50-333

# ENTERGY NUCLEAR NORTHEAST
# JAMES A. FITZPATRICK NUCLEAR POWER PLANT
# P.O. BOX 110
# LYCOMING, NY 13093
# DOCUMENT TRANSMITTAL AND RECEIPT ACKNOWLEDGEMENT FORM

**DATE: December 6, 2000**
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FROM: KATHY LOCKWOOD - EMERGENCY PLANNING DEPARTMENT

SUBJECT: EMERGENCY PLAN AND IMPLEMENTING PROCEDURES

Enclosed are revisions to your assigned copy of the JAFNPP Emergency Plan and Implementing Procedures. Please remove and **DISCARD** the old pages. Insert the attached, initial and date this routing sheet and return the completed routing sheet to ***Kathy Lockwood in the Emergency Planning Department within 15 days.*** If this transmittal is not returned within 15 days, your name will be removed from the controlled list.

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| **VOLUME 1 Update List Dated N/A** | | | |
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| **VOLUME 2 Update List Dated December 6, 2000** | | | |
|---|---|---|---|
| DOCUMENT | PAGES | REV. # | INITIALS/DATE |
| EAP-4.1 | REPLACE ALL | 12 | |
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| **VOLUME 3 Update List Dated N/A** | | | |
|---|---|---|---|
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# EMERGENCY PLAN IMPLEMENTING PROCEDURES/VOLUME 2
## UPDATE LIST

CONTROLLED COPY #34

Date of Issue: December 6, 2000

| Procedure Number | Procedure Title | Revision Number | Date of Last Review | Use of Procedure |
|---|---|---|---|---|
| N/A | TABLE OF CONTENTS | REV. 19 | 02/98 | N/A |
| IAP-1 | EMERGENCY PLAN IMPLEMENTATION CHECKLIST | REV. 23 | 08/00 | Continuous |
| IAP-2 | CLASSIFICATION OF EMERGENCY CONDITIONS | REV. 20 | 12/98 | Continuous |
| EAP-1.1 | OFFSITE NOTIFICATIONS | REV. 43 | 09/00 | Informational |
| EAP-2 | PERSONNEL INJURY | REV. 23 | 07/00 | Informational |
| EAP-3 | FIRE | REV. 21 | 08/00 | Informational |
| EAP-4 | DOSE ASSESSMENT CALCULATIONS | REV. 29 | 12/98 | Reference |
| EAP-4.1 | RELEASE RATE DETERMINATION | REV. 12 | 12/00 | Reference |
| EAP-5.1 | DELETED (02/94) | | | |
| EAP-5.2 | DELETED (04/91) | | | |
| EAP-5.3 | ONSITE/OFFSITE DOWNWIND SURVEYS AND ENVIRONMENTAL MONITORING | REV. 7 | 07/00 | Informational |
| EAP-6 | IN-PLANT EMERGENCY SURVEY/ENTRY | REV. 15 | 02/98 | Informational |
| EAP-7.1 | DELETED (02/94) | | | |
| EAP-7.2 | DELETED (02/94) | | | |
| EAP-8 | PERSONNEL ACCOUNTABILITY | REV. 49 | 10/00 | Reference |
| EAP-9 | SEARCH AND RESCUE OPERATIONS | REV. 9 | 02/98 | Informational |
| EAP-10 | PROTECTED AREA EVACUATION | REV. 14 | 02/98 | Informational |
| EAP-11 | SITE EVACUATION | REV. 15 | 02/98 | Informational |
| EAP-12 | DOSE ESTIMATED FROM AN ACCIDENTAL RELEASE OF RADIOACTIVE MATERIAL TO LAKE ONTARIO | REV. 10 | 08/99 | Reference |
| EAP-13 | DAMAGE CONTROL | REV. 13 | 12/98 | Informational |
| EAP-14.1 | TECHNICAL SUPPORT CENTER ACTIVATION | REV. 21 | 08/00 | Informational |
| EAP-14.2 | EMERGENCY OPERATIONS FACILITY ACTIVATION | REV. 19 | 07/00 | Informational |
| EAP-14.5 | OPERATIONAL SUPPORT CENTER ACTIVATION AND OPERATION | REV. 14 | 03/00 | Informational |

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| Procedure Number | Procedure Title | Revision Number | Date of Last Review | Use of Procedure |
|---|---|---|---|---|
| EAP-14.6 | HABITABILITY OF THE EMERGENCY FACILITIES | REV. 14 | 10/98 | Informational |
| EAP-15 | EMERGENCY RADIATION EXPOSURE CRITERIA AND CONTROL | REV. 10 | 02/00 | Informational |
| EAP-16 | PUBLIC INFORMATION PROCEDURE | REV. 6 | 02/98 | Informational |
| EAP-17 | EMERGENCY ORGANIZATION STAFFING | REV. 92 | 10/00 | Informational |
| EAP-18 | DELETED (12/93) | | | |
| EAP-19 | EMERGENCY USE OF POTASSIUM IODINE (KI) | REV. 20 | 08/00 | Informational |
| EAP-20 | POST ACCIDENT SAMPLE, OFFSITE SHIPMENT AND ANALYSIS | REV. 8 | 02/98 | Reference |
| EAP-21 | DELETED (12/85) | | | |
| EAP-22 | DELETED (02/98) | | | |
| EAP-23 | EMERGENCY ACCESS CONTROL | REV. 10 | 02/98 | Informational |
| EAP-24 | EOF VEHICLE AND PERSONNEL DECONTAMINATION | REV. 8 | 02/98 | Informational |
| EAP-25 | DELETED (02/94) | | | |

ENTERGY NUCLEAR NORTHEAST
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
EMERGENCY PLAN IMPLEMENTING PROCEDURE

# RELEASE RATE DETERMINATION*
**EAP-4.1**
**REVISION 12**

REVIEWED BY: PLANT OPERATING REVIEW COMMITTEE

MEETING NO. N/A DATE: N/A

APPROVED BY: [signature] DATE: 12/5/2000
RESPONSIBLE PROCEDURE OWNER

EFFECTIVE DATE: December 6, 2000

FIRST ISSUE ☐ FULL REVISION ☐ LIMITED REVISION ☒

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PERIODIC REVIEW DATE: FEBRUARY 2002

REVISION SUMMARY SHEET

REV. NO.

12
- Correction to Corrective Action DER-00-05633 On Attachment 11, page 1 of 2 and 2 of 2, changed Noble Gas Vent release formula conversion factor to 1432 and changed Noble Gas Stack release formula conversion formula to 333. Also changed 100% noble gas release values to agree with values in the ODCM. On page 24, added step 3 to show determination for obtaining noble gas setpoint release rates that are described in the ODCM.

11
- Removed the GM - Support Services approval line from the cover sheet per AP-02.04.
- On attachment 1, changed Stack count from "cpm" to cps.
- On attachment 3, added note pertaining to containment leak rate and dose rates at site boundary.
- Corrected the Reactor Building default K factor in step 4.1.1.D and attachment 1.
- Added brackets on Stack Release charts on pages 6, 8, and 17.
- Section 4.1.1.D, changed wording to use existing K Factor data unless an updated one is available based upon recent Chemistry sample data.

10
- Added a note in section 4.1.3 and added more information for clearer instructions on use of the EDAMS for windows program.
- Editorial Correction to Attachment 12 to correctly identify refuel accident source term to be consistent with EAP-4.

9
- Procedure reformatted to Microsoft Word editorial.
- Editorial Correction to pages 13 and 14.
- Section 4.2 reformatted to AP-02.04 (wording did not change, just format editorial change)

TABLE OF CONTENTS

## 1.0 PURPOSE

This procedure provides instructions for manually estimating release rates in the event of an accidental release of radioactivity to the environment.

## 2.0 REFERENCES

### 2.1 Performance References

None

### 2.2 Developmental References

2.2.1 EAP-5.3, ONSITE/OFFSITE DOWNWIND SURVEYS AND ENVIRONMENTAL MONITORING*

2.2.2 EAP-42, OBTAINING METEOROLOGICAL DATA*

2.2.3 NUREG-0654, Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants

2.2.4 JAF FSAR Chapter 14

2.2.5 EAP-4, DOSE ASSESSMENT CALCULATIONS*

2.2.6 High Range Containment Monitor Response to Post Accident Fission Product Releases - James A. FitzPatrick Nuclear Power Plant, SL-4370, Sergeant Lundy, May 1985

## 3.0 INITIATING EVENTS

3.1 An emergency classification has been declared as defined in IAP-2, and

3.2 A release of radioactivity exceeding technical specifications is suspected or underway.

## 4.0 PROCEDURE

### 4.1 Release Rate Determination

**NOTE:** Use Attachment 11 to calculate the percent of Tech. Spec. in order to determine if the Tech. Spec. release rate has been exceeded and for completion of the NRC Event Notification Worksheet, EAP-1.1, Attachment 6.

