NIAGARA MOHAWK NUCLEAR ENGINEERING

CALCULATION COVER SHEET

NINE MILE POINT NUCLEAR STATION Unit (1, 2 or 0=Both) : 1 Discipline : Health Physics

Title: Unit 1 LOCA Impact on CR Vent Monitor	Calculation No. H21C047			
	(Sub)system(s) CRAC	Building TB	Floor Elev. 277	Index No. N/A

Originator(s)
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Rev	Description	Design Change No.	Prep'd By	Date	Chk	Date	App	Date
00	Original Issue	N/A	AGM	5/1/98	[illegible]	5/1/98	TGK	5/1/98

Computer Output/Microfilm Filed Separately (Yes / No / NA): No Safety Class (SR / NSR / Qxx) : SR

Superseded Document(s) : None

Document Cross Reference(s) - For additional references see page(s) : 24-25

Ref No	Document No.	Doc Type	Index	Sheet	Rev
	See pages 24-25				

General Reference(s) :
See pages 24-25

Remarks :
Calculation determines count rate at Control Room Vent Monitor following LOCA. Also determines maximum bypass leakage which will result in LOCA doses being with GDC 19 limits without Control Room emergency ventilation actuation.

Confirmation Required (Yes / No) : No See Page(s) :	Final Issue Status (APP / FIO / VOI) : APP	File Location (Calc / Hold) :CALC	Operations Acceptance Required (Yes / No) : No

Evaluation Number(s) / Revision : SE 98-010 Rev 0
Copy of Applicability Review Attached (Yes / N/R)?N/R

Component ID(s) (As shown in MEL) :
RAM-210-42A
RAM-210-43A

Key Words : Doses, LOCA, GDC 19, radiation, monitors CRAC, setpoint, Control Room Habitability

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CALCULATION CONTINUATION SHEET

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OBJECTIVE OF CALCULATION

The objectives of this calculation are to determine the following:

- the amount of bypass leakage that would result in the control room (CR) 30 day LOCA doses in excess of GDC 19 limits without actuation of the CR emergency ventilation (CREV)
- the amount of LOCA bypass leakage which will result in CR air intake monitors RAM-210-42A (channel 11) and RAM-210-43A (channel 12) having a count rate ≥ 210 cpm response based on the radioactive concentration at the CR air intake
- the time at which the CREV system would have to be manually actuated after a LOCA to assure that GDC 19 doses would not be exceeded.

METHOD

This section provides a brief discussion of the general methodology used in calculating the CR ventilation air intake monitor setpoint for the LOCA releases. Additional details are provided in the specific calculation sections.

The DRAGON computer code (REF 21) is used to calculate isotopic activities in the reactor building, the environment outside and inside the CR, and doses in the CR due to airborne activity. The initial core noble gas and iodine isotopic activities are given in Table 1.

The following sources of radioactive releases are considered in this analysis:

- Leakage from primary containment pressure boundary to secondary containment, hereafter referred to as "containment leakage".
- Leakage from the isolation valves, which become the primary containment pressure boundary during and following a LOCA, to the turbine building, bypassing the secondary containment and hereafter referred to as "bypass leakage."
- Leakage that occurs in secondary containment from the Emergency Safety Feature (ESF) components that recirculate water drawn from the suppression chamber after a LOCA, hereafter referred to as "ESF leakage".

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DATA / ASSUMPTIONS

SOURCE TERM PARAMETERS-

1. The reactor is assumed to be operating at 102% of full thermal power at the time of the accident. (REF 5, page 15.6.5-5 and REF 18 recommend that 102% power be used in analyses to allow for possible instrument errors in registering the power level).

2. 100% reactor power level is 1850 MW_t and 102% power is 1887 MW_t. (REF2 d).

3. The radioactive material released from the reactor core and containment are as follows:

   a. 100% of the core noble gases and 25% of the core radioactive iodines are immediately available for release from the primary containment (REF 3, page 1).

   b. of the 25% of core iodines released per item 3.a above, 91% are elemental, 5% are particulate, and 4% are organic. (REF 3, page 1)

      For filtration and bypass leakage computations "elemental" halogens are assumed to include both the elemental and particulate halogens, and the "methyl" halogens are assumed to include only the organic halogens. This results in 0.96 * 0.25 = 0.24 (or 24%) and 0.04 * 0.25 = 0.01 (or 1%) of the core elemental and methyl, respectively, halogens are released to the primary containment atmosphere at time t = 0.

   c. 50% of the core iodine is assumed to be mixed in the sump water being circulated through the containment external piping systems. This is used for ESF leakage calculations (REF 5, Appendix B).

   In clarifying the source term, in section II.B.2 of NUREG 0737 (REF 4), the NRC stated that the source term in liquid-containing systems was 50% of the core halogens in the depressurized cooling water which does not contain noble gas. Also, only halogens are assumed to be present in ESF systems which is also consistent with NUREG 0737.

4. The core inventory in curie/MW_t (from REF 19) is multiplied by the core power level of 1850 MW_t (DATA/ASSUMPTION #2) and then by 1.02 to account for the instrument uncertainty (DATA/ASSUMPTIONS #1) to give core activity at the time of the accident. These data are given in Table 1.

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PRIMARY CONTAINMENT PARAMETERS

5. The drywell free volume is 180,000 ft³ and the torus (suppression chamber) free volume is 120,000 ft³ (REF 1.c). Combined, these volumes represent the total primary containment free volume of 3.0E+5 ft³. The initial suppression chamber water volume is 79,800 ft³ (REF 1, Table XV-32a). Although the water and free air volume of the suppression chamber change during the accident, they are assumed, in this analysis, to remain constant for duration of the accident.

6. The primary to secondary containment leak rate is 1.1% per day @ 22 psig. This value is consistent with the Licensing basis (REF 6). This leak rate value is limited to 1.5% per day @ 35 psig per Primary Containment Tech Spec Bases 3.3.3 and 4.3.3 (REF 2.a). The maximum allowable leak rate L_t @ pressure P_t can be determine using following equation (REF 12, pages 2 & 3):

$$L_t = L_a (L_{tm}/L_{am})$$

Where
L_t = maximum allowable containment leak rate to be measured.
L_a = maximum allowable containment leak rate at test pressure of P_a as specified for pre-operational test in Tech Spec = 1.5% given.
L_{tm} = total measured containment leakage @ pressure P_t during the original pre-operational test = 0.47%.
L_{am} = total measured containment leakage @ pressure P_a during the original pre-operational test = 0.64%.

Substituting values:

$$L_t = L_a (L_{tm}/L_{am}) = 1.5\% (0.47/0.64) = 1.1\%$$

SECONDARY CONTAINMENT PARAMETERS

7. The dual containment design at NMP 1 with a secondary containment which completely surrounds the primary containment and held at a negative pressure of 0.25 inch water gauge, below adjacent regions meets the criteria for the fission product structures for collection and control of the post-accident releases. Also, the return header provides a wide distribution over secondary containment (REF 1, Figure VI-24).Therefore, the leakage from the primary containment is assumed to mix with 50% of the secondary containment volume (REF 10).

8. The free volume of secondary containment is determined, as shown below:

   a. REF 1.a, page VII-36 states that the RBEV system fan discharge rate is equivalent to one reactor building volume per 24 hours.

   REF 1.a, page VII-39 states that the emergency ventilation fans discharge a volume equivalent to 100% of the building volume per 24 hours.

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REF 1, Section I.B.12.0, page 1-11 states the Design Leakage Rate for secondary containment to be 100% of the free volume per day, via the stack, while maintaining 0.25" water gauge negative pressure in the reactor building relative to atmosphere.

b. REF 1.a, page VII-56 states that each RBEVS filter bank has a rated flow capacity of 1600 cfm.

c. Based on a. and b. above, if the RBEVS exhausts one building volume per day, at the rate of 1600 cfm, the building free volume can be back calculated as follows:

$$\frac{1600\,ft^3}{\min} x \frac{60\min}{hr} x \frac{24hr}{day} = \frac{2.304E+6\,ft^3}{day} = \frac{1volume}{day}$$

Therefore, the secondary containment free air volume used in this calculation is 2.304E+6 ft^3 This is a maximum value, back calculated from the RBEV flow rate. As the secondary containment release rate required by the DRAGON computer code is in fractions per day, the actual volume used is irrelevant for release calculations.

9. High radiation must be detected by at least one monitor for a period of 2 to 3 sec to produce an actuation signal (REF 1, Page VII-36). Therefore, a delay of 3 seconds has been introduced to RBEVS to reduce spurious actuations while ensuring a valid actuation occurs. It is assumed that sufficient radiation is present to alarm the monitor at T=0 seconds. For conservatism, a 10 second delay in RBEVS actuation is assumed in this calculation. The reactor building is maintained at a negative pressure of 0.25" water gauge with respect to the atmosphere and is anticipated to be maintained by normal RB ventilation during the 10 second RBEVS delay.

