survey of the hot cell area to verify that no highly radioactive sample material remains inside or around the enclosure from a previous use. If an indication of radioactive sample materials is found, these materials should be promptly disposed of as set forth below under "Clean-Up" in Section 6 of this procedure.

2) Visually inspect the inside of the hot cell for unwanted material and for cleanliness. If material remains, remove and store or discard it, whichever is appropriate.

b. Acquisition of Required Supplies

Assemble the necessary supplies, equipment, etc. to perform the required steps. A listing of these supplies is presented in Appendix 1 to this procedure for the following preparation and analysis categories.

1) General Equipment Requirements (Sections 1, 2, and 6)

2) Dilution of Liquid Sample for Radiological Counting (Section 3)

3) Chemical Analysis for Boron Levels (Section 4)

4) Dilution of Off-gas for Isotopic Analysis (Section 5)

5) Containment Air Fractionation Supplies

c. Preparation of Hot Cell Area for Use

1) Open the access door to the hot cell

2) Close the receiver funnel drain valve.

3) Fill the receiver funnel with demin water.

4) Open receiver funnel drain valve and verify liquid drains in an unrestricted manner.

<u>NOTE</u>: If flow is obstructed, it may be necessary to blow out the drain line. This line <u>must</u> drain freely prior to using the hot cell for analyses. A squeeze bulb or Oxford pipet with plastic tip may be used to force flow.

5) Carefully position shielded sample holder brick for use in conjunction with pipet operations.

6) If a liquid sample for radiological analysis is to be diluted pursuant to Section 3 of this procedure, install an uncapped, clean 20 cc liquid scintillation vial into its appropriate sample port within the sample holder brick. Leave the cap and sealing tape outside the hot cell for later use.

7) If a Boron analysis is to be performed (pursuant to Section 4), install two 50 ml Erlenmeyer flasks into their appropriate sample ports within the sample holder brick. Leave rubber stopper caps (one for each 50 ml flask) outside the hot cell for later use.

8) If a Boron analysis is to be performed, install a clean, uncapped, prewiped 1 cm path length photocell into the appropriate sample port within the sample holder brick. Keep the cap plug available outside the hot cell for later use.

<u>NOTE</u>: Be careful not to scratch the transmission surfaces nor to deposit extraneous material (e.g. - powder or lint) especially from gloves.

9) Check that a RO-7-BM probe, or appropriate range probe, is installed in the mount above the receiving funnel. The probe should be 5 inches above the base of the hot

cell. The attached cable should run through the vent chimney and fit in the slot provided for it. Connect the cable to the RO-7 and turn the detector on.

10) Place the power cord for the magnetic stirrer, if used, along the same path as the cable mentioned above.

11) Verify air flow (a piece of paper is suggested) into the elephant trunk vent shroud.

12) Connect ventilation shroud to the chimney on top of cover switch.

13) Prepare remaining equipment, materials, reagents, etc. required for the planned sample manipulations and analyses.

2. Obtaining a Liquid Sample from the cart/cask

a. Move the cart/cask to the sink area and set the brake.

b. Uncover the sample vial by rolling the radiation shield away from the sample cavity.

c. Place an RO-2A over the funnel in the hot cell and determine the ambient background response of the RO-2A. Not the reading and then remove the RO-2A.

RO-2A Reading:________________mR/hr (ambient background)

d. Aliquot a sample of the diluted reactor coolant:

1) Transfer the bottle containing the diluted liquid to the hot cell and remove the lid.

2) Close the cask and move it away.

3) Close the access door to the hot cell.

e. Measure the radiation level with the RO-7 and record the reading.

_________________mR/hr (ambient background plus sample)

f. Calculate the net sample reading by subtracting the value of step 2.c. from the value of step 2.e.

_________________mR/hr (step 2.e.)

_________________mR/hr (step 2.c.)

_________________mR/hr (net sample reading)

3. Dilution and Preparation of Liquid Sample for Radioassay

This step involves selection and dilution of a sample aliquot to obtain a counting geometry of 10 mls liquid in a 20 ml vial. The sample volume is based on the exposure rate recorded in Step 2.f.

a. Select the appropriate pipet tip size and pipet volume as follows:

Pipet	Approx. Step 2.g. Reading	Check
5 ml	< 1.6 mR/hr	[ ]
1 ml	> 1.6 mR/hr but $\leq$ 16 mR/hr	[ ]
100 µl	> 16 mR/hr but $\leq$ 160 mR/hr	[ ]
10 µl	> 160 mR/hr	[ ]

b. Open the access door on top of shielded sample enclosure.

c. Using the pipet volume setting chosen in Step 3.a.) above, obtain this volume of RCS liquid sample from the receiver funnel, keeping hands as far away as possible from the "hot" sample liquid.

d. Slowly discharge the aliquot into the empty 20 cc liquid scintillation vial previously placed within the shield brick. Discard the pipet tip.

NOTE: Dispose of materials that have contacted highly contaminated mediums separately from those that have not.

e. Using the appropriate pipette and tip, add sufficient demin water to the 20 cc vial to bring the total liquid volume to 10 ml. Add 10 mls to the 10µl or 100µl aliquot.

f. Remove the diluted sample from the hot cell with tongs.

g. Cap the vial. Wipe it and seal it with tape.

h. Screen survey the vial to verify countability ($\leq$ 5 mR/hr contact).

i. Label and bag the vial noting the dilution, the aliquot volume used, and the radiation level measured.

j. Set the sample aside for transport to the TSC or counting room.

k. If a chemical analysis for Boron is to be performed, proceed below to Section 4. If no chemical analysis is to be performed, proceed below to Section 6 to clean up and secure the hot cell for later use.

4. Analysis of Liquid Sample for Boron

This section is a version of CAP C-17 "BORON COLORMETRIC", modified to permit the application to highly radioactive samples. Sample manipulations are performed primarily within the hot cell.

It is assumed that the reagents, equipment and supplies required for this procedure (which are itemized in Appendix 1) are assembled for use as specified in Section 1.b.

a. Pipet 5.00 ml of the standard boric acid solution into a 100 ml volumetric flask and dilute to the mark with demin water. The concentration of boron in this flask is 1/20 of the actual concentration of the standard solution (approximately 10 ppm). Note the actual concentration in the flask and run this standard as a check on the calibration curve.

b. Pipet 2 ml of the 10 ppm boron standard solution into a 50 ml Erlenmeyer flask. Pipet 2 ml of demin water into a second 50 ml Erlenmeyer flask. (Both these flasks should be outside the hot cell.)

c. Open the access door on top of the hot cell.

d. Pipet a 2 ml aliquot of the liquid sample solution from the receiver flask into one of the 50 ml Erlenmeyer flasks within the hot cell. (The other flask may be reserved as a back-up vessel or if desired, it may be used to prepare a duplicate "hot" sample.

NOTE: Open hot cell access lid whenever something is added to a flask. Close it immediately afterwards.

e. Pipet 10 μl of concentrated HCl to each flask stopper and swirl. Allow flasks to cool ($\sim$ 2 minutes).

f. Add 10.0 ml of concentrated H_2SO_4 into each flask, stopper and swirl. Allow flasks to cool room temperature ($\sim$ 15 minutes).

g. Add 10.0 ml of carminic acid solution into each flask. Stopper again and, using tongs, swirl to mix well.

h. Turn on the spectrophotometer and allow it to warm up. Absorbance should be read 45 to 60 minutes after carminic acid is added. Note the time. __________

i. Being careful to avoid direct hand contact with the cuvettes, between approximately 40 and 55 minutes after the carminic add, transfer solutions to clean, prewiped 1 cm cuvettes and carefully cap them. This may be accomplished using a 5 ml pipet set for 4 ml, and, in the case of the "hot" sample the capping and cuvette transfer must be performed using tongs.

j. Set the spectrophotometer to a wavelength of 585 nm and adjust the blank for 0% absorbance.

k. Read the boron standard to verify agreement with calibration graph within ±5%. If this agreement is not obtained continue the analysis but inform supervision immediately.

l. Read the absorbance of the sample(s). Record results and return the samples to the hot cell.

______________(Absorbance RCS)

Calibration Graph (Standard Curve)

ppm Boron RCS (diluted) = ____________________ppm

Record this on the data sheet in EP RB-16:F, Section (4)

m. Notify the Site Chemistry and Radiation Protection Coordinator of results of sample analysis.

n. Turn the spectrophotometer off and proceed to Section 5 below.