4.1.1 Low Range Effluent Monitor calculation

A. Record date, time and name of individual performing calculations in upper right-hand corner of Attachment 1.

B. Record observed gross count rate with appropriate units for the Reactor Building (RxB), Refuel Floor (RF), Radwaste (RW), Turbine Building (TB) and/or Stack. This data may be obtained from the EPIC computer. **IF** computer points are unavailable, Control Room **AND/OR** local monitors can be used for this data.

**NOTE:** For stack releases, it is important to determine whether any dilution fan is operating.

C. For **Building Vent Releases**, multiply the gross count rate (cpm) by the default K factor listed in table on following page, until update K factors are available based on recent chemistry sample data.

D. For **Stack Releases**, multiply the gross count rate (cps) by the default K factor listed below, unless an updated K factor is available based on recent Chemistry sample data.

| **Monitor** | **K Factor** | **Normal Flow RatesBased on (cfm)** |
|---|---|---|
| Reactor Bldg.(Pt. 3337) | 3.2E-1 μCi/sec/cpm | 61,000 |
| Refuel Floor(Pt. 3338) | 3.7E-1 μCi/sec/cpm | 70,000 |
| Radwaste Bldg.(Pt. 3340) | 1.7E-1 μCi/sec/cpm | 32,500 |
| Turbine Bldg.(Pt. 3339) | 5.6E-1 μCi/sec/cpm | 107,000 |
| Stack(Pt. 3336) | 6.0E-1 μCi/sec/cps | 6,600 |

**IF** flow rates differ from the Normal Flow Rates listed above, **THEN** a correction to the K factor is necessary as follows:

$$K_{(corrected)} = \left[\frac{\text{New Flow Rate}}{\text{Normal Flow Rate}}\right] \mathbf{x} \left[\text{K Factor}_{(listed)}\right]$$

**NOTE:** The accuracy of ventilation flow rate indications at the low end of an instrument range should be confirmed with appropriate instrument calibration procedures.

E. An estimate of the iodine release rate can be obtained by multiplying the I/NG ratio from a chemistry sample by the NG release rate. **IF** a chemistry sample is not available, **THEN** the iodine release rate can be estimated by multiplying a default I/NG ratio by the NG release rate. For default release rates and I/NG ratio, refer to Attachment 12.

F. **IF** the low range effluent monitors are inoperative or off-scale, **THEN** the appropriate high range effluent monitor must be used.

4.1.2 **High Range Effluent Monitor (HREM) Calculation**

A. Record date, time and individual performing calculation in upper right-hand corner of Attachment 2.

B. Record observed dose rate for the Stack, Turbine Building (TB) and/or Radwaste (RW). This data may be obtained from the EPIC computer. **IF** computer points are unavailable, **THEN** Control Room monitors can be used for this data.

**NOTE:** For stack releases, it is important to determine whether any dilution fan is operating.

C. Multiply the dose rate by the K factor listed below.

**NOTE:** These conversion constants are based on normal flow rates listed below. A conversion factor of 0.45 (μCi/cc)/(mR/hr) was applied to the normal flow rate. This value is given by General Electric and is based on the monitor response to Xe-133.

| **HREM** | **K FACTOR** | **NORMAL FLOW RATES (cfm)*** |
|---|---|---|
| **STACK** | | |
| One SGT train operating | 1.40 (Ci/sec)/(mR/hr) | based on 6,600 |
| One SGT train and one stack dilution fan operating | 2.54 (Ci/sec)/(mR/hr) | based on 12,000 |
| **TURBINE BLDG** | 22.6 (Ci/sec)/(mR/hr) | based on 107,000 |
| **RADWASTE BLDG** | 6.85 (Ci/sec)/(mR/hr) | based on 32,500 |

***IF** flow rates differ from the Normal Flow Rates listed above, then a correction to the K factor is necessary as follows:

$$K_{(corrected)} = \left[\frac{\text{New Flow Rate}}{\text{Normal Flow Rate}}\right] \times \left[\text{K Factor}_{(listed)}\right]$$

D. An estimate of the iodine release rate can be obtained by multiplying the I/NG ratio from a chemistry sample by the NG release rate. **IF** a chemistry sample is not available, the iodine release rate can be estimated by multiplying a default I/NG ratio by the NG release rate. For default release rates and I/NG ratios, refer to Attachment 12.

E. A back calculated release rate may be estimated from field survey data in lieu of or in addition to the estimate from low and high range effluent monitors.

4.1.3 **Back Calculations from Downwind Survey Dose Rate Data using EDAMS**

A. Start the EDAMS program and from the EDAMS icons, select "EDAMS".

**NOTE**: The mouse does NOT work in this DOS Sub-routine.

B. Select "Release Rate Calculations".

C. Select "James A. FitzPatrick".

D. Select "Back calculate".

E. Enter the time survey data was obtained (24-hour format).

F. Enter a number representing one of the accident types listed.

G. Enter the wind speed (mi/hr).

H. Enter "E" for elevated/stack or "G" for ground/vent release.

I. Enter the stability class (A - G).

J. Enter the three (3) foot closed window reading from the ion chamber (mR/hr).

K. Enter the downwind distance that the above reading was obtained. (Use 0.87 miles if the reading is taken at the site boundary.)

L. Hit the F9 key to calculate. Record or print the results.

4.1.4 **Release Rate Estimation Using Containment High Range Radiation Monitor Data**

A. Record date, time and individual performing calculations in upper right-hand corner of Attachment 3.

B. Record containment rad monitor I.D. (i.e., either 27-RE-104 A or B) in Column 1 or an average of the two.

C. Record the containment rad monitors average reading (dose rate) or the individual monitor reading (dose rate) in Column 2. Obtain readings from EPIC.

D. Record the time the containment rad monitor dose rate was observed in Column 3.

E. Record the time of shutdown in Column 4.

F. Determine the time in hours after shutdown that the containment radiation monitor reading was taken (Column 4 - Column 3) and record in Column 5.

**NOTE:** Ensure that credit is taken for any dilution provided to the value calculated in step 4.1.4.G prior to it entering the effluent pathway to the environment (i.e. dilution by Reactor Building volume, etc.).

G. Determine and record in Column 6 the calculated concentration in containment for the time after shutdown reading using the curves in Attachment 4 and the following core damage estimates:

| **Attachment 4 Location on Graph** | **Calculated Concentration* (Ci/cc)** |
|---|---|
| Area above Case #1 | 5.20E-2 |
| Area between Case #1 and Case #2 | 3.45E-2 |
| Area between Case #2 and Case #3 | 1.09E-2 |
| Area between Case #3 and Case #4 | 3.30E-4 |
| Area between Case #4 and Case #5 | 1.91E-5 |
| Area between Case #5 and Case #6 | 1.91E-6 |
| Area below Case #6 | Normal |
| *Concentrations derived using EAP-44 estimates of core inventory and a containment volume of 7.42E+9cc (i.e. drywell and torus gas space volume). | |

H. Determine the expected flow rate (cc/sec) to the environment and record in Column 7. Assistance from TSC engineering staff may be necessary in determining flow rates.

I. Determine the estimated release rate by multiplying Column 6 by Column 7. Record in Column 8.

**NOTE:** EPIC provides release rates based on default K factors and normal flow rates.

4.1.5 **Obtaining Release Rate Using EPIC**

A. Call up the Radioactivity Release Control (RRC) display on EPIC.

B. Obtain and record release rate data from RRC display for release pathway of concern.

## 4.2 Default Accident Source Terms

4.2.1 Various types of design basis accidents have been analyzed and source terms estimated. Refer to Attachment 12 for estimated values.

4.2.2 In addition, source term estimates have been developed based on differing amounts of core damage for accidents resulting in leakage of activity through the drywell boundary.

A. Attachments 5 through 10 provide correlation between stack source term estimates for given containment leak rates and containment high range radiation monitor readings.

B. These attachments can be used to project what a release rate may be given a break in containment and containment failure imminent.

C. These source terms are only estimates and should be input with the understanding of the assumptions used in their development.

D. The source terms correspond to test cases in the Sergeant Lundy study "High Range Containment Monitor Response to Post Accident Fission Product Release" and are plotted on Attachments 5 through 10. These graphs are based on calculation JAF-89-003 filed in the original procedure EAP-4 master file.