10. The RBEV flow rates are assumed to be:

- 70,000 cfm (REF 13, Table 3.4-5) unfiltered for the first 10 seconds of the accident while the RBEV is starting
- 3200 cfm + 10% filtered from 10 seconds to 30 minutes(REF 1.a and REF 20, page 14).
- 1600 cfm + 10% filtered from 30 minutes to 720 hrs (REF 1.a)

11. The Unit 1 Tech Specs. (REF 2b, Section 3.4.4.d) specify operations of RBEVS within ±10% of the design flow rate. Applying the 50% mixing in the secondary containment discussed in DATA/ASSUMPTIONS #7 above, the required release rates (volumes/day) for the DRAGON (REF 21) input are calculated as follows:

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70000 cfm *1440 min/day * 2*(1volume/2.304E6ft^3) = 87.5 volumes/day 0 - 10 sec

3200 cfm *1440 min/day 1.1* 2*(1volume/2.304E6ft^3) = 4.4 volumes/day 10 sec - 30 min

1600 cfm *1440 min/day 1.1* 2*(1volume/2.304E6ft^3) = 2.2 volumes/day 30 min - 720 hrs

12. The release point for RBEVS is the Main Stack. (REF 1.a, Section VII.H.1.0, page VII-36).

13. The iodine removal efficiency of the RBEV filters is assumed to be 99% for particulate and elemental iodine and 90% for organic iodines. The 99% efficiency assumed for particulate and elemental iodines agrees with the original Licensing basis as described in the UFSAR (REF 1, Sections XV.C.5.1.8 and VII-H.2.0) which describes the filter efficiency as 99% for methyl iodide and other iodine forms and the Technical Specifications (REF 2b, Section 3.4.4.b) which gives the halogenated hydrocarbon test requirement of ≥.99%. The duct heaters which control the humidity less than 70%. Per Regulatory Guide 1.52, Table 2 (REF 17), the filter efficiency should be 95%.

CONTROL ROOM PARAMETERS

14. The free volume of the NMP 1 control room is 1.36E+5 ft^3. (REF 14).

15. The control room normal intake rate is 3550 cfm unfiltered. This is calculated by taking the maximum flow rate of 16,300 minus the minimum recirc flow rate of 12,750 cfm (REF 1, Section III-B 2.2). Control room emergency air intake rate is 2875 + 10% cfm, or 3163 cfm (REF 1b, 2c).

16. The doors of the control room are weather-stripped and the penetrations sealed to maintain a positive pressure of approximately one-sixteenth of an inch of water (REF 1.b, page III-11), however, an unfiltered inleakage of 10 cfm to the control room is assumed per Reference 7, Section III.3.d.(2).(ii). An additional 20 cfm is assumed to account for an unfiltered inleakage (REF 26) through an unsealed drain. The total unfiltered inleakage of 30 cfm combined with DATA/ASSUMPTIONS #15, this makes the total normal air intake rate 3580 cfm and the total emergency air intake rate of 3193 cfm.

17. The CR emergency filters actuate within 32 seconds, that is, 5 second delay in radiation monitor response and 27 seconds assumed for normal intake valve closure (REF 22 & 23).

18. The iodine removal efficiencies of the CR emergency filters are assumed to be 99% for the particulate, and 90% for elemental and methyl iodines. The organic halogen filter efficiency is consistent with previous analysis and the elemental/particulate efficiency is more conservative than the 99% given in the Technical Specifications (REF 2c). Weighted filter efficiencies are determined below to account for the 30 cfm unfiltered inleakage to the control room:

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$$\text{Elemental efficiency} = \frac{(3163\ \text{cfm})(0.90)(91/96) + (3163\ \text{cfm})(0.99)(5/96) + (30\ \text{cfm})(0)}{3163\ \text{cfm} + 30\ \text{cfm}} = 0.896$$

$$\text{Methyl efficiency} = \frac{(3163\ \text{cfm})(0.90) + (30\ \text{cfm})(0)}{3163\ \text{cfm} + 30\ \text{cfm}} = 0.892$$

BYPASS LEAKAGE PARAMETERS

19. It is assumed that bypass leakage is released unfiltered to the environment via the stack (REF 6).

NOTE: Since bypass leakage is already included in the 1.1% per day containment leak rate, in a rigorous, mechanistic approach, the bypass leakage should be subtracted from the 1.1% per day containment leak rate assumed so that the sum of containment leakage and bypass leakage equals 1.1% containment volumes per day leak rate. Conservatively, this is not done in this calculation.

ESF LEAKAGE PARAMETERS

20. The ESF leakage is assumed to be 750 gph (REF 16) and is assumed to start at t=0 post-LOCA. Also, ESF leakage is assumed to undergo 50% mixing in the secondary containment. The basis for this assumption is the same as the assumption made for containment leakage (DATA/ASSUMPTIONS #7).

21. The ESF leakage consists of 50% of the core halogen inventory released to the suppression chamber (torus) water of 79,800 ft^3 and 10% of the pool halogens that leak to secondary containment are assumed to become airborne instantaneously. This is consistent with REF 5, Section 15.6.5, Appendix B, Part III for water temperatures below 212°F. The suppression chamber water temperature remains well below 212°F (REF 1.e) for entire duration of the accident.

OTHER PARAMETERS

22 A breathing rates (REF 3):

0-720 hrs 3.47E-04 m^3/sec

23. Main stack X/Q values used are taken from Reference 19, pages 12 & 13 and given in Table 2. Note: no adjustment factors for 8-24, 24-96, 96-720 hrs were used.

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24. RE-210-42 and RE-210-43 detector efficiencies given in Table 3 are taken from reference 25.

25. Because all 3 leakage paths start at T=0 and are assumed to be at a constant leak rate (containment leak 1.1% per day for time 0 to 720 hr, ESF leak 0 to 720 hr at 750 gph, and bypass leakage at a constant rate into the TB starting at T=0), the activity release rate in units of Ci/sec are calculated for the first 27 seconds. This time is chosen arbitrarily but is conservative in that the LOCA release rate in units of Ci/sec will be at its highest in the beginning of the accident prior to decay. That is, the CR vent monitor count rate during the first 27 seconds of the LOCA will be at its' highest as the activity release rate will be at its' highest value. Therefore, if the monitor will not alarm during this time period then it will not alarm at all.

26. The turbine building ventilation flow rate is 1 volume per hour. (REF 1.d)

27. Current min pathway bypass leakage (converted to 22 psig) = 5.28 scfh (REF 27)
    Current max pathway bypass leakage (converted to 22 psig) = 18.36 scfh (REF 27)

28. Revised CR vent monitor setpoint (process limit) 210 cpm. (REF 25).

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Table 1

CORE INVENTORY AT 102% THERMAL POWER		
ISOTOPE	ACTIVITY (Ci/MW$_t$)	CORE INVENTORY (Ci)
I-131	2.90E+04	5.47E+07
I-132	4.20E+04	7.93E+07
I-133	4.80E+04	9.06E+07
I-134	6.20E+04	1.17E+08
I-135	4.90E+04	9.25E+07
KR-83M	3.00E+03	5.66E+06
KR-85M	6.50E+03	1.23E+07
KR-85	3.00E+02	5.66E+05
KR-87	1.20E+04	2.26E+07
KR-88	1.70E+04	3.21E+07
KR-89	2.00E+04	3.77E+07
XE-131M	1.80E+02	3.40E+05
XE-133M	2.00E+02	3.77E+05
XE-133	5.60E+04	1.06E+08
XE-135M	1.70E+04	3.21E+07
XE-135	9.80E+03	1.85E+07
XE-138	4.40E+04	8.30E+07

TABLE 1: Ci/MW$_t$ from Reference 19, pages 6 & 7, is multiplied by 1850 MW$_t$ * 1.02 to determine core inventory.

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Table 2

X/Q VALUES @ MAIN STACK RELEASE FOR CONTROL ROOM AIR INTAKE (SEC/M^3)	
TIME	X/Q
0-2 HR	3.12E-04
2-720 HR	1.22E-08

TABLE 2: All X/Q values taken from REF 19, pages 12 & 13.

Table 3

Control Room Vent Monitor Response	
Isotope	Conversion Factor cpm/uCi/cc
I-131	1.66E+05
I-132	2.97E+05
I-133	2.88E+05
I-134	3.37E+05
I-135	2.60E+05
KR-83M	0.00E+00
KR-85M	1.89E+05
KR-85	1.99E+05
KR-87	3.70E+05
KR-88	1.86E+05
KR-89	3.45E+05
XE-131M	0.00E+00
XE-133M	0.00E+00
XE-133	6.85E+05
XE-135M	0.00E+00
XE-135	2.55E+05
XE-138	2.90E+05

REF 25

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CALCULATION

The DRAGON input description below applies to all runs made except where noted. The inputs are described in three sections;

- Containment Leakage
- ESF Leakage
- Bypass Leakage

CONTAINMENT LEAKAGE

The specified fractions of the reactor core isotopic inventory (Table 1) are released in the primary containment atmosphere volume and leaked into the secondary containment (SC) due to the post-LOCA pressurization of the primary containment. The core inventory which leaked in the SC mixes uniformly with 50% of the SC volume and is finally released to the environment through RBEV.

DRAGON computer code (REF 21) design inputs are as follows:

Core isotopic inventory from Table 1 and DATA/ASSUMPTIONS #4

Atmospheric dispersion factors @ Main Stack for CR Air Intake from Table 2 and DATA/ASSUMPTIONS #12 & 23

Fractions of core activities released to primary containment at time t = 0 sec: 100% core noble gas, 24% core elemental/particulate halogens, and 1% methyl halogens: DATA/ASSUMPTIONS #3.

