

Attachment 2  
to NLS2000033

**Review of Sciencetech Calculation 17080-M-03,  
Control Room, EAB and LPZ Doses  
Following a LOCA  
Attachment 1 to NEDC 99-033, Revision 1  
(84 pages plus 6 page NEDC cover)**

**ATTACHMENT 1 DESIGN CALCULATION COVER SHEET**

Title: <u>Review of Sciencetech Calculation 17080-M-03, Control Room, EAB, and LPZ Doses Following a LOCA</u> System/Structure: <u>HVAC, SGT, SC / ERP</u> Component: <u>N/A</u> Classification: [ <input checked="" type="checkbox"/> ] Essential; [ <input type="checkbox"/> ] Non-Essential	Calculation No: <u>NEDC 99-033</u> Task Identification No: <u>N/A</u> Design Change No: <u>N/A</u> Discipline: <u>Mechanical Design</u>
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**Calc. Description:**

**PURPOSE:**


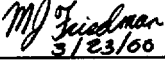
This calculation incorporates by attachment Sciencetech Engineering Calculation No. 17080-M-03, Rev. 1 and 2, prepared under Task Agreement 99A-C20, in accordance with CNS Engineering Procedure 3.4.7, Section 4. The calculation determines the doses to a Control Room operator and to a person at the Exclusion Area Boundary (EAB) and Low Population Zone (LPZ) following a postulated design basis Loss of Coolant Accident (LOCA). This calculation has been prepared as a Status 2 calculation for NRC review and will be as-built upon NRC approval. Revision 1 of this calculation incorporates the CNS response to the NRC Request for Additional Information. (See NLS 2000029 dated 3/20/00) The changes include assumptions for Secondary Containment mixing, Suppression Pool scrubbing, and MSIV leakage contribution related to diffuse releases from the Turbine Building.

**RESULTS:**

The results are tabulated in Section 11, Table 9 of Sciencetech's calculation for each of the three (3) receptor locations: 1. Control Room, 3. Exclusion Area Boundary (EAB), and 2. Low Population Zone (LPZ). All calculated doses are less than the corresponding regulatory limits.

**ATTACHMENTS:**

1. Sciencetech Engineering Calculation No. 17080-M-03, Rev.1 and 2 (including attachments thereto).
2. Reviewer Comments and Resolutions
3. Documentation of Sciencetech Concurrence, dated 3/21/00

1	2	Incorporate NRC Comments	Sciencetech, Inc. 3/20/00	J. J. Drasler 3/21/00 	N/A	M.J. Friedman 3/23/00 
0	2	Original Issue	Sciencetech, Inc. 12/3/99	J. J. Drasler 12/9/99	N/A	M.J. Friedman 12/10/99
Rev. No.	Status	Revision Description	Prepared By/Date	Reviewed By/Date	Independent Design Verification/Date	Approved By/Date

**Status Codes**

- |                     |                          |
|---------------------|--------------------------|
| 1. As - Built       | 3. For Construction      |
| 2. Information Only | 4. Superseded or Deleted |

**ATTACHMENT 2 DESIGN CALCULATION CROSS REFERENCE INDEX**

Nebraska Public Power District

**DESIGN CALCULATION CROSS REFERENCE INDEX**

NEDC: 99-033 Preparer: Scientech, Inc. Reviewer: J. J. Drasler 

Rev. No: 1 Date: 3/20/00 Date: 3/21/00

Item No.	DESIGN INPUTS	Rev. No.	PENDING CHANGES TO DESIGN INPUTS
1	NEDC 99-031	1	none
2	NEDC 99-036	0	none
3	Burns and Roe Dwg 2019, Sht 1	N35	none
4	Burns and Roe Dwg 2041	N68	none
5	Burns and Roe Dwg 2051	N16	DCN 00-183
6	Burns and Roe Dwg 2052	N14	DCNs 98-0071, 98-0994, 98-1043
7	Burns and Roe Dwg 4004	N01	none
8	Burns and Roe Dwg 4506	N06	none
9	GE Dwg 729E479B, Sht 1	N01	none
10	GE Dwg 729E479B, Sht 3	N01	none
11	TS 1.1	178	none
12	TS 3.6.1.3	178	none
13	TS 3.6.4.3	178	none
14	TS 3.7.4	178	OLCR 99-007, 2000-0001
15	TS 5.5.7	178	none
16	USAR XIV-6.3.7.2	7/22/96	none
17	USAR Table V-2-1	NA	none
18	SP 6.1(2)SGT.401	5	none
19	STP 94-199	0	none
20	STP 94-199-1	0	none
21	DCD-9	1	none
22	NEDC 94-176	0	none

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**DESIGN CALCULATION CROSS REFERENCE INDEX**

NEDC: 99-033 Preparer: Scientech, Inc. Reviewer: J. J. Drasler  
 Rev. No: 1 Date: 3/20/00 Date: 3/21/00

Item No.	Affected Documents	Rev. No.	CHANGE Required	Action Item Tracking Number (If change is required)
	none			

Nebraska Public Power District

DESIGN CALCULATIONS SHEET

NEDC: 99-033                      Preparer: Scientech, Inc.                      Reviewer: J. J. Drasler 

Rev. No: 1                              Date: 3/20/00                              Date: 3/21/00

**PURPOSE**

This calculation incorporates by attachment Scientech Engineering Calculation No. 17080-M-03, Rev. 1 and 2, prepared under Task Agreement 99A-C20, in accordance with CNS Engineering Procedure 3.4.7, Section 4. The calculation determines the doses to a Control Room operator and to a person at the Exclusion Area Boundary (EAB) and Low Population Zone (LPZ) following a postulated design basis Loss of Coolant Accident (LOCA).

**EXTENT OF REVIEW**

Scientech's calculation was performed under their own QA program, which included an independent technical review. Therefore, the NPPD review does not include in-depth checks of mathematical calculations, but rather focuses on general acceptability of design inputs, assumptions, methodology, and conclusions. Any significant comments or concerns identified during the review have been resolved with Scientech and incorporated.

**REVIEW SUMMARY**

Scientech's calculation is organized into a single main portion and Attachments 1 through 5, which include the computer code input and output, and Library File changes.

1. **Purpose** - The purpose of the calculation is as given above and as stated in Section 1 of Scientech's calculation. This section was reviewed and found to be acceptable.
  
2. **Design Inputs** - Design Inputs are identified throughout the text and particularly in Table 3 of Section 4 of Scientech's calculation with the references for the design inputs listed in Section 5. Design inputs listed in this table include data for the source term, containment and Control Room volumes, release rates and filtration efficiencies, and atmospheric dispersion factors. The source term is based on initial power level and operating history and is therefore independent of fuel type. ICRP 30 Dose Conversion Factors (DCF) used in the model are listed in Table 2 of Scientech's calculation. Atmospheric dispersion factors for the Control Room were taken from Reference 5.10 (NEDC 99-031) and from Reference 5.11 (NEDC 99-036) for the EAB and LPZ.

The design inputs were reviewed and found to be acceptable.

Documents comprising CNS-controlled source documents whose revision could impact input used in this calculation are identified on the Cross Reference Index in the front of this calculation. Non-status 1 inputs were verified using additional information and were found to be acceptable for use in this calculation.

3. **Assumptions** - Major assumptions are identified in Section 6 of Scientech's calculation. Additional assumptions are inferred in the input documents used and identified throughout Scientech's calculation by inference according to context and use.

It was assumed that all MSIV leakage is released at a rate of one percent of the turbine-condenser volume per day to the Turbine Building, where it is then released to the environment with no additional holdup or removal.

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DESIGN CALCULATIONS SHEET

NEDC: 99-033

Preparer: Scientech, Inc.

Reviewer: J. J. Drasler

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It was also assumed that there is sufficient time to isolate the Reactor Building and the normal Control Room intake due to a 30 minute delay in core damage for a LOCA . Both SGT fans are assumed to be in operation for the first hour and one SGT fan after 1 hour due to operator action to isolate the second fan.

The assumptions were reviewed and found to be acceptable.

- 4. Methodology - The methodology is described in Section 3, Technical Approach. In general, the Scientech-NUS computer code AXIDENT is used to predict the radiological dose consequences of the postulated Loss of Coolant Accident at the 3 receptor locations:

- 1. Control Room,
2. Exclusion Area Boundary (EAB), and
3. Low Population Zone (LPZ).

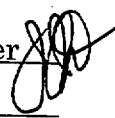
The AXIDENT code models the transport of radioactivity to the environment and to the control room. This code accounts for HVAC recirculation, filtration, atmospheric dispersion, and natural decay. The AXIDENT computer code version used is listed in Section 7. Supporting calculations for the Control Room volume, MSIV leak rate, and ESF leakage values used as input to the code are given in section 8. Calculations are also included in Section 8 to determine the effective SGTS and Control Room filter efficiencies and to adjust the Control Room X/Q values to account for Control Room occupancy factors. Separate computer runs were performed for the three release paths considered: containment release, ESF leakage, and MSIV leakage. The total dose for a given receptor location is the sum of the doses from the containment release, ESF leakage, and MSIV leakage.

The methodology was reviewed and found to be acceptable.

- 5. Results / Conclusions - Results and conclusions are given in Sections 10 and 11, respectively, of Scientech's calculation. Table 9 lists the calculated dose consequences for the Control Room, EAB, and LPZ. Calculated doses are summarized in the table below. The regulatory limits listed in this table are from Table 1 of the Scientech calculation.

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NEDC: 99-033      Preparer: Sciencetech, Inc.      Reviewer: J. J. Drasler 

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TABLE 1: SUMMARY OF LOCA ACCIDENT DOSES

	Control Room (30 days)			EAB (2 hours)		LPZ (30 days)	
	Thyroid	Whole Body	Beta	Thyroid	Whole Body	Thyroid	Whole Body
Total Dose (rem)	6.62	6.63E-3	0.262	10.1	2.13	74.8	4.74
Limit (rem)	30	5	30	300	25	300	25

The results and conclusions sections were reviewed and found to be acceptable. All calculated doses are below the corresponding regulatory limits.



ENGINEERING CALCULATION

CLIENT/PROJECT NPPD/Cooper CALC. NO. 17080-M-03 REV. 2

TITLE Control Room, EAB, and LPZ Doses Following a LOCA

AUTHOR/DATE: <i>Hanny A. Waigage</i> 3/20/2010	VERIFIED BY/DATE: <i>D. S. H.</i> 3/20/00	APPROVED BY/DATE: <i>[Signature]</i> 3/20/00
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**Purpose**

The purpose of this calculation is to determine the doses to the control room operator and to a person at the Exclusion Area Boundary (EAB) and at the Low Population Zone (LPZ) of the Cooper Nuclear Station (CNS) following a design basis loss-of-coolant accident.

Revision 1 of the calculation was made for the following:

- Delete dose calculations for the case with secondary containment mixing
- Remove NUREG-1465 assumption on delay in core melting
- Replace ORNL-NSIC-5 methodology on calculating MSIV leakage with analysis based on first principles
- Lower base SBGT and CREFS filter efficiencies by 1% to incorporate bypass leakage around filter
- Lower the suppression pool-scrubbing factor from 5 to 2, which is consistent with the current licensing basis.

Revision 2 of this calculation was made to update the MSIV release contribution to the control room LOCA dose to reflect the recalculated X/Q values for the Turbine Building diffuse release. [5.10] This recalculation was made to satisfy an NRC request which was made during the resolution of NRC Request for Additional Information. The NRC requested changing the calculation of the initial diffusion coefficients for diffuse releases to building dimensions divided by a factor of 6.

**Results**

The AXIDENT code predicted doses to control room operator and to a person located at EAB and LPZ are listed in Table 9. All the calculated doses are below the regulatory limits listed in Table 1.

SUPERSEDED BY REV.	QUALITY CLASS	DISTRIBUTION	VERIFICATION METHOD
SUPPLEMENTED BY CALC. NO.:	<input checked="" type="checkbox"/> SAFETY-RELATED <input type="checkbox"/> NON-SR <input type="checkbox"/> OTHER	<input checked="" type="checkbox"/> PROJECT <input checked="" type="checkbox"/> DCC <input type="checkbox"/> OTHER	<input checked="" type="checkbox"/> REVIEW <input type="checkbox"/> ALT. ANALYSIS



<b>SCIENTECH/NUS, Inc. and Subsidiaries</b>		<b>STANDARD CALCULATION SHEET</b>	
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**1 PURPOSE OF ANALYSIS**

The purpose of this calculation is to determine the doses to the control room operator and to a person at the Exclusion Area Boundary (EAB) and at the Low Population Zone (LPZ) of the Cooper Nuclear Station (CNS) following a design basis loss-of-coolant accident (LOCA).

Revision 1 of the calculation was made for the following:

- Delete dose calculations for the case with secondary containment mixing
- Remove NUREG-1465 assumption on delay in core melting
- Replace ORNL-NSIC-5 methodology on calculating MSIV leakage with analysis based on first principles
- Lower base SGTS and CREFS filter efficiencies by 1% to incorporate bypass leakage around filter
- Lower the suppression pool-scrubbing factor from 5 to 2, which is consistent with the current licensing basis.

Revision 2 of this calculation was made to update the MSIV release contribution to the control room LOCA dose to reflect the recalculated X/Q values for the Turbine Building diffuse release. [5.10] This recalculation was made to satisfy an NRC request which was made during the resolution of NRC Request for Additional Information. The NRC requested changing the calculation of the initial diffusion coefficients for diffuse releases to building dimensions divided by a factor of 6.

**2 INTENDED USE OF ANALYSIS RESULTS**

This analysis is intended to confirm that the calculated doses resulting from a design basis LOCA for the control room operator, a person at the EAB, and a person at the LPZ are less than the Regulatory dose limits as given in Table 1.

**Table 1. Regulatory Dose Limits (Rem)**

Dose Type	CR (30 day)	EAB (2 hour)	LPZ (30 day)
Thyroid Dose	30 <sup>a</sup>	300 <sup>b</sup>	300 <sup>b</sup>
Whole Body Dose	5 <sup>a, c</sup>	25 <sup>b</sup>	25 <sup>b</sup>
Beta Skin Dose	30 <sup>a</sup>	-	-

Notes: <sup>a</sup> SRP, Section 6.4, Acceptance Criteria-6 [5.1]

<sup>b</sup> 10 CFR Part 100, section 100.11 [5.2]

<sup>c</sup> 10 CFR Part 50, GDC-19, Appendix A [5.2]

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**3 TECHNICAL APPROACH**

The radiological doses to the control room operators and to a person located at the EAB and LPZ resulting from the design basis LOCA were assessed using the SCIENTECH-NUS "AXIDENT" computer code which is a transient control room and off-site dose analysis code. Three pathways of radiological releases from the containment were considered. The first was the release from the containment through the standby gas treatment system (SGTS). The second was the release from the emergency safety features (ESF) leakage into containment through the SGTS. The third was the release through the main steam isolation valves (MSIV) through the turbine building. Resultant doses were calculated by summing the doses from individual release paths. Figures 1 and 2 show schematics of the release model and control room flow model. The data shown on figures 1 and 2 were derived as described later in the report.

NUREG/CR-5009 notes that extended burnup fuel would not affect the LOCA releases, and therefore, extended burnup fuel was not considered in the present analysis. [5.17]

**3.1 Radioactive Release Pathways**

**3.1.1 Release from the Containment through SGTS**

At the time of the accident, 25% of all equilibrium iodine fission products and 100% of the noble gas fission products are assumed to be available for release from the containment within a short time (effectively immediately) after the accident (SRP 15.6.5). [5.1] Fission products released to the containment are assumed to release through the standby gas treatment system (SGTS) to the environment via the elevated release point (ERP). The SGTS filters will remove part of the iodine isotopes.

**3.1.2 Release from ESF Leakage through SGTS**

The dose contribution from radioactive leakage through engineered safety feature (ESF) system or components is subject to the requirements of SRP 15.6.5, Appendix B. [5.1] The ESF control room dose contribution is modeled separately and added to the doses from the SGTS and MSIV leakage. Fifty percent of core iodine inventory, based on maximum reactor power level, is mixed in the suppression pool water circulating through the containment external piping systems. In accordance with SRP 15.6.5, Appendix B, the iodine is assumed to be uniformly mixed in the minimum volume of the pressure suppression pool water.

With a temperature of the suppression pool water circulating outside of containment not exceeding 212°F, the flash fraction is taken to be 10%, consistent with SRP 15.6.5, Appendix B under a condition of no boiling. Ten percent of the iodine in the leakage is thus assumed to become airborne. The airborne activity released by flashing ESF water was

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conservatively assumed to release to the environment through SGTS without further mixing with the air in the Reactor Building.

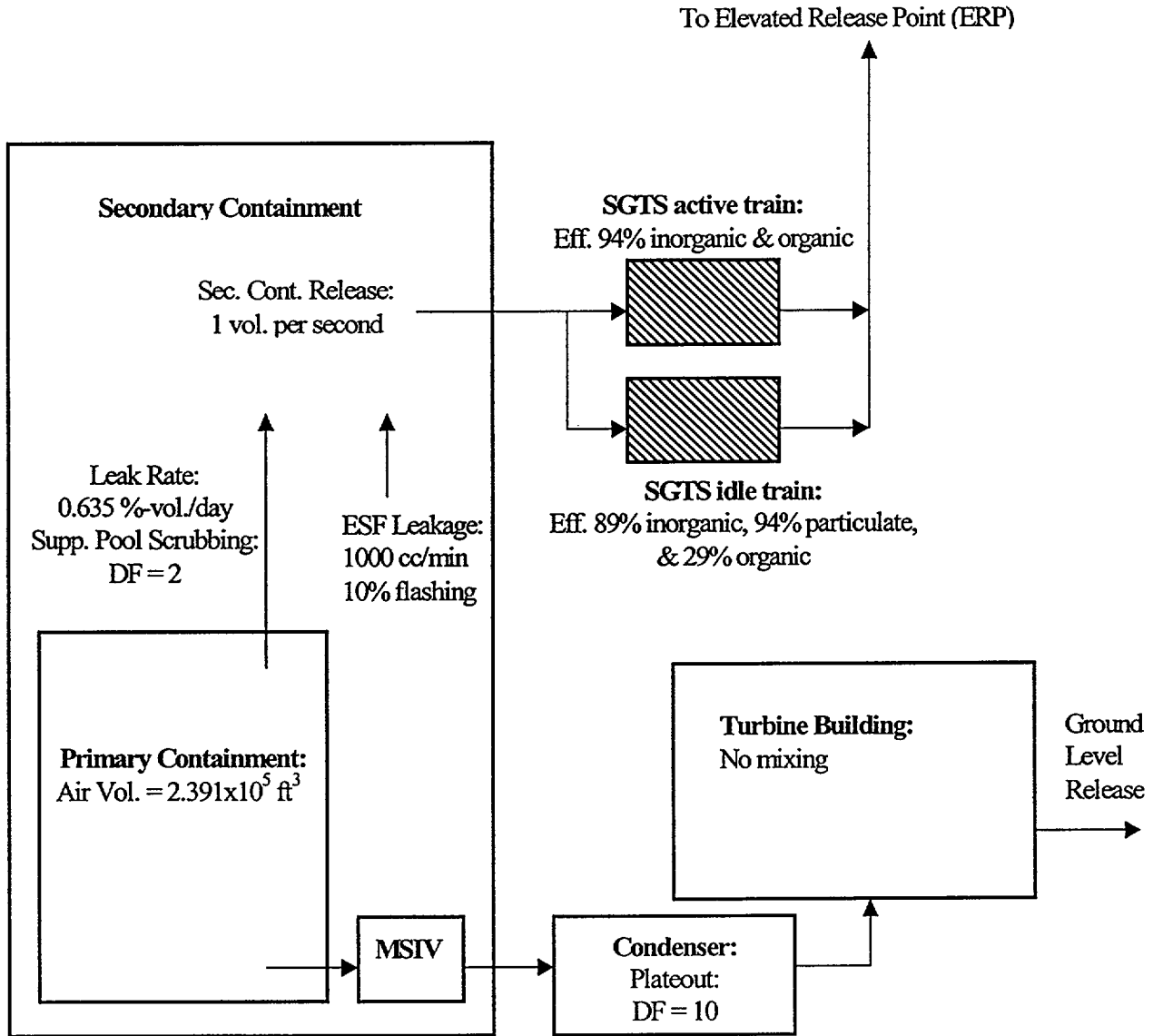
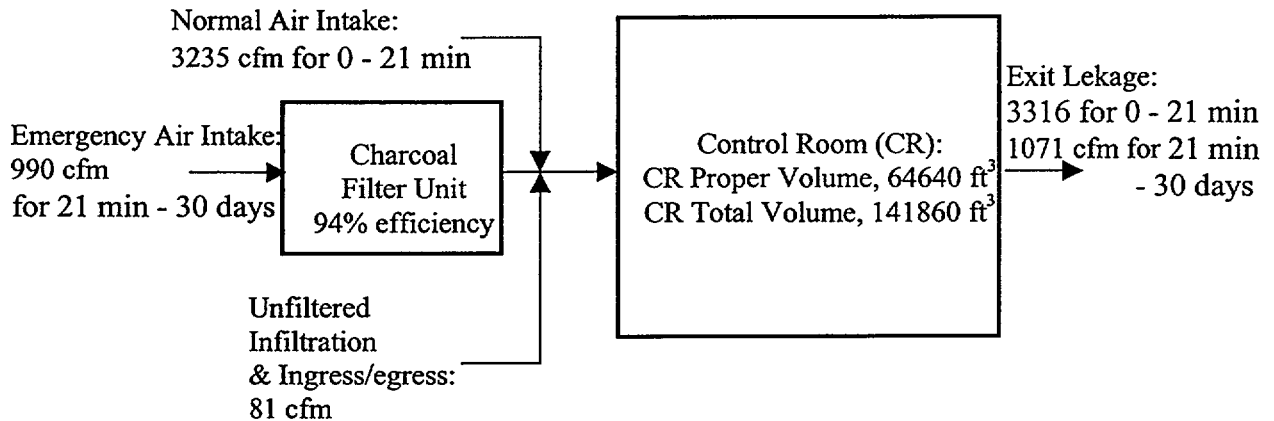


Figure 1. A schematic of the release model for LOCA

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**Figure 2. A schematic of Control Room Air Flows**

**3.1.3 Release from MSIV Leakage through Turbine Building**

The majority of the containment leakage is collected in the reactor building and exhausted to the atmosphere through the SGTS filters to the environment via the elevated release point (ERP). However, there are certain release pathways in BWRs from the containment, which will bypass the SGTS filters.