4.3 **Unmonitored Release**

All likely release pathways are monitored. If there is a release through an unmonitored pathway, the release should be evaluated based on a source term (area monitors, process monitors, and/or local grab samples, as appropriate) or back calculations from downwind readings as described in Section 4.1.3 of this procedure.

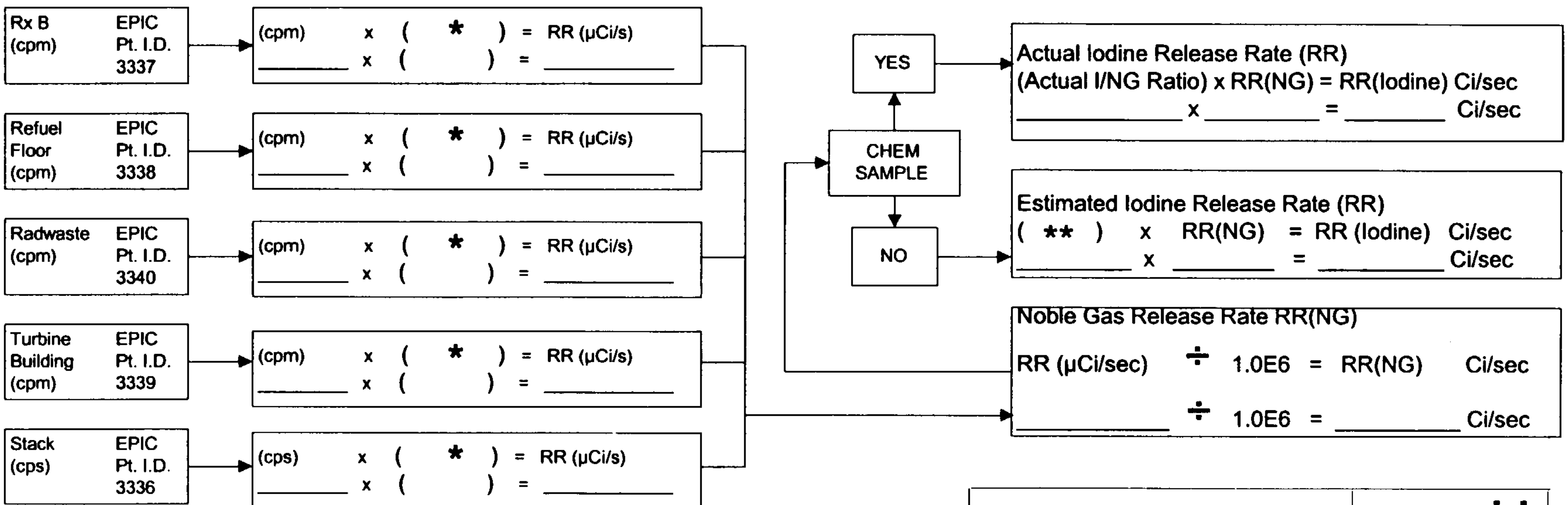
5.0 **ATTACHMENTS**

1. FLOW CHART TO DETERMINE RELEASE RATE FROM LOW RANGE EFFLUENT MONITORS
2. FLOW CHART TO DETERMINE RELEASE RATE FROM HIGH RANGE EFFLUENT MONITORS (HREM)
3. WORK SHEET TO DETERMINE RELEASE RATE FROM CONTAINMENT RAD MONITORS
4. FITZPATRICK HRCRM READINESS
5. 1.5% LEAKAGE SOURCE TERM ESTIMATE
6. 10% LEAKAGE SOURCE TERM ESTIMATE
7. 25% LEAKAGE SOURCE TERM ESTIMATE
8. 50% LEAKAGE SOURCE TERM ESTIMATE
9. 100% LEAKAGE SOURCE TERM ESTIMATE
10. CASTASTROPHIC LEAKEAGE SOURCE TERM ESTIMATE
11. CALCULATION METHOD FOR DETERMINING PERCENT OF TECHNICAL SPECIFICATION FOR NRC EVENT NOTIFICATION WORKSHEET
12. ANALYZED ACCIDENT TYPES

DATA: Rx B ________ (cpm) RF ________ (cpm) RW ________ (cpm)

Stack ________ (cps) TB ________ (cpm)

DATE:
TIME:
NAME:




| Iodine / Noble Gas Ratio | RATIOS ** |
|---|---|
| Loss of Coolant Accident | 2.98E-03 |
| Control Rod Drop | 9.93E-03 |
| Refueling Accident | 1.24E-04 |
| Steam Line Break Single Phase | 1.79E+01 |
| Steam Line Break Two Phase | 1.79E+01 |
| Containment Design Basis Accident | 2.13E-02 |

Refer to Section 4.1.1. C and D for additional guidance

| Monitor | K Factor * | Normal Flow Rates Based on (cfm) |
|---|---|---|
| Reactor Bldg. (Pt. 3337) | 3.2E-1 µCi/sec/cpm | 61,000 |
| Refuel Floor (Pt. 3338) | 3.7E-1 µCi/sec/cpm | 70,000 |
| Radwaste Bldg. (Pt. 3340) | 1.7E-1 µCi/sec/cpm | 32,500 |
| Turbine Bldg. (Pt. 3339) | 5.6E-1 µCi/sec/cpm | 107,000 |
| Stack (Pt. 3336) | 6.0E-1 µCi/sec/cps | 6,600 |

**IF** flow rates differ from the Normal Flow Rates listed above,
**THEN** a correction to the K factor is necessary as follows:

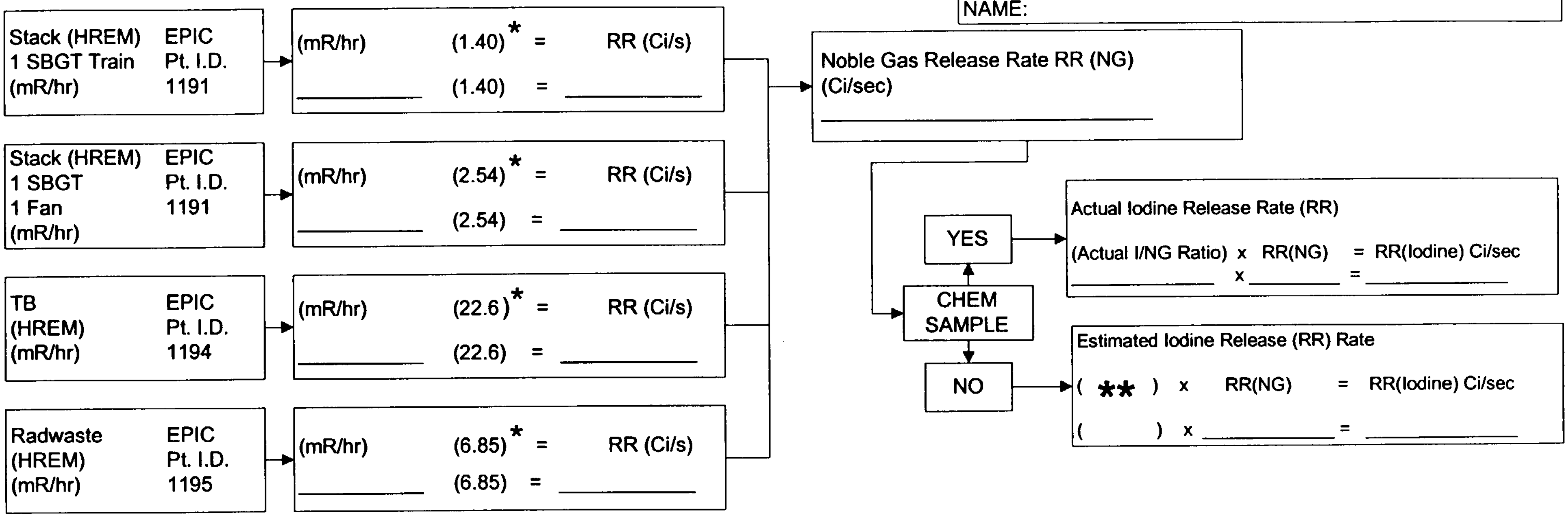
$$K_{(corrected)} = \left[\frac{\text{New Flow Rate}}{\text{Normal Flow Rate}}\right] \times \left[K\ \text{Factor}_{(listed)}\right]$$

**NOTE:** The accuracy of ventilation flow rate indications at the low end of an instrument range should be confirmed with appropriate instrument calibration procedures.