Primary containment:
volume - 3.0E+5 ft^3 : DATA/ASSUMPTIONS #5
leak rate 0.011 vol/day DATA/ASSUMPTIONS #6

Secondary Containment:
volume - 2.304E+6 cubic ft: DATA/ASSUMPTIONS #8c
leak rate (all assume 50% mixing, DATA/ASSUMPTIONS 7)
70000 cfm = 87.50 vol/day for 10 seconds
3200+10% cfm = 4.4 vol/day from 10 seconds to 30 minutes
1600 cfm+10% = 2.2 volumes/day from 30 minutes to 30 days: DATA/ASSUMPTIONS #11

RBEV Exhaust filter efficiencies:
0 to 10 seconds, No filtration through charcoal filter: DATA/ASSUMPTIONS #9-10
10 seconds until end of accident, elemental & particulate - 0.99, methyl - 0.90:
DATA/ASSUMPTIONS #13

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Control Room:

volume - 1.36E+5 cubic ft: DATA/ASSUMPTIONS #14
intake rate 0 to 720 hrs 3580 cfm : DATA/ASSUMPTIONS #15 - 16

Breathing rates DATA/ASSUMPTIONS #22

0-720 hrs 3.47E-04 m^3/sec

Note that because of the DRAGON code limitation that secondary containment filtration cannot be varied as a function of time, two runs are made for Containment Leakage:

- 0 to 10 seconds with no secondary containment filtration
- 10 seconds to 30 days with secondary containment filtration

ESF LEAKAGE

ESF leakage occurs in secondary containment from the engineering safety feature (ESF) system components that circulate water from the torus after a LOCA. 50% of the core halogens are assumed to e in the torus water available for release. Of the halogens in the water, 10% are assumed to become airborne during the leak (DATA/ASSUMPTIONS # 21).

The ESF leakage rate of 750 gallons per hour (DATA/ASSUMPTION # 20) is converted into a volume/day as follows for input to the DRAGON code:

$$\frac{750gal/hrx0.1336\,ft^3/galx24hr/day}{79800\,ft^3/vol} = 3.01E-2vol/day$$

The ESF leakage activity available for release is based on the assumptions that 50% of the halogens enter the suppression chamber, and 10% of the halogens in the ESF leakage become airborne immediately (DATA/ASSUMPTIONS # 21), so the halogen release fractions for input to DRAGON become:

96% elemental halogens * 50% * 10% = 0.048
4% methyl halogens * 50% * 10% = 0.002

The remainder of the inputs to DRAGON are given below:

Core activities available for release: Table 1 and DATA/ASSUMPTIONS #4
Atmospheric dispersion factors - Main Stack: Table 2 and DATA/ASSUMPTIONS #12 & 23
Fractions of core activities released to torus water at time t = 0:
0.048 elemental halogens and 0.002% methyl halogens: calculated above. Note that noble gases resulting rom the decay of the halogens are released to the secondary containment and to the environment.

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Torus water volume:

volume - 7.98E+4 cubic ft: DATA/ASSUMPTIONS #5
leak rate 3.01E-2 vol/day: calculated above

Secondary Containment:

volume - 2.304E+6 cubic ft: DATA/ASSUMPTIONS #8c
leak rate (all assume 50% mixing) - 70000 cfm = 87.50 vol/day for 10 seconds, 3200+10% cfm = 4.4 vol/day from 10 seconds to 30 minutes and 1600 cfm+10% = 2.2 volumes/day from 30 minutes to 30 days: DATA/ASSUMPTIONS #11
exhaust filter efficiencies:
0 to 10 seconds, no filter efficiency : DATA/ASSUMPTIONS #9&10
10 seconds until end of accident elemental/particulate - 0.99
methyl - 0.90: DATA/ASSUMPTIONS #13

Control Room:
volume - 1.36E+5 cubic ft: DATA/ASSUMPTIONS #14
intake rate 0 to 720 hrs 3580 cfm : DATA/ASSUMPTIONS # 15 - 16

Breathing rates DATA/ASSUMPTIONS #22

0-720 hrs 3.47E-04 m^3/sec

Note that because of the DRAGON code limitation that secondary containment filtration cannot be varied as a function of time, two runs are made for ESF leakage:

- 0 to 10 seconds with no secondary containment filtration
- 10 seconds to 30 days with secondary containment filtration

BYPASS LEAKAGE

Bypass leakage is the activity release pathway where process systems that pass from primary containment to areas outside of secondary containment, "bypassing" the secondary containment ventilation envelope. As a result, the activity is not filtered by RBEV. The release is assumed to be an elevated release through main stack as discussed in DATA/ASSUMPTIONS # 19. 10 scfh is arbitrarily used and then scaled, as dose varies linearly with leakage. Thus 10 scfh must be converted first to cfh and then volumes per day for input to DRAGON (REF 15). This is done below by application of the ideal gas law.

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FLOWs = FLOW rate at standard conditions 14.7 psia and 68° F = 10 scfh
FLOWa = FLOW rate at actual conditions of 22 psig and 262.06° F (262.06° F equals saturated steam temp at 36.7 psia)
Ts = standard temperature = 68°F = 293.2°K
Ta = actual temperature = 262.066°F= 401°K
Ps = standard pressure 14.7 psia
Pa = actual pressure 36.7 psia

$$FLOW_a = \frac{T_a}{T_s} x \frac{P_s}{P_a} x FLOW_s = \frac{401° K}{293.2° K} x \frac{14.7psia}{36.7psia} x 10.0scfh = 5.48cfh$$

Converting this flow rate to volumes per day is calculated as follows:

$$5.48 \frac{ft^3}{hr} x 24 \frac{hr}{day} x \frac{1volume}{3.0E+5 ft^3} = 4.38E-4 \frac{volumes}{day}$$

The other inputs to DRAGON are as follows

Core activities available for release: Table 1 and DATA/ASSUMPTIONS #4
Atmospheric dispersion factors - Main Stack: Table 2 and DATA/ASSUMPTIONS # 23
Fractions of core activities released to primary containment at time=0: 100% noble gas, 24% elemental halogens, and 1% methyl halogens: DATA/ASSUMPTIONS #3.

Primary containment:
volume - 3.0E+5 cubic ft: DATA/ASSUMPTIONS #5
leak rate 4.38E-4 vol/day calculated above

Control Room:
volume - 1.36E+5 cubic ft: DATA/ASSUMPTIONS #14
unfiltered intake rate 0 to 720 hrs 3580 cfm : DATA/ASSUMPTIONS #15 & 16

Breathing rates DATA/ASSUMPTIONS # 20

0-720 hrs 3.47E-04 m^3/sec

Most of the models analyzed assume the activity is instantaneously released to the environment with no holdup and no mixing in the Turbine Building. Runs are made with 50% mixing in the Turbine Building to determine impact on unfiltered dose and also to determine required manual actuation of the CR emergency filters.

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Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
A. Moisan 4/28/98	Glenn Stinson / 4/29/95	H21C047	00

CASE 1. Doses to the Control Room without actuation of Control Room Emergency Filtration

The following DRAGON runs were made to determine the doses in the control room for the case where the control intake rate is a constant 3580 ft^3 /min for the duration of the accident with no control room filtration in operation. Note the results of the 0 -10 second Containment Leakage and ESF leakage cases are somewhat conservative as the model assumes what leaked into the secondary containment in the first 10 seconds continues to leak to the environment without filtration by RBEV, even though the release from the secondary containment would actually be filtered after 10 seconds. This has minimal impact as very little activity is released in the first 10 seconds. Also this conservatism does not significantly impact the CR vent monitor count rate or CR doses.

Containment Leakage:
0-10 seconds - run # 7195 4/24/98
10 seconds to 30 days - run #7195 4/24/98

ESF Leakage:
0-10 seconds - run #8142 4/25/98
10 seconds to 30 days - run #8142 4/25/98

Bypass Leakage -
10 scfh no plateout (all iodine in leakage released to atmosphere) no holdup in TB - run #6541 4/24/98
10 scfh no plateout 50% mixing in TB (48 vol/day release rate) - run #7246 4/24/98

The results are given in Table 4 with the count rates at the CR vent monitor given in Table 5

TABLE 4 - CR DOSES WITH NO FILTRATION

	DOSE(REM)			DRAGON
RELEASE PATH	THYROID	GAMMA	BETA	RUN
CONT LK 0-10 SEC	9.28E-01	1.68E-04	1.48E-03	7195
CONT LK 10 SEC-720 HR	4.02E+00	1.77E-02	2.35E-01	7195
ESF LEAKAGE 0 - 10 SEC	5.08E-01	5.68E-05	3.54E-04	8142
ESF LEAKAGE 0 SEC - 720 HR	2.19E+00	5.95E-04	5.32E-03	8142
SUBTOTAL	7.65E+00	1.85E-02	2.42E-01	
BYPASS AT 10 SCFH				
NO PLATEOUT NO TB HOLDUP	1.27E+02	2.18E-02	1.94E-01	6541
NO PLATEOUT 50% MIX IN TB	9.55E+01	1.54E-02	1.38E-01	7246
TOTAL DOSES @ 10 SCFH				
NO PLATEOUT NO TB HOLDUP	1.35E+02	4.03E-02	4.36E-01	
NO PLATEOUT 50% MIX IN TB	1.03E+02	3.39E-02	3.80E-01	

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
A. Moisan 4/28/98	Glenn Stinson / 4/29/95	H21C047	00

As can be seen from Table 4, the limiting dose, as expected is the thyroid dose and obviously 10 scfh bypass leakage is unacceptable. For the no holdup in TB model, the amount of allowable bypass leakage which results in a thyroid dose of 30 Rem is calculated below:

Containment leakage 4.95 Rem Thyroid
ESF leakage 2.70 Rem Thyroid

Thyroid dose available for Bypass Leakage = 30 - (4.95 + 2.70) = 22.35 Rem

$$\frac{22.35\,Rem}{127\,Rem/10\,scfh} = 1.8\,scfh$$

For the case with 50% mixing assumed in the TB, the allowable bypass leak becomes

$$\frac{22.35\,Rem}{95\,Rem/10\,scfh} = 2.4\,scfh$$

Therefore, with a bypass leakage rate of 1.8 scfh (with no TB holdup) and 2.4 scfh (with 50% mixing in the TB), the thyroid doses in the Control Room, post LOCA, are calculated to be within GDC 19 dose limits without CR ventilation actuation. Note that the present min pathway bypass leakrate is 5.28 scfh. (Ref 27)

Next to be determined is the count rate at the CR vent monitor based on activities released in the first 27 seconds. The count rate is calculated in Table 5 below using the curies released from the DRAGON runs listed in Table 4 and the monitor efficiencies listed in Table 3.