CNS was designed and licensed prior to the adoption of Leakage Control Systems (LCS) which were installed in newer plants to further mitigate the consequences of the leakage down this release path. The original LOCA radiological consequence analysis in the CNS SER, [5.3] along with SERs for similar vintage plants, was silent on the effects of the MSIV leakage. This may be due to a general perception that the excessively conservative TID-14844 reactor siting type analysis envelops the consequence of these types of release paths. [5.4] For conservatism, all MSIV seat leakage is assumed to release via the Turbine Building with no holdup or removal credited for the Turbine Building; no MSIV seat leakage was assumed to enter the steam tunnel and released via SGTS.

For this CNS LOCA radiological transport and dose analysis, the model will conservatively add the effects of the MSIV leakage. A conservative model, which is similar to one employed at other non-LCS vintage plants, will be used. The model, which is more conservative than the current industry accepted methodology as documented in NUREG/CR-6189 in relation to the removal mechanisms, does however credit the effects of

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limited partitioning and plateout in the turbine condenser complex. [5.29] This is very conservative approach since even very smallest deposition velocities result in essentially all of the elemental and particulate iodines being removed (a DF of 25 is typically calculated for this type of release path). Furthermore, the DF of 10 for all the iodines in the release path is similar to the partitioning and plateout in the turbine and condensers allowed in SRP 15.4.9 [5.1].

The bypass leakage was quantified by assuming that all MSIV seats leak at the Technical Specification limit. Radioactivity leaking past the isolation valves could be released through the outboard MSIV stems into the steam tunnel or the turbine-condenser complex. Any stem leakage into the steam tunnel is exhausted by the SGTS filtration system, thus eliminating it as a bypass pathway. For conservatism, all MSIV seat leakage is assumed to release via the Turbine Building with no holdup or removal; no MSIV seat leakage was assumed to enter the steam tunnel and released via SGTS. *↑ credited for the Turbine Building*

*HAW*  
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Leakage down the steam lines is subject to plateout and delay within the lines. NUREG/CR-0009, Section 5.1.2 discusses iodine removal rates, which can be applied to calculate plateout on the piping and turbine-condenser surfaces. [5.5] Elemental and particulate iodine decontamination factors of over 100 can be calculated for small travel distances and long travel times down the steam lines, considering the small volume of leakage which passes the valves (§4.7.1).

The MSIV leakage travels down the steam piping to the turbine condenser complex where it is conservatively assumed to release at ground level, at a rate of 1% of the turbine-condenser volume per day. This leak rate is consistent with the conservative condenser leak rate used for the control rod drop accident in SRP 15.4.9. [5.1] Furthermore, it was conservatively assumed that radioactivity released into the turbine building is instantaneously released to the environment (i.e., no credit for holdup/mixing in the turbine building).

In actuality, the MSIV leakage passes through three different volumes, which provide holdup and the opportunity for plateout. The first volume consists of the steam lines between the inboard and outboard isolation valves. The second volume consists of the steam lines between the outboard isolation valves and the turbine stop valves. The third volume includes the steam lines after the turbine stop valves and the internal volume of the turbine-condenser complex.

The MSIV leakage will be released into the turbine building where it would be exhausted by the heating, ventilating, and air conditioning (HVAC) system if the HVAC were working. Additional plateout on ductwork, fans, and unit coolers would further minimize the iodine release. Should the HVAC system not be working, then any bypass leakage would tend to



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collect in the building and be subject to additional decay and plateout. However, once the MSIV leakage reaches the turbine building, it was conservatively assumed that no additional plateout or decay occurs.

**3.2 Control Room Model**

Figure 2 shows a schematic of the control room flow model.


SRP 6.4 suggests a 20-minute delay for manual isolation of the control room ventilation system when performing dose evaluations. [5.1] A total of 21 minutes, which includes 1-minute to close the dampers, was used as the time to align emergency ventilation supply.

Radioactive material enters the control room with filtered air intake through the emergency ventilation system and with unfiltered in-leakage and ingress/egress. Air is assumed to exit the control room along with radioactivity in it at a flow rate equal to that is entering the control room. No air circulation filters were assumed to be in operation, therefore, the only mechanisms of radioactivity removal from the control room are radioactive decay and release with air exiting the control room.

**3.3 Source Term Model**

The core is assumed to have operated at the design power level plus 2%, to account for uncertainties in power measurement, for a sufficiently extended period (typically about 3 years) such that the maximum equilibrium of fission products is present (SRP 15.6.5). [5.1] The iodine in the core is assumed to consist of 91% elemental iodine, 4% organic iodine, and 5% particulate iodine (SRP 15.6.5). Consistent with TID-14844, the AXIDENT code calculates the source term based on operation at given reactor power for 1000 days (2.74 years) and the above partition of iodine isotopes. [5.5, 5.7] As such, the source term is independent of the fuel type.

The AXIDENT code calculated source term was used for two release paths, 1) release from the containment atmosphere through SGTS and 2) release from the MSIV leakage through the turbine building. [5.7] However, for the release from ESF no noble gas is available because all the noble gasses were assumed to release into the containment atmosphere. Therefore, only iodine isotopes were used as the source term. The AXIDENT code reduces the iodine source term by a factor of 4 to account for the standard Reg. Guide 1.3 assumptions of 50% airborne release and 50% plate-out factor. [5.8] Thus, the desired iodine source term must be multiplied by a factor of 4 to cancel the reduction made by the program. To achieve an ESF source term of 50% of the core inventory, the core inventory must be multiplied by a factor of 2. Credit is not taken for plate-out of the ESF leakage term.

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### 3.4 Atmospheric Dispersion Factors (X/Qs)

Control room dose calculations were performed using atmospheric dispersion factors (X/Q values) for the control room ventilation calculated using ARCON96 computer code (SCIENTECH Calculation 17080-M-01; see §4.8). [5.9, 5.10] The ARCON96 code used site-specific information for CNS, including weather data.

Dispersion factors for the EAB and LPZ were obtained from SCIENTECH Calculation 17080-M-06 (see §4.9 and 4.10). [5.11]

### 3.5 Pressure Suppression Pool Scrubbing

SRP 6.5.5.III.1 notes that, for a Mark I containment, the applicant's decontamination factor of 5 or less may be accepted without any need to perform calculations. [5.1] However, in response to NRC Request for Additional Information, the suppression pool scrubbing decontamination factor was reduced from 5 to 2.

The initial isotopic activity airborne in the primary containment may be adjusted to account for the suppression pool scrubbing effect on iodine. Activity released from the core during the blowdown phase of a LOCA will be mixed in the drywell atmosphere. As a result of the pressure buildup in the drywell, the steam/air mixture in the drywell will be forced through the downcomers into the suppression pool (which is at a lower pressure) where condensable vapors are removed. In the process of passing through the suppression pool water, iodine fission products are scrubbed. The scrubbing of iodine is limited to particulate and elemental iodine because organic iodine is given a DF of 1 per SRP 6.5.5.III.1. [5.1] Based on pool DF data presented in NEDO-25420, suppression pool scrubbing factors of 30 to 1000 are justifiable for elemental and particulate iodine species. [5.12] With an instantaneous release of fission products postulated at the start of a LOCA, a large break LOCA would result in most of the blowdown and activity passing rapidly through the suppression pool.

A slower, more mechanistic activity release would result in less activity being available instantaneously for release to the reactor enclosure. However, the slow release would be accompanied by steam and hydrogen (e.g., NUREG/CR-2540), which would pressurize the drywell and force flow through the suppression pool where significant quantities of iodine would still be removed. [5.13] In addition, emergency cooling water circulating from the reactor to the drywell through the suppression pool and back to the core by core spray and LPCI would contribute to scrubbing of iodine being released from the core long after blowdown. As a result, the fission products that are released through the MSIV leak path, which may bypass the suppression pool but is still in contact with suppression pool water, will also be scrubbed. However, no scrubbing was assumed for fission products released through the MSIV leak path.

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### 3.6 ICRP 30 DCFs

The existing licensing basis accident analysis is based on the Dose Conversion Factors (DCFs) from Regulatory Guide 1.3 and TID-14844, which were developed in the early 60s. [5.8, 5.4] Since the development of Reg. Guide 1.3, work has been and continues to be performed in both the U.S. and overseas on developing new DCFs. RG 1.109 recommends DCFs that are significantly lower than those specified in RG 1.3 or TID-14844. [5.8, 5.4] ICRP Publication 30, "Limits for Intakes of Radionuclides by Workers," issued in 1979, provides more accurate DCFs. Although these DCFs have not been included in a Regulatory guide for use in accident analyses, they have been submitted and approved by NRC in a number of Post-TMI Control Room Habitability analyses. This analysis will use the ICRP 30 Dose Conversion Factors. [5.14] The various DCFs are compared in Table 2.

**Table 2. Comparison of Different Dose Conversion Factors for Iodine Isotopes**

Isotope	Dose Conversion Factor (Rem/Ci)		
	ICRP 2 [5.15]	RG 1.109 [5.8]	ICRP 30 [5.14]
I-131	1.48E+6	1.49E+6	1.10E+6
I-132	5.35E+4	1.43E+4	6.30E+3
I-133	4.00E+5	2.69E+5	1.80E+5
I-134	2.50E+4	3.73E+3	1.10E+3
I-135	1.24E+5	5.60E+4	3.10E+4

### 3.7 Design MSIV Leak Rate

Mass of a gas at given temperature and pressure is given by characteristic gas equation, which is shown in equation 1.

$$m = \frac{144PV}{RT} \quad (1)$$

Where:

- $m$  - Mass, lb
- $P$  - Pressure, psi
- $V$  - Volume, ft<sup>3</sup>
- $R$  - Characteristic gas constant, lf-ft/lb-°F
- $T$  - Temperature, R

Using equation 1 the total leak rate at drywell temperature and pressure,  $\dot{V}_d$ , can be calculated and given by equation 2, where 4 represents the number of MSIVs.

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$$\dot{V}_d = 4 \dot{V}_{STD} \frac{P_{STD}}{P_d} \frac{T_d}{T_{STD}} \quad (2)$$

Where  $\dot{V}$  represents volumetric leak rate and subscripts  $_{STD}$  and  $_d$  represent standard temperature and pressure condition and drywell atmosphere condition.

The fractional mass leak rate is calculated by dividing equation 2 by the volume of the containment,  $V_{cont}$ , and given by equation 3.

$$\frac{\dot{V}_d}{V_{cont}} = 4 \frac{\dot{V}_{STD}}{V_{cont}} \frac{P_{STD}}{P_d} \frac{T_d}{T_{STD}} \quad (3)$$

### 3.8 Resultant Iodine Removal Efficiencies for SGTS/Control-Room-Intake Filters

Different flow rates and removal efficiencies are assumed for the operating- and idle-SGTS trains.

There are two supply pathways into the control room, a filtered air supply and an unfiltered inleakage pathway. AXIDENT does not provide for two removal pathways from secondary containment with different filter efficiencies nor does it provide for both a filtered and an unfiltered supply to the Control Room. Each of the dual pathways is modeled as a single pathway with net removal efficiency. The net (resultant) iodine removal efficiencies for each of these pathways were calculated using equation 4, which is derived using conservation of mass.

$$\eta_{ires} = \frac{\left( \eta_i \dot{V} \right)_1 + \left( \eta_i \dot{V} \right)_2}{\left( \dot{V} \right)_1 + \left( \dot{V} \right)_2} \quad (4)$$

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where:

- $\eta_{i \text{ res}}$  = Resultant value of SGTS/control-room-intake filter efficiency for iodine isotope of form "i".
- $\eta_i$  = Individual efficiency of idle or operating train of SGTS/control-room-intake filter for iodine isotope of form "i". Note,  $\eta_i$  for unfiltered control room intake is zero.
- $\bar{V}$  = Airflow rate through idle or operating train of SGTS filter/ unfiltered or filtered airflow rate into the control room.

Subscripts 1 and 2 in equation 4 refer to idle and operating trains for SGTS or unfiltered and filtered flow for control room intake.

**3.9 Secondary Containment Release Rate**

The secondary containment release was assumed to be instantaneous, which was conservatively based on Regulatory Guide 1.3, in which leakage from primary to secondary is assumed to pass directly to the SGTS, where it is then discharged to the environment via the elevated release point. [5.8] A large release rate of 1 secondary building volume per second was used for this case.

**4 DESIGN INPUT**

Table 3 lists the design input.

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**Table 3. Design-Input Data**

No.	Item	Value	Source	Comments
<b>4.1 Reactor Data</b>				
4.1.1	Power Level, MWt	2381	T.S. 1.1 [5.18]	The T.S. value will be increased by 2% to account for power measurement uncertainties in accordance with SRP 15.6.5 (2429 MWt). [5.1]
4.1.2	Operating History	Constant power for 1000 days	R.G. 1.3 C.1.a [5.8]	Built into AXIDENT
<b>4.2 Source Term</b>				
4.2.1	Release into primary containment	Instantaneous	R.G. 1.3 C.1.a, R.G. 1.3 C.1.b [5.8]	Built into AXIDENT
4.2.2	Noble gas	100%	R.G. 1.3 C.1.b [5.8]	Built into AXIDENT
4.2.3	Iodine	25%	R.G. 1.3 C.1.a	Built into AXIDENT
4.2.4	Iodine forms:			
	Elemental	91%	R.G. 1.3 C.1.a	Built into AXIDENT
	Particulate	5%	[5.8]	
	Organic	4%		

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No.	Item	Value	Source	Comments
<b>4.3 Release Data</b>				
4.3.1	SGTS exhaust flow rate, cfm: 0 – 1 h: Both trains 1 h – 30 d: Idle Train (bypass) Operating Train Total	2984  288 1492 1780	Design Change 94-102 [5.19]	<ol style="list-style-type: none"> <li>The flow rates were used only to determine the effective SGTS filter efficiency. See §4.5.5 for release rate from the secondary containment.</li> <li>Single failure of the filter heater power. Operator shuts off the train with the failed filter power at 1 hour.</li> <li>Maximum bypass flow per DC 94-102 and Surveillance Procedure 6.1(2)SGT.401 is 280 cfm. [5.20] To account for various uncertainties, 288 cfm is conservatively used throughout.</li> </ol>
4.3.2	SGTS removal efficiency: Idle Train: Elemental Organic Particulate  Operating Train, for all iodine species	  89% 29% 94%  94%	TS 3.6.4.3 [5.18] R. G. 1.52 [5.8]  TS 5.5.7, R. G. 1.52 [5.18, 5.8]	Includes a correction of -1% to account for the filter bypass (TS 5.5.7). [5.18]

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No.	Item	Value	Source	Comments
<b>4.4 Primary Containment</b>				
4.4.1	Primary containment air volume, ft <sup>3</sup>	239,100	USAR chap XIV section 6.3.7.2 [5.21]	
4.4.2	Suppression Pool Decontamination Factor for Elemental and Particulate Iodine	2	SRP 6.5.5 [5.1]	The SRP scrubbing factor of 5 was reduced to 2 based on the licensing review process.
4.4.3	Suppression pool minimum water volume, ft <sup>3</sup>	87,650	USAR table V-2-1 [5.21]	These values are for standard plants 218T548 (see §8.2.2 for justification of usage).
	Reactor Coolant System Fluid Inventory	437,000	GE dwg 729E479-B, rev. 0, sheets 1 & 3 [5.22]	
	Lbs fluid in reactor vessel	89,000		
4.4.4	Primary Containment Leakage, %-vol/day (vol/sec)	0.635 (7.35E-8)	TS 1.1	
<b>4.5 Secondary Containment</b>				
4.5.1	Elevation of the roof of reactor building, ft	1052' 9"	CNS dwg 4506 [5.23]	These data are for information only: they were used only for calculating atmospheric dispersion factors, which were used in the present analysis.
4.5.2	Elevation of the grade in vicinity of reactor building, ft	903	CNS dwg 4004 [5.23]	
4.5.3	Minimum width of the reactor building, ft	112.75	CNS dwg 4506 [5.23]	

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No.	Item	Value	Source	Comments
4.5.4	Mixing	No mixing	Reg. Guide 1.3 [5.8]	See §3.9
4.5.5	Leak Rate after SGTS Startup, vol./sec	1	Reg. Guide 1.3 [5.8]	See §3.9
<b>4.6 ESF Release</b>				
4.6.1	ESF Leak Data (directly to SGTS), cc/min	1000	NEDC 94-176 [5.24]	The maximum allowable ECCS leakage of 602 cc/min is established per NEDC 94-176 and controlled per CNS Procedure 13.1. For this calculation, 1000 cc/min is conservatively assumed.
4.6.2	ESF flashing fraction	10%	SRP 15.6.5 [5.1]	
4.6.3	Source Term	50% equilibrium core iodine	SRP 15.6.5 [5.1]	
<b>4.7 MSIV Leak Data</b>				
4.7.1	MSIV leak rate per MSIV, scfh	11.5	SER Supplement 1, Docket No. 50- 298 [5.16]	
4.7.2	<del>Peak</del> drywell pressure, $P_d$ , psia for MSIV leak rate JD 3/21/00	65	CED 1999-0117 [5.31]	CED 1999-0117 gives values of 65.66 psia and 65.92 psia for the 102%/100% and 102%/102% power/flow values. The lower value was conservatively rounded down to 65 psia.