5. Dilution and Preparation of Off-gas for Isotopic Analysis

NOTE: Perform steps below only if sample vial dose rate is >5 mR/hr.

a. Obtain a clean 14 cc gas sample vial with a septum installed and using a 5 ml gas tight syringe, withdraw 1 cc of air from the vial and discharge the air from the syringe.

b. Insert the syringe into the off-gas sample vial and remove 1cc. Shut the valve on the syringe before removing the vial.

c. Insert the syringe into the counting vial; open the valve on the syringe and inject the contents into the vial.

d. Survey the newly prepared vial; if the dose rate is >5 mR/hr, repeat steps a. through e. above, diluting into new clean 14 cc gas sample vials until the sample vial is less than 5 mR/hr, keeping track of the number of dilutions.

e. Place a label on the counting vial repeating the information as found on the original vial. Calculate the new dilution factor by multiplying all dilutions together. Each dilution 15:1. Record this information on the data sheet.

f. Inquire from supervision whether the original sample vials should be discarded or stored for future use and perform as directed.

6. Cleaning and Securing the Hot Cell

a. Cleaning

1) Disposal of Radioactive Sample Residues

During these actions, the radiation levels in the sink area and airborne concentrations within the Sentry Room may become higher since the sample materials are being discharged via the sink.

a) Turn on sink drain faucet to provide a slow, steady stream.

b) Open receiver funnel drain valve to empty the liquid resides down the drain.

c) Flush the drain lines with about 20 ml flushes using demin water twice, followed by two caustic flushes and two more demin water flushes.

d) Open the access port on top of the hot cell. Remove sample caps using tongs and, using the remote handling device, empty out the contents of the flasks remaining in the enclosure down the receiver flask drain. (Be careful not to overfill the receiver flask drain).

e) Flush out the sample flasks and wash off all contaminated handling tools with demin water, caustic or acid wash solutions (as appropriate), followed by a demin water rinse.

f) Perform a general washdown of the hot cell to remove contamination. Close the access port when finished inside the hot cell.

g) Store sample flasks, vessels, etc. as "dirty" materials -- not to be used again unless thoroughly cleaned and inspected.

2) Disposal or Storage of Chemicals, etc.

a) Dispose of waste chemicals, materials, etc. in a similar fashion as above for the radioactive vessels. (Of course the precautions regarding radioactivity should not apply).

b) Chemicals, reagents and other supplies not consumed or compromised during the sample analyses may be stored for later use. These may be stored in the cabinet space adjacent to the sink area.

b. Securing Equipment

1) Valves

a) Verify the sample receiver funnel within the shielded sample enclosure is valved shut after the lines have been thoroughly flushed and surveyed clean.

b) Verify that the sink water flow is secured off.

2) Ventilation

a) If the hot cell and all survey/access ports are secured, the ventilation flow via the overhead duct may be turned off, provided there is no other requirement for this system.

3) When ready to do so, transfer samples to the TSC or counting room for counting.

4) Turn all ventilation OFF when leaving the Sentry Room unless the Sentry Room will be used in the near future.

5) When exiting through the Motor Repair Shop, note the pressures of the gas supply bottles.

Argon _______________psig

Cal Gas 1 _______________psig

Cal Gas 2 _______________psig

6) Close the bottle isolation valves for the Sentry supply gasses.

APPENDIX 1

CHECKLIST OF REQUIRED EQUIPMENT AND SUPPLIES

PERSONNEL PROTECTION AND EVALUATION (PRIOR TO PLANT ENTRY)	CHECK
Exposure rate survey equipment; 1 device/individual, including:	
1 teletector for Sentry Room use (as a minimum)	[ ]
Balance comprised of teletectors, RO-2A's or equivalent devices	
SCBA respirators; 1 device/individual	[ ]
SCBA spare breathing air bottles; 3 bottles/individual (in Sentry Room)	[ ]
Full set of protective clothing with duct tape; 1 set/individual	[ ]
Heavy rubber gloves (or two pair regular rubber gloves); 1 set per individual	[ ]
Normal and accident range dosimeters (pencil dosimeters and TLD's); 1 set/individual	[ ]
Extremity dosimeters for hands; 1 set/individual	[ ]
Lapel air samplers (recommended); 1 sampler/individual	[ ]
Voice communication amplifier (compatible with mask); 1 unit/individual	[ ]

GENERAL SAMPLE HANDLING AND MANIPULATIONS (Sections 1, 2, and 6)	
Fully operable hot cell (located in Sentry Room)	[ ]
Sample shield brick (with pre-bored holes)	[ ]
Long extension tongs: 14-16" in length, (2 pairs)	[ ]
RO-7 w/RO-7-BM probe and 5' cable	[ ]
Acid cleaning solution (1 gallon)	[ ]
Caustic cleaning solution (1 gallon)	[ ]
Demin water jug (5 gallons)	[ ]
Suction bulb	[ ]
Rubber hose (5' long with trigger spray nozzle and tap hook-up)	[ ]

APPENDIX 1 (Continued)

GENERAL SAMPLE HANDLING AND MANIPULATIONS (Sections 1, 2, and 6) (Continued)

30 ml beakers (3)	[ ]
Paper towels or equivalent (1 box)	[ ]
Alcohol (1 liter)	[ ]

RADIOACTIVE SAMPLE DILUTION SUPPLIES (SECTION 3)	CHECK
20 ml liquid scintillation vial w/cap (1)	[ ]
Sealing tape for 20 ml liquid scintillation vial (1 roll)	[ ]
Labels for 20 ml liquid scintillation vial (1 box)	[ ]
Small plastic bags; sealable (1 dozen)	[ ]
10 µl pipet w/tip	[ ]
1 ml pipet w/tip	[ ]
Adjustable 0-5 ml pipet w/tip	[ ]
Shielded syringe (calibrated for 5 cc volume)	[ ]
Spare syringe cylinder	[ ]

BORON SAMPLE ANALYSIS SUPPLIES (SECTION 4)

50 ml Erlenmeyer flasks w/rubber stoppers (4 sets)	[ ]
1 cm path length spectrophotometer cells w/caps (3 sets)	[ ]
Dri-wipes for spectrophotometer cells (1 box)	[ ]
Rinse/soak bath for 1 cm path length spectrophotometer cells	[ ]
100 ml volumetric flask	[ ]

[1]Reagents must be stored in boron free containers; use plastic

APPENDIX 1 (Continued)

BORON SAMPLE ANALYSIS SUPPLIES (SECTION 4) (Continued)

Adjustable 0-5 ml pipets (2) w/tips (1)	[ ]
10 μl pipet w/tips (3)	[ ]
Spectrophotometer unit	[ ]
Dilute nitric acid, HNO_3 (bath)	[ ]
Carminic acid solution[1], Stability: 1 week (30 ml/analysis)	[ ]
Hydrochloric acid[1], HCl, concentrated (30 ml/analysis)	[ ]
Sulfuric acid[1], H_2SO_4, concentrated (30 ml/analysis)	[ ]
Standard boric acid solution[1], 200 ppm B, Stability: Restandardize monthly (5 ml/analysis)	

DILUTION OF OFF-GAS FOR ISOTOPIC ANALYSIS (SECTION 5)	CHECK
14 cc gas sample vials w/septums installed (2)	[ ]
5 cc gas tight syringe/needle	[ ]
Labels for 14 cc gas vials	[ ]
Small plastic bags; sealable	[ ]
Sealing tape	[ ]

CONTAINMENT AIR FRACTIONATION SUPPLIES

Spare U-tube filter assembly	[ ]

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DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

NUMBER	EP RB-16:F
REVISION	0
DATE	7/19/84
PAGE	1 OF 2

TITLE EMERGENCY OPERATING PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM
-- DATA ANALYSIS
(NOT INTENDED TO MEET THE 3-HOUR TIME LIMIT)

APPROVED R. C. Thornberry 7-31-84
PLANT MANAGER DATE

IMPORTANT TO
ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of this procedure is to provide a means to assemble the data generated from the various EP RB-16 sub-procedures into a concise form.

PROCEDURE

1. RCS stripped gas data are to be processed on Section (1) of the attached form.

2. Hydrogen data from containment atmosphere analysis by the in situ Hydrogen Analyzer System are to be processed in Section (2)a) of the attached form.