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
A. Moisan 4/28/98	Glenn Stinson / 4/29/95	H21C047	00

TABLE 5 CURIES RELEASED AND CPM AT MONITOR

NO PLATEOUT NO HOLDUP IN TURBINE BUILDING 1.8 SCFH BYPASS LEAK RATE

ISOTOPE	CONT LK 0-10 SEC	CONT LEAK 10 - 27 SEC	ESF LK 0-10 SEC	ESF LK 10-27 SEC	BYPASS 10 SCFH 0-27 SEC	BYPASS 1.8 SCFH 0-27 SEC	TOTAL CI RLSD 0-27 SEC	RELEASE RATE CI/SEC 0-27 SEC	STACK X/Q (SEC/M**3)	CONC AT DUCT INLET (UCI/CC)	MONITOR EFF CPM/ UCI/CC	MONITOR CPM
I-131	1.03E-01	1.74E-04	5.64E-02	9.52E-05	1.87E+00	3.37E-01	4.96E-01	1.84E-02	3.12E-04	5.73E-06	1.66E+05	9.52E-01
I-132	1.49E-01	2.52E-04	8.17E-02	1.38E-04	2.71E+00	4.88E-01	7.19E-01	2.66E-02		8.31E-06	2.97E+05	2.47E+00
I-133	1.71E-01	2.88E-04	9.34E-02	1.58E-04	3.10E+00	5.58E-01	8.23E-01	3.05E-02		9.51E-06	2.88E+05	2.74E+00
I-134	2.20E-01	3.70E-04	1.20E-01	2.03E-04	3.99E+00	7.18E-01	1.06E+00	3.92E-02		1.22E-05	3.37E+05	4.12E+00
I-135	1.74E-01	2.94E-04	9.53E-02	1.61E-04	3.16E+00	5.69E-01	8.39E-01	3.11E-02		9.69E-06	2.60E+05	2.52E+00
KR-83M	4.26E-02	5.28E-03	0.00E+00	0.00E+00	7.74E-01	1.39E-01	1.87E-01	6.93E-03		2.16E-06	0.00E+00	0.00E+00
KR-85M	9.26E-02	1.15E-02	0.00E+00	0.00E+00	1.68E+00	3.02E-01	4.07E-01	1.51E-02		4.70E-06	1.89E+05	8.88E-01
KR-85	4.26E-03	5.30E-04	0.00E+00	0.00E+00	7.75E-02	1.40E-02	1.87E-02	6.94E-04		2.17E-07	1.99E+05	4.31E-02
KR-87	1.70E-01	2.11E-02	0.00E+00	0.00E+00	3.09E+00	5.56E-01	7.47E-01	2.77E-02		8.64E-06	3.70E+05	3.20E+00
KR-88	2.42E-01	3.00E-02	0.00E+00	0.00E+00	4.30E+00	7.90E-01	1.06E+00	3.93E-02		1.23E-05	1.86E+05	2.28E+00
KR-89	2.75E-01	3.26E-02	0.00E+00	0.00E+00	4.91E+00	8.84E-01	1.19E+00	4.41E-02		1.38E-05	3.45E+05	4.75E+00
XE-131M	2.56E-03	3.18E-04	3.51E-09	1.40E-09	4.65E-02	8.37E-03	1.12E-02	4.17E-04		1.30E-07	0.00E+00	0.00E+00
XE-133M	2.84E-03	3.53E-04	8.32E-08	3.31E-08	5.16E-02	9.29E-03	1.25E-02	4.62E-04		1.44E-07	0.00E+00	0.00E+00
XE-133	7.98E-01	9.92E-02	1.16E-06	4.64E-07	1.45E+01	2.61E+00	3.51E+00	1.30E-01		4.05E-05	6.85E+04	2.78E+00
XE-135M	2.41E-01	2.97E-02	9.27E-05	3.69E-05	4.37E+00	7.87E-01	1.06E+00	3.92E-02		1.22E-05	0.00E+00	0.00E+00
XE-135	1.39E-01	1.73E-02	1.44E-05	5.72E-06	2.54E+00	4.57E-01	6.14E-01	2.27E-02		7.09E-06	2.55E+05	1.81E+00
XE138	6.21E-01	7.63E-02	0.00E+00	0.00E+00	1.12E+01	2.02E+00	2.71E+00	1.00E-01		3.14E-05	2.90E+05	9.09E+00
	8.45E+00	3.26E-01	4.47E-01	7.98E-04	6.26E+01	1.12E+01	1.65E+01					3.76E+01
RUN NO	7195	7195	8142	8142	6541							

The 2.4 scfh model with the TB holdup case is not analyzed as it would result in a lower count rate as the curies released would be less due to the holdup in the TB.

CASE 2 Amount of bypass leakage required to obtain a monitor count rate ≥ 210 cpm.

This case does not require additional DRAGON runs as the bypass relationship to Ci released is linear. Therefore, Table 6 is generated by substituting in different values for bypass leakage into the spreadsheet that generated Table 5 until a count rate value of 210 cpm is reached. 210 cpm is chosen as that will be the new setpoint for the CR vent monitors based on the results of Reference 25. Table 6 below shows that a bypass leakage value of 14 scfh will result in a count rate of 222 cpm.

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
A. Moisan 4/28/98	Glenn Stinson / 4/29/95	H21C047	00

TABLE 6 CURIES RELEASED AND CPM AT MONITOR

NO PLATEOUT NO HOLDUP IN TURBINE BUILDING 14 SCFH BYPASS LEAK RATE

								RELEASE		CONC	MONITOR	
					BYPASS	BYPASS	TOTAL CI	RATE	STACK	AT DUCT	EFF	
	CONT LK	CONT LEAK	ESF LK	ESF LK	10 SCFH	14 SCFH	RLSD	CI/SEC	X/Q	INLET	CPM/	MONITOR
ISOTOPE	0-10 SEC	10 - 27 SEC	0-10 SEC	10-27 SEC	0-27 SEC	0-27 SEC	0-27 SEC	0-27 SEC	(SEC/M^3)	(UCI/CC)	UCI/CC	CPM
I-131	1.03E-01	1.74E-04	5.64E-02	9.52E-05	1.87E+00	2.62E+00	2.78E+00	1.03E-01	3.12E-04	3.21E-05	1.66E+05	5.33E+00
I-132	1.49E-01	2.52E-04	8.17E-02	1.38E-04	2.71E+00	3.79E+00	4.03E+00	1.49E-01		4.65E-05	2.97E+05	1.38E+01
I-133	1.71E-01	2.88E-04	9.34E-02	1.58E-04	3.10E+00	4.34E+00	4.60E+00	1.71E-01		5.32E-05	2.88E+05	1.53E+01
I-134	2.20E-01	3.70E-04	1.20E-01	2.03E-04	3.99E+00	5.59E+00	5.93E+00	2.20E-01		6.85E-05	3.37E+05	2.31E+01
I-135	1.74E-01	2.94E-04	9.53E-02	1.61E-04	3.16E+00	4.42E+00	4.69E+00	1.74E-01		5.42E-05	2.60E+05	1.41E+01
KR-83M	4.26E-02	5.28E-03	0.00E+00	0.00E+00	7.74E-01	1.08E+00	1.13E+00	4.19E-02		1.31E-05	0.00E+00	0.00E+00
KR-85M	9.26E-02	1.15E-02	0.00E+00	0.00E+00	1.68E+00	2.35E+00	2.46E+00	9.10E-02		2.84E-05	1.89E+05	5.36E+00
KR-85	4.26E-03	5.30E-04	0.00E+00	0.00E+00	7.75E-02	1.09E-01	1.13E-01	4.20E-03		1.31E-06	1.99E+05	2.61E-01
KR-87	1.70E-01	2.11E-02	0.00E+00	0.00E+00	3.09E+00	4.33E+00	4.52E+00	1.67E-01		5.22E-05	3.70E+05	1.93E+01
KR-88	2.42E-01	3.00E-02	0.00E+00	0.00E+00	4.39E+00	6.15E+00	6.42E+00	2.38E-01		7.42E-05	1.86E+05	1.38E+01
KR-89	2.75E-01	3.26E-02	0.00E+00	0.00E+00	4.91E+00	6.87E+00	7.18E+00	2.66E-01		8.30E-05	3.45E+05	2.86E+01
XE-131M	2.56E-03	3.18E-04	3.51E-09	1.40E-09	4.65E-02	6.51E-02	6.80E-02	2.52E-03		7.86E-07	0.00E+00	0.00E+00
XE-133M	2.84E-03	3.53E-04	8.32E-08	3.31E-08	5.15E-02	7.22E-02	7.54E-02	2.79E-03		8.72E-07	0.00E+00	0.00E+00
XE-133	7.98E-01	9.92E-02	1.16E-06	4.64E-07	1.45E+01	2.03E+01	2.12E+01	7.85E-01		2.45E-04	6.85E+04	1.68E+01
XE-135M	2.41E-01	2.97E-02	9.27E-05	3.69E-05	4.37E+00	6.12E+00	6.39E+00	2.37E-01		7.38E-05	0.00E+00	0.00E+00
XE-135	1.39E-01	1.73E-02	1.44E-05	5.72E-06	2.54E+00	3.56E+00	3.71E+00	1.37E-01		4.29E-05	2.55E+05	1.09E+01
XE138	6.21E-01	7.63E-02	0.00E+00	0.00E+00	1.12E+01	1.57E+01	1.64E+01	6.07E-01		1.89E-04	2.90E+05	5.49E+01
	3.45E+00	3.26E-01	4.47E-01	7.98E-04	6.25E+01	8.74E+01	9.17E+01					2.22E+02
RUN NO	7195	7195	8142	8142	6541							

This table shows that if bypass leakage was in excess of 14 scfh, Control Room ventilation monitor count rate would exceed the alarm setpoint of 210 cpm.