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No.	Item	Value	Source	Comments
4.7.3	Number of outboard MSIVs	4	CNS dwg 2041, Rev. N68 [5.23]	
4.7.4	Containment temperature at <del>design basis LOCA maximum peak containment pressure</del> , deg F (R) <i>for MSIV leak rate</i>	309 (769)	TS B.3.6.1.5 [5.18]	
4.7.5	Standard pressure, psia	14.7		
4.7.6	Standard temperature, deg F (R)	60 (520)		
<b>4.8 Control Room</b>				
4.8.1	Unfiltered Inleakage, scfm infiltration ingress/egress	71 10	STP 94-199 [5.26] SRP 6.4 III.3.d.2)ii [5.1]	
4.8.2	Time to isolate air intake, min	21	SRP 6.4.III.3.d [5.1] NEDC 99-081 [5.6]	20 min to give isolation signal per SRP 6.4.III.3.d plus 1 min closing time for the dampers per NEDC 99 081 [5.1, 5.6]
4.8.3	Air intake rate, scfm: 0 - 21 m: Normal Supply  21 m - 30 days: Emergency Supply	3235  900 ± 10%	CNS dwg 2019 sheet 1 [5.23] TS 3.7.4 [5.18]	
4.8.4	Charcoal Filter Efficiency for all iodine types	94%	TS 5.5.7 [5.18]	Includes a correction of -1% to account for the filter bypass (TS 5.5.7). [5.18]

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No.	Item	Value	Source	Comments
4.8.5	Recirculation flow rate	0	CNS dwg 2019 sheet 1 [5.23]	Recirculation is not considered, because it has no effect on airborne iodine and noble gas activity (no charcoal).
4.8.6	Control Room Proper		CNS dwgs: [5.23]	These are gross dimensions. A reduction factor of 20% to account for walls, floors, and equipment is used to determine the net volume (see §8.1).
	Width	72'	2051	
	Length	80'9" - 13'3" = 67.5'	2052	
	Floor El	932'6"	2052	
	High point of roof slab	949'1.5"	4506	
	Cable Room			
	West of column H7			
	Outside wall to H7	80'9" - 13'3" = 67.5'	2052	
	N-S	72'	2051	
	Floor El	918'	2051	
	Column H7 to G			
	H7 to G	35' + 13'3" =	2052	
	E-W	48.25'	2051	
	Floor El	37'3"	2051	
		918'		
4.8.7	Breathing Rate (duration of accident), m <sup>3</sup> /sec	3.47E-4	R. G. 1.3 [5.8]	Use maximum breathing rate from R. G. 1.3. Built into the AXIDENT code.
4.8.8	Occupancy Factors:		SRP 6.4, Table	These will be explicitly included in the X/Q that are used as input to the AXIDENT code.
	0 - 24 hr	1.0	6.4-1	
	1 - 4 days	0.6	Murphy &	
	4 - 30 days	0.4	Campe [5.1, 5.27]	

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No.	Item	Value	Source	Comments
4.8.9	Arcon96 Dispersion Data, s/m <sup>3</sup>  Turbine Building (MSIV) - Diffuse Release: 0 - 2 hr 2 - 8 hr 8 - 24 hr 1 - 4 days 4 - 30 days  SGTS: 0 - 2 hr 2 - 8 hr 8 - 24 hr 1 - 4 days 4 - 30 days	   9.54E-4 4.93E-4 2.69E-4 1.72E-4 1.43E-4  1.00E-9 2.65E-9 6.41E-8 2.00E-8 1.66E-8	17080-M-01 [5.10]	17080 -M-01 calculated 5 X/Qs for each time period based on meteorological data for 1994 through 1998. The maximum value was chosen for each time period.
<b>4.9 EAB</b>				
4.9.1	Ground Level Release (s/m <sup>3</sup> ) 0 - 2 hours Elevated Release Point 0 - 0.5 hours 0.5 - 2 hours	 5.2E-4  1.2E-4 1.6E-5	17080-M-06 [5.11]	

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No.	Item	Value	Source	Comments
<b>4.10 LPZ</b>				
4.10.1	Ground Level Release (s/m <sup>3</sup> )		17080-M-06	
	0 - 8 hours	2.9E-4	[5.11]	
	8 - 24 hours	7.3E-5		
	1 - 4 days	2.5E-5		
	4 - 30 days	5.2E-6		
	Elevated Release Point			
	0 - 0.5 hours	1.4E-4		
	0.5 - 8 hours	4.0E-5		
	8 - 24 hours	1.6E-5		
	1 - 4 days	5.8E-6		
	4 - 30 days	1.7E-6		

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## 5 REFERENCES

- 5.1 Nuclear Regulatory Commission, "Standard Review Plan," NUREG-0800, Rev. 2, July 1981:  
 Section 6.4, "Control Room Habitability Systems,"  
 Section 6.5.3, Fission Product Control Systems and Structures  
 Section 6.5.5, Pressure Suppression Pool as a Fission Product Cleanup System.  
 Section 15.4.9, Radiological Consequences of Control Rod Drop Accident (BWR), Appendix A  
 Section 15.6.5, "Loss-of-Coolant Accidents Resulting from Spectrum of Postulated Piping Breaks within the Reactor Coolant Pressure Boundary"
- 5.2 Code of Federal Regulations:  
 10 CFR Part 100, Section 100.11.  
 10 CFR Part 50, GDC-19, Appendix A.
- 5.3 CNS Safety Evaluation Report
- 5.4 TID-14844, "Calculation of Distance Factors for Power and Test Reactors Sites," 1962.
- 5.5 NUREG/CR-0009, "Technological Bases for Modes of Spray Washout of Airborne Contaminants on Containment Vessels," August 1978.
- 5.6 NEDC 99-081, Rev. 0, "Control Room Isolation Time."
- 5.7 HALLIBURTON NUS - AXIDENT, "A Digital Computer Dose Calculation Model," Version 2, Mod 4, February 18, 1992
- 5.8 Regulatory Guides:  
 1.3, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors," Rev. 2 6/74.  
 1.52, "Design, Testing, and Maintenance Criteria for Post Accident Engineered-Safety-Feature Atmospheric Cleanup system Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants," Rev. 2, 3/78.
- 5.9 J. V. Ramsdell Jr. and C. A. Simonen, "Atmospheric Relative Concentrations in Building Wakes," NUREG/CR-6331, PNPL-10521, Revision 1, U.S. Nuclear Regulatory Commission, Washington, D.C., 1997.
- 5.10 SCIENTECH Calculation 17080-M-01, "X/Q Values for Use in Control Room Habitability Analysis Using ARCON 96." Rev. 1.
- 5.11 SCIENTECH Calculation 17080-M-06, "EAB and LPZ Meteorological Dispersion-Accident Analyses." Rev. 0.

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- 5.12 NEDO-25420, "Suppression Pool Scrubbing Factor for Postulated Boiling Water Reactor Accident Conditions," June 1981.
- 5.13 NUREG/CR-2540, "A Method for the Analysis of Hydrogen and Steam Releases to Containment During Degraded Core Cooling Accidents," February 1982.
- 5.14 ICRP Publication 30, "Limits for Intakes of Radionuclides by Workers," 1979.
- 5.15 ICRP Publication 2, "Report of Committee II, Permissible Dose for Internal Radiation," 1959.
- 5.16 Supplement 1 to the SER, Docket No. 50-298, July 16, 1973.
- 5.17 Nuclear Regulatory Commission, "Assessment of the Use of Extended Burnup Fuel in Light Water Power Reactors," NUREG/CR-5009.
- 5.18 Technical Specifications:
- 1.1
  - 3.6.1.3
  - 3.6.4.3
  - 3.7.4
  - 5.5.7
  - B.3.6.1.5
- 5.19 DC 94-102, "SGT System Crosstie Valve Modification/Heater Setpoint Change."
- 5.20 Surveillance Procedure 6.1(2)SGT.401.
- 5.21 CNS USAR
- 5.22 GE drawing 729E479-B, Rev. 0, sheets 1 & 3
- 5.23 CNS Burns & Roe drawings:
- 2019 sheet 1, Revision N35
  - 2041, Revision N68
  - 2051, Revision N16
  - 2052, Revision N14
  - 4004, Revision N01
  - 4506, Revision N06
- 5.24 NEDC 94-176
- 5.25 DCD 9, Primary Containment (PC) System.
- 5.26 STP:
- STP 94-199 Control Room Envelope Unfiltered Inleakage Test
  - STP 94-199-1 Control Room Envelope Unfiltered Inleakage Test, Amendment 1
- 5.27 13<sup>th</sup> AEC Air Cleaning Conference, "Nuclear Power Plant Control Room Ventilation System Design for Meeting General Design Criterion 19", K. G. Murphy and K. M. Campe.
- 5.28 Software Verification Memo from H. Wagage to T. Bladen, 11/4/1999.
- 5.29 Nuclear Regulatory Commission, "Simplified Model of Aerosol Removal by Natural Processes in Reactor Containments," NUREG/CR-6189.

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5.30 NEDO-10320  
5.31 CED 1999-0117

## 6 MAJOR ASSUMPTIONS

Table 4 lists the major assumptions used in the present analysis.

**Table 4. Major Assumptions Used**

No.	Item	Value	Comments
6.1	Mixing: Primary Containment	100%	Conservative to assume MSIV leakage goes directly to environment without holdup in the Turbine Building.  Most activity enters prior to isolation of Control Room via the supply air fans. The supply air is well mixed with the room air by means of the recirculation system.  No mixing per Reg. Guide 1.3 [5.8]
	Turbine Building (MSIV leakage)	0%	
	Control Room	100%	
	Secondary Containment	0%	
6.2	Turbine Building leak rate, vol./sec	1	Instantaneous release, which does not allow holdup, was conservatively assumed.
6.3	Timing aspects of radiological release model.	na	In accordance with the regulatory approach, the analysis assumes model is in effect at the onset of the accident and is maintained (with constant leakrates) for the duration of the event. Regulatory Guide 1.3, Section C.1.e states that "The primary containment should be assumed to leak at the leak rate incorporated or to be incorporated in the technical specifications for the duration of the accident." <sup>1</sup> The leakage should be assumed to pass directly to the emergency exhaust system without mixing <sup>2</sup> in the surrounding reactor building atmosphere and should then be assumed to be released as an elevated plume for those facilities with stacks." <sup>3</sup> [5.8]
6.4	Removal DF for all iodine species in the condenser:	10	See §3.1.3 discussion.

<sup>1</sup> The effect on containment leakage under accident conditions of features provided to reduce the leakage of radioactive materials from the containment will be evaluated on an individual case basis.

<sup>2</sup> In some cases, credit for mixing will be allowed; however, the amount of credit allowed will be evaluated on an individual case basis.

<sup>3</sup> Credit for an elevated release should be given only if the point of release is (1) more than two and one-half times the height of any structure close enough to affect the dispersion of the plume, or (2) located far enough from any structure which could have an affect on the dispersion of the plume. For those BWR's without stacks the atmospheric diffusion factors assuming ground level release given in section 2.h. should be used to determine site acceptability.



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## 7 COMPUTER CODES AND COMPUTER USED

The AXIDENT program was executed on a Dell Latitude laptop computer running a Windows NT Version 4.0 operating system as currently assigned to Harry A. Wagage. Satisfactory operation of the AXIDENT code on this computer has been confirmed by revalidation. Satisfactory operation of the AXIDENT code on this computer has been confirmed by revalidation. [Ref. 5.28] The original "AXIDENT" code library data used the very conservative DCFs that were in effect and used for the design basis 10CFR100 type reactor siting analyses (i.e., TID 14844 and ICRP Publication 2). [5.2, 5.4, 5.15] During this calculation the AXIDENT-code library data file was changed to use the newer and more accurate DCFs presented in ICRP 30. [5.14] See section 3.6 for additional discussion. A listing of the updated library (with the changes indicated) is provided in attachment 5.

## 8 DETAILED CALCULATIONS

### 8.1 Control Room Volume

Control Room parameters provided in §4.8.6.

Control Room proper

$$\text{Height} = 949'1.5'' - 932'6'' = 16.625'$$

$$\text{Volume} = (72') * (67.5') * (16.625') = 80,800 \text{ ft}^3$$

Cable Room

$$\text{Height} = 932'6'' - 918' = 14.5'$$

$$\text{Volume} = (72') * (67.5') * (14.5') + (37.25') * (48.25') * (14.5') = 96,530 \text{ ft}^3$$

$$\text{Total volume} = 80,800 + 96,530 = 177,330 \text{ ft}^3$$

Assuming 20% of the volumes include walls, floors, and equipment, the net volumes are:

$$\text{Control Room proper} = 64,640 \text{ ft}^3$$

$$\text{Control Room envelope} = 141,860 \text{ ft}^3$$

### 8.2 Additional Input to AXIDENT code

#### 8.2.1 Design MSIV Leak Rate

Using equation 2 and the following design input data, the fractional mass leak rate was calculated:

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MSIV leak rate per MSIV, scfh (§4.7.1)	11.5	for MSIV leak rate
<del>Peak</del> drywell pressure, $P_d$ , psia (§4.7.2)	65	
Number of outboard MSIVs (§4.7.3)	4	
Containment temperature at design-basis LOCA maximum peak <del>containment</del> pressure, $R$ (§4.7.4)	769	for MSIV leak rate
Standard pressure, psia (§4.7.5)	14.7	
Standard temperature, $R$ (§4.7.6)	520	

$$\begin{aligned} \frac{\dot{V}_d}{V_{cont}} &= (4) \frac{(11.5 \text{ scfh}) (14.7 \text{ psia}) (769 \text{ R})}{(239,100 \text{ ft}^3) (65 \text{ psia}) (520 \text{ R})} \\ &= 6.43E-5 \text{ h}^{-1} \\ &= 0.154 \frac{\%}{\text{day}} \\ &= 1.79E-8 \frac{\text{vol}}{\text{s}} \end{aligned}$$

**8.2.2 ESF Leakage**

Per §4.4.3,

Mass fluid in reactor vessel = 437,000 lb

Mass fluid in primary piping system = 89,000 lb

Total mass = 526,000 lb

Given a specific volume of 0.01672 ft<sup>3</sup>/lb for water at 212 F (ASME Steam Tables), the fluid volume is 8795 ft<sup>3</sup>.

Note that the values provided in §4.4.3 are for standard plant 218T548, but are considered adequate for estimating values for CNS. The fluid volume is less than 10% of the total volume and therefore inconsistencies with these values will have a minimal effect on the results of the calculation.

The ESF leak rate was calculated using the following values:

ESF Leak Data (directly to SGTS), cc/min (§4.6.1)	1000
ESF flashing fraction (§4.6.2)	10%
Volume of water in the suppression pool, ft <sup>3</sup> (§4.4.3)	87,650

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Volume of reactor coolant, ft<sup>3</sup> 8,795  
 Total ESF volume, ft<sup>3</sup> 96,445

The leakage of ESF as a fraction of the suppression pool volume  
 = (1000 cc/min)(1 min/60 s)(1E-6 m<sup>3</sup>/cc)(35.3 ft<sup>3</sup>/m<sup>3</sup>)(10%)/(96445 ft<sup>3</sup>)  
 = 6.10E-10 sup.-pool-vol./sec  
 = 0.005 %sup. pool vol./day

The initial activity in the suppression pool as listed in table 5 was obtained by multiplying the source term developed by AXIDENT in the base containment release case (Attachment 1a1) by 2 as described in § 3.3.

**Table 5. Core Inventory and ESF Leakage Source Term**

Isotope	Core Inventory from Attachment 1a1 (Ci)	ESF Leakage Source Term (Ci)
I-131	6.114E7	1.22E8
I-132	9.098E7	1.82E8
I-133	1.406E8	2.81E8
I-134	1.639E8	3.28E8
I-135	1.303E8	2.61E8

**8.2.3 Resultant Iodine Removal Efficiencies and Non-Removal Factors for SGTS/Control-Room-Intake Filters**

Resultant iodine removal efficiencies for SGTS filters were calculated using equation 4 in §3.8 as given in Table 6. The non-removal factor (NRF) is equal to one minus the efficiency; this is used for SGTS treatment of ESF leakage. The suppression pool decontamination factor of 2 for elemental and particulate iodine was incorporated into the non-removal factor (§4.4.2); this is used for SGTS treatment of containment leakage.

Resultant iodine non-removal factors for control room intake were calculated using the following Control Room design input in equation 4.

Unfiltered infiltration, scfm (§4.8.1) 71  
 Unfiltered ingress/egress, scfm (§4.8.1) 10  
 Total unfiltered intake, scfm (71 + 10) 81

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Normal supply air rate, scfm (§4.8.3)	3235
Emergency supply air rate, scfm (900 scfm ± 10%) (§4.8.3)	990
Charcoal filter efficiency for all iodine species (§4.8.4)	94%
Total control room intake during normal supply, scfm (81 + 3235)	3316
Total control room intake during emergency supply, scfm (81 + 990)	1071

**Table 6. Resultant Iodine Removal Efficiencies and Non-Removal Factors for SGTS Filters**

	Active	Inactive	Total		
<b>0 – 1 h: both trains operate; heater power to one train failed</b>					
Flow rate (cfm)	1492	1492	2984		
	Efficiency	Efficiency	Efficiency	NRF (1)	NRF incl. DF (2)
Elemental Iodine	94%	89%	91.5%	8.50E-2	4.25E-2
Particulate Iodine	94%	94%	94.0%	6.00E-2	3.00E-2
Organic Iodine	94%	29%	61.5%	0.385	0.385
<b>0 – 1 h: one train operates; the train w/ failed heater power shut off</b>					
Flow rate (cfm)	1492	288	1780		
	Efficiency	Efficiency	Efficiency	NRF (1)	NRF incl. DF (2)
Elemental Iodine	94%	89%	93.2%	6.81E-2	3.40E-2
Particulate Iodine	94%	94%	94.0%	6.00E-2	3.00E-2
Organic Iodine	94%	29%	83.5%	0.165	0.165

Notes:

1. NRF = non-removal factor = 1 – efficiency
2. NRF incl. DF incorporates suppression pool DF of 2 for elemental and particulate iodine.

Resultant removal efficiency for all iodine types for control room intake  
= [(81 scfm)(0%) + (990 scfm)(94%)]/(1071 scfm)  
= 86.9%

Resultant non-removal factor for all iodine types for control room intake  
= 1 – 0.869  
= 0.131

#### 8.2.4 Iodine Non-Removal Factors for Turbine Building for MSIV Leakage

The removal of iodine isotopes by condenser is modeled in the AXIDENT code as filter non-removal factors for the turbine building, which is treated as the secondary building. The iodine removal DF for all iodine species in the condenser is 10 (§6.4). Therefore, the non-removal factor for all iodine types is 0.10 (=1/10).

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### 8.2.5 X/Q Values for Control Room Intake

The site-specific values of X/Q for the control room intake that were calculated using the ARCON96 code were updated for the occupancy factors as given in Table 7.

**Table 7. Control Room Intake X/Q Values, Updated for Control Room Occupancy Factors**

Duration	X/Q (s/m <sup>3</sup> ) (§4.8.9)	Occupancy Factor (§4.8.8)	Resultant X/Q (s/m <sup>3</sup> )
<b>MSIV Leakage</b>			
0 - 2 hr	9.54E-4	1	9.54E-4
2 - 8 hr	4.93E-4	1	4.93E-4
8 - 24 hr	2.69E-4	1	2.69E-4
1 - 4 Days	1.72E-4	0.6	1.03E-4
4 - 30 Days	1.43E-4	0.4	5.72E-5
<b>SGTS Leakage (Containment and ESF)</b>			
0 - 2 hr	1.00E-9	1	1.00E-9
2 - 8 hr	2.65E-9	1	2.65E-9
8 - 24 hr	6.41E-8	1	6.41E-8
1 - 4 Days	2.00E-8	0.6	1.20E-8
4 - 30 Days	1.66E-8	0.4	6.64E-9

### 8.2.6 Miscellaneous Parameters Required by AXIDENT

No spray removal:

- FRA- time at which spray removal starts = 30 days = 2.6E6 sec
- Spray removal rates = 0
- Mixing flow rate between sprayed and unsprayed regions = 1
- Sprayed region volume = 1

Unsprayed region volume = Primary Containment volume = 239,100 ft<sup>3</sup>

## 9 COMPUTER INPUT AND OUTPUT

The AXIDENT code output for different runs that were performed are given in attachments as shown in the Table 8. At the beginning of each output is the listing of input values.

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**Table 8. Attachment Numbers Giving AXIDENT Code Output for Different Cases**

Release Path	LPZ and Control Room			EAB	
	0 - 21 m	21 m - 1 h	1 h - 30 d	0 - 1 h	1 h - 2 h
SGTS Release: Containment	1a1	1a2	1a3	2a1	2a2
SGTS Release: ESF	1b1	1b2	1b3	2b1	2b2
MSIV Leakage*	1c1	1c2		2c	

\* Note: MSIV leakage is independent on the secondary building release rate; thus, the same runs are used for both cases.

**10 SUMMARY OF RESULTS**

The AXIDENT code predicted doses to control room operator and to a person located at EAB and LPZ are listed in Table 9. All the calculated doses are below the regulatory limits listed in table 1.

**Table 9. AXIDENT Predictions of Doses in the Control Room and at EAB and LPZ at Cooper following a Design-Basis LOCA**

Rel. Path	LPZ Dose				CR Dose				EAB Dose			
	Att.	Thyroid (Rem)	Whole Body (Rem)	Beta (Rem)	Att.	Thyroid (Rem)	Whole Body (Rem)	Beta (Rem)	Att.	Thyroid (Rem)	Whole Body (Rem)	Beta (Rem)
SGTS: Cont.	1a1	6.06	1.60	0.647	1a1	1.11E-4	3.35E-7	6.44E-6	2a1	8.39	1.94	0.818
	1a2	5.04	0.858	0.402	1a2	1.01E-5	1.91E-7	3.77E-6	2a2	1.36	0.187	0.109
	1a3	57.7	2.26	2.45	1a3	2.38E-2	1.06E-4	3.75E-3	-	-	-	-
SGTS: ESF	1b1	0.173	1.03E-3	2.54E-4	1b1	3.17E-6	4.07E-10	3.28E-9	2b1	0.240	1.37E-3	3.39E-4
	1b2	0.144	7.46E-4	1.88E-4	1b2	2.88E-7	3.23E-11	2.73E-10	2b2	4.13E-2	1.64E-4	4.40E-5
	1b3	1.79	2.75E-3	1.03E-3	1b3	7.47E-4	1.52E-8	2.03E-7	-	-	-	-
MSIV	1c1	4.02E-4	5.54E-5	2.28E-5	1c1	3.57E-3	6.03E-6	1.14E-4	2c	2.31E-2	1.49E-3	7.96E-4
	1c2	3.94	1.54E-2	3.70E-2	1c2	6.59	6.52E-3	0.258	-	-	-	-
Total	-	74.8	4.74	3.54	-	6.62	6.63E-3	0.262	-	10.1	2.13	0.928

**11 CONCLUSIONS**

The AXIDENT code predicted doses to control room operator and to a person located at EAB and LPZ are listed in Table 9. All the calculated doses are below the regulatory limits listed in table 1.

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AXIDENT VER 2 MOD 4

PRODUCTION DATE 02/18/92  
 BEGIN EXECUTION DATE: 03/14/2000  
 BEGIN EXECUTION TIME: 11:21:04.78

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 0 - 21 m  
 2 2 2 1.0 1.0  
 3 2429 2.6E6 141860 64640  
 4 0.0 0.0 0.0 1.0 1.0 2.391E5 0.0  
 5 1260 2.592E6  
 6 2\*7.35E-8  
 7 2\*1.0  
 8 2\*1.0  
 9 3316. 1071.  
 10 1.40E-4 0.  
 11 1.00E-9 0.  
 12 2\*0.0  
 13 2\*0.0  
 14 2\*0.0  
 15 2\*0.0  
 16 2\*0.0  
 17 2\*0.0  
 18 2\*0.0  
 19 2\*0.0  
 20 2\*0.0  
 21 4.25E-2 3.00E-2 0.385 3\*1.  
 22 3\*1.