DATA: Stack ________ (mR/hr)

TB ________ (mR/hr) RW ________ (mR/hr)

| | |
|---|---|
| DATE: | |
| TIME: | |
| NAME: | |




* Based on G. E. Data for monitor response under **normal flow rates** listed on page 7.

| Iodine / Noble Gas Ratio | RATIOS ** |
|---|---|
| Loss of Coolant Accident | 2.98E-03 |
| Control Rod Drop | 9.93E-03 |
| Refueling Accident | 1.24E-04 |
| Steam Line Break Single Phase | 1.79E+01 |
| Steam Line Break Two Phase | 1.79E+01 |
| Containment Design Basis Accident | 2.13E-02 |

# WORK SHEET TO DETERMINE RELEASE RATE FROM CONTAINMENT RAD MONITORS

DATE: ____________
TIME: ____________
NAME:

| Column 1 | Column 2 | Column 3 | Column 4 | Column 5 | Column 6 | | Column 7 | | Column 8 |
|---|---|---|---|---|---|---|---|---|---|
| Containment Rad Monitor I.D. | Containment Rad Monitor Dose Rate (R/Hr) | Time of Reading | Time of Shutdown | Time of Reading After Shutdown (Hr) ΔT | Calculated Concentration in containment (ci/cc) | | Expected Flow Rate to Environment *(cc/sec) | | Estimated Release Rate (Ci/sec) |
| | | | | | | x | | = | |
| | | | | | | x | | = | |

*To convert cfm to cc/sec, multiply cfm by 472 from CRC handbook of Chemistry and Physics, 64th Edition, pg. F-308.

| **Attachment 4 Location on Graph** | **Calculated Concentration* (Ci/cc)** |
|---|---|
| Area above Case #1 | 5.20E-2 |
| Area between Case #1 and Case #2 | 3.45E-2 |
| Area between Case #2 and Case #3 | 1.09E-2 |
| Area between Case #3 and Case #4 | 3.30E-4 |
| Area between Case #4 and Case #5 | 1.91E-5 |
| Area between Case #5 and Case #6 | 1.91E-6 |
| Area below Case #6 | Normal |

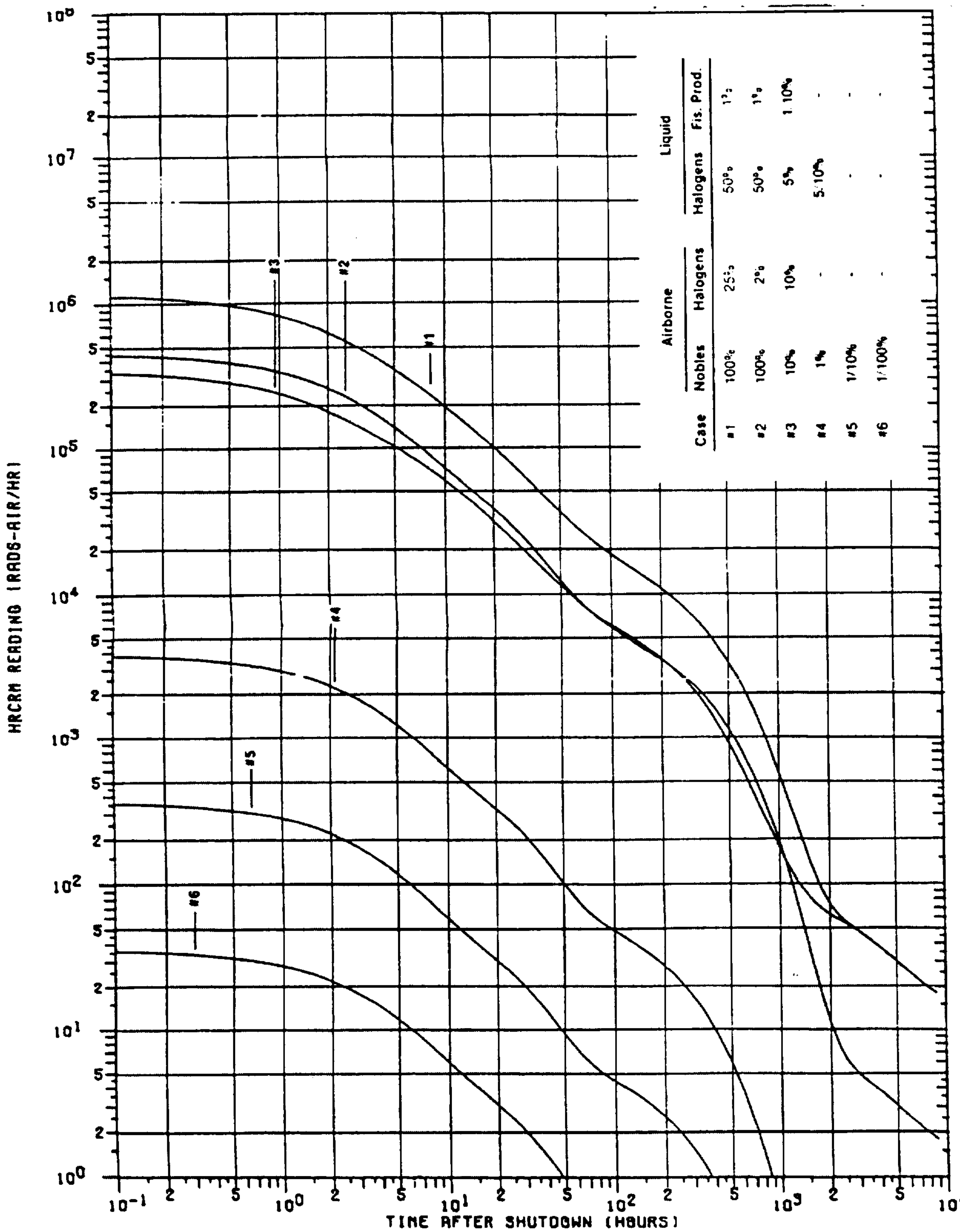
*Concentrations derived using EAP-44 estimates of core inventory and a containment volume of 7.42E+9cc (i.e. drywell and torus gas space volume).

**Note:** The Primary Containment and Reactor Building leak rate default value is 1.5% per day. The as-left Primary Containment leak rate calculated after RO-13 was approximately 1,437 scf/day.

The dose rate at the site boundary for 100% of Tech Spec's, per section 3.2.a, volume 1B, is 500 mr/yr whole body from noble gas, 1,500 mr/yr for any organ from iodines and particulates with half lives greater than 8 days.