The next question is should the monitor alarm and cause emergency ventilation actuation within 32 seconds, would the existing maximum path bypass leakage result in doses within GDC 19 dose limits. Two DRAGON runs were made:

ESF and Containment Leakage - run #3719 4/28/98 and bypass leakage - run # 5690 4/29/98 with the with the differences between this run and those previously performed for CASE 1 being:

Control room intake rate (DATA/ASSUMPTIONS #15):

- 0 - 32 seconds - 3580 cfm unfiltered = 3550 cfm fan flow rate + 30 cfm through doors and drain
- 32 seconds - 720 hrs - 3193 cfm filtered = 2875 cfm + 10% + 30 cfm through doors and drain

Control Room filter efficiencies - elemental 0.896 and organic 0.892 (DATA/ASSUMPTIONS #18)

The doses are presented below in Table 7. Note the conservative assumption of no holdup in the TB and no plateout.

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
A. Moisan 4/28/98	Glenn Stinson / 4/29/95	H21C047	00

TABLE 7 - CR DOSE
CR FILTRATION ACTUATION AT 32 SEC

	DOSE(REM)			DRAGON
RELEASE PATH	THYROID	GAMMA	BETA	RUN
CONT LK 0-10 SEC	1.25E-01	9.29E-05	1.04E-03	3719
CONT LK 10 SEC-720 HR	4.22E-01	1.71E-02	2.30E-01	3719
ESF LEAKAGE 0 - 10 SEC	6.84E-02	1.61E-05	1.19E-04	3719
ESF LEAKAGE 0 SEC - 720 HR	2.30E-01	4.21E-04	4.32E-03	3719
SUBTOTAL	8.45E-01	1.76E-02	2.35E-01	
BYPASS AT 10 SCFH				
NO PLATEOUT NO TB HOLDUP	1.38E+01	1.17E-02	1.35E-01	5690
BYPASS AT 18.36 SCFH				
	2.53E+01	2.15E-02	2.48E-01	
TOTAL DOSES @ 18.36SCFH				
NO PLATEOUT NO TB HOLDUP	2.62E+01	3.91E-02	4.83E-01	

CASE 3 Time at which CR emergency ventilation would have to be manually activated to ensure doses less than GDC limits.

A number of runs were made with the time of actuation of the filters varied to determine the time at which the operators would have to actuate the CR filters. Only the runs which support the final answer are included.

The DRAGON models were modified as follows:

Control room intake rate (DATA/ASSUMPTIONS #15):

- 0 seconds to time of filter actuation - 3580 cfm = 3550 cfm fan flow rate + 30 cfm through doors and drain
- time of filter actuation to 720 hours - 3193 cfm = 2875 cfm + 10% + 30 cfm through doors and drain

Control Room filter efficiencies - elemental 0.896 and organic 0.892 (DATA/ASSUMPTIONS #18)

Bypass leakage was assumed to undergo 50% mixing in the Turbine Building. This assumption was made to more realistically model the accident and while somewhat reducing the conservatism of the previous analysis, it is still conservative as no credit is being taken for plateout of the iodine. This analysis assumes all the iodine associated with the bypass leakage is released into the air.

The results of the following DRAGON runs are given below in Table 8 - all runs are with CR filters on at 20 min:

Containment Leakage:
0-10 seconds - run # 2641 4/28/98
10 seconds to 30 days - run #2641 4/28/98

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

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ESF Leakage:
0-10 seconds - run #2641 4/28/98
10 seconds to 30 days - run #26414/28/98

Bypass Leakage - run #8827, 4/26/98
0-720 hrs - 10 scfh leak rate, 50% mixing in TB, no plateout

TABLE 8 - CR DOSES
CR FILTRATION ACTUATION AT 20 MIN

	DOSE(REM)			DRAGON
RELEASE PATH	THYROID	GAMMA	BETA	RUN
CONT LK 0-10 SEC	3.79E-01	1.23E-04	1.22E-03	2641
CONT LK 10 SEC-720 HR	6.34E-01	1.72E-02	2.32E-01	2641
ESF LEAKAGE 0 - 10 SEC	2.07E-01	3.14E-05	2.06E-04	2641
ESF LEAKAGE 0 SEC - 720 HR	3.46E-01	4.34E-04	4.40E-03	2641
SUBTOTAL	1.57E+00	1.78E-02	2.38E-01	
BYPASS AT 10 SCFH				
NO PLATEOUT 50% MIX IN TB	1.56E+01	8.81E-03	9.89E-02	8827

Table 8 shows that 1 scfh of bypass leakage results in 1.56 Rem thyroid. The current max pathway bypass leakage (when adjusted to 22 psig which this calculation assumes) is 18.36 scfh. This makes the total thyroid dose:

Containment Leak + Bypass Leak	=	1.57 Rem
Bypass Leak 18.36 scfh * 1.56 Rem/scfh	=	28.64 Rem
Total	=	30.21 Rem

Therefore, assuming the model described above, the control room emergency filtration must be actuated in less than 20 minutes to ensure that the Control Room doses are within GDC 19 limits.

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
A. Moisan 4/28/98	Glenn Stinson / 4/29/95	H21C047	00

RESULTS/CONCLUSIONS

CASE 1 - Doses to the Control Room without actuation of Control Room Emergency Filtration.
CASE 2 - Amount of bypass leakage required to obtain a monitor count rate ≥ 210 cpm

Assuming the following :

1. Containment leakage at 1.1% per day starting at T= 0 seconds.
2. ESF Leakage at 750 gph - source 50% core halogens with 10% flash fraction starting at T = 0 seconds.
3. RBEV filter actuation at T = 10 seconds.
4. Bypass leakage at 22 psig leaking directly from the primary containment to the turbine building with no halogen plateout and no holdup in the Turbine Building.

The following doses to the control room with and without actuation of the Control Room filters -

- For bypass leakage less than 1.8 scfh , doses to the CR would be less than GDC 19 requirements and the CR vent monitor would not alarm. Note: assuming 50% mixing in the TB, the allowable bypass leakage would increase to 2.4 scfh.
- For bypass leakage greater than 1.8 scfh and less than 14 scfh, the CR vent monitor would not alarm and with no actuation of CR filters, GDC 19 doses would be exceeded.
- For bypass leakage greater than 14 scfh and less than the current max pathway leak rate of 18.36 scfh, the CR vent monitor count rate would exceed 210 cpm , actuate the monitor and doses would be within GDC 19 limits provided the bypass leakage remained below the current max pathway value of 18.36 scfh

- Given the model described in CASE 1, 14 scfh is the minimum bypass leakage rate that results in a CR monitor count rate > 210 cpm

CASE 3 - Time at which CR emergency ventilation would have to be manually activated to ensure doses less than GDC 19 limits.

- Given the model described in CASE 1 with the exception of the assumption of 50% mixing in the Turbine Building, CR emergency filtration would have to actuated in less than 20 minutes to ensure doses less than GDC 19 limits.

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
A. Moisan 4/28/98	Glenn Stinson / 4/29/95	H21C047	00

COMPUTER RUN LOG

JOB #	DATE	DESCRIPTION OF RUN
7195	4/24/98	Containment Leak - no CR filters
8142	4/25/98	ESF Leak - no CR filters
6541	4/24/98	Bypass leak - no CR filters
7246	4/24/98	Bypass leak 50% mix in TB - no CR filters
3719	4/28/98	Cont,. leak & ESF leak - CR filt actuation at t=32 sec
5690	4/29/98	Bypass leak - CR filt actuation at t=32 sec
2641	4/28/98	Cont leak & ESF leak - CR filt actuation at t=20 min
8827	4/26/98	Bypass leak - CR filt actuation at t=20 min

Note: Card images of computer runs listed above are given in APPENDIX A

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
A. Moisan 4/28/98	Glenn Stinson / 4/29/95	H21C047	00

REFERENCES

1. Nine Mile Point Unit 1 Final Safety Analysis Report Revision 14.
   a. Section VII.H, "Emergency Ventilation System."
   b. Section III.B.2.2, "Control Room Heating Ventilation and Air Conditioning System."
   c. Section VI.B.2.1, Page VI-9.
   d. Chapter III.A.2.2, "Turbine Building Heating and Ventilation System"
   e. UFSAR Figure XV-56G
2. Nine Mile Point Unit 1 Technical Specifications.
   a. Section 3.3.3.a, "Limiting Condition for Operation for Leakage Specification."
   b. Section 3.4.4.b, 3.4.4.c, and 3.4.4.d, "Limiting Condition for Operation of Emergency Ventilation System."
   c. Section 3.4.5.b, 3.4.5.c, and 3.4.5.d, "Limiting Condition for Operation of Control Room Air Treatment System."
   d. Facility Operating License which accomapanied the Technical Specifications
3. Regulatory Guide 1.3, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss Of Coolant Accident for Boiling Water Reactors", Revision 2, June 1974.
4. NUREG-0737, Section III.D.3.4, "Control Room Habitability Requirements."
5. NUREG-0800, U.S. NRC Standard Review Plan Chapter 15.6.5, Appendix A & B.
6. NMPC Letter to NRC, Dated 03/19/84, "Response to TMI Action Item III.D.3.4 - Control Room Habitability."
7. NUREG-0800, Standard Review Plan 6.4, "Control Room Habitability System."
8. Not used.
9. Not used.
10. NUREG 0800, US NRC Standard Review Plan Chapter 6.5.3, Rev 2, "Fission Product Control Systems and Structures."