1

CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 0 - 21 m

INITIAL CONTAINMENT INVENTORY

ISOTOPE ACTIVITY (CURIES)

I-131 6.114E+07  
 I-132 9.098E+07  
 I-133 1.406E+08  
 I-134 1.639E+08  
 I-135 1.303E+08  
 XE-131M 4.622E+05  
 XE-133M 3.572E+06  
 XE-133 1.406E+08  
 XE-135M 3.782E+07  
 XE-135 1.324E+08  
 XE-138 1.240E+08  
 KR-83M 1.093E+07  
 KR-85M 2.731E+07  
 KR-85 9.167E+05  
 KR-87 5.253E+07  
 KR-88 7.480E+07

1

CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 0 - 21 m

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT .350 HOURS: X/Q(SITE)= .14E-03 SEC/M3 PRIMARY LEAK RATE= .635 PERCENT/DAY CONTROL ROOM INTAKE=3316.0 CFM

00.00 X/Q CONT ROOM= .10E-08 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM =

	CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS	
	SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER
ELEMENTAL	.000	.000	.000	.000	.043	1.000
PARTICULATE	.000	.000	.000	.000	.030	1.000
ORGANIC	.000	.000	.000	.000	.385	1.000

ISOTOPE	ACTIVITY (CURIES)			CONTROL ROOM (CURIES) (UCI/CM3)			SITE BOUNDARY DOSES (REM)			CONTROL ROOM DOSES (REM)		
	PRIMARY	SECONDARY	RELEASE	THYROID	WH BODY	BETA	THYROID	WH BODY	BETA	THYROID	WH BODY	BETA
ELEMENTAL												
I-131	1.39E+07	1.02E+00	5.47E+01	6.76E-08	1.68E-11	2.92E+00	7.10E-04	3.47E-04	4.37E-06	3.93E-11	5.19E-10	
I-132	1.86E+07	1.37E+00	7.72E+01	9.06E-08	2.26E-11	2.36E-02	6.49E-03	1.11E-03	3.48E-08	3.06E-10	1.64E-09	
I-133	3.16E+07	2.32E+00	1.25E+02	1.54E-07	3.83E-11	1.09E+00	2.09E-03	1.70E-03	1.63E-06	1.45E-10	2.55E-09	
I-134	2.82E+07	2.07E+00	1.28E+02	1.37E-07	3.41E-11	6.83E-03	8.68E-03	1.87E-03	9.79E-09	5.29E-10	2.68E-09	

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0.00E+00 0.00E+00 0.00E+00 1.02E-04 2.88E-07 5.52E-06

TOTAL DOSES 0-30 DAYS 6.06E+00 1.60E+00 6.47E-01 1.11E-04 3.35E-07 6.44E-06

1

CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 0 - 21 m

ISOTOPE	ACTIVITY RELEASED (CURIES)		
	0. HRS	720. HRS	
<b>ELEMENTAL</b>			
I-131	5.47E+01	3.80E+04	3.81E+04
I-132	7.72E+01	6.94E+02	7.72E+02
I-133	1.25E+02	1.07E+04	1.08E+04
I-134	1.28E+02	3.96E+02	5.24E+02
I-135	1.14E+02	3.10E+03	3.22E+03
<b>PARTICULATE</b>			
I-131	2.12E+00	1.47E+03	1.48E+03
I-132	3.00E+00	2.69E+01	2.99E+01
I-133	4.85E+00	4.14E+02	4.19E+02
I-134	4.96E+00	1.54E+01	2.03E+01
I-135	4.44E+00	1.20E+02	1.25E+02
<b>ORGANIC</b>			
I-131	2.18E+01	1.51E+04	1.52E+04
I-132	3.08E+01	2.77E+02	3.07E+02
I-133	4.98E+01	4.25E+03	4.30E+03
I-134	5.09E+01	1.58E+02	2.09E+02
I-135	4.56E+01	1.24E+03	1.28E+03
<b>NOBLE GASES</b>			
XE-131M	4.28E+01	3.87E+04	3.87E+04
XE-133M	3.30E+02	7.21E+04	7.24E+04
XE-133	1.30E+04	6.37E+06	6.38E+06
XE-135M	2.27E+03	1.48E+03	3.75E+03
XE-135	1.21E+04	4.47E+05	4.59E+05
XE-138	7.79E+03	6.01E+03	1.38E+04
KR-83M	9.48E+02	6.84E+03	7.79E+03
KR-85M	2.46E+03	4.33E+04	4.58E+04
KR-85	8.48E+01	1.59E+05	1.59E+05
KR-87	4.42E+03	2.10E+04	2.54E+04
KR-88	6.63E+03	7.32E+04	7.98E+04

END EXECUTION DATE: 03/14/2000  
END EXECUTION TIME: 11:21:04.89

NEDC 99-033 r1 ATTACH 1  
SHEET 34 OF 84

AXIDENT VER 2 MOD 4

PRODUCTION DATE 02/18/92  
 BEGIN EXECUTION DATE: 03/14/2000  
 BEGIN EXECUTION TIME: 11:21:05.00

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 21 m - 1 h  
 2 4 2 1.0 1.0  
 3 2429 2.6E6 141860 64640  
 4 0.0 0.0 0.0 1.0 1.0 2.391E5 0.0  
 5 1260 1800 3600 2.592E6  
 6 4\*7.35E-8  
 7 4\*1.0  
 8 4\*1.0  
 9 3235. 3\*1071.  
 10 0. 1.40E-4 4.00E-5 0.  
 11 0. 1.00E-9 1.00E-9 0.  
 12 4\*0.0  
 13 4\*0.0  
 14 4\*0.0  
 15 4\*0.0  
 16 4\*0.0  
 17 4\*0.0  
 18 4\*0.0  
 19 4\*0.0  
 20 4\*0.0  
 21 4.25E-2 3.00E-2 0.385 3\*0.131  
 22 3\*1.

1

CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 21 m - 1 h

INITIAL CONTAINMENT INVENTORY

ISOTOPE	ACTIVITY (CURIES)
I-131	6.114E+07
I-132	9.098E+07
I-133	1.406E+08
I-134	1.639E+08
I-135	1.303E+08
XE-131M	4.622E+05
XE-133M	3.572E+06
XE-133	1.406E+08
XE-135M	3.782E+07
XE-135	1.324E+08
XE-138	1.240E+08
KR-83M	1.093E+07
KR-85M	2.731E+07
KR-85	9.167E+05
KR-87	5.253E+07
KR-88	7.480E+07

1

CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 21 m - 1 h

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

VOL

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED

AT  
CFM

.350 HOURS: X/Q(SITE)= .00E+00 SEC/M3 PRIMARY LEAK RATE= .635 PERCENT/DAY CONTROL ROOM INTAKE=3235.0

00.00

X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM =

	CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS	
	SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER
ELEMENTAL	.000	.000	.000	.000	.043	.131
PARTICULATE	.000	.000	.000	.000	.030	.131
ORGANIC	.000	.000	.000	.000	.385	.131

ISOTOPE	ACTIVITY (CURIES)			CONTROL ROOM (CURIES) (UCI/CM3)			SITE BOUNDARY DOSES (REM)			CONTROL ROOM DOSES (REM)		
	PRIMARY	SECONDARY	RELEASE	THYROID	WH	BODY	THYROID	WH	BODY	THYROID	WH	BETA
ELEMENTAL												
I-131	1.39E+07	1.02E+00	5.47E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-132	1.86E+07	1.37E+00	7.72E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-133	3.16E+07	2.32E+00	1.25E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-134	2.82E+07	2.07E+00	1.28E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

NEDC 99-033-1 ATTACH 1  
 SHEET 35 OF 84



2.59E+00 5.00E-01 2.25E-01 8.04E-08 2.64E-09 5.16E-08

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 21 m - 1 h

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 1.000 HOURS: X/Q(SITE)= .40E-04 SEC/M3 PRIMARY LEAK RATE= .635 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM
X/Q CONT ROOM= .10E-08 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

Table with columns: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Rows include ELEMENTAL, PARTICULATE, and ORGANIC with sub-columns for SPRAY, PRIMARY, SECONDARY, CONT CENTER, RELEASE, and CONT CENTER.

Table with columns: ISOTOPE, ACTIVITY (CURIES), CONTROL ROOM, SITE BOUNDARY DOSES (REM), CONTROL ROOM DOSES (REM). Rows include ELEMENTAL, PARTICULATE, ORGANIC, and NOBLE GASES with sub-columns for PRIMARY, SECONDARY, RELEASE, (CURIES), (UCI/CM3), THYROID, WH, BODY, BETA, THYROID, WH, BODY, BETA.

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 21 m - 1 h

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 720.000 HOURS: X/Q(SITE)= .00E+00 SEC/M3 PRIMARY LEAK RATE= .635 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM
X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

Table with columns: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Rows include ELEMENTAL, PARTICULATE, and ORGANIC with sub-columns for SPRAY, PRIMARY, SECONDARY, CONT CENTER, RELEASE, and CONT CENTER.

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ISOTOPE	ACTIVITY (CURIES)			CONTROL ROOM		SITE BOUNDARY DOSES (REM)			CONTROL ROOM DOSES (REM)		
	PRIMARY	SECONDARY	RELEASE	(CURIES)	(UCI/CM3)	THYROID	WH BODY	BETA	THYROID	WH BODY	BETA
ELEMENTAL											
I-131	8.67E+05	6.38E-02	3.79E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.35E-06	3.91E-11	5.17E-10
I-132	1.03E-87	7.57E-95	5.71E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.67E-08	1.46E-10	7.86E-10
I-133	1.26E-03	9.24E-11	1.05E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.49E-06	1.32E-10	2.33E-09
I-134	0.00E+00	0.00E+00	2.36E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.92E-09	1.04E-10	5.26E-10
I-135	1.21E-25	8.87E-33	2.90E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.94E-07	2.02E-10	1.28E-09
PARTICULATE											
I-131	4.77E+04	3.50E-03	1.47E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.69E-07	1.52E-12	2.00E-11
I-132	5.66E-89	4.16E-96	2.21E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.47E-10	5.68E-12	3.05E-11
I-133	6.91E-05	5.08E-12	4.05E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.79E-08	5.13E-12	9.02E-11
I-134	0.00E+00	0.00E+00	9.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.45E-11	4.02E-12	2.04E-11
I-135	6.63E-27	4.87E-34	1.13E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.53E-09	7.84E-12	4.96E-11
ORGANIC											
I-131	3.81E+04	2.80E-03	1.51E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.73E-06	1.56E-11	2.06E-10
I-132	4.53E-89	3.33E-96	2.27E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.64E-09	5.83E-11	3.13E-10
I-133	5.53E-05	4.06E-12	4.16E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.95E-07	5.26E-11	9.26E-10
I-134	0.00E+00	0.00E+00	9.39E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.64E-10	4.13E-11	2.10E-10
I-135	5.31E-27	3.90E-34	1.16E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.73E-08	8.05E-11	5.09E-10
NOBLE GASES											
XE-131M	6.57E+04	4.83E-03	3.86E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.07E-11	2.12E-09
XE-133M	2.98E+02	2.19E-05	7.15E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.01E-10	1.82E-08
XE-133	2.26E+06	1.66E-01	6.34E+06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.82E-08	6.91E-07
XE-135M	0.00E+00	0.00E+00	2.62E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.29E-10	1.27E-09
XE-135	1.94E-16	1.42E-23	4.26E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.57E-08	1.16E-06
XE-138	0.00E+00	0.00E+00	1.28E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.93E-09	5.06E-08
KR-83M	0.00E+00	0.00E+00	5.38E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.25E-10	4.83E-09
KR-85M	1.12E-42	8.22E-50	3.91E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.01E-09	1.38E-07
KR-85	7.54E+05	5.54E-02	1.58E+05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.71E-12	7.00E-09
KR-87	0.00E+00	0.00E+00	1.47E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.30E-08	4.95E-07
KR-88	2.21E-70	1.62E-77	6.23E+04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.77E-08	4.41E-07
						0.00E+00	0.00E+00	0.00E+00	8.71E-06	1.52E-07	3.02E-06
TOTAL DOSES 0-30 DAYS						5.04E+00	8.58E-01	4.02E-01	1.01E-05	1.91E-07	3.77E-06

1

CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 21 m - 1 h

ISOTOPE	ACTIVITY RELEASED (CURIES)		
	1. HRS	720. HRS	
ELEMENTAL			
I-131	1.56E+02	3.79E+04	3.81E+04
I-132	2.01E+02	5.71E+02	7.72E+02
I-133	3.54E+02	1.05E+04	1.08E+04
I-134	2.89E+02	2.36E+02	5.24E+02
I-135	3.16E+02	2.90E+03	3.22E+03
PARTICULATE			
I-131	6.05E+00	1.47E+03	1.48E+03
I-132	7.79E+00	2.21E+01	2.99E+01
I-133	1.37E+01	4.05E+02	4.19E+02
I-134	1.12E+01	9.14E+00	2.03E+01
I-135	1.23E+01	1.13E+02	1.25E+02
ORGANIC			
I-131	6.21E+01	1.51E+04	1.52E+04
I-132	8.00E+01	2.27E+02	3.07E+02
I-133	1.41E+02	4.16E+03	4.30E+03
I-134	1.15E+02	9.39E+01	2.09E+02
I-135	1.26E+02	1.16E+03	1.28E+03
NOBLE GASES			
XE-131M	1.22E+02	3.86E+04	3.87E+04
XE-133M	9.39E+02	7.15E+04	7.24E+04
XE-133	3.71E+04	6.34E+06	6.38E+06
XE-135M	3.49E+03	2.62E+02	3.75E+03
XE-135	3.37E+04	4.26E+05	4.59E+05
XE-138	1.25E+04	1.28E+03	1.38E+04
KR-83M	2.41E+03	5.38E+03	7.79E+03
KR-85M	6.68E+03	3.91E+04	4.58E+04
KR-85	2.42E+02	1.58E+05	1.59E+05
KR-87	1.07E+04	1.47E+04	2.54E+04
KR-88	1.75E+04	6.23E+04	7.98E+04

END EXECUTION DATE: 03/14/2000  
 END EXECUTION TIME: 11:21:05.11

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 SHEET 38 OF 84

AXIDENT VER 2 MOD 4

PRODUCTION DATE 02/18/92
BEGIN EXECUTION DATE: 03/14/2000
BEGIN EXECUTION TIME: 11:21:06.43

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 1 h - 30 d
2 6 2 1.0 1.0
3 2429 2.6E6 141860 64640
4 0.0 0.0 0.0 1.0 1.0 2.391E5 0.0
5 3600 7.2E3 2.88E4 8.64E4 3.456E5 2.592E6
6 6\*7.35E-8
7 6\*1.0
8 6\*1.0
9 6\*1071.
10 0. 4.00E-5 4.00E-5 1.60E-5 5.80E-6 1.70E-6
11 0. 1.00E-9 2.65E-9 6.41E-8 1.20E-8 6.64E-9
12 6\*0.0
13 6\*0.0
14 6\*0.0
15 6\*0.0
16 6\*0.0
17 6\*0.0
18 6\*0.0
19 6\*0.0
20 6\*0.0
21 3.40E-2 3.00E-2 0.165 3\*0.131
22 3\*1.

1

CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 1 h - 30 d

INITIAL CONTAINMENT INVENTORY

Table with 2 columns: ISOTOPE, ACTIVITY (CURIES). Lists isotopes like I-131, I-132, I-133, I-134, I-135, XE-131M, XE-133M, XE-133, XE-135M, XE-135, XE-138, KR-83M, KR-85M, KR-85, KR-87, KR-88 with their respective activities.

1

CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 1 h - 30 d

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EPF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 1.000 HOURS: X/Q(SITE)= .00E+00 SEC/M3 PRIMARY LEAK RATE= .635 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM

X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

Table with 7 columns: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Sub-columns include SPRAY, PRIMARY, SECONDARY, CONT CENTER, RELEASE, and CONT CENTER. Rows include ELEMENTAL, PARTICULATE, and ORGANIC.

Table with 12 columns: ISOTOPE, ACTIVITY (CURIES) (PRIMARY, SECONDARY, RELEASE), CONTROL ROOM DOSES (REM) (UCI/CM3), and SITE BOUNDARY DOSES (REM) (THYROID, WH BODY, BETA). Rows include ELEMENTAL, I-131, I-132, I-133, I-134, and I-135.

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1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 1 h - 30 d

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 8.000 HOURS: X/Q(SITE)= .40E-04 SEC/M3 PRIMARY LEAK RATE= .635 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM

X/Q CONT ROOM= .27E-08 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

Table with columns: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Includes sub-tables for ELEMENTAL, PARTICULATE, ORGANIC, and NOBLE GASES with various isotope activity and dose data.

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 1 h - 30 d

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 24.000 HOURS: X/Q(SITE)= .16E-04 SEC/M3 PRIMARY LEAK RATE= .635 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM

X/Q CONT ROOM= .64E-07 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

Table with columns: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Includes sub-tables for ELEMENTAL, PARTICULATE, ORGANIC, and NOBLE GASES with various isotope activity and dose data.

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ELEMENTAL

Table with 12 columns of numerical data for Elemental isotopes I-131, I-132, I-133, I-134, and I-135.

PARTICULATE

Table with 12 columns of numerical data for Particulate isotopes I-131, I-132, I-133, I-134, and I-135.

ORGANIC

Table with 12 columns of numerical data for Organic isotopes I-131, I-132, I-133, I-134, and I-135.

NOBLE GASES

Table with 12 columns of numerical data for Noble Gases isotopes XE-131M, XE-133M, XE-133, XE-135M, XE-135, XE-138, KR-83M, KR-85M, KR-85, KR-87, and KR-88.

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 1 h - 30 d

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 96.000 HOURS: X/Q(SITE)= .58E-05 SEC/M3 PRIMARY LEAK RATE= .635 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM

00.00 X/Q CONT ROOM= .12E-07 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM =

Table with 7 columns: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Rows include ELEMENTAL, PARTICULATE, and ORGANIC.

Table with 12 columns: ISOTOPE, ACTIVITY (CURIES), CONTROL ROOM (CURIES) (UCI/CM3), SITE BOUNDARY DOSES (REM), CONTROL ROOM DOSES (REM). Rows include ELEMENTAL, PARTICULATE, ORGANIC, and NOBLE GASES.

NEDC 99-033 r/ATTACH 1 SHEET 42 OF 84

KR-85M	7.10E+00	5.22E-07	1.03E+03	2.52E-11	6.27E-15	0.00E+00	2.34E-04	3.21E-04	0.00E+00	4.09E-08	1.41E-06
KR-85	8.93E+05	6.56E-02	1.72E+04	3.17E-06	7.88E-10	0.00E+00	5.23E-05	5.11E-03	0.00E+00	4.65E-09	1.20E-05
KR-87	7.86E-16	5.78E-23	4.99E-02	2.79E-27	6.94E-31	0.00E+00	9.95E-08	6.99E-08	0.00E+00	1.28E-11	4.89E-10
KR-88	3.44E-03	2.53E-10	2.08E+02	1.22E-14	3.04E-18	0.00E+00	5.25E-04	9.46E-05	0.00E+00	8.74E-08	4.96E-07
						1.45E+01	1.21E-01	4.22E-01	6.84E-03	2.73E-05	1.04E-03

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 1 h - 30 d

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 720.000 HOURS: X/Q(SITE)= .17E-05 SEC/M3 PRIMARY LEAK RATE= .635 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM

X/Q CONT ROOM= .66E-08 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS	
SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER
ELEMENTAL	.000	.000	.000	.034	.131
PARTICULATE	.000	.000	.000	.030	.131
ORGANIC	.000	.000	.000	.165	.131