**Attachment 4** 

**FITZPATRICK HRCRM READINGS**

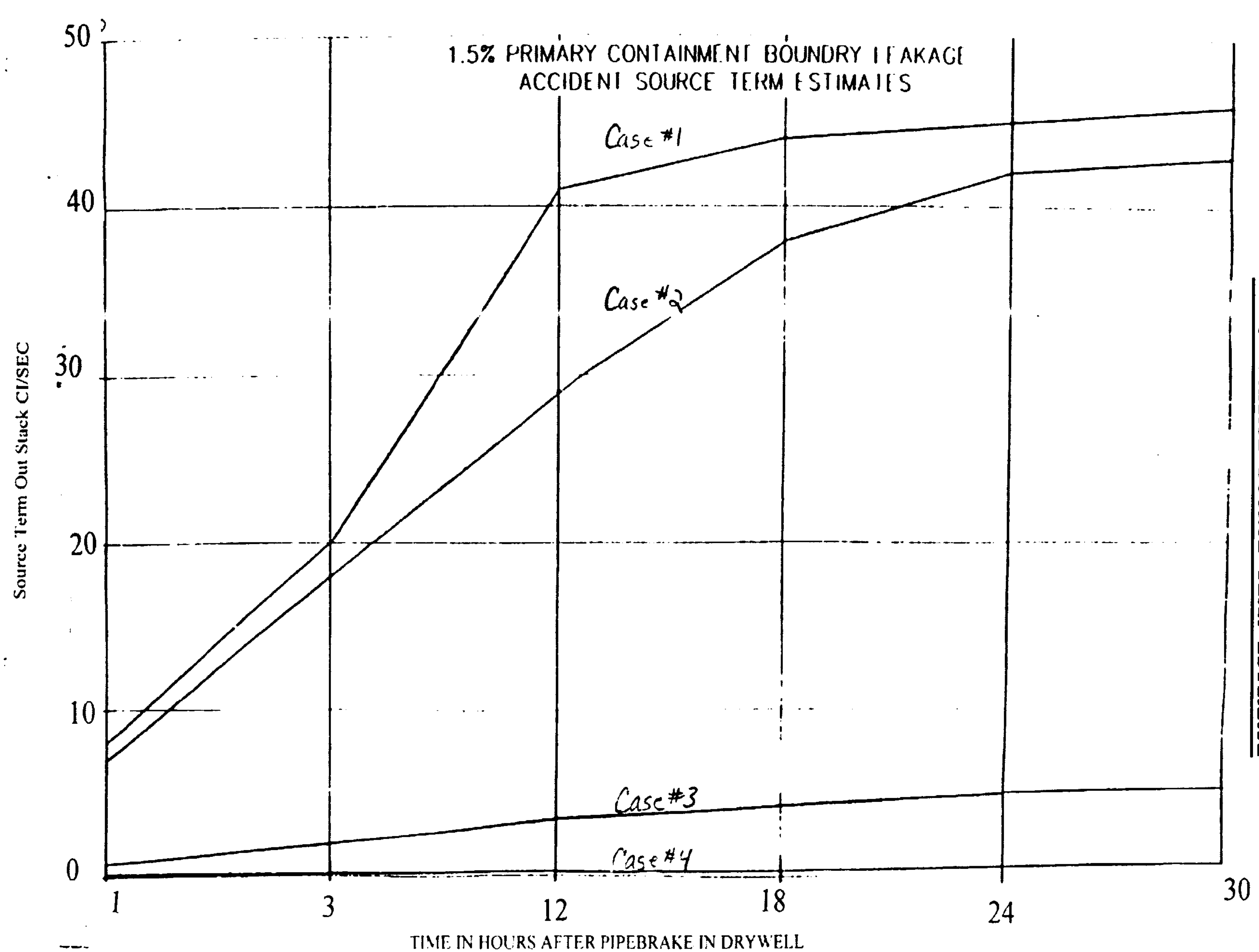



FITZPATRICK - HRCRM READINGS

# Attachment 5

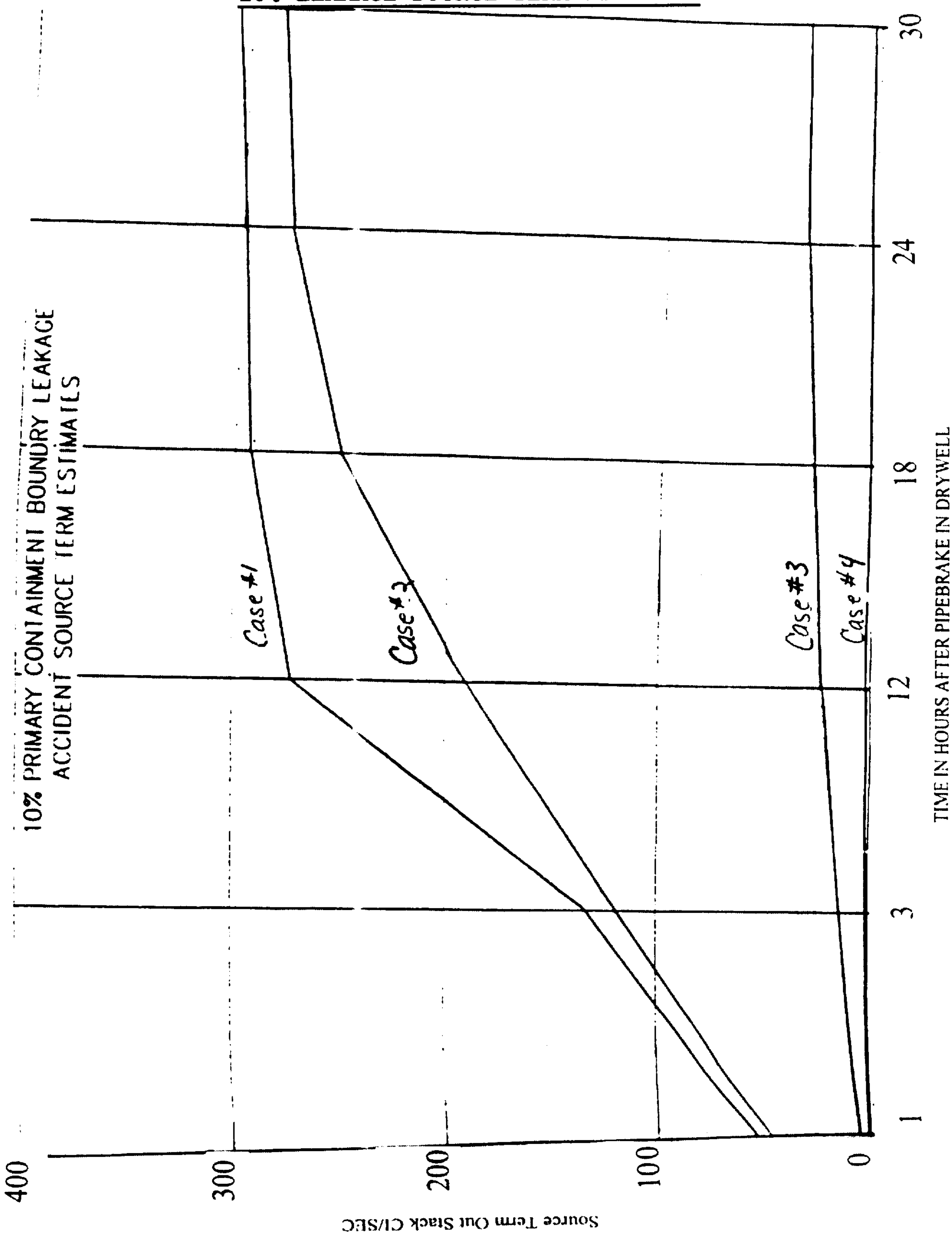
## 1.5% LEAKAGE SOURCE TERM ESTIMATE





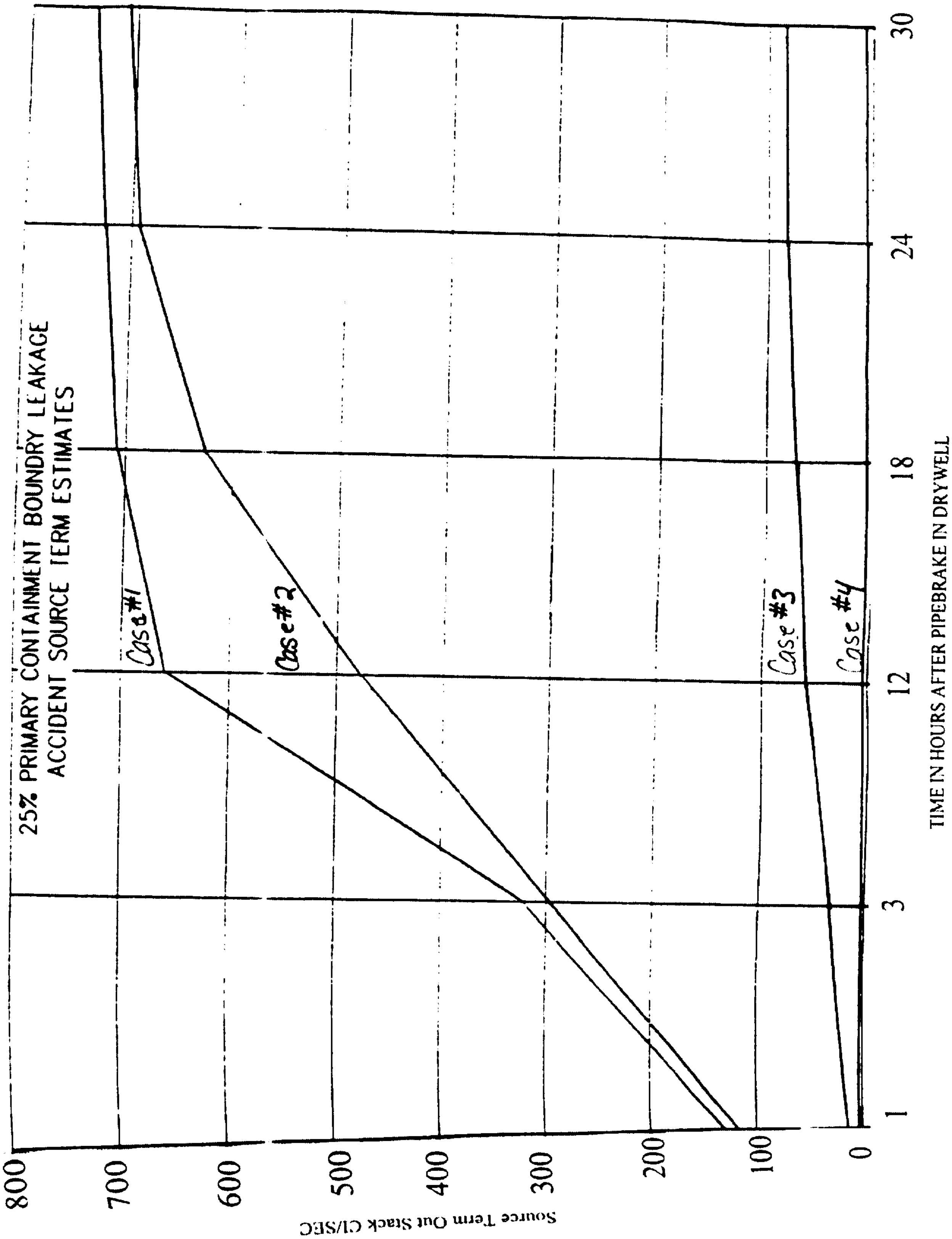
Attachment 6 **Page 1 of 1**

**10% LEAKAGE SOURCE TERM ESTIMATE**

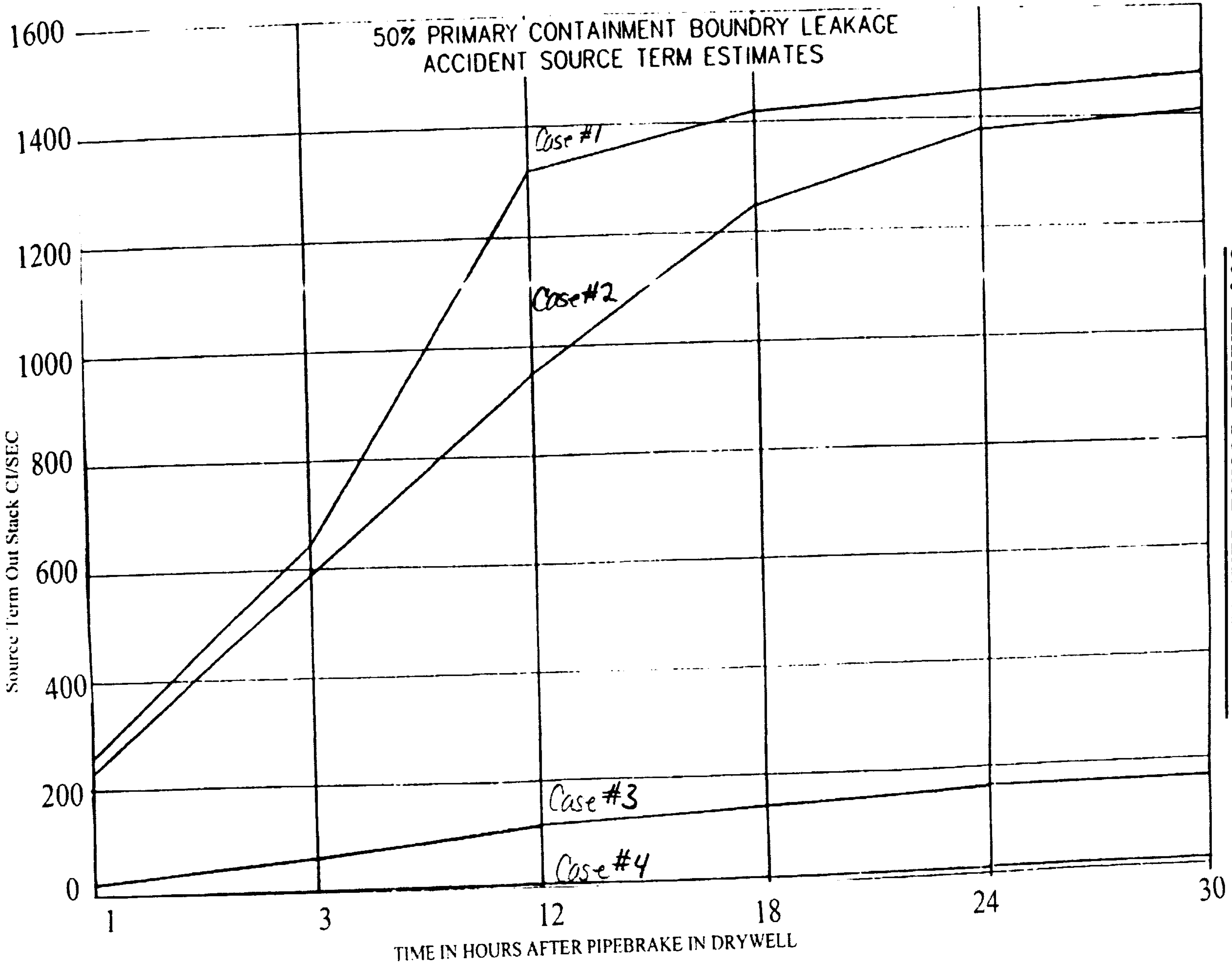


**Attachment 7** **Page 1 of 1**

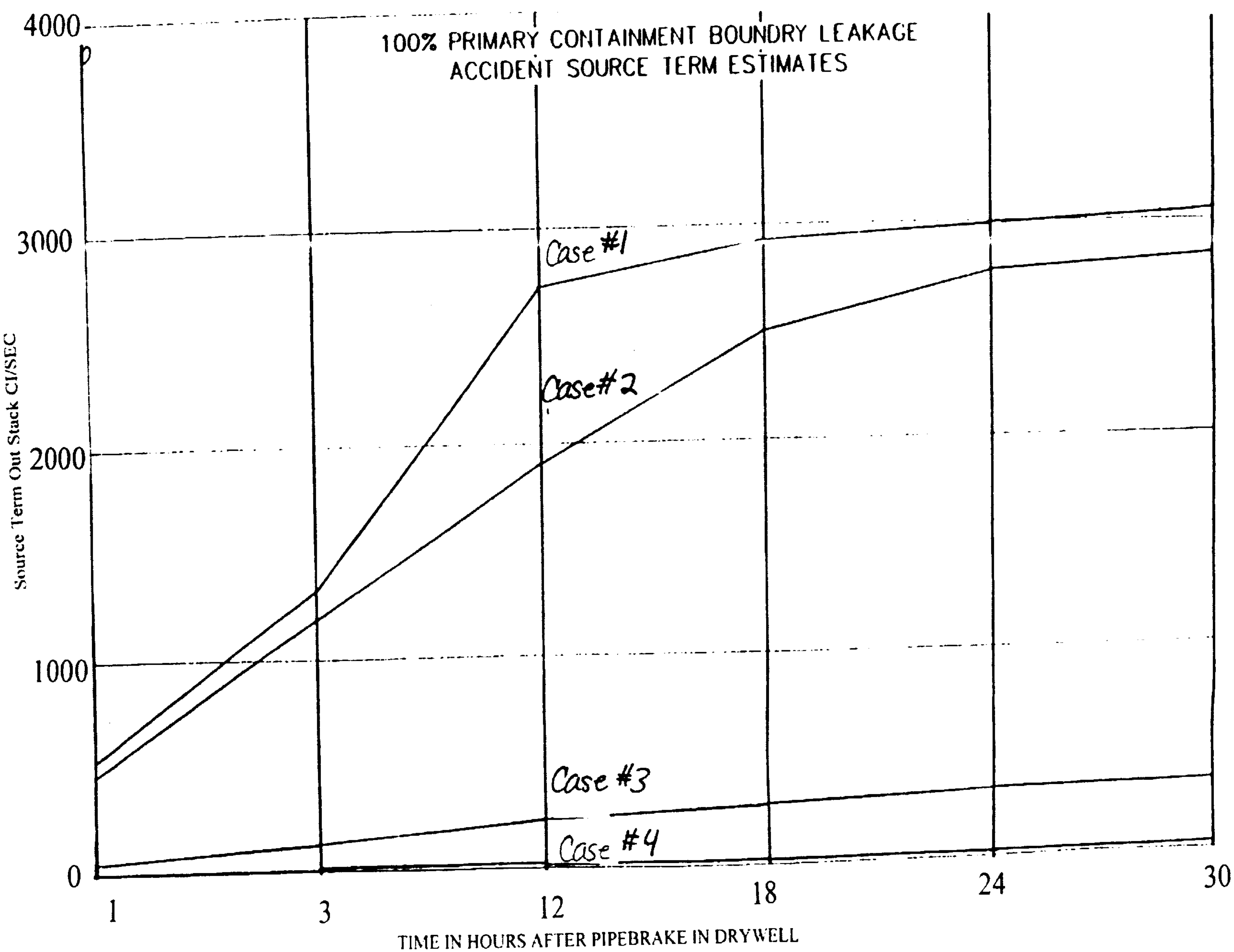
**25% LEAKAGE SOURCE TERM ESTIMATE**



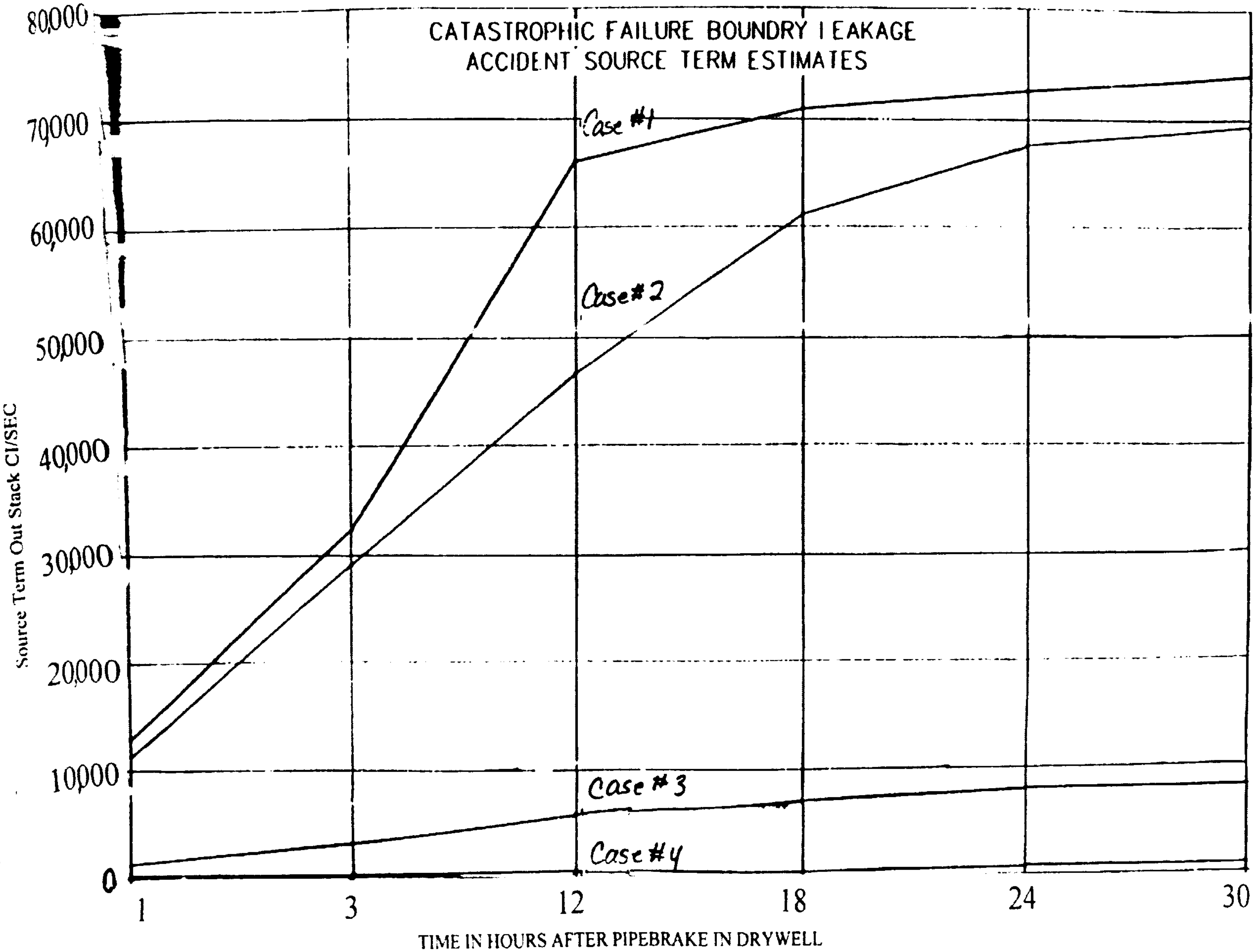
**50% LEAKAGE SOURCE TERM ESTIMATE**



## 100% LEAKAGE SOURCE TERM ESTIMATE



## CATASTROPHIC LEAKAGE SOURCE TERM ESTIMATE



CALCULATION METHOD FOR DETERMINING PERCENT OF TECHNICAL SPECIFICATION FOR NRC EVENT NOTIFICATION WORKSHEET

1. The formula for calculating the percent of Technical Specification of Airborne releases was derived from the JAF Offsite Dose Calculation Manual, Revision 7.

   The following assumptions apply:

   The release Technical Specification limit of 500 mrem/year (Technical Specifications, Appendix B, Section 3.2.a.1) was used as the basis for the noble gas instantaneous release limit.

   The Technical Specification of 1,500 mrem/year to any organ (Technical Specifications, Appendix B, Section 3.2.a.2) was used as the basis for the radioiodine, tritium and eight day particulate instantaneous release limit.

   The most conservative X/q (4.83E-7 sec/m$^3$) for ground based receptors at the site boundary was used for all cases and is the FSAR defined accident X/q.