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
A. Moisan 4/28/98	Glenn Stinson / 4/29/95	H21C047	00

11. 10 Codes of Federal Regulation, Part 50, Appendix A, General Design Criteria 19.

12. NMPC Calculation No. SO-APPJ-M001, 10CFR50 Appendix J, ILRT & LLRT Acceptance Criteria, Rev 3.

13. System Design Document (SDBD), " Reactor Building HVAC System" SDBD-601, Rev 0, 6/22/94.

14. NMPC Internal Correspondence, R.J. Cazzolli to Distribution, Dated 08/30/91, Subject: DBD Input, File Code: SM-HP91-0115.

15. NMPC Internal Correspondence, RJ Cazzolli to File, Dated 07/31/87, Subject: Post-Accident Control Room Doses.

16 NMPC Internal Correspondence, MG Annett to T. Kurtz/A. Moisan, Dated 02/18/97, Subject: Unit 1 ESF Leak Rate, File Code M97-011.

17. NRC Regulatory Guide 1.52, "Design, Testing, and Maintenance Criteria for Post Accident Engineered-Safety-Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants", Rev 2, March,1978.

18. NRC Regulatory Guide 1.49, Revision 1, "Power Levels of Nuclear Power Plants."

19. G&H Calculation No. N83-1, Rev 1 in CDS as Calc H21C020, " LOCA - CR, TSC & EOF Doses"

20. NMPC Procedure N1-OP-10 Revision 13

21. DRAGON Computer Code, SWEC Number NU-115, Version 5, Level 0.

22. DCR N1-93-001LS213, Control Room Vent Monitor - Modify Software, Attachment 7, "NMP1 SCAM Microcomputer Software Modifications ", pages 7 and 8. Field work completed under SC1-0038-93 and Ops accepted on 11/18/93.

23. NMPC calculation S10-CR277.G36-U1.000, revision 00

24. Not used.

25. NMPC calculation S18.9TB300D23U1.210, revision 03

26 NMPC calculation S10-CR277.A-U1.210

27. Calculation S0-APPJ-A001, Revision 0.

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
A. Moisan 4/28/98	Glenn Stinson / 4/29/95	H21C047	00

APPENDIX A (11 pages total)