ISOTOPE	ACTIVITY (CURIES)			CONTROL ROOM (CURIES) (UCI/CM3)		SITE BOUNDARY DOSES (REM)			CONTROL ROOM DOSES (REM)		
	PRIMARY	SECONDARY	RELEASE	THYROID	WH BODY	BETA	THYROID	WH BODY	BETA		
ELEMENTAL											
I-131	8.67E+05	6.38E-02	2.04E+04	7.58E-09	1.89E-12	8.85E+00	3.22E-03	1.57E-03	6.83E-03	6.14E-08	8.11E-07
I-132	1.03E-87	7.57E-95	1.65E-10	9.00-102	2.24-105	4.09E-16	1.68E-16	2.89E-17	4.15E-19	3.64E-21	1.95E-20
I-133	1.26E-03	9.24E-11	3.54E+02	1.10E-17	2.74E-21	2.52E-02	7.18E-05	5.86E-05	2.03E-05	1.80E-09	3.17E-08
I-134	0.00E+00	0.00E+00	1.96E-31	0.00E+00	0.00E+00	8.48E-38	1.61E-37	3.48E-38	9.85E-41	5.32E-42	2.70E-41
I-135	1.21E-25	8.87E-33	1.24E-01	1.05E-39	2.63E-43	1.51E-06	9.34E-08	1.49E-08	1.33E-09	1.39E-12	8.76E-12
PARTICULATE											
I-131	4.77E+04	3.50E-03	9.89E+02	3.67E-10	9.15E-14	4.29E-01	1.56E-04	7.62E-05	3.31E-04	2.98E-09	3.93E-08
I-132	5.66E-89	4.16E-96	7.99E-12	4.36-103	1.09-106	1.98E-17	8.15E-18	1.40E-18	2.01E-20	1.76E-22	9.47E-22
I-133	6.91E-05	5.08E-12	1.72E+01	5.33E-19	1.33E-22	1.22E-03	3.48E-06	2.84E-06	9.85E-07	8.72E-11	1.53E-09
I-134	0.00E+00	0.00E+00	9.48E-33	0.00E+00	0.00E+00	4.11E-39	7.81E-39	1.69E-39	4.77E-42	2.58E-43	1.31E-42
I-135	6.63E-27	4.87E-34	5.99E-03	5.11E-41	1.27E-44	7.32E-08	4.53E-09	7.21E-10	6.45E-11	6.72E-14	4.25E-13
ORGANIC											
I-131	3.81E+04	2.80E-03	4.35E+03	1.62E-09	4.02E-13	1.89E+00	6.86E-04	3.35E-04	1.46E-03	1.31E-08	1.73E-07
I-132	4.53E-89	3.33E-96	3.51E-11	1.92-102	4.78-106	8.73E-17	3.58E-17	6.16E-18	8.84E-20	7.76E-22	4.17E-21
I-133	5.53E-05	4.06E-12	7.56E+01	2.34E-18	5.83E-22	5.37E-03	1.53E-05	1.25E-05	4.34E-06	3.84E-10	6.75E-09
I-134	0.00E+00	0.00E+00	4.17E-32	0.00E+00	0.00E+00	1.81E-38	3.44E-38	7.42E-39	2.10E-41	1.13E-42	5.76E-42
I-135	5.31E-27	3.90E-34	2.64E-02	2.25E-40	5.60E-44	3.22E-07	1.99E-08	3.17E-09	2.84E-10	2.96E-13	1.87E-12
NOBLE GASES											
XE-131M	6.57E+04	4.83E-03	2.84E+04	1.29E-07	3.21E-11	0.00E+00	2.65E-04	1.50E-03	0.00E+00	1.69E-07	5.89E-06
XE-133M	2.98E+02	2.19E-05	2.07E+04	5.84E-10	1.45E-13	0.00E+00	2.90E-04	1.25E-03	0.00E+00	5.54E-08	5.01E-06
XE-133	2.26E+06	1.66E-01	3.63E+06	4.43E-06	1.10E-09	0.00E+00	4.63E-02	2.07E-01	0.00E+00	2.15E-05	8.19E-04
XE-135M	0.00E+00	0.00E+00	3.13-108	0.00E+00	0.00E+00	0.00E+00	5.61-115	1.19-115	0.00E+00	1.41-118	7.84-118
XE-135	1.94E-16	1.42E-23	3.05E+02	3.80E-28	9.46E-32	0.00E+00	3.19E-05	3.84E-05	0.00E+00	5.16E-09	1.68E-07
XE-138	0.00E+00	0.00E+00	1.17E-95	0.00E+00	0.00E+00	0.00E+00	1.43-101	3.66-102	0.00E+00	9.18-106	2.40-104
KR-83M	0.00E+00	0.00E+00	2.64E-12	0.00E+00	0.00E+00	0.00E+00	5.60E-21	3.51E-20	0.00E+00	1.64E-23	1.87E-22
KR-85M	1.12E-42	8.22E-50	1.19E-02	2.19E-54	5.46E-58	0.00E+00	7.89E-10	1.08E-09	0.00E+00	1.48E-13	5.12E-12
KR-85	7.54E+05	5.54E-02	1.36E+05	1.48E-06	3.68E-10	0.00E+00	1.21E-04	1.18E-02	0.00E+00	1.80E-08	4.64E-05
KR-87	0.00E+00	0.00E+00	3.80E-19	0.00E+00	0.00E+00	0.00E+00	2.22E-25	1.56E-25	0.00E+00	2.31E-29	8.79E-28
KR-88	2.21E-70	1.62E-77	3.67E-06	4.33E-82	1.08E-85	0.00E+00	2.72E-12	4.89E-13	0.00E+00	4.33E-16	2.46E-15
						1.12E+01	5.12E-02	2.24E-01	8.64E-03	2.18E-05	8.78E-04
TOTAL DOSES 0-30 DAYS						5.77E+01	2.26E+00	2.45E+00	2.38E-02	1.06E-04	3.75E-03

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: CONT. REL: 1 h - 30 d

ISOTOPE	ACTIVITY RELEASED (CURIES)				
	2. HRS	8. HRS	24. HRS	96. HRS	720. HRS
ELEMENTAL					
I-131	2.49E+02	7.37E+02	1.88E+03	7.17E+03	2.04E+04
I-132	2.80E+02	2.82E+02	5.49E+01	4.44E-01	1.65E-10
I-133	5.57E+02	1.46E+03	2.73E+03	3.54E+03	3.54E+02
I-134	3.35E+02	8.41E+01	7.00E-01	1.95E-06	1.96E-31
I-135	4.82E+02	9.68E+02	9.10E+02	2.14E+02	1.24E-01
PARTICULATE					
I-131	1.21E+01	3.57E+01	9.13E+01	3.48E+02	9.89E+02
I-132	1.36E+01	1.37E+01	2.66E+00	2.15E-02	7.99E-12
I-133	2.70E+01	7.10E+01	1.33E+02	1.71E+02	1.72E+01
I-134	1.62E+01	4.08E+00	3.39E-02	9.45E-08	9.48E-33
I-135	2.33E+01	4.70E+01	4.41E+01	1.04E+01	5.99E-03

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ORGANIC						
I-131	5.32E+01	1.57E+02	4.02E+02	1.53E+03	4.35E+03	6.49E+03
I-132	5.96E+01	6.03E+01	1.17E+01	9.47E-02	3.51E-11	1.32E+02
I-133	1.19E+02	3.12E+02	5.83E+02	7.54E+02	7.56E+01	1.84E+03
I-134	7.14E+01	1.79E+01	1.49E-01	4.16E-07	4.17E-32	8.95E+01
I-135	1.03E+02	2.07E+02	1.94E+02	4.57E+01	2.64E-02	5.49E+02
NOBLE GASES						
XE-131M	2.44E+02	7.24E+02	1.87E+03	7.50E+03	2.84E+04	3.87E+04
XE-133M	1.87E+03	5.31E+03	1.23E+04	3.23E+04	2.07E+04	7.24E+04
XE-133	7.40E+04	2.17E+05	5.43E+05	1.91E+06	3.63E+06	6.38E+06
XE-135M	3.74E+03	1.82E+01	2.08E-06	6.38E-25	3.13-108	3.75E+03
XE-135	6.50E+04	1.45E+05	1.76E+05	7.34E+04	3.05E+02	4.59E+05
XE-138	1.37E+04	1.19E+02	7.66E-05	2.36E-21	1.17E-95	1.38E+04
KR-83M	4.08E+03	3.31E+03	3.99E+02	1.06E+00	2.64E-12	7.79E+03
KR-85M	1.24E+04	2.04E+04	1.19E+04	1.03E+03	1.19E-02	4.58E+04
KR-85	4.85E+02	1.45E+03	3.86E+03	1.72E+04	1.36E+05	1.59E+05
KR-87	1.69E+04	8.18E+03	3.18E+02	4.99E-02	3.80E-19	2.54E+04
KR-88	3.12E+04	3.76E+04	1.08E+04	2.08E+02	3.67E-06	7.98E+04

END EXECUTION DATE: 03/14/2000  
END EXECUTION TIME: 11:21:06.59

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AXIDENT VER 2 MOD 4

PRODUCTION DATE 02/18/92
BEGIN EXECUTION DATE: 03/14/2000
BEGIN EXECUTION TIME: 11:21:05.22

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 0 - 21 m
2 2 2 1.0 1.0
3 -2429 2.6E6 141860 64640
4 0.0 0.0 0.0 1.0 1.0 2.391E5 0.0
5 1260 2.592E6
6 2\*6.10E-10
7 2\*1.0
8 2\*1.0
9 3316. 1071.
10 1.40E-4 0.
11 1.00E-9 0.
12 2\*0.0
13 2\*0.0
14 2\*0.0
15 2\*0.0
16 2\*0.0
17 2\*0.0
18 2\*0.0
19 2\*0.0
20 2\*0.0
21 8.50E-2 6.00E-2 0.385 3\*1.
22 3\*1.
23 1.22E8 1.82E8 2.81E8 3.28E8 2.61E8 3\*0.
24 8\*0.

1

CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 0 - 21 m

INITIAL CONTAINMENT INVENTORY

Table with 2 columns: ISOTOPE, ACTIVITY (CURIES). Lists isotopes like I-131, I-132, I-133, I-134, I-135, XE-131M, XE-133M, XE-133, XE-135M, XE-135, XE-138, KR-83M, KR-85M, KR-85, KR-87, KR-88 and their activities.

1

CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 0 - 21 m

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT .350 HOURS: X/Q(SITE)= .14E-03 SEC/M3 PRIMARY LEAK RATE= .005 PERCENT/DAY CONTROL ROOM INTAKE=3316.0 CFM

X/Q CONT ROOM= .10E-08 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

Table with 2 main sections: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Includes sub-columns for SPRAY, PRIMARY, SECONDARY, CONT CENTER, RELEASE, and CONT CENTER.

Table with 4 main columns: ACTIVITY (CURIES), CONTROL ROOM DOSES (REM), SITE BOUNDARY DOSES (REM), CONTROL ROOM DOSES (REM). Includes sub-columns for ISOTOPE, PRIMARY, SECONDARY, RELEASE, THYROID, WH BODY, BETA.

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0.00E+00 0.00E+00 0.00E+00 2.91E-06 3.54E-10 2.91E-09

TOTAL DOSES 0-30 DAYS 1.73E-01 1.03E-03 2.54E-04 3.17E-06 4.07E-10 3.28E-09

1

CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 0 - 21 m

ISOTOPE	ACTIVITY RELEASED (CURIES)	
	0. HRS	720. HRS
<b>ELEMENTAL</b>		
I-131	1.81E+00	1.33E+03
I-132	2.57E+00	2.31E+01
I-133	4.15E+00	3.57E+02
I-134	4.25E+00	1.32E+01
I-135	3.81E+00	1.03E+02
<b>PARTICULATE</b>		
I-131	7.02E-02	5.17E+01
I-132	9.95E-02	8.95E-01
I-133	1.61E-01	1.39E+01
I-134	1.65E-01	5.11E-01
I-135	1.48E-01	4.01E+00
<b>ORGANIC</b>		
I-131	3.60E-01	2.65E+02
I-132	5.11E-01	4.60E+00
I-133	8.26E-01	7.11E+01
I-134	8.46E-01	2.62E+00
I-135	7.58E-01	2.06E+01
<b>NOBLE GASES</b>		
XE-131M	0.00E+00	0.00E+00
XE-133M	0.00E+00	0.00E+00
XE-133	0.00E+00	0.00E+00
XE-135M	0.00E+00	0.00E+00
XE-135	0.00E+00	0.00E+00
XE-138	0.00E+00	0.00E+00
KR-83M	0.00E+00	0.00E+00
KR-85M	0.00E+00	0.00E+00
KR-85	0.00E+00	0.00E+00
KR-87	0.00E+00	0.00E+00
KR-88	0.00E+00	0.00E+00

END EXECUTION DATE: 03/14/2000  
END EXECUTION TIME: 11:21:05.28

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AXIDENT VER 2 MOD 4

PRODUCTION DATE 02/18/92
BEGIN EXECUTION DATE: 03/14/2000
BEGIN EXECUTION TIME: 11:21:05.39

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 21 m - 1 h
2 4 2 1.0 1.0
3 -2429 2.6E6 141860 64640
4 0.0 0.0 0.0 1.0 1.0 2.391E5 0.0
5 1260 1800 3600 2.592E6
6 4\*6.10E-10
7 4\*1.0
8 4\*1.0
9 3235. 3\*1071.
10 0. 1.40E-4 4.00E-5 0.
11 0. 1.00E-9 1.00E-9 0.
12 4\*0.0
13 4\*0.0
14 4\*0.0
15 4\*0.0
16 4\*0.0
17 4\*0.0
18 4\*0.0
19 4\*0.0
20 4\*0.0
21 8.50E-2 6.00E-2 0.385 3\*0.131
22 3\*1.
23 1.22E8 1.82E8 2.81E8 3.28E8 2.61E8 3\*0.
24 8\*0.

1

CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 21 m - 1 h

INITIAL CONTAINMENT INVENTORY

Table with 2 columns: ISOTOPE, ACTIVITY (CURIES). Lists isotopes like I-131, I-132, I-133, I-134, I-135, XE-131M, XE-133M, XE-133, XE-135M, XE-135, XE-138, KR-83M, KR-85M, KR-85, KR-87, KR-88 with their respective activities.

1

CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 21 m - 1 h

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT .350 HOURS: X/Q(SITE)= .00E+00 SEC/M3 PRIMARY LEAK RATE= .005 PERCENT/DAY CONTROL ROOM INTAKE=3235.0 CFM

X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

Table with 7 columns: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Sub-columns include SPRAY, PRIMARY, SECONDARY, CONT CENTER, RELEASE, and CONT CENTER. Rows include ELEMENTAL, PARTICULATE, and ORGANIC.

Table with 12 columns: ACTIVITY (CURIES) and CONTROL ROOM DOSES (REM). Sub-columns include ISOTOPE, PRIMARY, SECONDARY, RELEASE, CONTROL ROOM (CURIES), (UCI/CM3), THYROID, WH, BODY, BETA, THYROID, WH, BODY, BETA. Rows include ELEMENTAL, I-131, I-132, and I-133.

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Table with 12 columns and multiple rows of data. Categories include PARTICULATE, ORGANIC, and NOBLE GASES. Values are in scientific notation (e.g., 5.64E+07, 3.44E-02).

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 21 m - 1 h

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO

AT .500 HOURS: X/Q(SITE)= .14E-03 SEC/M3 PRIMARY LEAK RATE= .005 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM

X/Q CONT ROOM= .10E-08 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

Table with 2 main sections: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Columns include SPRAY, PRIMARY, SECONDARY, CONT CENTER, RELEASE, and CONT CENTER. Rows include ELEMENTAL, PARTICULATE, and ORGANIC.

Table with 12 columns: ISOTOPE, ACTIVITY (CURIES) [PRIMARY, SECONDARY, RELEASE], CONTROL ROOM (CURIES) (UCI/CM3), SITE BOUNDARY DOSES (REM) [THYROID, WH BODY, BETA], CONTROL ROOM DOSES (REM) [THYROID, WH BODY, BETA]. Rows include ELEMENTAL, PARTICULATE, ORGANIC, and NOBLE GASES.

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7.39E-02 4.03E-04 1.01E-04 2.30E-09 4.29E-13 3.10E-12

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 21 m - 1 h

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 1.000 HOURS: X/Q(SITE)= .40E-04 SEC/M3 PRIMARY LEAK RATE= .005 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM

X/Q CONT ROOM= .10E-08 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

	CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS	
	SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER
ELEMENTAL	.000	.000	.000	.000	.085	.131
PARTICULATE	.000	.000	.000	.000	.060	.131
ORGANIC	.000	.000	.000	.000	.385	.131

ISOTOPE	ACTIVITY (CURIES)			CONTROL ROOM (CURIES) (UCI/CM3)		SITE BOUNDARY DOSES (REM)			CONTROL ROOM DOSES (REM)		
	PRIMARY	SECONDARY	RELEASE	THYROID	WH BODY	BETA	THYROID	WH BODY	BETA		
ELEMENTAL											
I-131	2.77E+07	1.69E-02	2.58E+00	1.92E-10	4.79E-14	3.94E-02	9.58E-06	4.68E-06	2.12E-08	1.90E-13	2.51E-12
I-132	3.06E+07	1.87E-02	3.09E+00	2.13E-10	5.31E-14	2.70E-04	7.41E-05	1.27E-05	1.43E-10	1.25E-12	6.73E-12
I-133	6.19E+07	3.77E-02	5.82E+00	4.30E-10	1.07E-13	1.45E-02	2.78E-05	2.27E-05	7.80E-09	6.90E-13	1.21E-11
I-134	3.36E+07	2.05E-02	3.85E+00	2.34E-10	5.81E-14	5.88E-05	7.46E-05	1.61E-05	3.03E-11	1.64E-12	8.32E-12
I-135	5.35E+07	3.27E-02	5.13E+00	3.73E-10	9.28E-14	2.21E-03	9.12E-05	1.45E-05	1.18E-09	1.23E-12	7.76E-12
PARTICULATE											
I-131	1.52E+06	9.27E-04	1.00E-01	7.46E-12	1.86E-15	1.53E-03	3.72E-07	1.82E-07	8.21E-10	7.39E-15	9.75E-14
I-132	1.68E+06	1.03E-03	1.20E-01	8.27E-12	2.06E-15	1.05E-05	2.87E-06	4.93E-07	5.54E-12	4.86E-14	2.61E-13
I-133	3.40E+06	2.07E-03	2.26E-01	1.67E-11	4.16E-15	5.64E-04	1.08E-06	8.79E-07	3.02E-10	2.68E-14	4.71E-13
I-134	1.84E+06	1.12E-03	1.49E-01	9.06E-12	2.25E-15	2.28E-06	2.90E-06	6.25E-07	1.18E-12	6.35E-14	3.23E-13
I-135	2.94E+06	1.79E-03	1.99E-01	1.45E-11	3.60E-15	8.56E-05	3.54E-06	5.64E-07	4.57E-11	4.76E-14	3.01E-13
ORGANIC											
I-131	1.22E+06	7.42E-04	5.14E-01	3.83E-11	9.54E-15	7.85E-03	1.91E-06	9.32E-07	4.22E-09	3.79E-14	5.00E-13
I-132	1.35E+06	8.21E-04	6.14E-01	4.24E-11	1.06E-14	5.37E-05	1.47E-05	2.53E-06	2.84E-11	2.50E-13	1.34E-12
I-133	2.72E+06	1.66E-03	1.16E+00	8.57E-11	2.13E-14	2.90E-03	5.53E-06	4.51E-06	1.55E-09	1.37E-13	2.42E-12
I-134	1.47E+06	9.00E-04	7.66E-01	4.65E-11	1.16E-14	1.17E-05	1.49E-05	3.21E-06	6.04E-12	3.26E-13	1.66E-12
I-135	2.35E+06	1.44E-03	1.02E+00	7.42E-11	1.85E-14	4.39E-04	1.82E-05	2.89E-06	2.35E-10	2.44E-13	1.55E-12
NOBLE GASES											
XE-131M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-133M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-133	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-135M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-135	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-138	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-83M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-85M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-87	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-88	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
						7.00E-02	3.43E-04	8.75E-05	3.75E-08	6.19E-12	4.64E-11

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 21 m - 1 h

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 720.000 HOURS: X/Q(SITE)= .00E+00 SEC/M3 PRIMARY LEAK RATE= .005 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM

X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

	CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS	
	SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER
ELEMENTAL	.000	.000	.000	.000	.085	.131
PARTICULATE	.000	.000	.000	.000	.060	.131
ORGANIC	.000	.000	.000	.000	.385	.131

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ISOTOPE	ACTIVITY (CURIES)			CONTROL ROOM		SITE BOUNDARY DOSES (REM)			CONTROL ROOM DOSES (REM)		
	PRIMARY	SECONDARY	RELEASE	(CURIES)	(UCI/CM3)	THYROID	WH BODY	BETA	THYROID	WH BODY	BETA
ELEMENTAL											
I-131	2.09E+06	1.28E-03	1.33E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.44E-07	1.30E-12	1.71E-11
I-132	2.49E-87	1.52E-96	1.90E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.54E-10	4.86E-12	2.61E-11
I-133	3.04E-03	1.85E-12	3.50E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.96E-08	4.39E-12	7.72E-11
I-134	0.00E+00	0.00E+00	7.84E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.38E-11	3.44E-12	1.75E-11
I-135	2.92E-25	1.78E-34	9.67E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.46E-09	6.72E-12	4.25E-11
PARTICULATE											
I-131	1.15E+05	7.01E-05	5.15E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.59E-09	5.03E-14	6.64E-13
I-132	1.37E-88	8.34E-98	7.36E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.15E-11	1.89E-13	1.01E-12
I-133	1.67E-04	1.02E-13	1.36E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.92E-09	1.70E-13	2.99E-12
I-134	0.00E+00	0.00E+00	3.04E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.47E-12	1.34E-13	6.78E-13
I-135	1.61E-26	9.79E-36	3.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.50E-10	2.61E-13	1.65E-12
ORGANIC											
I-131	9.19E+04	5.61E-05	2.65E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.87E-08	2.58E-13	3.41E-12
I-132	1.09E-88	6.67E-98	3.78E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.10E-10	9.68E-13	5.20E-12
I-133	1.33E-04	8.14E-14	6.96E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.87E-09	8.74E-13	1.54E-11
I-134	0.00E+00	0.00E+00	1.56E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-11	6.86E-13	3.48E-12
I-135	1.28E-26	7.83E-36	1.93E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.29E-09	1.34E-12	8.47E-12
NOBLE GASES											
XE-131M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-133M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-133	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-135M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-135	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-138	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-83M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-85M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-87	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-88	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
						0.00E+00	0.00E+00	0.00E+00	2.49E-07	2.56E-11	2.23E-10
TOTAL DOSES 0-30 DAYS						1.44E-01	7.46E-04	1.88E-04	2.88E-07	3.23E-11	2.73E-10

1

CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 21 m - 1 h

ISOTOPE	ACTIVITY RELEASED (CURIES)		
	1. HRS	720. HRS	
ELEMENTAL			
I-131	5.17E+00	1.33E+03	1.33E+03
I-132	6.67E+00	1.90E+01	2.56E+01
I-133	1.17E+01	3.50E+02	3.61E+02
I-134	9.59E+00	7.84E+00	1.74E+01
I-135	1.05E+01	9.67E+01	1.07E+02
PARTICULATE			
I-131	2.01E-01	5.15E+01	5.17E+01
I-132	2.59E-01	7.36E-01	9.95E-01
I-133	4.55E-01	1.36E+01	1.40E+01
I-134	3.72E-01	3.04E-01	6.76E-01
I-135	4.08E-01	3.75E+00	4.16E+00
ORGANIC			
I-131	1.03E+00	2.65E+02	2.66E+02
I-132	1.33E+00	3.78E+00	5.11E+00
I-133	2.34E+00	6.96E+01	7.20E+01
I-134	1.91E+00	1.56E+00	3.47E+00
I-135	2.10E+00	1.93E+01	2.14E+01
NOBLE GASES			
XE-131M	0.00E+00	0.00E+00	0.00E+00
XE-133M	0.00E+00	0.00E+00	0.00E+00
XE-133	0.00E+00	0.00E+00	0.00E+00
XE-135M	0.00E+00	0.00E+00	0.00E+00
XE-135	0.00E+00	0.00E+00	0.00E+00
XE-138	0.00E+00	0.00E+00	0.00E+00
KR-83M	0.00E+00	0.00E+00	0.00E+00
KR-85M	0.00E+00	0.00E+00	0.00E+00
KR-85	0.00E+00	0.00E+00	0.00E+00
KR-87	0.00E+00	0.00E+00	0.00E+00
KR-88	0.00E+00	0.00E+00	0.00E+00

END EXECUTION DATE: 03/14/2000  
 END EXECUTION TIME: 11:21:05.50

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AXIDENT VER 2 MOD 4

PRODUCTION DATE 02/18/92
BEGIN EXECUTION DATE: 03/14/2000
BEGIN EXECUTION TIME: 11:21:06.70

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 1 h - 30 d
2 6 2 1.0 1.0
3 -2429 2.6E6 141860 64640
4 0.0 0.0 0.0 1.0 1.0 2.391E5 0.0
5 3600 7.2E3 2.88E4 8.64E4 3.456E5 2.592E6
6 6\*6.10E-10
7 6\*1.0
8 6\*1.0
9 6\*1071.
10 0. 4.00E-5 4.00E-5 1.60E-5 5.80E-6 1.70E-6
11 0. 1.00E-9 2.65E-9 6.41E-8 1.20E-8 6.64E-9
12 6\*0.0
13 6\*0.0
14 6\*0.0
15 6\*0.0
16 6\*0.0
17 6\*0.0
18 6\*0.0
19 6\*0.0
20 6\*0.0
21 6.81E-2 6.00E-2 0.165 3\*0.131
22 3\*1.
23 1.22E8 1.82E8 2.81E8 3.28E8 2.61E8 3\*0.
24 8\*0.