3. Hydrogen data by Sentry Gas Chromatographic analysis are to be process on Section (2)b) of the attachment form.

4. Containment Air Isotopic Data are to be processed on Section (3) of the attached form.

5. Analytical data for boron and/or chloride are to be process on Section (4) of the attached form.

6. Depressurized liquid isotopic data are to be processed on Section (5) of the attached form.

7. After filling in the pertinent sections of the attached form, acquire approval signatures from the Chemistry and Radiation Protection Foreman and the Chemistry and Radiation Protection Engineer.

8. Attach all pertinent chemistry and radiochemistry data to this form.

9. Deliver the completed form to the Site Emergency Coordinator for disposition.

TITLE SENTRY POST-ACCIDENT SAMPLING SYSTEM
-- DATA ANALYSIS
(NOT INTENDED TO MEET THE 3-HOUR TIME LIMIT)

ATTACHMENT

1. Form 69-10862, Post Accident Liquid Sample Data Sheet, Rev. 7/84
2. Temperature Correction Table for pH
3. Solubility of Oxygen in Air Saturated Water

PACIFIC GAS AND ELECTRIC COMPANY
DEPARTMENT OF NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

TITLE: POST ACCIDENT SAMPLE DATA SHEET (EP RB-16:F)

DATE ____________ DAY ____________
ANALYST INITIALS ______

(1). RCS Off-Gas Data (GAMMA ASSAY)

P_1 = Pressure Recorded on RC-G-2.1 (EP RB-16:B3, step 9.e.) _____psig

P_2 = Pressure Recorded on RC-G-2.1 (EP RB-16:D, step 4.i.) _____psig

Calculate the Gas Dilution Factor (DF):

$$DF_1 = \frac{V_1 (P_1 + 14.7)}{V_2 (P_2 + 14.7)} = \frac{A_1}{A_2}, \text{ where}$$

A_1 = Initial activity isolated in sample line up to RC-V-15 (before GC analysis).

V_1 = System Volume (RC-EV-1 and lines to RC-V-15) = 360 cc

P_1 = Pressure Recorded Above

A_2 = Final Activity after GC analysis (the time at which the off-gas sample is collected).

V_2 = Volume of RC-DV-2 = 0.023 cc

P_2 = Pressure Recorded Above

Initial counting vial dilution factor = 11 = DF_2 11

NOTE: When the syringe is first injected into the 10 cc Sentry sample bottle and then the plunger is withdrawn to 1 cc (provided the syringe is still inserted in the 10 cc bottle), the total volume is 11 cc. If the sample is homogeneous, then the true dilution factor = 11, not 10.

Subsequent dilution factor for 1 cc = 14 cc results in a multiplicative factor of 15 for each dilution = DF_3

NOTE: The same argument used in the previous note applies here. The D.F. = 15, not 14.

(Use 1 if no subsequent dilutions are made) ____

Total dilution factor $DF_1 \times DF_2 \times DF_3$ = ____

TITLE: POST ACCIDENT SAMPLE DATA SHEET (EP RB-16:F)

DATE ________ DAY ________
ANALYST INITIALS ________

(2)a) Hydrogen Concentration in Containment Air*

Hydrogen Analyzer System

	CEL-82	CEL-83
Time switched from OFF to STANDBY (N/A if in STANDBY made fore this date)	________	________
Scale Used (10% or 20%)	________	________
Meter Reading (%)	________	________
Time	________	________

*Data from EP RB-16:A, Section 6

DATE ________ DAY ________
ANALYST INITIALS ________

(3)b) Hydrogen by Gas Chromatography

Loop Used (1, 2, 3, or 4)	________	
Sample Time	________	
Standard Calibration Reference Pressure* (from Calibration Sheet)	________	(psia)
Sampling Pressure, PS (EP RB-16:I, Step 1.i.)*	________	(psia)
Peak Height, H (EP RB-16:D, Step 4.n.)	________	(mm)
Peak Height Correction Factor † CF, (From Calibration Sheet)	________	
Corrected Peak Height, H_c = (H_c = H x CF)	________	(mm)
% H_2 (From Standard Calibration Curve)	________	%

*To convert to absolute pressure (psia):
for pressure $\geq$ 0 : 14.7 + pressure reading (psig)
for pressure $\leq$ 0 : $1.47 - \frac{\text{vacuum reading includes Hg}}{2.03}$

† Correction Factor for Peak Height:

$$\frac{\text{Peak Height at Standard Calibration Pressure}}{\text{Peak Height at Sampling Pressure}}$$

TITLE: POST ACCIDENT SAMPLE DATA SHEET (EP RB-16:F)

DATE ________________ ANALYST INITIALS ______ DAY ________________

(3) Containment Air Isotopic Analysis

Containment Temperature, T_c (EP RB-16:C, Step 1.e.) ________ °K

Sample Temperature, T_s (EP RB-16:C, Step 2.e.) ________ °K

Sample Collection Time ________________

Containment Noble Gas

Fractional Yield = $T_c/(43{,}400 \times T_s) = Y_{NG}$ ____________

Noble Gas Activity = __________ µCi/cc

Containment Air Iodine

Fractional Yield = T_c/T_s = ____________ Y_{IP}

Iodine and Particulate Activity = __________ µCi/cc

Counted By ____________________

Where: Y_{IP} and Y_{NG} are fractional yields entered into the analysis program.

TITLE: POST ACCIDENT SAMPLE DATA SHEET (EP RB-16:F)

DATE ____________________ ANALYST INITIALS ______ DAY ________________

(4) Chemical Analysis

a) Boron

Concentration from analysis, B __________ ppm

SYSTEM DILUTION FACTOR, DF, (usually 1000) _________

Corrected Concentration, C.C., (BxDF) __________ ppm

Supplemental Dilution Factor S.D.F. (1 if no other chemistry dilutions are performed) _______________

Final Corrected Concentration (C.C. x S.D.F.) ________ppm

b) Chloride

Standard Check

Standard Peak Height (EP RB-16:G, Step 2.)

1. ppm chloride ________ ppm (A)
2. in standard 2.n. ________ mm
3. ppm chloride from calibration curve 2.o. ________ ppm Cl^-
4. $\frac{(A-1.0)}{1.0} \times 100$ ________ % Difference (B)
5. Is B. within ±10% (YES/NO) ________ ?

NOTE: 5. should be YES before proceeding with the analysis.

Sample Analysis

1. Sample peak height (EP RB-16:G, Step 4.i.)________ mm
2. ppm Cl^- in Sample (EP RB-16:G, Step 4.j.) ________ ppm Cl^-

TITLE: POST ACCIDENT SAMPLE DATA SHEET (EP RB-16:F)

DATE ____________________ ANALYST INITIALS ______ DAY ________________

(5) Liquid Isotopic Analysis

Initial Dilution Factor ____________ (DF_1)

Additional Sample Dilution Factor (DF)

(use 1 if there is no additional DF) ____________ (DF_2)

Final Dilution Factor for Isotopic Analysis

($DF_1 \times DF_2$) ____________ (DF_3)

Fractional Yield to be entered into Isotopic Program $1/DF_3$ ____________ (Y_L)

DATE ____________________ ANALYST INITIALS ______ DAY ________________

(6) pH Determination of Reactor Coolant

(a) First pH Calibration Data Point

Temperature of Buffer Solution (EP RB-16:H, Step 1.a.6)) ____________ °C

Temperature Corrected Buffer pH Value (See Attachment 2) ____________ corrected pH

(b) Second pH Calibration Data Point

1. Temperature of Buffer Solution (EP RB-16:H, Step 1.a.16)) ____________ °C
2. Temperature Corrected Buffer pH Value (See Attachment 2) ____________ corrected pH
3. Temperature Corrected pH Measurement Recorded on pH Meter (Step 1.a. 17)) ____________ pH
4. Accuracy = 6)(b)3. - 6)(b)-2. ____________
5. Is 4. within ± 0.5 pH units (YES/NO) ____________ ?