CARD IMAGE OF COMPUTER RUNS

* * * * * * * * * CARD IMAGE OF INPUT SUBMITTED TO DRAGON * * * * * * * * *

```
CARD COLUMNS              1         2         3         4         5         6         7         8     CARD COLUMNS
          12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
CARD NO.
    1     **UNIT 1 LOCA CONTAINMENT LEAKAGE 0-10 SEC NO CR FILTER
    2       8   1110 1 1111      0    1.0      0      0   0.24   0.01      1
    3      PRIMARY CONTAINMENT       3.00+5     0      0      0      0 0.011     0      0      0
    4      SECONDARY CONTAINMENT     2.30+6     0      0      0      0   1.0     0      0      0
    5      CONTROL ROOM              1.36+5     0      0      0      0 3540.   0.0    0.0    1.0
    6                5.47+7 7.93+7 9.06+7 1.17+8 9.25+7
    7                               5.66+6 1.23+7 5.66+5 2.26+7 3.21+7
    8          3.77+7 3.40+5 3.77+5 1.06+8 3.21+7 1.85+7        8.30+7
    9      1           1     0 87.50     0      0      1      13.12-4          1      12.78-3
   10      2           0     0   4.4     0      0      1      13.12-4          1      1 7.5-3
   11      3           0     0   4.4     1      1      1      13.12-4          1      1   0.5
   12      4           0     0   2.2     1      1      1      13.12-4          1      1   2.0
   13      5           0     0   2.2     1      1      1      11.22-8          1      1   8.0
   14      6           0     0   2.2     1      1      1      11.22-8          1      1  24.0
   15      7           0     0   2.2     1      1      1      11.22-8          1      1  96.0
   16      8           0     0   2.2     1      1      1      11.22-8          1      1 720.0
   17     **UNIT 1 LOCA CONTAINMENT LEAKAGE 10 SEC 720 HR CR 99% ROEV FILTERS
   18       8   1110 1 1111      0    1.0      0      0   0.24   0.01      1
   19      PRIMARY CONTAINMENT       3.00+5     0      0      0      0 0.011     0      0      0
   20      SECONDARY CONTAINMENT     2.30+6     0      0      0      0   1.0   .99    .90      0
   21      CONTROL ROOM              1.36+5     0      0      0      0 3580.   0.0    0.0    1.0
   22                5.47+7 7.93+7 9.06+7 1.17+8 9.25+7
   23                               5.66+6 1.23+7 5.66+5 2.26+7 3.21+7
   24          3.77+7 3.40+5 3.77+5 1.06+8 3.21+7 1.85+7        8.30+7
   25      1           0     0 87.50     0      0      1      13.12-4          1      12.78-3
   26      2           1     0   4.4     0      0      1      13.12-4          1      1 7.5-3
   27      3           1     0   4.4     1      1      1      13.12-4          1      1   0.5
   28      4           1     0   2.2     1      1      1      13.12-4          1      1   2.0
   29      5           1     0   2.2     1      1      1      11.22-8          1      1   8.0
   30      6           1     0   2.2     1      1      1      11.22-8          1      1  24.0
   31      7           1     0   2.2     1      1      1      11.22-8          1      1  96.0
   32      8           1     0   2.2     1      1      1      11.22-8          1      1 720.0
   33     **UNIT 1 LOCA ESF LEAKAGE 0-720 HR
   34       8   1110 1 1111      0    1.0      0      0  0.048  0.002
   35      TORUS WATER               7.98+4     0      0      0      0 .0301     0      0      0
   36      SECONDARY CONTAINMENT     2.30+6     0      0      0      0   1.0   .99    .90      0
   37      CONTROL ROOM              1.36+5     0      0      0      0 3580.   0.0    0.0    1.0
   38                5.47+7 7.93+7 9.06+7 1.17+8 9.25+7
   39                               5.66+6 1.23+7 5.66+5 2.26+7 3.21+7
   40          3.77+7 3.40+5 3.77+5 1.06+8 3.21+7 1.85+7        8.30+7

          12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
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* * * * * * * * * CARD IMAGE OF INPUT SUBMITTED TO DRAGON * * * * * * * * *

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CARD COLUMNS              1         2         3         4         5         6         7         8     CARD COLUMNS
          12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
CARD NO.
    1     **UNIT 1 LOCA ESF LEAKAGE 0-10 SEC W/NO CR FILTER
    2       8   1110 1 1111       0     1.0       0       0  0.040  0.002
    3      TORUS WATER              7.98+4      0      0      0      0 .0301      0      0      0
    4      SECONDARY CONTAINMENT    2.30+6      0      0      0      0   1.0      0      0      0
    5      CONTROL ROOM             1.36+5      0      0      0      0 3580.   0.0    0.0    1.0
    6                5.47+7 7.93+7 9.06+7 1.17+8 9.25+7
    7                               5.66+6 1.23+7 5.66+5 2.26+7 3.21+7
    8          3.77+7 3.40+5 3.77+5 1.06+8 3.21+7 1.85+7        8.30+7
    9      1            1      0 87.50      0      0      1      13.12-4            1      12.78-3
   10      2            0      0   4.4      0      0      1      13.12-4            1      1 7.5-3
   11      3            0      0   4.4      1      1      1      13.12-4            1      1    0.5
   12      4            0      0   2.2      1      1      1      13.12-4            1      1    2.0
   13      5            0      0   2.2      1      1      1      11.22-8            1      1    8.0
   14      6            0      0   2.2      1      1      1      11.22-8            1      1   24.0
   15      7            0      0   2.2      1      1      1      11.22-8            1      1   96.0
   16      8            0      0   2.2      1      1      1      11.22-8            1      1  720.0
   17     **UNIT 1 LOCA ESF LEAKAGE 10 SEC-720 HR W/NO CR FILTER
   18       8   1110 1 1111       0     1.0       0       0  0.040  0.002
   19      TORUS WATER              7.98+4      0      0      0      0 .0301      0      0      0
   20      SECONDARY CONTAINMENT    2.30+6      0      0      0      0   1.0    .99    .90      0
   21      CONTROL ROOM             1.36+5      0      0      0      0 3580.   0.0    0.0    1.0
   22                5.47+7 7.93+7 9.06+7 1.17+8 9.25+7
   23                               5.66+6 1.23+7 5.66+5 2.26+7 3.21+7
   24          3.77+7 3.40+5 3.77+5 1.06+8 3.21+7 1.85+7        8.30+7
   25      1            0      0 87.50      0      0      1      13.12-4            1      12.78-3
   26      2            1      0   4.4      0      0      1      13.12-4            1      1 7.5-3
   27      3            1      0   4.4      1      1      1      13.12-4            1      1    0.5
   28      4            1      0   2.2      1      1      1      13.12-4            1      1    2.0
   29      5            1      0   2.2      1      1      1      11.22-8            1      1    8.0
   30      6            1      0   2.2      1      1      1      11.22-8            1      1   24.0
   31      7            1      0   2.2      1      1      1      11.22-8            1      1   96.0
   32      8            1      0   2.2      1      1      1      11.22-8            1      1  720.0
   33     **UNIT 1 LOCA ESF LEAKAGE 0-10 SEC W/CR FILTER
   34       8   1110 1 1111       0     1.0       0       0  0.040  0.002
   35      TORUS WATER              7.98+4      0      0      0      0 .0301      0      0      0
   36      SECONDARY CONTAINMENT    2.30+6      0      0      0      0   1.0      0      0      0
   37      CONTROL ROOM             1.36+5      0      0      0      0 3193.  .941   .892    1.0
   38                5.47+7 7.93+7 9.06+7 1.17+8 9.25+7
   39                               5.66+6 1.23+7 5.66+5 2.26+7 3.21+7
   40          3.77+7 3.40+5 3.77+5 1.06+8 3.21+7 1.85+7        8.30+7

          12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
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***** PROGRAM --    DRAGON    -- NULIS.VERDS.LEVDO--  4/30/96 -- *****

* * * * * * * * * CARD IMAGE OF INPUT SUBMITTED TO DRAGON   * * * * * * * * *

CARD COLUMNS              1         2         3         4         5         6         7         8     CARD COLUMNS
          12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
CARD NO.
    1     **UNIT 1 LOCA BYPASS LEAKAGE GROUND LEVEL @ 10 SCFH
    2       6   1010 1 0011       0     1.0       0       0   0.24    0.01    1.0
    3      PRIMARY CONTAINMENT        3.00+5    0.0     0.0    0.0    0.04.38-4    0.0    0.0    0.0
    4      CONTROL ROOM               1.36+5    0.0     0.0    0.0    0.0  3580    0.0    0.0    1.0
    5         0.00+0 5.47+7 7.93+7 9.06+7 1.17+8 9.25+7 0.00+0 0.00+0
    6         0.00+0 0.00+0 0.00+0 5.66+6 1.23+7 5.66+5 2.26+7 3.21+7
    7         3.77+7 3.40+5 3.77+5 1.06+8 3.21+7 1.85+7 0.00+0 8.30+7
    8      1          1     0     1     0     0     1     13.12-4          1     1  7.5-3
    9      2          1     0     1     1     1     1     13.12-4          1     1    2.0
   10      3          1     0     1     1     1     1     11.22-8          1     1    8.0
   11      4          1     0     1     1     1     1     11.22-8          1     1   24.0
   12      5          1     0     1     1     1     1     11.22-8          1     1   96.0
   13      6          1     0     1     1     1     1     11.22-8          1     1  720.0

          12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
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4/26/96

* * * * * * * * * CARD IMAGE OF INPUT SUBMITTED TO DRAGON * * * * * * * * *

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CARD COLUMNS              1         2         3         4         5         6         7         8     CARD COLUMNS
                 12345678901234567890123456789012345678901234567890123456789012345678901234567890
CARD NO.
     1           **UNIT 1 LOCA BYPASS LEAKAGE CONDENSER RELEASE NO PLATCOUT NO FILTER
     2             6   1110 1 0011       0    1.0       0       0   0.24    0.01    1.0
     3           PRIMARY CONTAINMENT        3.0015    0.0     0.0     0.0   0.04.38-4    0.0     0.0     0.0
     4           TURBINE BUILDING           1.0217      0       0       0       0   46.0    0.0     0.0       0
     5           CONTROL ROOM               1.3615    0.0     0.0     0.0     0.0   3580    0.0     0.0     1.0
     6              0.0010 5.4717 7.9317 9.0617 1.1718 9.2517 0.0010 0.0010
     7              0.0010 0.0010 0.0010 5.6616 1.2317 5.6615 2.2617 3.2117
     8              3.7717 3.4015 3.7715 1.0618 3.2117 1.8517 0.0010 8.3017
     9           1         1     0     1     0     0     1     13.12-4          1     1  7.5-3
    10           2         1     0     1     1     1     1     13.12-4          1     1    2.0
    11           3         1     0     1     1     1     1     11.22-8          1     1    8.0
    12           4         1     0     1     1     1     1     11.22-8          1     1   24.0
    13           5         1     0     1     1     1     1     11.22-8          1     1   96.0
    14           6         1     0     1     1     1     1     11.22-8          1     1  720.0

                 12345678901234567890123456789012345678901234567890123456789012345678901234567890
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* * * * * * * * * CARD IMAGE OF INPUT SUBMITTED TO DRAGON * * * * * * * * *

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CARD COLUMNS              1         2         3         4         5         6         7         8     CARD COLUMNS
          12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
CARD NO.
   41      1          1    0 87.50    0    0 1.121 1.1213.12-4          1      12.79-3
   42      2          0    0   4.4    0    0 1.121 1.1213.12-4          1      18.89-3
   43      3          0    0   4.4    1    1    1    13.12-4          1    1   0.5
   44      4          0    0   2.2    1    1    1    13.12-4          1    1   2.0
   45      5          0    0   2.2    1    1    1    11.22-8          1    1   4.0
   46      6          0    0   2.2    1    1    1    11.22-8          1    1  24.0
   47      7          0    0   2.2    1    1    1    11.22-8          1    1  96.0
   48      8          0    0   2.2    1    1    1    11.22-8          1    1 720.0
   49     **UNIT 1 LOCA ESF LEAKAGE 10 SEC - 720 HR W/CH FILTER @ 32 SEC
   50      8   1110 1 1111      0    1.0      0      0  0.348  0.002
   51     TORUS WATER              7.9844    0    0    0    0 .0301    0    0    0
   52     SECONDARY CONTAINMENT    2.3046    0    0    0    0   1.0   .97   .90    0
   53     CONTROL ROOM             1.3645    0    0    0    0 3193.  .896  .892  1.0
   54                5.4747 7.9347 9.0647 1.1748 9.2547
   55                            5.6646 1.2347 5.6645 2.2647 3.2147
   56          3.7747 3.4045 3.7745 1.0644 3.2147 1.8547        8.3047
   57      1          0    0 97.50    0    0 1.121 1.1213.12-4          1      12.79-3
   58      2          1    0   4.4    0    0 1.121 1.1213.12-4          1      18.89-3
   59      3          1    0   4.4    1    1    1    13.12-4          1    1   0.5
   60      4          1    0   2.2    1    1    1    13.12-4          1    1   2.0
   61      5          1    0   2.2    1    1    1    11.22-8          1    1   4.0
   62      6          1    0   2.2    1    1    1    11.22-8          1    1  24.0
   63      7          1    0   2.2    1    1    1    11.22-8          1    1  96.0
   64      8          1    0   2.2    1    1    1    11.22-8          1    1 720.0

          12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
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P31

* * * * * * * * * CARD IMAGE OF INPUT SUBMITTED TO DRAGON * * * * * * * * *

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CARD COLUMNS              1         2         3         4         5         6         7         8     CARD COLUMNS
                 12345678901234567890123456789012345678901234567890123456789012345678901234567890
CARD NO.
    1            **UNIT 1 LOCA CONTAINMENT LEAKAGE 0-10 SEC W/CR FILTER @ 32 SEC
    2             0   1110 1 1111      0    1.0       0       0   0.24    0.01       1
    3            PRIMARY CONTAINMENT       3.0045      0       0       0       0 0.011      0       0       0
    4            SECONDARY CONTAINMENT     2.3046      0       0       0       0   1.0      0       0       0
    5            CONTROL ROOM              1.3645      0       0       0       0 3193.  .896  .892     1.0
    6                      5.4747 7.9347 9.0647 1.1748 9.2547
    7                             5.6646 1.2347 5.6645 2.2647 3.2147
    8               3.7747 3.4045 3.7745 1.0648 3.2147 1.8547         8.3047
    9            1          1     0 87.50     0     0 1.121 1.1213.12-4           1      12.79-3
   10            2          0     0   4.4     0     0 1.121 1.1213.12-4           1      18.89-3
   11            3          0     0   4.4     1     1     1     13.12-4           1      1    0.5
   12            4          0     0   2.2     1     1     1     13.12-4           1      1    2.0
   13            5          0     0   2.2     1     1     1     11.22-8           1      1    8.0
   14            6          0     0   2.2     1     1     1     11.22-8           1      1   24.0
   15            7          0     0   2.2     1     1     1     11.22-8           1      1   95.0
   16            8          0     0   2.2     1     1     1     11.22-8           1      1  720.0
   17            **UNIT 1 LOCA CONTAINMENT LEAKAGE 10 SEC-720 HR W/CR FILTERS @ 32 SEC
   18             8   1110 1 1111      0    1.0       0       0   0.24    0.01       1
   19            PRIMARY CONTAINMENT       3.0045      0       0       0       0 0.011      0       0       0
   20            SECONDARY CONTAINMENT     2.3046      0       0       0       0   1.0   .99   .90       0
   21            CONTROL ROOM              1.3645      0       0       0       0 3193.  .896  .892     1.0
   22                      5.4747 7.9347 9.0647 1.1748 9.2547
   23                             5.6646 1.2347 5.6645 2.2647 3.2147
   24               3.7747 3.4045 3.7745 1.0648 3.2147 1.8547         8.3047
   25            1          0     0 87.50     0     0 1.121 1.1213.12-4           1      12.79-3
   26            2          1     0   4.4     0     0 1.121 1.1213.12-4           1      18.89-3
   27            3          1     0   4.4     1     1     1     13.12-4           1      1    0.5
   28            4          1     0   2.2     1     1     1     13.12-4           1      1    2.0
   29            5          1     0   2.2     1     1     1     11.22-8           1      1    8.0
   30            6          1     0   2.2     1     1     1     11.22-8           1      1   24.0
   31            7          1     0   2.2     1     1     1     11.22-8           1      1   95.0
   32            8          1     0   2.2     1     1     1     11.22-8           1      1  720.0
   33            **UNIT 1 LOCA ESF LEAKAGE 0-10 SEC W/CR FILTER @ 32 SEC
   34             9   1110 1 1111      0    1.0       0       0  0.048   0.002
   35            TORUS WATER               7.9044      0       0       0       0 .0301      0       0       0
   36            SECONDARY CONTAINMENT     2.3046      0       0       0       0   1.0      0       0       0
   37            CONTROL ROOM              1.3645      0       0       0       0 3193.  .896  .892     1.0
   38                      5.4747 7.9347 9.0647 1.1748 9.2547
   39                             5.6646 1.2347 5.6645 2.2647 3.2147
   40               3.7747 3.4045 3.7745 1.0648 3.2147 1.8547         8.3047

                 12345678901234567890123456789012345678901234567890123456789012345678901234567890
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***** PROGRAM --     DRAGON    -- NUTIS.V2405.LEV00--  4/10/86 -- *****

* * * * * * * * * CARD IMAGE OF INPUT SUBMITTED TO DRAGON   * * * * * * * * *

CARD COLUMNS              1         2         3         4         5         6         7         8     CARD COLUMNS
          12345678901234567890123456789012345678901234567890123456789012345678901234567890
CARD NO.
    1     **UNIT 1 LOCA BYPASS LEAKAGE TO SCFH CR FILTERS 932 SECONDS
    2       6   1010 1 0011       0     1.0       0       0    0.24    0.01     1.0
    3      PRIMARY CONTAINMENT        3.0045    0.0    0.0    0.0    0.04.39-4    0.0    0.0    0.0
    4      CONTROL ROOM               1.3445    0.0    0.0    0.0    0.0 3193.   .096   .972    1.0
    5         0.0040 5.4747 7.9347 9.0647 1.1749 9.2947 0.0040 0.0040
    6         0.0040 0.0040 0.0040 5.6516 1.2347 5.6545 2.2547 3.2147
    7         3.7747 3.4015 3.7745 1.0648 3.2147 1.9547 0.0040 9.3047
    8      1            1     0     1     0     0 1.121 1.1213.12-4            1      19.99-1
    9      2            1     0     1     1     1     1     13.12-4            1      1    2.0
   10      3            1     0     1     1     1     1     11.22-8            1      1    4.0
   11      4            1     0     1     1     1     1     11.22-8            1      1   24.0
   12      5            1     0     1     1     1     1     11.22-9            1      1   34.0
   13      6            1     0     1     1     1     1     11.22-9            1      1  720.0

          12345678901234567890123456789012345678901234567890123456789012345678901234567890
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***** PROGRAM --     DRAGON    -- NULIS.VE905.LEV00--  4/30/96 -- *****                    PAGE  1

* * * * * * * * CARD IMAGE OF INPUT SUBMITTED TO DRAGON   * * * * * * * *

CARD COLUMNS              1         2         3         4         5         6         7         8     CARD COLUMNS
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
CARD NO.
  1   **UNIT 1 LOCA CONTAINMENT LEAKAGE 0-10 SEC W/CR FILTER @ 20 MIN
  2    8   1110 1 1111      0    1.0       0       0   0.24    0.01       1
  3   PRIMARY CONTAINMENT       3.0015      0       0       0       0 0.011      0       0       0
  4   SECONDARY CONTAINMENT     2.3016      0       0       0       0   1.0      0       0       0
  5   CONTROL ROOM              1.3615      0       0       0       0 3193.  .896  .892   1.0
  6              5.4717 7.9317 9.0617 1.1718 9.2517
  7                           5.6616 1.2317 5.6615 2.2617 3.2117
  8       3.7717 3.4015 3.7715 1.0618 3.2117 1.8517        8.3017
  9   1            1      0 87.50      0       0 1.121 1.1213.12-4            1      12.78-3
 10   2            0      0   4.4      0       0 1.121 1.1213.12-4            1      1   0.33
 11   3            0      0   4.4      1       1       1     13.12-4          1      1   0.5
 12   4            0      0   2.2      1       1       1     13.12-4          1      1   2.0
 13   5            0      0   2.2      1       1       1     11.22-8          1      1   8.0
 14   6            0      0   2.2      1       1       1     11.22-8          1      1  24.0
 15   7            0      0   2.2      1       1       1     11.22-8          1      1  96.0
 16   8            0      0   2.2      1       1       1     11.22-8          1      1 720.0
 17  **UNIT 1 LOCA CONTAINMENT LEAKAGE 10 SEC-720 HR W/CR FILTERS @ 20 MIN
 18    8   1110 1 1111      0    1.0       0       0   0.24    0.01       1
 19   PRIMARY CONTAINMENT       3.0015      0       0       0       0 0.011      0       0       0
 20   SECONDARY CONTAINMENT     2.3016      0       0       0       0   1.0    .99    .90       0
 21   CONTROL ROOM              1.3615      0       0       0       0 3193.  .896  .892   1.0
 22              5.4717 7.9317 9.0617 1.1718 9.2517
 23                           5.6616 1.2317 5.6615 2.2617 3.2117
 24       3.7717 3.4015 3.7715 1.0618 3.2117 1.8517        8.3017
 25   1            0      0 87.50      0       0 1.121 1.1213.12-4            1      12.78-3
 26   2            1      0   4.4      0       0 1.121 1.1213.12-4            1      1   0.33
 27   3            1      0   4.4      1       1       1     13.12-4          1      1   0.5
 28   4            1      0   2.2      1       1       1     13.12-4          1      1   2.0
 29   5            1      0   2.2      1       1       1     11.22-8          1      1   8.0
 30   6            1      0   2.2      1       1       1     11.22-8          1      1  24.0
 31   7            1      0   2.2      1       1       1     11.22-8          1      1  96.0
 32   8            1      0   2.2      1       1       1     11.22-8          1      1 720.0
 33  **UNIT 1 LOCA ESF LEAKAGE 0-10 SEC W/CR FILTER @ 20 MIN
 34    8   1110 1 1111      0    1.0       0       0 0.040  0.002
 35   TORUS WATER               7.9814      0       0       0       0 .0301      0       0       0
 36   SECONDARY CONTAINMENT     2.3016      0       0       0       0   1.0      0       0       0
 37   CONTROL ROOM              1.3615      0       0       0       0 3193.  .896  .892   1.0
 38              5.4717 7.9317 9.0617 1.1718 9.2517
 39                           5.6616 1.2317 5.6615 2.2617 3.2117
 40       3.7717 3.4015 3.7715 1.0618 3.2117 1.8517        8.3017

12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
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REVISED P34

* * * * * * * * * CARD IMAGE OF INPUT SUBMITTED TO DRAGON * * * * * * * * *