   All assumptions and conservatism of the ODCM were applied.

2. As a result of these assumptions and conservatism, these formulae should be used only to estimate the initial percent of Technical Specifications as required by the NRC Event Notification Worksheet (EAP-1.1, Attachment 6). As more detailed source term and meteorological data become available, a more accurate determination of percent Technical Specification should be performed.

3. Technical Specification release rates for stack and vent noble gas releases are obtained from the setpoint release rates for these points described in the ODCM.

4. Calculation method for determining the initial percent of Technical Specifications for NRC Event Worksheet (use calculation worksheet on next page).

   For Noble Gas Vent Release:
   $\% \text{ T.S.} = RR_{NG}$ (Ci/s) x 1432

   For Noble Gas Stack Release:
   $\% \text{ T.S.} = RR_{NG}$ (Ci/s) x 333

   Where $RR_{NG}$ = noble gas release rate in curies per second
   1432 = 100% divided by vent setpoint release rate of 0.0698 Ci/sec
   333 = 100% divided by stack setpoint release rate of 0.3 Ci/sec

   These equations assume an instantaneous release rate, ODCM dose conversion factors, and historical meteorological data.

   For Gross Liquid Release excluding Tritium:
   $\% \text{ T.S.} = F_L$ (gal/m) x $C_L$ (μCi/ml) x 2120

   Where $F_L$ = flow rate in gallons per minute