(c) Sample pH Measurement

1. pH Readout (EP RB-16:H, Step 3.f.) ____________ pH

Temp ____________ °C

TITLE: POST ACCIDENT SAMPLE DATA SHEET (EP RB-16:F)

DATE ____________ ANALYST INITIALS ______ DAY ____________

7) Determination of Conductivity of Reactor Coolant

Conductivity Reading (EP RB-16:H, Step 3.b.) __________ μmho

Temperature of Sample Stream (EP RB-16:H, Step 3.b.) __________ °C

DATE ____________ ANALYST INITIALS ______ DAY ____________

8) Determination of Dissolved Oxygen Concentration of Reactor Coolant

a) Oxygen Standardization

Temperature of the Recirculation Water (EP RB-16:H, Step 1.b.4)) __________ °C

Accepted Concentration of O_2 in Recirculation Steam (See Attachment 3) __________ ppm O_2

b) Sample Analysis

Dissolved O_2, Readout (EP RB-16:H, Step 3.e.) __________ ppm O_2

Reviewed by ____________ Foreman ____________ Chemistry and Radiation Protection Engineer

PACIFIC GAS AND ELECTRIC COMPANY
DEPARTMENT OF NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

ATTACHMENT 1

TITLE: pH TEMPERATURE CORRECTION TABLES

SAMPLE pH TEMPERATURE CORRECTION TABLE

TEMP°C	CORR	TEMP°C	CORR
16	-.31	31	+.20
17	-.27	32	+.24
18	-.24	33	+.26
19	-.20	34	+.29
20	-.16	35	+.32
21	-.13	36	+.36
22	-.10	37	+.40
23	-.07	38	+.43
24	-.03	39	+.46
25	.00	40	+.50
26	+.04	41	+.53
27	+.07	42	+.56
28	+.10	43	+.59
29	+.14	44	+.63
30	+.17	45	+.66

BUFFER pH TEMPERATURE CORRECTION TABLE

TEMP	RED pH4	GREEN pH7	BLUE pH10
10°C	4.00	7.06	10.18
15°C	--	--	10.12
20°C	4.00	7.02	10.06
25°C	4.00	7.00	10.01
30°C	4.01	6.99	9.97
35°C	--	--	9.93
40°C	4.03	6.98	9.89
45°C	--	--	9.86
50°C	4.06	6.97	9.83
60°C	4.09	6.98	--
70°C	4.12	6.99	--
80°C	4.16	7.00	--
90°C	4.19	7.02	--
95°C	4.21	7.03	--

*TAKEN FROM LABELS ON BECKMAN BUFFERS

PACIFIC GAS AND ELECTRIC COMPANY
DEPARTMENT OF NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

TITLE: SOLUBILITY OF OXYGEN IN AIR SATURATED WATER (For Oxygen in Air at 1 atm.)

ATTACHMENT 3

TEMP °C	PPM DISSOLVED OXYGEN	TEMP °C	PPM DISSOLVED OXYGEN
16	9.9	31	7.5
17	9.7	32	7.4
18	9.5	33	7.3
19	9.3	34	7.2
20	9.2	35	7.1
21	9.0	36	7.0
22	8.8	37	6.8
23	8.7	38	6.7
24	8.5	39	6.6
25	8.4	40	6.5
26	8.2	41	6.4
27	8.1	42	6.3
28	7.9	43	6.2
29	7.8	44	6.1
30	7.7	45	6.0

PG&E **Pacific Gas and Electric Company**

NUMBER EP RB-16:G
REVISION 0
DATE 7/19/84
PAGE 1 OF 10

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

TITLE EMERGENCY OPERATING PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM
--ION CHROMATOGRAPHIC CHLORIDE ANALYSIS
(NOT INTENDED TO MEET THE 3-HOUR TIME LIMIT)

APPROVED R. C. Thornberry 7-31-84
PLANT MANAGER DATE

IMPORTANT TO ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of this procedure is to detail the steps required to measure chloride concentrations of reactor coolant. Included are steps to complete flushing of both the LSP reactor coolant module and CAP lines. This procedure requires operator actions at the LSP, CAP, and CMP.

PREREQUISITES

1. The Ion Chromatograph (IC) was turned on according to Procedure EP RB-16:A and has warmed up for 30 minutes.

2. CAP, CMP, and LSP systems lined up as detailed in Procedure EP RB-16:A.

3. Verify that the following annunciator windows are off on the PCP:

   a. REACTOR COOLANT SAMPLE COOLING WATER LOW FLOW

   b. REACTOR COOLANT SAMPLE COOLING WATER LOW PRESS

   c. REACTOR COOLANT SAMPLE COOLING WATER HIGH TEMP

   d. REACTOR COOLANT PURGE HIGH TEMP

   e. REACTOR COOLANT SAMPLE HIGH TEMP

   f. LIQUID SAMPLE PANEL HIGH PLENUM PRESS

   g. CHEM ANALYSIS PANEL HIGH PLENUM PRESS

4. The following equipment should be available:

   a. Meter-long reach rod

PRECAUTIONS

1. This sampling involves processing of water that may be highly radioactive. Precautions should be taken to prevent skin contact or ingestion.

2. Time in a radiation field should be limited to that necessary to perform the required operations. During purge and flush periods, it may not be necessary to stand near the panels and consideration should be given to moving to a low dose area.

3. A dose rate instrument should be on and periodic monitoring is suggested during purge and sampling exercises.

4. For the Ion Chromatograph (IC):

   a. The calibration curve should be checked once every 4 samples by analyzing a chloride standard.

   b. Calibration should be checked when first using a new eluent.

   c. Regeneration is required about once every 4 hours of continuous operation. Refer to the troubleshooting and surveillance and maintenance procedure.

   d. During continuous operation, the separator column must be cleaned on a daily basis or every other regeneration by pumping 0.006M sodium carbonate (Eluent 1) through the column for a minimum of 10 minutes, followed by a 20 minute demineralized water rinse. This may be coincident with regeneration of the suppressor column. Refer to the troubleshooting and surveillance and maintenance procedure.

PROCEDURE

1. Instrument Calibration

   NOTE: If analysis is require' from a second sample source, then monitor calibration i not needed again. Proceed to step 2. LSP and CAP Purging.

   a. Set the OFFSET range switch to left. [ ]

   b. Adjust the COARSE vernier switch to zero the meter. It may be necessary to adjust the FINE pot to zero the meter. [ ]

   c. Operate the system until the baseline is stabilized with the μmho FULL SCALE switch in the 1 position adjusting the FINE pot as necessary to zero the meter. [ ]

2. Chloride Standard Check

a. Close or check closed CAP-V-15. [ ]

b. Verify CAP-CAL-3 is at least half full. (STP G-15, Section 8, directs filling). [ ]

c. Set MODE switch to LIN and bring the conductivity meter needle on scale with the COARSE OFFSET or FINE control. Set the needle to 0 on the scale. [ ]

d. Align CAP-V-5 to CHLORIDE CALIB. SOL'N. [ ]

e. Open CAP-V-15. [ ]

f. Turn on the L&N recorder. [ ]

g. After 1 minute, place the LOAD/INJECT switch at the CMP to INJECT and mark the recorder trace with date, time, injection point, analyst's initials, sample type, and conductivity meter setting. [ ]

h. After 1 minute, place the LOAD/INJECT switch in LOAD position. [ ]

NOTE: The Cl^- peak will elute about 5 min. after injection.

i. Close CAP-V-15. [ ]

j. Align CAP-V-5 Counterclockwise to CLOSED. [ ]

k. Align CAP-V-29 to vent (6 o'clock) [ ]

l. After the Cl^- peak has eluted, wait 5 minutes then shut off the L&N recorder. [ ]

m. Align CAP-V-5 to RCS sample (9 o'clock). [ ]

n. Determine the peak height:

Peak height = (Trace Peak Height - Baseline) x Attentuation

Peak Height = ________mm

Corresponding ppm Cl^- from CAL. Curve ________ppm (A)

o. Compare the Cl^- standard peak with the calibration curve. For the same μmho setting, the values should be within ±10%.

$$\frac{(A) - 1.0}{1.0} \times 100 = \_\_\_\_\_\_\_\_ \text{\% Difference (B)}$$

Is (B) within ±10%?__________ (YES/NO)

3. LSP and CAP Purging

a. Open RC-SV-1 and RC-SV-2 by placing BKR #10 to the ON position at breaker panel PYNM11. [ ]

b. Open the following valves:

RC-V-7 [ ]
RC-V-3 [ ]

c. Position RC-V-22 to the TO CHEM PANEL position. [ ]

d. Open the remote flush isolation valve at the PCP (see Attachment 1 for proper valve.) Open the remote flush isolation valve then allow the sample to recirculate for 5 minutes. Close the remote flush isolation valve. [ ]