1

CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 1 h - 30 d

INITIAL CONTAINMENT INVENTORY

Table with 2 columns: ISOTOPE, ACTIVITY (CURIES). Lists isotopes like I-131, I-132, I-133, I-134, I-135, XE-131M, XE-133M, XE-133, XE-135M, XE-135, XE-138, KR-83M, KR-85M, KR-85, KR-87, KR-88 and their corresponding activity values.

1

CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 1 h - 30 d

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 1.000 HOURS: X/Q(SITE)= .00E+00 SEC/M3 PRIMARY LEAK RATE= .005 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM
X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

Table with 2 main sections: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Includes sub-headers for SPRAY, PRIMARY, SECONDARY, CONT CENTER, RELEASE, and CONT CENTER. Rows include ELEMENTAL, PARTICULATE, and ORGANIC.

Table with 4 main sections: ACTIVITY (CURIES), CONTROL ROOM, SITE BOUNDARY DOSES (REM), and CONTROL ROOM DOSES (REM). Includes sub-headers for ISOTOPE, PRIMARY, SECONDARY, RELEASE, (CURIES), (UCI/CM3), THYROID, WH BODY, BETA, THYROID, WH BODY, BETA. Rows include ELEMENTAL, I-131, I-132, and I-133.

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Table with 12 columns showing radiation levels for various isotopes (I-134, I-135, PARTICULATE, ORGANIC, NOBLE GASES) and locations (XE-131M, KR-83M, etc.). Values are in scientific notation (e.g., 3.36E+07).

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 1 h - 30 d

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 2.000 HOURS: X/Q(SITE)= .40E-04 SEC/M3 PRIMARY LEAK RATE= .005 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM

00.00 X/Q CONT ROOM= .10E-08 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM =

Table with 7 columns: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Rows include ELEMENTAL, PARTICULATE, and ORGANIC.

Large table with 12 columns: ISOTOPE, ACTIVITY (CURIES), CONTROL ROOM, SITE BOUNDARY DOSES (REM), CONTROL ROOM DOSES (REM). Rows include ELEMENTAL, PARTICULATE, ORGANIC, and NOBLE GASES.

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1.03E-01 4.11E-04 1.10E-04 6.61E-08 8.38E-12 6.83E-11

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 1 h - 30 d

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 8.000 HOURS: X/Q(SITE)= .40E-04 SEC/M3 PRIMARY LEAK RATE= .005 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM

X/Q CONT ROOM= .27E-08 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

Table with columns: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Includes sub-sections for ELEMENTAL, PARTICULATE, ORGANIC, and ISOTOPE with various activity and dose values.

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 1 h - 30 d

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 24.000 HOURS: X/Q(SITE)= .16E-04 SEC/M3 PRIMARY LEAK RATE= .005 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM

X/Q CONT ROOM= .64E-07 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

Table with columns: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Includes sub-sections for ELEMENTAL, PARTICULATE, ORGANIC, and ISOTOPE with various activity and dose values.

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XE-138	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-83M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-85M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-87	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-88	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
						4.47E-01	2.67E-04	1.54E-04	2.11E-04	3.58E-09	5.24E-08	

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 1 h - 30 d

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 720.000 HOURS: X/Q(SITE) = .17E-05 SEC/M3 PRIMARY LEAK RATE = .005 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM

X/Q CONT ROOM = .66E-08 SEC/M3 SEC RELEASE RATE = .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

	CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS	
	SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER
ELEMENTAL	.000	.000	.000	.000	.068	.131
PARTICULATE	.000	.000	.000	.000	.060	.131
ORGANIC	.000	.000	.000	.000	.165	.131

ISOTOPE	ACTIVITY (CURIES)			CONTROL ROOM (CURIES) (UCI/CM3)		SITE BOUNDARY DOSES (REM)			CONTROL ROOM DOSES (REM)		
	PRIMARY	SECONDARY	RELEASE	(CURIES)	(UCI/CM3)	THYROID	WH BODY	BETA	THYROID	WH BODY	BETA
ELEMENTAL											
I-131	2.09E+06	1.28E-03	7.32E+02	3.04E-10	7.56E-14	3.17E-01	1.15E-04	5.64E-05	2.45E-04	2.20E-09	2.90E-08
I-132	2.49E-87	1.52E-96	5.62E-12	3.61-103	8.99-107	1.40E-17	5.74E-18	9.85E-19	1.41E-20	1.24E-22	6.67E-22
I-133	3.04E-03	1.85E-12	1.22E+01	4.41E-19	1.10E-22	8.64E-04	2.47E-06	2.01E-06	6.98E-07	6.17E-11	1.09E-09
I-134	0.00E+00	0.00E+00	6.67E-33	0.00E+00	0.00E+00	2.90E-39	5.50E-39	1.19E-39	3.36E-42	1.81E-43	9.21E-43
I-135	2.92E-25	1.78E-34	4.23E-03	4.24E-41	1.06E-44	5.17E-08	3.20E-09	5.10E-10	4.55E-11	4.74E-14	3.00E-13
PARTICULATE											
I-131	1.15E+05	7.01E-05	3.54E+01	1.47E-11	3.66E-15	1.54E-02	5.58E-06	2.73E-06	1.18E-05	1.07E-10	1.41E-09
I-132	1.37E-88	8.34E-98	2.72E-13	1.75-104	4.35-108	6.76E-19	2.78E-19	4.77E-20	6.85E-22	6.01E-24	3.23E-23
I-133	1.67E-04	1.02E-13	5.89E-01	2.13E-20	5.31E-24	4.18E-05	1.19E-07	9.74E-08	3.38E-08	2.99E-12	5.26E-11
I-134	0.00E+00	0.00E+00	3.23E-34	0.00E+00	0.00E+00	1.40E-40	2.66E-40	5.75E-41	1.63E-43	8.78E-45	4.46E-44
I-135	1.61E-26	9.79E-36	2.05E-04	2.05E-42	5.11E-46	2.50E-09	1.55E-10	2.47E-11	2.20E-12	2.30E-15	1.45E-14
ORGANIC											
I-131	9.19E+04	5.61E-05	7.79E+01	3.23E-11	8.05E-15	3.38E-02	1.23E-05	6.00E-06	2.61E-05	2.34E-10	3.09E-09
I-132	1.09E-88	6.67E-98	5.99E-13	3.85-104	9.58-108	1.49E-18	6.11E-19	1.05E-19	1.51E-21	1.32E-23	7.10E-23
I-133	1.33E-04	8.14E-14	1.30E+00	4.69E-20	1.17E-23	9.20E-05	2.63E-07	2.14E-07	7.43E-08	6.58E-12	1.16E-10
I-134	0.00E+00	0.00E+00	7.11E-34	0.00E+00	0.00E+00	3.08E-40	5.86E-40	1.26E-40	3.58E-43	1.93E-44	9.80E-44
I-135	1.28E-26	7.83E-36	4.51E-04	4.52E-42	1.12E-45	5.51E-09	3.41E-10	5.43E-11	4.85E-12	5.05E-15	3.19E-14
NOBLE GASES											
XE-131M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-133M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-133	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-135M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-135	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-138	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-83M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-85M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-87	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-88	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
						3.68E-01	1.36E-04	6.74E-05	2.83E-04	2.61E-09	3.48E-08
						1.79E+00	2.75E-03	1.03E-03	7.47E-04	1.52E-08	2.03E-07
TOTAL DOSES 0-30 DAYS											

1 CNS LOCA W/ 1 V/S SEC CONT REL - CR & LPZ - SBGTS: ESF REL: 1 h - 30 d

ISOTOPE	ACTIVITY RELEASED (CURIES)				
	2. HRS	8. HRS	24. HRS	96. HRS	720. HRS
ELEMENTAL					
I-131	8.27E+00	2.45E+01	6.27E+01	2.42E+02	7.32E+02
I-132	9.30E+00	9.40E+00	1.83E+00	1.49E-02	5.62E-12
I-133	1.85E+01	4.87E+01	9.12E+01	1.19E+02	1.22E+01
I-134	1.11E+01	2.80E+00	2.33E-02	6.53E-08	6.67E-33
I-135	1.60E+01	3.23E+01	3.04E+01	7.19E+00	4.23E-03
PARTICULATE					
I-131	4.00E-01	1.18E+00	3.04E+00	1.17E+01	3.54E+01
I-132	4.50E-01	4.55E-01	8.86E-02	7.20E-04	2.72E-13
I-133	8.96E-01	2.36E+00	4.42E+00	5.76E+00	5.89E-01

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I-134	5.39E-01	1.36E-01	1.13E-03	3.16E-09	3.23E-34	6.76E-01
I-135	7.77E-01	1.56E+00	1.47E+00	3.48E-01	2.05E-04	4.16E+00
ORGANIC						
I-131	8.81E-01	2.61E+00	6.68E+00	2.57E+01	7.79E+01	1.14E+02
I-132	9.90E-01	1.00E+00	1.95E-01	1.58E-03	5.99E-13	2.19E+00
I-133	1.97E+00	5.19E+00	9.72E+00	1.27E+01	1.30E+00	3.08E+01
I-134	1.19E+00	2.98E-01	2.49E-03	6.95E-09	7.11E-34	1.49E+00
I-135	1.71E+00	3.44E+00	3.24E+00	7.66E-01	4.51E-04	9.15E+00
NOBLE GASES						
XE-131M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-133M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-133	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-135M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-135	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-138	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-83M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-85M	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-85	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-87	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-88	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

END EXECUTION DATE: 03/14/2000  
END EXECUTION TIME: 11:21:06.87

NEDC 090331 ATTACH 1  
SHEET 57 OF 84



AXIDENT VER 2 MOD 4

PRODUCTION DATE 02/18/92
BEGIN EXECUTION DATE: 03/20/2000
BEGIN EXECUTION TIME: 17:48:42.76

1 COOPER LOCA W/ ARCON96 & RG 1.3 X/Q - LPZ & CR - MSIV: 0 - 21 m
2 2 2 1.0 1.0
3 2429 2.6E6 141860 64640
4 0.0 0.0 0.0 1.0 1.0 2.391E5 0.0
5 1260 2.592E6
6 2\*1.79E-8
7 2\*1.16E-7
8 2\*1.0
9 3316. 1071.
10 2.90E-4 0.0
11 9.54E-4 0.
12 2\*0.0
13 2\*0.0
14 2\*0.0
15 2\*0.0
16 2\*0.0
17 2\*0.0
18 2\*0.0
19 2\*0.0
20 2\*0.0
21 3\*0.1 3\*1.
22 3\*1.

1

COOPER LOCA W/ ARCON96 & RG 1.3 X/Q - LPZ & CR - MSIV: 0 - 21 m

INITIAL CONTAINMENT INVENTORY

Table with 2 columns: ISOTOPE, ACTIVITY (CURIES). Lists isotopes like I-131, I-132, I-133, I-134, I-135, XE-131M, XE-133M, XE-133, XE-135M, XE-135, XE-138, KR-83M, KR-85M, KR-85, KR-87, KR-88 with their respective activities.

1

COOPER LOCA W/ ARCON96 & RG 1.3 X/Q - LPZ & CR - MSIV: 0 - 21 m

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT .350 HOURS: X/Q(SITE)= .29E-03 SEC/M3 PRIMARY LEAK RATE= .155 PERCENT/DAY CONTROL ROOM INTAKE=3316.0 CFM

X/Q CONT ROOM= .95E-03 SEC/M3 SEC RELEASE RATE= .10E-01 VOL/DAY PCT PRI LKG TO ATM = 00.00

Table with 6 columns: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Sub-columns include SPRAY, PRIMARY, SECONDARY, CONT CENTER, RELEASE, and CONT CENTER. Rows include ELEMENTAL, PARTICULATE, and ORGANIC.

Table with 12 columns: ISOTOPE, ACTIVITY (CURIES) (PRIMARY, SECONDARY, RELEASE), CONTROL ROOM (CURIES) (UCI/CM3), SITE BOUNDARY DOSES (REM) (THYROID, WH BODY, BETA), CONTROL ROOM DOSES (REM) (THYROID, WH BODY, BETA). Rows include ELEMENTAL, I-131, I-132, I-133, I-134.

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SHEET 58 OF 84

Table with 12 columns of numerical data representing various isotopes and particulates (I-135, I-131, I-132, I-133, I-134, I-135, ORGANIC, NOBLE GASES, etc.).

1 COOPER LOCA W/ ARCON96 & RG 1.3 X/Q - LPZ & CR - MSIV: 0 - 21 m

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED

VOL

AT 720.000 HOURS: X/Q(SITE)= .00E+00 SEC/M3 PRIMARY LEAK RATE= .155 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM

00.00 X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .10E-01 VOL/DAY PCT PRI LKG TO ATM =

Table with 7 columns: ELEMENTAL, PARTICULATE, ORGANIC, SPRAY, PRIMARY, SECONDARY, CONT CENTER, FILTER NON-REMOVAL FACTORS, RELEASE, CONT CENTER.

Large table with 12 columns: ISOTOPE, ACTIVITY (CURIES) PRIMARY, SECONDARY, RELEASE, CONTROL ROOM (CURIES) (UCI/CM3), SITE BOUNDARY DOSES (REM) THYROID, WH, BODY, BETA, CONTROL ROOM DOSES (REM) THYROID, WH, BODY, BETA.

NEDC 99-033 r/ATTACH 1 SHEET 59 OF 84

0.00E+00 0.00E+00 0.00E+00 3.37E-03 5.47E-06 1.03E-04

TOTAL DOSES 0-30 DAYS 4.02E-04 5.54E-05 2.28E-05 3.57E-03 6.03E-06 1.14E-04

1

COOPER LOCA W/ ARCON96 & RG 1.3 X/Q - LPZ & CR - MSIV: 0 - 21 m

ISOTOPE	ACTIVITY RELEASED (CURIES)		
	0. HRS	720. HRS	
<b>ELEMENTAL</b>			
I-131	2.29E-03	1.94E+03	1.94E+03
I-132	3.18E-03	6.09E-01	6.12E-01
I-133	5.23E-03	7.78E+01	7.78E+01
I-134	5.11E-03	1.52E-01	1.57E-01
I-135	4.77E-03	7.43E+00	7.44E+00
<b>PARTICULATE</b>			
I-131	1.26E-04	1.07E+02	1.07E+02
I-132	1.75E-04	3.35E-02	3.37E-02
I-133	2.87E-04	4.28E+00	4.28E+00
I-134	2.81E-04	8.34E-03	8.63E-03
I-135	2.62E-04	4.08E-01	4.09E-01
<b>ORGANIC</b>			
I-131	1.01E-04	8.55E+01	8.55E+01
I-132	1.40E-04	2.68E-02	2.69E-02
I-133	2.30E-04	3.42E+00	3.42E+00
I-134	2.25E-04	6.68E-03	6.90E-03
I-135	2.10E-04	3.27E-01	3.27E-01
<b>NOBLE GASES</b>			
XE-131M	7.61E-04	9.94E+02	9.94E+02
XE-133M	5.87E-03	5.67E+02	5.67E+02
XE-133	2.31E-01	1.06E+05	1.06E+05
XE-135M	3.43E-02	1.09E-01	1.43E-01
XE-135	2.14E-01	6.13E+02	6.13E+02
XE-138	1.20E-01	4.71E-01	5.91E-01
KR-83M	1.65E-02	2.12E+00	2.14E+00
KR-85M	4.34E-02	2.94E+01	2.95E+01
KR-85	1.51E-03	5.69E+03	5.69E+03
KR-87	7.63E-02	4.64E+00	4.72E+00
KR-88	1.16E-01	3.26E+01	3.27E+01

END EXECUTION DATE: 03/20/2000  
END EXECUTION TIME: 17:48:42.82

NEDC 09-033 r1 ATTACH 1  
SHEET 60 OF 84

AXIDENT VER 2 MOD 4

PRODUCTION DATE 02/18/92  
 BEGIN EXECUTION DATE: 03/20/2000  
 BEGIN EXECUTION TIME: 17:48:42.87

1 COOPER LOCA W/ ARCON96 & RG 1.3 X/Q - LPZ & CR - MSIV: 21 m - 30 d  
 2 7 2 1.0 1.0  
 3 2429 2.6E6 141860 64640  
 4 0.0 0.0 0.0 1.0 1.0 2.391E5 0.0  
 5 1260 1.8E3 7.2E3 2.88E4 8.64E4 3.456E5 2.592E6  
 6 7\*1.79E-8  
 7 7\*1.16E-7  
 8 7\*1.0  
 9 3235. 6\*1071.  
 10 0. 3\*2.90E-4 7.30E-5 2.50E-5 5.20E-6  
 11 0. 2\*9.54E-4 4.93E-4 2.69E-4 1.03E-4 5.72E-5  
 12 7\*0.0  
 13 7\*0.0  
 14 7\*0.0  
 15 7\*0.0  
 16 7\*0.0  
 17 7\*0.0  
 18 7\*0.0  
 19 7\*0.0  
 20 7\*0.0  
 21 3\*0.1 3\*0.131  
 22 3\*1.