   $C_L$ = concentration of liquid effluent in μCi/ml
   2120 = unit and dose conversion factor

   For iodine, tritium and particulates with half-lives greater than 8 days:

   $\% \text{ T.S.}_{\text{iodine and particulate}} = RR_{\text{iodine}}$ (Ci/sec) x 40.48
   $\% \text{ T.S.}_{\text{tritium}} = RR_{\text{tritium}}$ (Ci/sec) x 0.32
   Total % T.S. = Σ % T.S. for all release points

# ATTACHMENT 11
## CALCULATION METHOD FOR DETERMINING PERCENT OF TECHNICAL SPECIFICATION FOR NRC EVENT NOTIFICATION WORKSHEET

**NOTE:**
100% NG Vent Release= 0.0698 ci/sec
100% NG Stack Release = 0.3 ci/sec

Noble Gas Vent Release

% T.S. = $RR_{NG}$ x 1432
% T.S. = [$RR_{NG}$ __________] Ci/s x 1432
% T.S. = __________

**NOTE:**
If % TS ≥ 100 - Fill out Part II Form.
This is indication of a release in progress.

Noble Gas Stack Release

% T.S. = $RR_{NG}$ (Ci/s) x 333
% T.S. = [$RR_{NG}$ __________] Ci/s x 333
% T.S. = __________

Gross Liquid Release excluding Tritium

% T.S. = $F_L$ x $C_L$ (μCi/ml) x 2120
% T.S. = [$F_L$ __________] gal/m x [$C_L$ __________] μCi/ml x [2120]
% T.S. = __________

Iodine and Particulate with half lives greater than 8 days

% T.S. $_{i\&p}$ = Σ RR(Ci/s)$_{i\&p}$ (all vents) x 40.48

% T.S. $_{i\&p}$ = [($RR_{i\&p}$ __________ stack) Ci/s + ($RR_{i\&p}$ __________ T.B. vent) Ci/s +
$RR_{i\&p}$ __________ Rx Bldg vent) Ci/s + ($RR_{i\&p}$ __________ Refuel Floor) Ci/s +
($RR_{i\&p}$ __________ Radwaste Bldg) Ci/s] x 40.48