NOTE: The sample source valves are labeled RC-V-1.1 through RC-V-1.5. Throughout this procedure, the form RC-V-1.X will be used to indicate the source valve to be operated. The sample source used for sampling should have been given at the briefing by the site Chem and Rad Protection Coordinator.

e. Open RC-V-1.X (see Attachment 1 for proper valve). [ ]

f. Open RC-VREL-1 until RC-FI-1 indicates 100% full flow. Purge for 5 minutes. [ ]

NOTE: Sample will now be flowing into the back of the LSP. The meter-long reach rod should be used to operate valves and a dose rate survey should be done to monitor radiation levels.

g. Slowly close RC-VREL-1 until RC-FI-1 indicates about 45% full flow. Continue the purge for 1 minute. [ ]

h. Close RC-V-3. [ ]

i. Open RC-V-2. [ ]

j. Adjust RC-VREL-2 until RC-FI-2 indicates 100% full flow. [ ]

j. Verify that the red FULL FLOW lights are lit for the ION CHROMAT loop at the CMP and CAP panels. Adjust RC-VREL-2 if necessary to obtain proper flow rate. [ ]

k. Continue the purge for 5 minutes. [ ]

4. Sample Analysis

a. At the CMP, activate the L&N recorder. [ ]

b. Place the IC LOAD/INJECT switch in the INJECT position and mark the inject position on the chart paper. [ ]

c. On the chart paper, record the date/time, sample source used, μmho setting, chart speed, and analyst's initials. [ ]

d. After approximately 1 minute from sample injection, place the LOAD/INJECT switch in the LOAD position. [ ]

NOTE: The chloride peak will appear approximately 5 minutes after injection at the same retention time observed for the standard.

e. Turn CAP-V-5 to the DEMIN WATER position. [ ]

f. Flush with demin water for 2 minutes. [ ]

g. Examine the L&N recorder. If the chloride peak goes off-scale, a reanalysis must be completed using a larger µmho setting (3 µmho) and following the steps below, otherwise skip to step "h". [ ]

1) Select appropriate attenuation. [ ]

2) Align CAP-V-5 to LIQUID SAMPLE. [ ]

3) Continue the purge for 1 minute. [ ]

4) Place LOAD/INJECT switch in the INJECT position and mark the inject position on the chart paper. [ ]

5) On the chart paper, record the date/time, sample source used, µmho setting, chart speed, and analyst's initials. [ ]

6) After approximately 1 minute, place the LOAD/INJECT switch in the LOAD position. [ ]

NOTE: The chloride peak will appear at approximately 5 minutes after injection.

7) Turn CAP-V-5 to the DEMIN WATER position. [ ]

8) Flush with demin water for 2 minutes. [ ]

9) Examine the L&N recorder for the chloride peak. [ ]

NOTE: If the chloride peak is off scale, change the µmho setting and repeat step g. until the chloride peak is on scale.

h. After the Cl^- peak has eluted, wait 5 minutes then turn off the L&N recorder. [ ]

i. Determine the peak height

Peak height = (Trace peak height - baseline) x attentuation

Peak height = _____ mm

j. Determine the ppm chloride from the calibration curve and record on the data sheet (EP RB-16:F).

________ppm Cl^-

5. Flushing

a. At the PCP, perform the following:

1) Close the remote plant and source isolation valves.(see Attachment 1). [ ]

2) Open the remote flush isolation valve (see Attachment 1 for proper valve). [ ]

b. At the LSP, close RC-V-1.X. [ ]

c. At the CAP, align CAP-V-5 to LIQUID SAMPLE. [ ]

d. At the LSP, open RC-V-4. [ ]

e. Open RC-VREL-2 until RC-FI-2 indicates 100% of full flow. Flush with demin water for 3 minutes. [ ]

f. Close RC-V-7. [ ]

g. Open RC-V-3. [ ]

h. Adjust RC-VREL-1 until RC-FI-1 indicates 100% of full flow. Flush with demin water for 1 minute. [ ]

i. Close RC-V-3. [ ]

j. Open RC-V-1.X and flush with demin water for 5 minutes. [ ]

k. Close RC-V-1.X. [ ]

l. Open RC-V-7. [ ]

m. Adjust RC-VREL-2 until RC-FI-2 indicates 100% of full flow. Flush with demin water for 3 minutes. [ ]

n. At the CMP, cycle the LOAD/INJECT switch at least 3 times. Return it to the LOAD position. [ ]

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

p. Turn CAP-V-6 to LIQUID SAMPLE (9 o'clock) and flush with demin water for 2 minutes. [ ]

q. Turn CAP-V-6 to OXYGEN CALIB SOLUTION. [ ]

r. Close CAP-V-11. [ ]

s. Terminate flushing by closing the following valves:

RC-V-7 [ ]
RC-V-2 [ ]
RC-V-4 [ ]
RC-VREL-1 [ ]
RC-VREL-2 [ ]

t. Align RC-V-22 to WASTE. [ ]

u. At the PCP, close the remote flush isolation valve. (Attachment 1) [ ]

v. At breaker panel PYNM11, place BKR #10 to the OFF position. [ ]

w. Call the control room and have operations close the containment isolation valves opened earlier. [ ]

6. Flushing the Separator and Suppressor Columns

If the IC is not needed for further sampling in an 8 hour period then the following steps should be performed before system shutdown can be started.

a. Perform the following IC valve alignments to wash the iodine and other cations from the suppressor column:

NOTE: Direction from the Site Emergency Coordinator may preclude this section, if radiological conditions warrant.

1) Check that the conductivity meter mode switch is set to ZERO. [ ]

2) In the eluent/pump enclosure of the CAP, check the following:

a) Check the levels of eluent, water, and regenerants are at least half full. [ ]

b) Check that the I.C. pumps and vent if air is visible in the sightglass or tubing. [ ]

c) Check that the pump stroke settings are set at 40% for both pumps. [ ]

3) At the CMP, check the following:

a) Check that the regeneration time thumbwheels are set at 15 min for REG and 45 min for RIN. [ ]

b) Align the following air toggle switches to the indicated positions:

E_1	E_1	[ ]
E_2	DOWN	[ ]
SEP-1	SEP-1	[ ]
SUP-1/RGN-2	SUP-2/RGN-1	[ ]
INJECT/LOAD	LOAD	[ ]

4) Depress regeneration START button and the suppressor column will automatically be regenerated. [ ]

5) Flush the separator column for 20 min. After 20 min., turn the E_1 switch to DOWN and rinse the separator column with demin. water for 10 min. [ ]

7. System Shutdown

   a. After completion of column regeneration, perform the following:

      1) Turn IC POWER switch to OFF. [ ]

      2) Turn AIR switch to OFF. [ ]

      3) Turn GAUGE switch to OFF. [ ]

      4) Turn ELUENT pump switch to OFF. [ ]

      5) Turn conductivity meter MODE switch to ZERO. [ ]

8. Data Analysis

   a. Proceed to EP RB-16:F for data analysis

REFERENCES

1. Sentry Equipment Corp. High Radiation Sampling System Operating and Maintenance Manual.

ATTACHMENTS

1. Valves for Obtaining Samples from Reactor Coolant

TITLE: VALVES FOR OBTAINING SAMPLES FROM REACTOR COOLANT

ATTACHMENT 1

SAMPLE SOURCE	REMOTE PLANT ISOLATION VALVE (RPIV)	REMOTE SOURCE ISOLATION VALVE (RSIV)	REMOVE FLUSH ISOLATION VALVE (RFIV)	LSP SAMPLE SOURCE VALVE (SSV)
RC Hot Leg 1	FCV-9351 A	FCV-692	FCV-1416	RC-V-1.1
RC Hot Leg 4	FCV-9351 B	FCV-692	FCV-1416	RC-V-1.1
PZR Liquid	FCV-9350 B	FCV-693	FCV-1417	RC-V-1.2
PZR Steam	FCV-9350 A	FCV-694	FCV-1418	RC-V-1.3
RHR Pump 1-1 Discharge	FCV-9353 A	FCV-1413	FCV-1419	RC-V-1.4
RHR Pump 1-2 Discharge	FCV-9353 B	FCV-1413	FCV-1419	RC-V-1.4
VCT Liquid	N/A	FCV-1412	FCV-1420	RC-V-1.5

PG&E **Pacific Gas and Electric Company**

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

NUMBER EP RB-16:H
REVISION 0
DATE 7/26/84
PAGE 1 OF 8

TITLE EMERGENCY OPERATING PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM
-- PH/CONDUCTIVITY/YSI DISSOLVED OXYGEN
(NOT INTENDED TO MEET THE 3-HOUR TIME LIMIT)

APPROVED R. C. Thornberry 7-31-84
PLANT MANAGER DATE

IMPORTANT TO ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of this procedure is to detail the steps required to measure pH, conductivity, and dissolved oxygen concentrations of reactor coolant. Included are steps to complete flushing of both the LSP reactor coolant module an CAP lines. This procedure requires operator actions at the LSP, CAP, and CMP.