1

COOPER LOCA W/ ARCON96 & RG 1.3 X/Q - LPZ & CR - MSIV: 21 m - 30 d

INITIAL CONTAINMENT INVENTORY

ISOTOPE	ACTIVITY (CURIES)
I-131	6.114E+07
I-132	9.098E+07
I-133	1.406E+08
I-134	1.639E+08
I-135	1.303E+08
XE-131M	4.622E+05
XE-133M	3.572E+06
XE-133	1.406E+08
XE-135M	3.782E+07
XE-135	1.324E+08
XE-138	1.240E+08
KR-83M	1.093E+07
KR-85M	2.731E+07
KR-85	9.167E+05
KR-87	5.253E+07
KR-88	7.480E+07

1

COOPER LOCA W/ ARCON96 & RG 1.3 X/Q - LPZ & CR - MSIV: 21 m - 30 d

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

VOL 1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED

AT .350 HOURS: X/Q(SITE)= .00E+00 SEC/M3 PRIMARY LEAK RATE= .155 PERCENT/DAY CONTROL ROOM INTAKE=3235.0  
 CFM  
 X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .10E-01 VOL/DAY PCT PRI LKG TO ATM =  
 00.00

	CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS	
	SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER
ELEMENTAL	.000	.000	.000	.000	.100	.131
PARTICULATE	.000	.000	.000	.000	.100	.131
ORGANIC	.000	.000	.000	.000	.100	.131

ISOTOPE	ACTIVITY (CURIES)			CONTROL ROOM		SITE BOUNDARY DOSES (REM)			CONTROL ROOM DOSES (REM)				
	PRIMARY	SECONDARY	RELEASE	(CURIES)	(UCI/CM3)	THYROID	WH	BODY	BETA	THYROID	WH	BODY	BETA
ELEMENTAL													
I-131	1.39E+07	3.13E+02	2.29E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-132	1.86E+07	4.20E+02	3.18E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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 SHEET 61 OF 84



KR-85	9.17E+05	2.95E+01	1.57E-03	7.35E-07	1.83E-10	0.00E+00	2.39E-10	2.34E-08	0.00E+00	9.33E-13	2.41E-09	
KR-87	4.00E+07	1.29E+03	7.13E-02	3.20E-05	7.97E-09	0.00E+00	7.10E-06	4.99E-06	0.00E+00	1.33E-08	5.07E-07	
KR-88	6.61E+07	2.13E+03	1.15E-01	5.30E-05	1.32E-08	0.00E+00	1.46E-05	2.62E-06	0.00E+00	4.73E-08	2.69E-07	
							4.17E-04	4.56E-05	2.03E-05	5.62E-06	1.03E-07	2.01E-06

1 COOPER LOCA W/ ARCON96 & RG 1.3 X/Q - LPZ & CR - MSIV: 21 m - 30 d

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 2.000 HOURS: X/Q(SITE)= .29E-03 SEC/M3 PRIMARY LEAK RATE= .155 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM

X/Q CONT ROOM= .95E-03 SEC/M3 SEC RELEASE RATE= .10E-01 VOL/DAY PCT PRI LKG TO ATM = 00.00

CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS		
	SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER
ELEMENTAL	.000	.000	.000	.000	.100	.131
PARTICULATE	.000	.000	.000	.000	.100	.131
ORGANIC	.000	.000	.000	.000	.100	.131

ISOTOPE	ACTIVITY (CURIES)			CONTROL ROOM (CURIES) (UCI/CM3)		SITE BOUNDARY DOSES (REM)			CONTROL ROOM DOSES (REM)			
	PRIMARY	SECONDARY	RELEASE	THYROID	WH BODY	BETA	THYROID	WH BODY	BETA			
ELEMENTAL												
I-131	1.38E+07	1.78E+03	6.98E-02	3.48E-06	8.67E-10	7.73E-03	1.88E-06	9.17E-07	8.04E-04	7.23E-09	9.55E-08	
I-132	1.13E+07	1.46E+03	6.90E-02	2.86E-06	7.11E-10	4.37E-05	1.20E-05	2.06E-06	4.39E-06	3.85E-08	2.07E-07	
I-133	2.99E+07	3.86E+03	1.54E-01	7.55E-06	1.88E-09	2.79E-03	5.33E-06	4.35E-06	2.89E-04	2.56E-08	4.51E-07	
I-134	7.54E+06	9.71E+02	6.49E-02	1.90E-06	4.73E-10	7.18E-06	9.12E-06	1.97E-06	6.72E-07	3.63E-08	1.84E-07	
I-135	2.41E+07	3.10E+03	1.29E-01	6.08E-06	1.51E-09	4.04E-04	1.67E-05	2.66E-06	4.15E-05	4.32E-08	2.73E-07	
PARTICULATE												
I-131	7.59E+05	9.77E+01	3.84E-03	1.91E-07	4.76E-11	4.25E-04	1.03E-07	5.04E-08	4.42E-05	3.97E-10	5.24E-09	
I-132	6.22E+05	8.02E+01	3.79E-03	1.57E-07	3.91E-11	2.40E-06	6.60E-07	1.13E-07	2.41E-07	2.12E-09	1.14E-08	
I-133	1.64E+06	2.12E+02	8.46E-03	4.15E-07	1.03E-10	1.53E-04	2.93E-07	2.39E-07	1.59E-05	1.41E-09	2.48E-08	
I-134	4.14E+05	5.34E+01	3.56E-03	1.04E-07	2.60E-11	3.95E-07	5.01E-07	1.08E-07	3.69E-08	1.99E-09	1.01E-08	
I-135	1.32E+06	1.71E+02	7.11E-03	3.34E-07	8.31E-11	2.22E-05	9.17E-07	1.46E-07	2.28E-06	2.38E-09	1.50E-08	
ORGANIC												
I-131	6.07E+05	7.82E+01	3.07E-03	1.53E-07	3.81E-11	3.40E-04	8.25E-08	4.03E-08	3.53E-05	3.18E-10	4.20E-09	
I-132	4.98E+05	6.41E+01	3.03E-03	1.26E-07	3.13E-11	1.92E-06	5.28E-07	9.06E-08	1.93E-07	1.69E-09	9.09E-09	
I-133	1.32E+06	1.70E+02	6.77E-03	3.32E-07	8.26E-11	1.23E-04	2.34E-07	1.91E-07	1.27E-05	1.13E-09	1.98E-08	
I-134	3.31E+05	4.27E+01	2.85E-03	8.36E-08	2.08E-11	3.16E-07	4.01E-07	8.65E-08	2.95E-08	1.59E-09	8.10E-09	
I-135	1.06E+06	1.36E+02	5.69E-03	2.67E-07	6.65E-11	1.78E-05	7.34E-07	1.17E-07	1.83E-06	1.90E-09	1.20E-08	
NOBLE GASES												
XE-131M	4.60E+05	5.93E+01	2.32E-02	8.85E-06	2.20E-09	0.00E+00	3.71E-08	2.09E-07	0.00E+00	4.76E-09	1.66E-07	
XE-133M	3.48E+06	4.49E+02	1.77E-01	6.70E-05	1.67E-08	0.00E+00	4.23E-07	1.83E-06	0.00E+00	1.60E-08	1.45E-06	
XE-133	1.39E+08	1.79E+04	7.04E+00	2.68E-03	6.66E-07	0.00E+00	1.53E-05	6.85E-05	0.00E+00	1.43E-06	5.44E-05	
XE-135M	1.84E+05	2.36E+01	8.38E-02	3.53E-06	8.80E-10	0.00E+00	2.57E-06	5.42E-07	0.00E+00	5.18E-08	2.88E-07	
XE-135	1.14E+08	1.46E+04	6.01E+00	2.19E-03	5.45E-07	0.00E+00	1.07E-04	1.29E-04	0.00E+00	3.13E-06	1.02E-04	
XE-138	1.07E+06	1.38E+02	3.65E-01	2.06E-05	5.13E-09	0.00E+00	7.59E-05	1.95E-05	0.00E+00	4.14E-07	1.08E-05	
KR-83M	5.20E+06	6.70E+02	3.32E-01	1.00E-04	2.49E-08	0.00E+00	1.20E-07	7.52E-07	0.00E+00	5.01E-08	5.71E-07	
KR-85M	1.99E+07	2.57E+03	1.11E+00	3.84E-04	9.55E-08	0.00E+00	1.25E-05	1.72E-05	0.00E+00	3.89E-07	1.34E-05	
KR-85	9.17E+05	1.18E+02	4.62E-02	1.76E-05	4.39E-09	0.00E+00	7.04E-09	6.88E-07	0.00E+00	2.12E-10	5.47E-07	
KR-87	1.76E+07	2.26E+03	1.26E+00	3.38E-04	8.42E-08	0.00E+00	1.26E-04	8.85E-05	0.00E+00	1.72E-06	6.55E-05	
KR-88	4.56E+07	5.87E+03	2.68E+00	8.77E-04	2.18E-07	0.00E+00	3.39E-04	6.10E-05	0.00E+00	8.28E-06	4.70E-05	
							1.21E-02	7.28E-04	4.01E-04	1.25E-03	1.56E-05	2.97E-04

1 COOPER LOCA W/ ARCON96 & RG 1.3 X/Q - LPZ & CR - MSIV: 21 m - 30 d

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 8.000 HOURS: X/Q(SITE)= .29E-03 SEC/M3 PRIMARY LEAK RATE= .155 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM

X/Q CONT ROOM= .49E-03 SEC/M3 SEC RELEASE RATE= .10E-01 VOL/DAY PCT PRI LKG TO ATM = 00.00

CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS		
	SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER

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Table with columns for isotope labels (I-132, I-133, etc.) and 11 numerical values in scientific notation representing various parameters.

1 COOPER LOCA W/ ARCON96 & RG 1.3 X/Q - LPZ & CR - MSIV: 21 m - 30 d

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 96.000 HOURS: X/Q(SITE)= .25E-04 SEC/M3 PRIMARY LEAK RATE= .155 PERCENT/DAY CONTROL ROOM INTAKE=1071.0 CFM
X/Q CONT ROOM= .10E-03 SEC/M3 SEC RELEASE RATE= .10E-01 VOL/DAY PCT PRI LKG TO ATM = 00.00

Table with columns for CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS, including sub-columns for SPRAY, PRIMARY, SECONDARY, CONT CENTER, RELEASE, and CONT CENTER.

Table with columns for ISOTOPE, ACTIVITY (CURIES), CONTROL ROOM DOSES (REM), and SITE BOUNDARY DOSES (REM), including sub-columns for PRIMARY, SECONDARY, RELEASE, THYROID, WH BODY, and BETA.

1 COOPER LOCA W/ ARCON96 & RG 1.3 X/Q - LPZ & CR - MSIV: 21 m - 30 d

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

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XE-133	7.51E+00	1.10E+02	8.77E+02	1.12E+04	9.41E+04	1.06E+05
XE-135M	1.39E-01	4.40E-03	1.77E-09	1.58E-27	3.07-110	1.43E-01
XE-135	6.44E+00	7.03E+01	2.58E+02	2.75E+02	3.39E+00	6.13E+02
XE-138	5.61E-01	2.93E-02	6.56E-08	5.85E-24	1.15E-97	5.91E-01
KR-83M	3.64E-01	1.34E+00	4.33E-01	2.87E-03	2.65E-14	2.14E+00
KR-85M	1.19E+00	9.42E+00	1.57E+01	3.19E+00	1.24E-04	2.95E+01
KR-85	4.93E-02	7.39E-01	6.29E+00	1.05E+02	5.58E+03	5.69E+03
KR-87	1.41E+00	2.99E+00	3.18E-01	1.31E-04	3.79E-21	4.72E+00
KR-88	2.91E+00	1.64E+01	1.29E+01	5.93E-01	3.74E-08	3.27E+01

END EXECUTION DATE: 03/20/2000  
END EXECUTION TIME: 17:48:43.09

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SHEET 67 OF 84

AXIDENT VER 2 MOD 4

PRODUCTION DATE 02/18/92
BEGIN EXECUTION DATE: 03/14/2000
BEGIN EXECUTION TIME: 11:21:05.72

1 CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBGTS: CONT. REL: 0 - 1 h
2 2 2 1.0 1.0
3 2429 2.6E6 141860 64640
4 0.0 0.0 0.0 1.0 1.0 2.391E5 0.0
5 1.8E3 3600
6 2\*7.35E-8
7 2\*1.0
8 2\*1.0
9 2\*0.0
10 1.20E-4 1.60E-5
11 2\*0.0
12 2\*0.0
13 2\*0.0
14 2\*0.0
15 2\*0.0
16 2\*0.0
17 2\*0.0
18 2\*0.0
19 2\*0.0
20 2\*0.0
21 4.25E-2 3.00E-2 0.385 3\*0.131
22 3\*1.

1

CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBGTS: CONT. REL: 0 - 1 h

INITIAL CONTAINMENT INVENTORY

Table with 2 columns: ISOTOPE and ACTIVITY (CURIES). Lists isotopes like I-131, I-132, I-133, I-134, I-135, XE-131M, XE-133M, XE-133, XE-135M, XE-135, XE-138, KR-83M, KR-85M, KR-85, KR-87, KR-88 with their respective activities.

1

CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBGTS: CONT. REL: 0 - 1 h

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT .500 HOURS: X/Q(SITE)= .12E-03 SEC/M3 PRIMARY LEAK RATE= .635 PERCENT/DAY CONTROL ROOM INTAKE= .0 CFM
X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

Table with 2 main sections: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Includes sub-headers for SPRAY, PRIMARY, SECONDARY, CONT CENTER, RELEASE, and CONT CENTER. Lists elemental, particulate, and organic cleanup rates and filter factors.

Table with 3 main sections: ACTIVITY (CURIES), CONTROL ROOM DOSES (REM), and SITE BOUNDARY DOSES (REM). Includes sub-headers for ISOTOPE, PRIMARY, SECONDARY, RELEASE, CONTROL ROOM (UCI/CM3), THYROID, WH BODY, BETA, and CONTROL ROOM THYROID, WH BODY, BETA. Lists elemental isotopes I-131, I-132, I-133, I-134, I-135 and their associated activity and dose values.

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PARTICULATE

Table with 12 columns: Isotope, and 11 numerical values. Rows include I-131, I-132, I-133, I-134, I-135.

ORGANIC

Table with 12 columns: Isotope, and 11 numerical values. Rows include I-131, I-132, I-133, I-134, I-135.

NOBLE GASES

Table with 12 columns: Isotope, and 11 numerical values. Rows include XE-131M, XE-133M, XE-133, XE-135M, XE-135, XE-138, KR-83M, KR-85M, KR-85, KR-87, KR-88.

1 CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBTGS: CONT. REL: 0 - 1 h

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 1.000 HOURS: X/Q(SITE)= .16E-04 SEC/M3 PRIMARY LEAK RATE= .635 PERCENT/DAY CONTROL ROOM INTAKE= .0 CFM

X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

Table with 7 columns: ELEMENTAL, PARTICULATE, ORGANIC, SPRAY, PRIMARY, SECONDARY, CONT CENTER, CLEANUP RATES (HR-1), FILTER NON-REMOVAL FACTORS, RELEASE, CONT CENTER.

Table with 12 columns: ISOTOPE, ACTIVITY (CURIES), CONTROL ROOM, SITE BOUNDARY DOSES (REM), CONTROL ROOM DOSES (REM). Rows include ELEMENTAL (I-131 to I-135), PARTICULATE (I-131 to I-135), ORGANIC (I-131 to I-135), NOBLE GASES (XE-131M to KR-88).

NEDC 99-033 r1 ATTACH 1 SHEET 69 OF 84

TOTAL DOSES 0-30 DAYS 8.39E+00 1.94E+00 8.18E-01 0.00E+00 0.00E+00 0.00E+00

1

CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBGTS: CONT. REL: 0 - 1 h

ISOTOPE	ACTIVITY RELEASED (CURIES)	
	1. HRS	
ELEMENTAL		
I-131	1.56E+02	1.56E+02
I-132	2.01E+02	2.01E+02
I-133	3.54E+02	3.54E+02
I-134	2.89E+02	2.89E+02
I-135	3.16E+02	3.16E+02
PARTICULATE		
I-131	6.05E+00	6.05E+00
I-132	7.79E+00	7.79E+00
I-133	1.37E+01	1.37E+01
I-134	1.12E+01	1.12E+01
I-135	1.23E+01	1.23E+01
ORGANIC		
I-131	6.21E+01	6.21E+01
I-132	8.00E+01	8.00E+01
I-133	1.41E+02	1.41E+02
I-134	1.15E+02	1.15E+02
I-135	1.26E+02	1.26E+02
NOBLE GASES		
XE-131M	1.22E+02	1.22E+02
XE-133M	9.39E+02	9.39E+02
XE-133	3.71E+04	3.71E+04
XE-135M	3.49E+03	3.49E+03
XE-135	3.37E+04	3.37E+04
XE-138	1.25E+04	1.25E+04
KR-83M	2.41E+03	2.41E+03
KR-85M	6.68E+03	6.68E+03
KR-85	2.42E+02	2.42E+02
KR-87	1.07E+04	1.07E+04
KR-88	1.75E+04	1.75E+04

END EXECUTION DATE: 03/14/2000  
END EXECUTION TIME: 11:21:05.77

NEDC 99-033 r1 ATTACH 1  
SHEET 70 OF 84

AXIDENT VER 2 MOD 4

PRODUCTION DATE 02/18/92  
 BEGIN EXECUTION DATE: 03/14/2000  
 BEGIN EXECUTION TIME: 11:21:06.15

1 CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBGTS: CONT. REL: 1 - 2 h  
 2 2 2 1.0 1.0  
 3 2429 2.6EG 141860 64640  
 4 0.0 0.0 0.0 1.0 1.0 2.391E5 0.0  
 5 3600 7.2E3  
 6 2\*7.35E-8  
 7 2\*1.0  
 8 2\*1.0  
 9 2\*0.0  
 10 0. 1.60E-5  
 11 2\*0.0  
 12 2\*0.0  
 13 2\*0.0  
 14 2\*0.0  
 15 2\*0.0  
 16 2\*0.0  
 17 2\*0.0  
 18 2\*0.0  
 19 2\*0.0  
 20 2\*0.0  
 21 3.40E-2 3.00E-2 0.165 3\*0.131  
 22 3\*1.

1

CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBGTS: CONT. REL: 1 - 2 h

INITIAL CONTAINMENT INVENTORY

ISOTOPE	ACTIVITY (CURIES)
I-131	6.114E+07
I-132	9.098E+07
I-133	1.406E+08
I-134	1.639E+08
I-135	1.303E+08
XE-131M	4.622E+05
XE-133M	3.572E+06
XE-133	1.406E+08
XE-135M	3.782E+07
XE-135	1.324E+08
XE-138	1.240E+08
KR-83M	1.093E+07
KR-85M	2.731E+07
KR-85	9.167E+05
KR-87	5.253E+07
KR-88	7.480E+07

1

CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBGTS: CONT. REL: 1 - 2 h

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 1.000 HOURS: X/Q(SITE)= .00E+00 SEC/M3 PRIMARY LEAK RATE= .635 PERCENT/DAY CONTROL ROOM INTAKE= .0 CFM

X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

	CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS	
	SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER
ELEMENTAL	.000	.000	.000	.000	.034	.131
PARTICULATE	.000	.000	.000	.000	.030	.131
ORGANIC	.000	.000	.000	.000	.165	.131

ISOTOPE	ACTIVITY (CURIES)			CONTROL ROOM		SITE BOUNDARY DOSES (REM)			CONTROL ROOM DOSES (REM)		
	PRIMARY	SECONDARY	RELEASE	(CURIES)	(UCI/CM3)	THYROID	WH BODY	BETA	THYROID	WH BODY	BETA
ELEMENTAL											
I-131	1.39E+07	1.02E+00	1.25E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-132	1.53E+07	1.13E+00	1.61E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-133	3.09E+07	2.27E+00	2.83E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-134	1.68E+07	1.23E+00	2.31E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-135	2.67E+07	1.96E+00	2.53E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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 SHEET 71 OF 84



1

TOTAL DOSES 0-30 DAYS	1.36E+00	1.87E-01	1.09E-01	0.00E+00	0.00E+00	0.00E+00
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CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBGTS: CONT. REL: 1 - 2 h

ISOTOPE	ACTIVITY RELEASED (CURIES)	
	2. HRS	
ELEMENTAL		
I-131	2.49E+02	2.49E+02
I-132	2.80E+02	2.80E+02
I-133	5.57E+02	5.57E+02
I-134	3.35E+02	3.35E+02
I-135	4.82E+02	4.82E+02
PARTICULATE		
I-131	1.21E+01	1.21E+01
I-132	1.36E+01	1.36E+01
I-133	2.70E+01	2.70E+01
I-134	1.62E+01	1.62E+01
I-135	2.33E+01	2.33E+01
ORGANIC		
I-131	5.32E+01	5.32E+01
I-132	5.96E+01	5.96E+01
I-133	1.19E+02	1.19E+02
I-134	7.14E+01	7.14E+01
I-135	1.03E+02	1.03E+02
NOBLE GASES		
XE-131M	2.44E+02	2.44E+02
XE-133M	1.87E+03	1.87E+03
XE-133	7.40E+04	7.40E+04
XE-135M	3.74E+03	3.74E+03
XE-135	6.50E+04	6.50E+04
XE-138	1.37E+04	1.37E+04
KR-83M	4.08E+03	4.08E+03
KR-85M	1.24E+04	1.24E+04
KR-85	4.85E+02	4.85E+02
KR-87	1.69E+04	1.69E+04
KR-88	3.12E+04	3.12E+04

END EXECUTION DATE: 03/14/2000  
END EXECUTION TIME: 11:21:06.21

NEDC 09033rl ATTACH 1  
SHEET 73 OF 84



AXIDENT VER 2 MOD 4

PRODUCTION DATE 02/18/92
BEGIN EXECUTION DATE: 03/14/2000
BEGIN EXECUTION TIME: 11:21:05.99

1 CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBGTS: ESF REL: 0 - 1 h
2 2 2 1.0 1.0
3 -2429 2.6E6 141860 64640
4 0.0 0.0 0.0 1.0 1.0 2.391E5 0.0
5 1.8E3 3600
6 2\*6.10E-10
7 2\*1.0
8 2\*1.0
9 2\*0.0
10 1.20E-4 1.60E-5
11 2\*0.0
12 2\*0.0
13 2\*0.0
14 2\*0.0
15 2\*0.0
16 2\*0.0
17 2\*0.0
18 2\*0.0
19 2\*0.0
20 2\*0.0
21 8.50E-2 6.00E-2 0.385 3\*0.131
22 3\*1.
23 1.22E8 1.82E8 2.81E8 3.28E8 2.61E8 3\*0.
24 8\*0.

1

CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBGTS: ESF REL: 0 - 1 h

INITIAL CONTAINMENT INVENTORY

ISOTOPE ACTIVITY (CURIES)

I-131 1.220E+08
I-132 1.820E+08
I-133 2.810E+08
I-134 3.280E+08
I-135 2.610E+08
XE-131M 0.000E+00
XE-133M 0.000E+00
XE-133 0.000E+00
XE-135M 0.000E+00
XE-135 0.000E+00
XE-138 0.000E+00
KR-83M 0.000E+00
KR-85M 0.000E+00
KR-85 0.000E+00
KR-87 0.000E+00
KR-88 0.000E+00

1

CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBGTS: ESF REL: 0 - 1 h

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO
SPRAYED VOL

AT .500 HOURS: X/Q(SITE)= .12E-03 SEC/M3 PRIMARY LEAK RATE= .005 PERCENT/DAY CONTROL ROOM INTAKE=
.0 CFM
X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM =
00.00

Table with columns: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Rows include ELEMENTAL, PARTICULATE, ORGANIC, and sub-columns for SPRAY, PRIMARY, SECONDARY, CONT CENTER, RELEASE, and CONT CENTER.