% T.S. $_{i\&p}$ = ($RR_{i\&p}$ __________ total vents) Ci/s x 40.48

% T.S. $_{i\&p}$ = __________

Tritium

% T.S. $_{Tritium}$ = Σ RR(Ci/s)$_{Tritium}$ (all vents) x 0.32
% T.S. $_{Tritium}$ = [($RR_{Tritium}$ __________ stack) Ci/s + ($RR_{Tritium}$ __________ T.B. vent) Ci/s +
($RR_{Tritium}$ __________ Rx Bldg vent) Ci/s + ($RR_{Tritium}$ __________ Refuel Floor) Ci/s +
($RR_{Tritium}$ __________ Radwaste Bldg) Ci/s] x 0.32

% T.S. $_{Tritium}$ = ($RR_{Tritium}$ __________ total vents) Ci/s x 0.32

% T.S. $_{Tritium}$ = __________

Where:

RR= release rate (Ci/sec)
$F_L$ = Flow Rate (gal/m)
$C_L$ = Concentration of liquid effluent (μCi/ml)

**ATTACHMENT 12** 

ANALYZED ACCIDENT TYPES

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | New Accident Names/Analyzed Accidents per Attachment A of EAP-4 | **Loss of Coolant Accident** | **Control Rod Drop** | **Refueling Accident** | **Steam Line Break Two Phase** | **Steam Line Break** | **LOCA - Engineered Safety Feature Component Leakage** |
| | | loca.jaf | crd.jaf | rfa.jaf | slb2.jaf | slb2.jaf | esf.jaf |
| | OLD EDAMS Accident Name Used | Loss of Coolant Accident | Control Rod Drop | Refueling Accident | | Steam Line Break Two Phase | Containment Design Basis Accident |
| | Analyzed Release Point | **Elevated** | **Ground** | **Elevated** | **Ground** | **Ground** | **Elevated** |
| | **Nuclide** | **LOCA** | **CRD** | **RFA** | **SLB1** | **SLB2** | **CDBA** |
| NOBLE GASES (Ci/sec) | Kr 83M | 1.353E+00 | 1.577E-03 | 6.117E-03 | 1.517E-05 | 1.517E-05 | 1.154E-02* |
| | Kr 85M | 2.906E+00 | 3.386E-03 | 8.839E-02 | 2.725E-05 | 2.725E-05 | 1.508E-04 |
| | Kr 85 | 1.301E-01 | 1.156E-04 | 1.604E-01 | 8.917E-08 | 8.917E-08 | 3.658E-09 |
| | Kr 87 | 5.572E+00 | 6.494E-03 | 1.432E-05 | 8.917E-05 | 8.917E-05 | 0.000E+00 |
| | Kr 88 | 7.894E+00 | 9.200E-03 | 2.777E-02 | 8.917E-05 | 8.917E-05 | 0.000E+00 |
| | Kr 89 | 9.817E+00 | 1.144E-02 | 0.000E+00 | 5.800E-04 | 5.800E-04 | 0.000E+00 |
| | *Kr subtotal* | *2.767E+01* | *3.221E-02* | *2.827E-01* | *8.008E-04* | *8.008E-04* | *1.508E-04* |
| | Xe131m | 6.825E-02 | 7.953E-05 | 8.783E-02 | 6.692E-08 | 6.692E-08 | 7.994E-05* |
| | Xe133m | 9.942E-01 | 1.159E-03 | 1.048E+00 | 1.292E-06 | 1.292E-06 | 1.934E-03 |
| | Xe133 | 2.386E+01 | 2.781E-02 | 2.833E+01 | 3.658E-05 | 3.658E-05 | 2.769E-02 |
| | Xe135 | 3.081E+00 | 3.589E-03 | 6.522E+00 | 9.833E-05 | 9.833E-05 | 1.952E-01 |
| | Xe135m | 4.494E+00 | 5.239E-03 | 3.578E-01 | 1.158E-04 | 1.158E-04 | 5.686E-01 |
| | Xe137 | 2.094E+01 | 2.440E-02 | 0.000E+00 | 6.692E-04 | 6.692E-04 | 0.000E+00 |
| | Xe138 | 1.988E+01 | 2.316E-02 | 0.000E+00 | 3.975E-04 | 3.975E-04 | 0.000E+00 |
| | *Xe subtotal* | 7.332E+01 | 8.544E-02 | 3.635E+01 | 1.319E-03 | 1.319E-03 | 7.934E-01 |
| | ***Noble Gas (NG) subtotal*** | ***1.010E+02*** | ***1.176E-01*** | ***3.663E+01*** | ***2.120E-03*** | ***2.120E-03*** | ***7.936E-01*** |
| IODINES (Ci/sec) | I131 | 3.406E-02 | 1.323E-04 | 1.299E-03 | 9.808E-04 | 9.808E-04 | 1.918E-03 |
| | I132 | 4.975E-02 | 1.933E-04 | 1.680E-03 | 7.628E-03 | 7.628E-03 | 2.803E-03 |
| | I133 | 7.119E-02 | 2.766E-04 | 1.346E-03 | 6.536E-03 | 6.536E-03 | 4.011E-03 |
| | I134 | 7.839E-02 | 3.044E-04 | 0.000E+00 | 1.380E-02 | 1.380E-02 | 4.417E-03 |
| | I135 | 6.725E-02 | 2.612E-04 | 2.233E-04 | 9.075E-03 | 9.075E-03 | 3.789E-03 |
| | ***Iodine subtotal*** | ***3.006E-01*** | ***1.168E-03*** | ***4.548E-03*** | ***3.802E-02*** | ***3.802E-02*** | ***1.694E-02*** |
| PARTICULATES (Ci/sec) | CS137 | 3.583E-03 | 1.671E-05 | 1.769E-04 | 1.198E-05 | 1.198E-05 | 2.019E-04 |
| | TE132 | 8.178E-03 | 0.000E+00 | 0.000E+00 | 6.900E-04 | 6.900E-04 | 4.606E-04 |
| | SR 89 | 2.132E-03 | 0.000E+00 | 0.000E+00 | 1.489E-04 | 1.489E-04 | 1.201E-04 |
| | SR 90 | 2.228E-04 | 0.000E+00 | 0.000E+00 | 1.126E-05 | 1.126E-05 | 1.255E-05 |
| | Ba140 | 4.094E-03 | 0.000E+00 | 0.000E+00 | 4.358E-04 | 4.358E-04 | 2.306E-04 |
| | La140 | 4.336E-05 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 0.000E+00 | 2.443E-06 |
| | ***Particulate subtotal*** | ***1.83E-02*** | ***1.67E-05*** | ***1.77E-04*** | ***1.30E-03*** | ***1.30E-03*** | ***1.03E-03*** |
| | RELEASE RATE TOTALS (Ci/sec) | **1.01E+02** | **1.19E-01** | **3.66E+01** | **4.14E-02** | **4.14E-02** | **8.12E-01** |
| | Accident Duration Used for EDAMS | **8 hours** | **4 hours** | **2 hours** | **2 hours** | **2 hours** | **2 hours** |
| | TOTAL Release Assumed (Ci) | **2.92E+06** | **1.71E+03** | **2.64E+05** | **2.98E+02** | **2.98E+02** | **5.84E+03** |
| RATIOS | **RATIOS** | **Loss of Coolant Accident** | **Control Rod Drop** | **Refueling Accident** | **Steam Line Break Two Phase** | **Steam Line Break** | **LOCA - Engineered Safety Feature Component Leakage** |
| | Iodine / Noble Gas Ratio | 2.98E-03 | 9.93E-03 | 1.24E-04 | 1.79E+01 | 1.79E+01 | 2.13E-02 |
| | Noble gas / Iodine Ratio | 3.36E+02 | 1.01E+02 | 8.05E+03 | 5.58E-02 | 5.58E-02 | 4.69E+01 |
| | Noble Gas / Particulate Ratio | 5.53E+03 | 7.04E+03 | 2.07E+05 | 1.63E+00 | 1.63E+00 | 7.72E+02 |
| | Iodine / Particulate Ratio | 1.65E+01 | 6.99E+01 | 2.57E+01 | 2.93E+01 | 2.93E+01 | 1.65E+01 |
| | NG / Particulate + Iodine Ratio | 3.17E+02 | 9.93E+01 | 7.75E+03 | 5.39E-02 | 5.39E-02 | 4.42E+01 |