PREREQUISITES

1. Monitors are turned on according to procedure EP RB-16:A:

   a. and have warmed up for 1 hour if oxygen analyzer has not been calibrated within 1 week;

   b. or, have warmed up for 30 minutes if oxygen analyzer does not need calibration.

2. CAP, CMP, and LSP systems lined up as detailed in procedure EP RB-16:A.

3. Verify that the following annunciator windows are off on the PCP:

   a. REACTOR COOLANT SAMPLE COOLING WATER LOW FLOW

   b. REACTOR COOLANT SAMPLE COOLING WATER LOW PRESS

   c. REACTOR COOLANT SAMPLE COOLING WATER HIGH TEMP

   d. REACTOR COOLANT PURGE HIGH TEMP

   e. REACTOR COOLANT SAMPLE HIGH TEMP

   f. LIQUID SAMPLE PANEL HIGH PLENUM PRESS

   g. CHEM ANALYSIS PANEL HIGH PLENUM PRESS

4. The following equipment must be available:

   a. Meter-long reach rod

   b. Small screwdriver

5. The conductivity meter should have been calibrated within the last 3 months.

PRECAUTIONS

1. This sampling involves processing of water that will be highly radioactive. Precautions should be taken to prevent skin contact or ingestion.

2. Time in a radiation field should be limited to that necessary to perform the required operations. During purge and flush periods, it may not be necessary to stand near the panels and consideration should be given to moving to a low dose area.

3. A dose rate instrument should be on and periodic monitoring is suggested during purge and sampling exercises.

PROCEDURE

1. Monitor Calibration

   NOTE: If analysis is required from a second sample source, then monitor calibration is not needed again. Proceed to step 2. LSP and CAP Purging

   a. pH Calibration

      1) Align CAP-V-6 to pH CALIB SOLUTION [ ]

      2) Adjust CAP-V-26 until sufficient flow is indicated by red flow indicator light. Flow for 2 minutes. Cycle CAP-V-7 to Rexnard and then back to the YSI Oxygen Analyzer. [ ]

      3) Turn CAP-V-6 counterclockwise to OXYGEN CALIB. SOLUTION to terminate flow. [ ]

      4) Align CAP-V-27 to vent position. [ ]

5) Observe and record the temperature of the buffer solution as indicated on the CMP.

Temp. _______°C

a) Correct the buffer pH value for the recorded temp. from the pH Temperature Correction Table (Attachment 1). [ ]

6) Adjust the pH monitor R-3 until the meter indicates the temperature corrected pH value. [ ]

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

pH __________

8) Align CAP-V-6 to DEMIN WATER and flush for 2 minutes. [ ]

9) Align CAP-V-30 to pH calibration tank CAL-2. [ ]

10) Align CAP-V-28 to the nitrogen supply line. [ ]

11) Align CAP-V-6 to the pH CALIB SOLUTION. [ ]

12) Align CAP-V-16 until the red flow indicator is lit. Flow for 2 minutes. Cycle CAP-V-7 to Rexnard and then back to YSI Oxygen Analyzer. [ ]

13) Turn CAP-V-6 counterclockwise to the OXYGEN CALIB SOLUTION to terminate flow. [ ]

14) Align CAP-V-28 to vent position. [ ]

15) Observe and record the temperature of the buffer solution as indicated on the CMP.

Temp. _______°C

a) Correct the buffer pH valve for the recorded temp. from the pH Temperature Correction Table (Attachment 1). [ ]

16) After the meter reading has stabilized, record the reading and compare to the temperature corrected pH value. The reading should be within ±0.5 pH units of the temperature corrected value.

pH ____________

17) Align CAP-V-6 to DEMIN WATER and flush for 2 minutes. [ ]

b. Dissolved Oxygen Analyzer Calibration

NOTE: If calibration has been performed within 1 week proceed to step 2. LSP and CAP Purging.

1) Open CAP-V-9. [ ]

2) Align CAP-V-6 to OXYGEN CALIB SOLUTION. [ ]

3) Close CAP-V-17 until the red flow indicator is lit. Flow for 5 minutes. [ ]

4) Read and record the temperature of the water in CAL-4 at the CMP.

Temp. _______°C

5) Determine the dissolved oxygen concentration from the Solubility of Oxygen in Air Saturated Water table (Attachment 2) and record the value.

______ ppm dissolved oxygen

6) While flowing, adjust the O_2 calibration knob until the pen traces to the dissolved oxygen concentration in ppm recorded in step 5). [ ]

7) Turn the oxygen calibration pump to OFF. [ ]

8) Close CAP-V-9. [ ]

9) Align CAP-V-6 to LIQUID SAMPLE. (9 o'clock) [ ]

2. LSP and CAP Purging

   a. Open RC-SV-1 and RC-SV-2 by placing BKR #10 to the ON position at breaker panel PYNM11. [ ]

   b. Open the following valves:

      RC-V-7 [ ]
      RC-V-3 [ ]

   c. Position RC-V-22 to the TO CHEM PANEL position. [ ]

   d. Close the remote flush isolation valve at the PCP (see Attachment 3 for proper valve). [ ]

   NOTE: The sample source valves are labeled RC-V-1.1 thru RC-V-1.5. Throughout this procedure, the form RC-V-1.X will be used to indicate the source valve to be operated. The sample source used for sampling will have been given at the briefing by the site Chem and Rad Protection Coordinator.

   e. Open RC-V-1.X (see Attachment 3 for proper valve). [ ]

   f. Open RC-VREL-1 until RC-FI-1 indicates 100%. Purge for 5 minutes. [ ]

   NOTE: Sample will now be flowing into the back of the LSP. The meter-long reach rod should be used to operate valves and a dose rate survey should be done to monitor radiation levels.

   g. Slowly close RC-VREL-1 until RC-FI-1 indicates 30%. Continue purge for 1 minute. [ ]

   h. Close RC-V-3. [ ]

   i. Open RC-V-2. [ ]

   j. Adjust RC-VREL-2 until RC-FI-2 indicates 100%. [ ]

k. Verify that the red FULL FLOW lights are lit for the pH, O_2, and COND loop at the CMP and CAP panels. Adjust RC-VREL-2 if necessary to obtain proper flow rate. [ ]

l. At the CMP, turn YSI CHART SPEED to RAPID and verify PEN INPUT is set to $-O_2$. [ ]

3. Sample Analysis

a. Flow for 5 minutes or until YSI trace is linear. Cycle CAP-V-7 to Rexnard for 30 seconds and back to YSI Oxygen Analyzer. [ ]

b. Observe and record conductivity meter reading and temperature of the sample stream from the CMP.