Table with columns: ACTIVITY (CURIES), CONTROL ROOM (CURIES) (UCI/CM3), SITE BOUNDARY DOSES (REM) THYROID WH BODY BETA, CONTROL ROOM DOSES (REM) THYROID WH BODY BETA. Rows include ELEMENTAL, I-131, I-132, I-133.

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2.80E-02 1.37E-04 3.50E-05 0.00E+00 0.00E+00 0.00E+00

TOTAL DOSES 0-30 DAYS 2.40E-01 1.37E-03 3.39E-04 0.00E+00 0.00E+00 0.00E+00

1

CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBGTS: ESF REL: 0 - 1 h

ISOTOPE	1. HRS	ACTIVITY RELEASED (CURIES)
<b>ELEMENTAL</b>		
I-131	5.17E+00	5.17E+00
I-132	6.67E+00	6.67E+00
I-133	1.17E+01	1.17E+01
I-134	9.59E+00	9.59E+00
I-135	1.05E+01	1.05E+01
<b>PARTICULATE</b>		
I-131	2.01E-01	2.01E-01
I-132	2.59E-01	2.59E-01
I-133	4.55E-01	4.55E-01
I-134	3.72E-01	3.72E-01
I-135	4.08E-01	4.08E-01
<b>ORGANIC</b>		
I-131	1.03E+00	1.03E+00
I-132	1.33E+00	1.33E+00
I-133	2.34E+00	2.34E+00
I-134	1.91E+00	1.91E+00
I-135	2.10E+00	2.10E+00
<b>NOBLE GASES</b>		
XE-131M	0.00E+00	0.00E+00
XE-133M	0.00E+00	0.00E+00
XE-133	0.00E+00	0.00E+00
XE-135M	0.00E+00	0.00E+00
XE-135	0.00E+00	0.00E+00
XE-138	0.00E+00	0.00E+00
KR-83M	0.00E+00	0.00E+00
KR-85M	0.00E+00	0.00E+00
KR-85	0.00E+00	0.00E+00
KR-87	0.00E+00	0.00E+00
KR-88	0.00E+00	0.00E+00

END EXECUTION DATE: 03/14/2000  
END EXECUTION TIME: 11:21:06.04

NEDC 99-033 r/ATTACH 1  
SHEET 76 OF 84

AXIDENT VER 2 MOD 4

PRODUCTION DATE 02/18/92
BEGIN EXECUTION DATE: 03/14/2000
BEGIN EXECUTION TIME: 11:21:05.88

1 CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBGTS: ESF REL: 1 - 2 h
2 2 2 1.0 1.0
3 -2429 2.6E6 141860 64640
4 0.0 0.0 0.0 1.0 1.0 2.391E5 0.0
5 3600 7.2E3
6 2\*6.10E-10
7 2\*1.0
8 2\*1.0
9 2\*0.0
10 0. 1.60E-5
11 2\*0.0
12 2\*0.0
13 2\*0.0
14 2\*0.0
15 2\*0.0
16 2\*0.0
17 2\*0.0
18 2\*0.0
19 2\*0.0
20 2\*0.0
21 6.81E-2 6.00E-2 0.165 3\*0.131
22 3\*1.
23 1.22E8 1.82E8 2.81E8 3.28E8 2.61E8 3\*0.
24 8\*0.

1

CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBGTS: ESF REL: 1 - 2 h

INITIAL CONTAINMENT INVENTORY

Table with 2 columns: ISOTOPE, ACTIVITY (CURIES). Lists isotopes like I-131, I-132, I-133, I-134, I-135, XE-131M, XE-133M, XE-133, XE-135M, XE-135, XE-138, KR-83M, KR-85M, KR-85, KR-87, KR-88 and their corresponding activities.

1

CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBGTS: ESF REL: 1 - 2 h

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT 1.000 HOURS: X/Q(SITE)= .00E+00 SEC/M3 PRIMARY LEAK RATE= .005 PERCENT/DAY CONTROL ROOM INTAKE=.0 CFM
X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .86E+05 VOL/DAY PCT PRI LKG TO ATM = 00.00

Table with 2 main sections: CLEANUP RATES (HR-1) and FILTER NON-REMOVAL FACTORS. Includes sub-columns for SPRAY, PRIMARY, SECONDARY, CONT CENTER, and RELEASE, CONT CENTER.

Table with 4 main columns: ACTIVITY (CURIES), CONTROL ROOM DOSES (REM), SITE BOUNDARY DOSES (REM), CONTROL ROOM DOSES (REM). Includes sub-columns for ISOTOPE, PRIMARY, SECONDARY, RELEASE, (CURIES), (UCI/CM3), THYROID, WH BODY, BETA, THYROID, WH BODY, BETA.

NEDC 99-033 r1 ATTACH 1
SHEET 77 OF 84



4.13E-02 1.64E-04 4.40E-05 0.00E+00 0.00E+00 0.00E+00

TOTAL DOSES 0-30 DAYS 4.13E-02 1.64E-04 4.40E-05 0.00E+00 0.00E+00 0.00E+00

1

CNS LOCA W/ 1 V/S SEC CONT REL - EAB - SBGTS: ESF REL: 1 - 2 h

ISOTOPE	2. HRS		ACTIVITY RELEASED (CURIES)
<b>ELEMENTAL</b>			
I-131	8.27E+00	8.27E+00	
I-132	9.30E+00	9.30E+00	
I-133	1.85E+01	1.85E+01	
I-134	1.11E+01	1.11E+01	
I-135	1.60E+01	1.60E+01	
<b>PARTICULATE</b>			
I-131	4.00E-01	4.00E-01	
I-132	4.50E-01	4.50E-01	
I-133	8.96E-01	8.96E-01	
I-134	5.39E-01	5.39E-01	
I-135	7.77E-01	7.77E-01	
<b>ORGANIC</b>			
I-131	8.81E-01	8.81E-01	
I-132	9.90E-01	9.90E-01	
I-133	1.97E+00	1.97E+00	
I-134	1.19E+00	1.19E+00	
I-135	1.71E+00	1.71E+00	
<b>NOBLE GASES</b>			
XE-131M	0.00E+00	0.00E+00	
XE-133M	0.00E+00	0.00E+00	
XE-133	0.00E+00	0.00E+00	
XE-135M	0.00E+00	0.00E+00	
XE-135	0.00E+00	0.00E+00	
XE-138	0.00E+00	0.00E+00	
KR-83M	0.00E+00	0.00E+00	
KR-85M	0.00E+00	0.00E+00	
KR-85	0.00E+00	0.00E+00	
KR-87	0.00E+00	0.00E+00	
KR-88	0.00E+00	0.00E+00	

END EXECUTION DATE: 03/14/2000  
END EXECUTION TIME: 11:21:05.94

NEDC 99-033r/ATTACH 1  
SHEET 79 OF 84

AXIDENT VER 2 MOD 4

PRODUCTION DATE 02/18/92  
 BEGIN EXECUTION DATE: 03/20/2000  
 BEGIN EXECUTION TIME: 16:42:25.77

1 COOPER LOCA W/ RG 1.3 X/Q - EAB - MSIV  
 2 2 2 1.0 1.0  
 3 2429 2.6E6 141860 64640  
 4 0.0 0.0 0.0 1.0 1.0 2.391E5 0.0  
 5 1.8E3 7.2E3  
 6 2\*1.79E-8  
 7 2\*1.16E-7  
 8 2\*1.0  
 9 2\*0.0  
 10 2\*5.20E-4  
 11 2\*0.0  
 12 2\*0.0  
 13 2\*0.0  
 14 2\*0.0  
 15 2\*0.0  
 16 2\*0.0  
 17 2\*0.0  
 18 2\*0.0  
 19 2\*0.0  
 20 2\*0.0  
 21 3\*0.1 3\*0.131  
 22 3\*1.

1

COOPER LOCA W/ RG 1.3 X/Q - EAB - MSIV

INITIAL CONTAINMENT INVENTORY

ISOTOPE	ACTIVITY (CURIES)
I-131	6.114E+07
I-132	9.098E+07
I-133	1.406E+08
I-134	1.639E+08
I-135	1.303E+08
XE-131M	4.622E+05
XE-133M	3.572E+06
XE-133	1.406E+08
XE-135M	3.782E+07
XE-135	1.324E+08
XE-138	1.240E+08
KR-83M	1.093E+07
KR-85M	2.731E+07
KR-85	9.167E+05
KR-87	5.253E+07
KR-88	7.480E+07

1

COOPER LOCA W/ RG 1.3 X/Q - EAB - MSIV

ANALYSIS BASED ON: 2429 MWT, 141860. FT3 CONT CENTER VOLUME, 64640. FT3 CONTROL ROOM VOLUME, 31.37 FT EFF RADIUS

1. FT3 SPRAYED VOL, 239100. FT3 UNSPRAYED VOL, 1. CFM MIXING, 00.00 PCT REL TO SPRAYED VOL

AT .500 HOURS: X/Q(SITE)= .52E-03 SEC/M3 PRIMARY LEAK RATE= .155 PERCENT/DAY CONTROL ROOM INTAKE=.0 CFM  
 X/Q CONT ROOM= .00E+00 SEC/M3 SEC RELEASE RATE= .10E-01 VOL/DAY PCT PRI LKG TO ATM = 00.00

ISOTOPE	CLEANUP RATES (HR-1)				FILTER NON-REMOVAL FACTORS		
	SPRAY	PRIMARY	SECONDARY	CONT CENTER	RELEASE	CONT CENTER	
ELEMENTAL	.000	.000	.000	.000	.100	.131	
PARTICULATE	.000	.000	.000	.000	.100	.131	
ORGANIC	.000	.000	.000	.000	.100	.131	

ISOTOPE	ACTIVITY (CURIES)			CONTROL ROOM (CURIES) (UCI/CM3)			SITE BOUNDARY DOSES (REM)			CONTROL ROOM DOSES (REM)		
	PRIMARY	SECONDARY	RELEASE	THYROID	WH	BODY	THYROID	WH	BODY	THYROID	WH	BETA
ELEMENTAL												
I-131	1.39E+07	4.47E+02	4.67E-03	0.00E+00	0.00E+00	9.28E-04	2.25E-07	1.10E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-132	1.78E+07	5.74E+02	6.30E-03	0.00E+00	0.00E+00	7.16E-06	1.97E-06	3.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-133	3.15E+07	1.01E+03	1.06E-02	0.00E+00	0.00E+00	3.46E-04	6.60E-07	5.38E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-134	2.50E+07	8.05E+02	9.65E-03	0.00E+00	0.00E+00	1.92E-06	2.43E-06	5.25E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-135	2.81E+07	9.07E+02	9.63E-03	0.00E+00	0.00E+00	5.39E-05	2.23E-06	3.55E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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1

TOTAL DOSES 0-30 DAYS    \*\*\*\*\*    \*\*\*\*\*    \*\*\*\*\*    \*\*\*\*\*    \*\*\*\*\*    \*\*\*\*\*  
 2.31E-02    1.49E-03    7.96E-04    0.00E+00    0.00E+00    0.00E+00

COOPER LOCA W/ RG 1.3 X/Q - EAB - MSIV

ISOTOPE	2. HRS		ACTIVITY RELEASED (CURIES)					
<b>ELEMENTAL</b>								
I-131	7.45E-02	7.45E-02						
I-132	7.53E-02	7.53E-02						
I-133	1.65E-01	1.65E-01						
I-134	7.45E-02	7.45E-02						
I-135	1.39E-01	1.39E-01						
<b>PARTICULATE</b>								
I-131	4.09E-03	4.09E-03						
I-132	4.14E-03	4.14E-03						
I-133	9.05E-03	9.05E-03						
I-134	4.09E-03	4.09E-03						
I-135	7.64E-03	7.64E-03						
<b>ORGANIC</b>								
I-131	3.27E-03	3.27E-03						
I-132	3.31E-03	3.31E-03						
I-133	7.24E-03	7.24E-03						
I-134	3.28E-03	3.28E-03						
I-135	6.11E-03	6.11E-03						
<b>NOBLE GASES</b>								
XE-131M	2.48E-02	2.48E-02						
XE-133M	1.89E-01	1.89E-01						
XE-133	7.51E+00	7.51E+00						
XE-135M	1.39E-01	1.39E-01						
XE-135	6.44E+00	6.44E+00						
XE-138	5.61E-01	5.61E-01						
KR-83M	3.64E-01	3.64E-01						
KR-85M	1.19E+00	1.19E+00						
KR-85	4.93E-02	4.93E-02						
KR-87	1.41E+00	1.41E+00						
KR-88	2.91E+00	2.91E+00						

END EXECUTION DATE: 03/20/2000  
 END EXECUTION TIME: 16:42:25.88

NEDC 99-033 r1 ATTACH 1  
 SHEET 82 OF 84

### ICRP 30 Change to AXIDENT Library File

The *AXIDENT* library file is a plain ASCII text file, which is read by the code. The dose conversion factors used in the original code are very conservative. They were in effect and used for the design-basis 10-CFR-100 type reactor siting analyses (i.e., TID 14844 and ICRP Publication 2). For this analysis, more realistic DCFs are used. The DCFs used are obtained from ICRP 30. This required a change to the *AXIDENT* library file. The changes made are shown below.

#### Section of original library file

I-131	9.97E-07	1.48E+06	2.91	0.197	0.371	9
I-132	8.37E-05	5.35E+04	4.33	0.448	2.40	34
I-133	9.17E-06	4.00E+05	6.69	0.423	0.477	6
I-134	2.22E-04	2.50E+04	7.8	0.455	1.939	24
I-135	2.87E-05	1.24E+05	6.2	0.308	1.779	25

#### Section of new library file

I-131	9.97E-07	1.10E+06	2.91	0.197	0.371	9
I-132	8.37E-05	6.30E+03	4.33	0.448	2.40	34
I-133	9.17E-06	1.80E+05	6.69	0.423	0.477	6
I-134	2.22E-04	1.10E+03	7.8	0.455	1.939	24
I-135	2.87E-05	3.10E+04	6.2	0.308	1.779	25

The complete library file used is presented below.

I-131	9.97E-07	1.10E+06	2.91	0.197	0.371	9		
I-132	8.37E-05	6.30E+03	4.33	0.448	2.40	34		
I-133	9.17E-06	1.80E+05	6.69	0.423	0.477	6		
I-134	2.22E-04	1.10E+03	7.8	0.455	1.939	24		
I-135	2.87E-05	3.10E+04	6.2	0.308	1.779	25		
XE-131M	6.79E-07	0	0.022	0.135	0.022	3		
XE-133M	3.55E-06	0	0.17	0.155	0.033	3		
XE-133	1.52E-06	0	6.69	0.146	0.030	8		
XE-135M	7.40E-04	0	1.8	0.097	0.422	3		
XE-135	2.11E-05	0	6.3	0.322	0.246	13		
XE-138	6.60E-04	0	5.9	0.800	2.870	9		
KR-83M	1.03E-04	0	0.52	0.034	0.005	3		
KR-85M	4.38E-05	0	1.3	0.233	0.156	4		
KR-85	2.04E-09	0	0.27	0.223	0.0021	1		
KR-87	1.52E-04	0	2.5	1.050	1.375	13		
KR-88	6.88E-05	0	3.56	0.341	1.743	19		
0.03	5.6	E-02 0.08016	2.5	E-02 0.17723	2.5	E-03 0.28431	5.9	E-02
0.32578	2.5	E-02 0.36447	7.97	E-01 0.503	3.6	E-03 0.637	6.8	E-02
0.7229	1.5	E-02 0.1472	2.	E-03 0.263	2.	E-02 0.285	5.	E-03
0.504	1.	E-02 0.508	2.	E-02 0.523	1.6	E-01 0.6206	4.	E-02
0.63	1.9	E-01 0.6502	4.	E-02 0.6521	4.	E-02 0.6678	9.2	E-01
0.6697	6.	E-02 0.6715	6.	E-02 0.727	3.2	E-02 0.729	3.2	E-02
0.7729	8.3	E-01 0.9547	1.94	E-01 1.138	2.	E-02 1.14	4.	E-02
1.22	7.	E-03 1.28	6.	E-02 1.36	2.	E-02 1.398	8.	E-02
1.44	3.	E-02 1.72	3.	E-03 1.77	5.	E-03 1.91	1.3	E-02
1.99	1.3	E-02 2.08	3.	E-03 2.16	2.	E-03 2.22	2.	E-03
2.39	2.	E-03 2.55	5.	E-04 2.68	2.	E-04 0.53	9.4	E-01
0.75	2.	E-02 0.86	7.	E-02 1.03	1.	E-02 1.24	2.	E-02
1.35	2.	E-02 0.136	5.	E-02 0.18	7.	E-02 0.39	7.	E-02
0.41	6.	E-03 0.43	3.	E-02 0.51	9.	E-03 0.54	8.	E-02
0.61	2.4	E-01 0.69	7.	E-02 0.75	1.	E-02 0.77	6.	E-02
0.85	9.5	E-01 0.86	4.	E-02 0.89	7.	E-01 0.96	2.	E-02
1.	5.	E-02 1.07	1.8	E-01 1.15	1.2	E-01 1.28	1.	E-02

1.34	2.	E-02	1.46	4.	E-02	1.49	1.	E-02	1.62	5.	E-02
1.79	5.	E-02	0.2204	1.8	E-02	0.2884	3.4	E-02	0.4175	3.2	E-02
0.434	8.2	E-03	0.5269	1.49	E-01	0.5465	6.2	E-02	0.7077	5.9	E-03
0.8369	5.	E-02	0.9724	1.8	E-02	1.0387	9.	E-02	1.1017	1.7	E-02
1.1243	3.3	E-02	1.1316	1.75	E-01	1.1691	7.9	E-03	1.2604	2.58	E-01
1.4575	7.1	E-02	1.5029	1.2	E-02	1.5659	1.4	E-02	1.6785	9.5	E-02
1.707	3.8	E-02	1.7919	7.6	E-02	1.8314	6.4	E-03	2.0467	8.3	E-03
2.2567	6.3	E-03	2.4079	9.	E-03	0.005	6.	E-02	0.03	5.9	E-01
0.16398	2.3	E-02	0.0297	1.41	E-01	0.0338	3.2	E-02	0.2328	8.	E-02
0.0308	3.82	E-01	0.0353	8.6	E-02	0.0796	6.	E-03	0.081	3.7	E-01
0.1607	6.6	E-04	0.2234	2.4	E-06	0.3031	5.1	E-05	0.3841	2.3	E-04
0.0045	4.	E-04	0.0304	1.35	E-01	0.527	8.2	E-01	0.031	4.5	E-02
0.1585	2.1	E-03	0.1999	2.	E-04	0.2498	9.16	E-01	0.3586	2.2	E-03
0.3731	1.1	E-04	0.4082	3.1	E-03	0.5733	5.	E-05	0.6086	2.4	E-02
0.6546	3.2	E-04	0.7319	4.6	E-04	0.8126	5.	E-04	1.063	3.	E-05
0.03	3.	E-02	0.155	7.8	E-02	0.243	3.6	E-02	0.259	3.7	E-01
0.397	7.4	E-02	0.402	2.8	E-02	0.434	2.3	E-01	1.77	2.	E-01
2.00	1.6	E-01	0.0016	8.	E-02	0.0093	8.	E-02	0.0128	1.6	E-01
0.0016	6.5	E-04	0.0128	5.2	E-02	0.1495	7.7	E-01	0.305	1.35	E-01
0.514	4.35	E-03	0.403	5.9	E-01	0.6743	2.5	E-02	0.836	8.	E-03
0.8458	8.1	E-02	1.1755	1.4	E-02	1.338	7.5	E-03	1.384	5.5	E-03
1.741	2.	E-02	2.012	2.6	E-02	2.556	9.5	E-02	2.559	5.1	E-02
2.8112	4.	E-03	3.3098	6.	E-03	0.166	6.9	E-02	0.1961	3.81	E-01
0.3626	3.	E-02	0.3904	6.	E-03	0.4723	6.	E-03	0.8347	1.31	E-01
0.8624	5.	E-03	0.9867	1.6	E-02	1.1417	1.8	E-02	1.1833	9.	E-03
1.25	1.1	E-02	1.5185	1.5	E-02	1.5298	1.14	E-01	2.0295	4.8	E-02
2.0353	4.8	E-02	2.1959	1.51	E-01	2.2316	3.6	E-02	2.3524	2.	E-03
2.392	3.82	E-01									
0.01	4.99		0.015	1.55		0.02	0.752		0.03		0.349
0.04	0.248		0.05	0.208		0.06	0.188		0.08		0.167
0.1	0.154		0.15	0.136		0.2	0.123		0.3		0.107
0.4	0.0954		0.5	0.087		0.6	0.0805		0.8		0.0707
1.	0.0636		1.5	0.0518		2.0	0.0445		3.0		0.0358
4.0	0.0308										
4.61	1.27		0.511	0.148		0.0669	0.0406		0.0305		0.0243
0.0234	0.0250		0.0268	0.0288		0.0295	0.0297		0.0296		0.0289
0.0280	0.0257		0.0238	0.0212		0.0194					
I-131	I-132	I-133	I-134	I-135	I-131	I-132	I-133	I-134			
I-135	I-131	I-132	I-133	I-134	I-135	XE-131M	XE-133M	XE-133			
XE-135M	XE-135	XE-138	KR-83M	KR-85M	KR-85	KR-87	KR-88				