Cond.__________µmho
Temp.__________°C

c. Turn CAP-V-6 counterclockwise to OXYGEN CALIB SOLUTION to terminate sample flow and permit pH reading to stabilize. [ ]

d. Turn YSI CHART SPEED to 1 and mark the chart paper with the date/time, O_2 range, sample source, sample temperature, and operator's initials. [ ]

e. Read the O_2 from the trace. __________ppmO_2

f. Observe the pH meter for 1 minute to ensure the reading has stabilized. Record the pH reading.

ph__________
Temp.__________°C

4. Flushing

a. At the PCP, perform the following:

1) Close the remote source isolation valve. [ ]

2) Open the remote flush isolation valve (see Attachment 3 for proper valve). [ ]

b. At the LSP, close RC-V-1.X. [ ]

c. At the CAP, align and CAP-V-6 to LIQUID SAMPLE. (9 o'clock) [ ]

d. At the LSP, open RC-V-4. [ ]

e. Open RC-VREL-2 until RC-FI-2 indicates 100% flow. Flush with demin water for 1 minute. [ ]

f. Close RC-V-7. [ ]

g. Open RC-V-3 [ ]

h. Adjust RC-VREL-1 until RC-FI-1 indicates 100% flow. Flush with demin water for 1 minute. [ ]

i. Close RC-V-3. [ ]

j. Open RC-V-1.X and flush with demin water for 5 minutes. [ ]

k. Close RC-V-1.X. [ ]

l. Open RC-V-7. [ ]

m. Adjust RC-VREL-2 until RC-FI-2 indicates 100% flow. Flush with demin water for 3 minutes. [ ]

n. At the CAP, align CAP-V-6 to OXYGEN CALIB SOLUTION. [ ]

o. Terminate flushing by closing the following valves:

RC-V-7 [ ]
RC-V-2 [ ]
RC-V-4 [ ]
RC-VREL-1 [ ]
RC-VREL-2 [ ]

p. Align RC-V-22 to WASTE. [ ]

q. At the PCP, close the remote flush isolation valve. [ ]

r. At breaker panel PYNM11, place BKR #10 to the OFF position. [ ]

s. Call the control room and have operations close the containment isolation valves opened earlier. [ ]

5. System Shutdown

NOTE: If monitors are going to be used again for a different sample source, skip to step 6., Sample Calculations.

a. pH Monitor

1) Turn switches S-3 and S-1 to the OFF position. [ ]

b. Conductivity Monitor

1) Turn function select switch to ZERO position. [ ]

c. YSI Monitor

1) Turn YSI POWER switch to OFF position. [ ]

2) Remove chart paper. [ ]

6. Sample Calculations

a. Correct the recorded sample pH for temperature from the pH Temperature Correction Table (Attachment 1).

Temp. corrected pH________

REFERENCES

1. Sentry Equipment Corp. High Radiation Sampling System Operating and Maintenance Manual.

ATTACHMENTS

1. pH Temperature Correction Table

2. Solubility of Oxygen in Air Saturated Water

3. Valves for Obtaining Samples from Reactor Coolant

PACIFIC GAS AND ELECTRIC COMPANY
DEPARTMENT OF NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

ATTACHMENT 1

TITLE: pH TEMPERATURE CORRECTION TABLES

SAMPLE pH TEMPERATURE CORRECTION TABLE

TEMP°C	CORR	TEMP°C	CORR
16	-.31	31	+.20
17	-.27	32	+.24
18	-.24	33	+.26
19	-.20	34	+.29
20	-.16	35	+.32
21	-.13	36	+.36
22	-.10	37	+.40
23	-.07	38	+.43
24	-.03	39	+.46
25	.00	40	+.50
26	+.04	41	+.53
27	+.07	42	+.56
28	+.10	43	+.59
29	+.14	44	+.63
30	+.17	45	+.66

BUFFER pH TEMPERATURE CORRECTION TABLE

TEMP	RED pH4	GREEN pH7	BLUE pH10
10°C	4.00	7.06	10.18
15°C	--	--	10.12
20°C	4.00	7.02	10.06
25°C	4.00	7.00	10.01
30°C	4.01	6.99	9.97
35°C	--	--	9.93
40°C	4.03	6.98	9.89
45°C	--	--	9.86
50°C	4.06	6.97	9.83
60°C	4.09	6.98	--
70°C	4.12	6.99	--
80°C	4.16	7.00	--
90°C	4.19	7.02	--
95°C	4.21	7.03	--

*TAKEN FROM LABELS ON BECKMAN BUFFERS

PACIFIC GAS AND ELECTRIC COMPANY
DEPARTMENT OF NUCLEAR PLANT OPERATIONS
DIABLO CANYON POWER PLANT UNIT NOS. 1 AND 2

TITLE: SOLUBILITY OF OXYGEN IN AIR SATURATED WATER
(For Oxygen in Air at 1 atm.)

ATTACHMENT 2

TEMP °C	PPM DISSOLVED OXYGEN	TEMP °C	PPM DISSOLVED OXYGEN
16	9.9	31	7.5
17	9.7	32	7.4
18	9.5	33	7.3
19	9.3	34	7.2
20	9.2	35	7.1
21	9.0	36	7.0
22	8.8	37	6.8
23	8.7	38	6.7
24	8.5	39	6.6
25	8.4	40	6.5
26	8.2	41	6.4
27	8.1	42	6.3
28	7.9	43	6.2
29	7.8	44	6.1
30	7.7	5	6.0

TITLE: VALVES FOR OBTAINING SAMPLES FROM REACTOR COOLANT

ATTACHMENT 3

SAMPLE SOURCE	REMOTE PLANT ISOLATION VALVE (RPIV)	REMOTE SOURCE ISOLATION VALVE (RSIV)	REMOTE FLUSH ISOLATION VALVE (RFIV)	LSP SAMPLE SOURCE VALVE (SSV)
RC Hot Leg 1	9351 A	FCV-692	FCV-1416	RC-V-1.1
RC Hot Leg 4	9351 B	FCV-692	FCV-1416	RC-V-1.1
PZR Liquid	9350 B	FCV-693	FCV-1417	RC-V-1.2
PZR Steam	9350 A	FCV-694	FCV-1418	RC-V-1.3
RHR Pump 1-1 Discharge	9353 A	FCV-1413	FCV-1419	RC-V-1.4
RHR Pump 1-2 Discharge	9353 B	FCV-1413	FCV-1419	RC-V-1.4
VCT Liquid	N/A	FCV-1412	FCV-1420	RC-V-1.5

PG&E **Pacific Gas and Electric Company**

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

NUMBER EP RB-16:I
REVISION 0
DATE 7/20/84

TITLE EMERGENCY OPERATING PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM
-- UNDILUTED CONTAINMENT AIR SAMPLING
(NOT INTENDED TO MEET THE 3-HOUR TIME LIMIT)

APPROVED R. C. Thornberry 7-31-84
PLANT MANAGER DATE

IMPORTANT TO ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of this procedure is to detail the steps required to obtain an undiluted containment air sample in a cart/cask assembly for gross isotopic analysis.

Complete system flushing will be done at the completion of sampling and the valve line up will be returned to the initial line up.

PREREQUISITES

1. System was initially lined up as described in procedure EP RB-16:A.

2. Verify that the following annunciator window is off on the PCP and CCP.

   a. CONTAINMENT AIR SAMPLE PANEL HIGH PLENUM PRESS.

3. The following equipment must be available and operational:

   a. Meter-long reach rod.

   b. 4 Channel MBIS Pressure Monitor (CASP-PI-1109)

PRECAUTIONS

1. This sampling involves processing of containment air that will be highly radioactive. Precautions should be taken to prevent releases to the sampling environment.

2. Time in a radiation field should be limited to that necessary to perform the required operations. During purge and flush periods, it may not be necessary to stand near the panels and consideration should be given to moving to a low dose rate area.

3. A dose rate instrument should be on and periodic monitoring is suggested during purge and sampling exercises.

PROCEDURE

1. Automatic Undiluted Sampling of Containment Air Into The Cart/Cask

   a. Ensure that a cart/cask is engaged and locked on the quick disconnects in the SAMPLE 1 location and the BYPASS valve is closed and the INLET and OUTLET valves are open. [ ]

      1) Connect the Pressure Monitor unit to the cart/cask being used. [ ]

      2) Plug the AC power cord into the outlet near the CASP and turn on the Pressure Monitor to the cell number corresponding to the cart/cask being used. [ ]

   b. Place the following valve switches on the CCP in the AUTO position:

      CCP-AV-1 [ ]
      CCP-SV-1.2 [ ]
      CCP-SV-5 [ ]
      CCP-AV-2 [ ]
      CCP-SV-10 [ ]

   c. Ensure that CASP-V-17 is closed [ ]

   d. Ensure that the following valves are in the position indicated: [ ]

      CASP-V-16 to CASP-DV-1 [ ]
      CASP-DV-1 to CASP-SF-5 [ ]

   e. At the CASP, verify that the green INACTIVE Light is on. If not, push the RESET button directly below the ACTIVE/INACTIVE lights. [ ]

   f. At the CCP, press the SYSTEM RESET pushbutton [ ]

   g. At the Containment Isolation Valve Panel open the following valves:

      FCV-698 [ ]
      FCV-699 [ ]
      FCV-700 [ ]

h. Press the EXERCISE START pushbutton. [ ]

NOTE: The system will automatically sample containment air through the following sequential operations:

2 minute presample backflush
3 minute sample capture
15 second equilibrate flask pressure
3 minute residual gas removal
15 second post sample backflush
15 second post sample backflush

i. When the ISOLATION SAMPLE FLASK alarm sounds, proceed to the CCP and perform the following:

1) Press the EXERCISE STOP pushbutton and verify the red light in the knob is lit. [ ]

a) Note containment pressure as indicated on CASP-PI-1109 and record it on the printer paper at the CCP along with the initials of the person taking the sample. [ ]
PI-1109

2) Using the meter-long reach rod, close the INLET and OUTLET valves and open the BYPASS valve on the cart/cask. [ ]

3) At the CCP, release the EXERCISE STOP pushbutton and press the EXERCISE START pushbutton and verify that the SAMPLE LINE FLASK FLUSH timer is on. [ ]

NOTE: If the above steps 1) - 3) are not done within 3 minutes, the program sequencer will reset to home position and the sample flask must be manually flushed as detailed in step k.

j. Observe that the SF EXERCISE COMPLETE light is lit for SF-1. If indicator is lit proceed to step l. [ ]

k. Manual Sample Flask Line Flushing

NOTE: This section is to be done only if the SF EXERCISE COMPLETE light is not on. [ ]

1) Using the meter-long reach rod, close the INLET and OUTLET valves and open the BYPASS valve on the cart/cask. [ ]

a) Note containment pressure as indicated on CASP-PI-1109 and record it on the printer paper at the CCP along with the initials of the person taking the sample. [ ]

2) At the CCP, turn all valve switches to the CLOSED position. [ ]

3) Turn the following valve switches to the OPEN position:

CCP-SV-10 [ ]
CCP-SV-1.2 [ ]
CCP-AV-1 [ ]

4) Flush the sample flask line for 3 minutes. [ ]

5) Close the following valves:

CCP-SV-1.2 [ ]
CCP-AV-1 [ ]
CCP-SV-10 [ ]

1. Sample Cart/Cask Removal

1) Turn off Pressure Monitor and disconnect from cart/cask. [ ]

2) Unlock the quick disconnects from SF-1, remove the cart/cask assembly and place it in a temporary hold area. [ ]

3) Detach the paper with the cart/cask information from the printer on the CCP an attach it to the cart/cask. [ ]

NOTE: Perform a radiation/contamination survey on cart/cask assembly.

4) Install a backup cart/cask assembly. [ ]

5) Push the RESET button at the CASP to change the sampling flask indicator light from ACTIVE to INACTIVE status. [ ]

6) At the CCP, check closed or close all valve switches. [ ]

m. At the containment isolation valve panel, close the following valves:

FCV-698 [ ]
FCV-699 [ ]
FCV-700 [ ]

PG&E **Pacific Gas and Electric Company**

DEPARTMENT OF NUCLEAR PLANT OPERATIONS

DIABLO CANYON POWER PLANT UNIT NO(S) 1 AND 2

NUMBER	EP RB-16:J
REVISION	0
DATE	7/17/84
PAGE	1 OF 4

TITLE EMERGENCY PROCEDURE
SENTRY POST-ACCIDENT SAMPLING SYSTEM
-- SAMPLE STORAGE AND DISPOSAL
(NOT INTENDED TO MEET THE 3-HOUR TIME LIMIT)

APPROVED R. C. Thornberry 7-31-84
PLANT MANAGER DATE

IMPORTANT TO
ENVIRONMENTAL QUALITY

DISCUSSION

The purpose of this procedure is to provide a means for disposal of stripped-gas samples and storage of RCS liquid samples.

PRECAUTIONS

1. Same as EP RB-16:A.

PREREQUISITES

1. Modified GE-8300 transfer cask.
2. Gas bottle Griptong.
3. 14 cc gas sample bottle.

PROCEDURE

1. Disposal of Reactor Coolant Stripped-Gas Samples

   a. At the LSP

      1) Close or check closed valves. RC-V-1.1 through RC-V-1.5 [ ]

      2) Verify that RC-G-4 indicates approximately 100 psig Ar. [ ]

   b. At the PCP

      1) Close or check closed

         FCV-9351A, FCV-9351-B [ ]
         FCV-9350A, FCV-9350-B [ ]
         FCV-9353A [ ]

DC00107 1III

FCV-692, FCV-693, FCV-694 [ ]
FCV-1412, FCV-1413 [ ]
FCV-1416, FCV-1417, FCV-1418 [ ]
FCV-1419, FCV-1420 [ ]

c. Align the following valves:

RC-V-10 (closed) [ ]
RC-V-15 (closed) [ ]
RC-V-14 (closed) [ ]
RC-V-11 (CLOSED) [ ]
RC-V-13 (closed) [ ]
RC-V-12 (closed) [ ]
RC-DV-2 (9 o'clock) [ ]

d. Bottle Evacuation

1) With the griptong, install the diluted gas sample bottle on the front panel needle. [ ]

2) Open RC-V-13. [ ]

3) Open RC-V-12 and evacuate until RC-G-2.2 indicates a minimum vacuum of 22 inches mercury. [ ]

4) Turn RC-DV-2 to the 6 o'clock position and continue the evacuation until a minimum vacuum of 22 inches of mercury is indicated on RC-G-2.2 [ ]

5) Close in order RC-V-13 and RC-V-12. [ ]

6) Open RC-V-14 and allow the bottle to pressurize to approximately 1 psig as indicated on RC-G-2.2. [ ]

7) Close RC-V-14. [ ]

8) Open RC-V-13 and RC-V-12 and evacuate until RC-G-2.2 indicates a minimum vacuum of 22 inches mercury. [ ]

9) Close in order RC-V-13 and RC-V-12. [ ]

10) Open RC-V-14 and allow the bottle to pressurize to approximately 1 psig as indicated on RC-G-2.2. [ ]

11) Close RC-V-14. [ ]

12) Repeat steps 8 through 11 three times to remove all radioactive gases. [ ]

e. Bottle Disposal

1) Remove the griptong from the panel. [ ]

2) Perform a radioactive survey of the bottle and dispose accordingly. [ ]

2. Access and Removal of Liquid Sample Bottle

a. Open the Sentry cart/cask. [ ]

b. Align the modified GE-8300 transfer cask over the Sentry cart/cask cavity. [ ]

c. Withdraw the tungsten shield at the base of the transfer cask. [ ]

d. Slowly lower the sample bottle access mechanism until the latch grasps the sample bottle. [ ]

e. Slowly raise the sample bottle into the cavity of the transfer cask. [ ]

f. Close the tungsten shield at the base of the transfer cask. [ ]

g. With two persons (one at each arm of the transfer cask), carefully move the bottle to the storage location. [ ]

h. Place the transfer cask on the sample bottle storage platform. [ ]

i. Withdraw the tungsten shield at the base of the transfer cask. [ ]

TITLE SENTRY POST-ACCIDENT SAMPLING SYSTEM
-- SAMPLE STORAGE AND DISPOSAL
(NOT INTENDED TO MEET THE 3-HOUR TIME LIMIT)

j. Slowly lower the sample bottle to the platform and continue the downward movement until the sample bottle is released. [ ]

k. Raise the bottle access mechanism and close the tungsten shield. [ ]

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REGION V

J. O. SCHUYLER
VICE PRESIDENT
NUCLEAR POWER GENERATION

August 27, 1984

PGandE Letter No.: DCL-84-291

Mr. John B. Martin, Regional Administrator
U. S. Nuclear Regulatory Commission, Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596-5368

Re: Docket No. 50-275, OL-DPR-76
Docket No. 50-323
Diablo Canyon Units 1 and 2
Emergency Plan Implementing Procedures Updates

Dear Mr. Martin:

In accordance with Section V, "Implementing Procedures," of 10 CFR 50, Appendix E, PGandE is submitting one copy of the updates to the detailed Implementing Procedures (Enclosure 2) for the Diablo Canyon Power Plant Units 1 and 2 Emergency Plan. These updates are listed in Enclosure 1. Concurrently, two copies of each update are being submitted to the Document Control Desk.

Kindly acknowledge receipt of the above material on the enclosed copy of this letter and return it in the enclosed addressed envelope.

Sincerely,

J. O. Schuyler

Enclosures

cc: R. Fish
Document Control Desk (2)
Service List

cc w/o Enc. 2: G. W. Knighton

1/1
IE-28