```
CARD COLUMNS              1         2         3         4         5         6         7         8     CARD COLUMNS
          12345678901234567890123455789012345678901234567890123456789012345678901234567890123456789 0
CARD NO.
   41     1          1     0 87.50     0     0 1.121 1.1213.12-4          1     12.78-3
   42     2          0     0   4.4     0     0 1.121 1.1213.12-4          1     1  0.33
   43     3          0     0   4.4     1     1     1     13.12-4          1     1   0.5
   44     4          0     0   2.2     1     1     1     13.12-4          1     1   2.0
   45     5          0     0   2.2     1     1     1     11.22-8          1     1   8.0
   46     6          0     0   2.2     1     1     1     11.22-8          1     1  24.0
   47     7          0     0   2.2     1     1     1     11.22-8          1     1  96.0
   48     8          0     0   2.2     1     1     1     11.22-8          1     1 720.0
   49    **UNIT 1 LOCA ESF LEAKAGE 10 SEC - 720 HR W/CR FILTER @ 20 MIN
   50     8   1110 1 1111       0    1.0       0       0  0.048  0.002
   51    TORUS WATER                 7.98+4     0     0     0     0 .0301     0     0     0
   52    SECONDARY CONTAINMENT       2.30+6     0     0     0     0   1.0   .99   .90     0
   53    CONTROL ROOM                1.36+5     0     0     0     0 3193.  .895  .892   1.0
   54              5.47+7 7.93+7 9.06+7 1.17+8 9.25+7
   55                         5.66+6 1.23+7 5.66+5 2.26+7 3.21+7
   56        3.77+7 3.40+5 3.77+5 1.06+8 3.21+7 1.85+7        8.30+7
   57     1          0     0 87.50     0     0 1.121 1.1213.12-4          1     12.78-3
   58     2          1     0   4.4     0     0 1.121 1.1213.12-4          1     1  0.33
   59     3          1     0   4.4     1     1     1     13.12-4          1     1   0.5
   60     4          1     0   2.2     1     1     1     13.12-4          1     1   2.0
   61     5          1     0   2.2     1     1     1     11.22-8          1     1   8.0
   62     6          1     0   2.2     1     1     1     11.22-8          1     1  24.0
   63     7          1     0   2.2     1     1     1     11.22-8          1     1  96.0
   64     8          1     0   2.2     1     1     1     11.22-8          1     1 720.0

          12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789 0
```

APPENDIX A
DRAGON RUN TIME
4/23/86

* * * * * * * * * CARD IMAGE OF INPUT SUBMITTED TO DRAGON * * * * * * * * *

```
CARD COLUMNS              1         2         3         4         5         6         7         8      CARD COLUMNS
          12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
CARD NO.
    1     **UNIT 1 LOCA 10 SCFH BP. - NO PLATEOUT 50% MIX 15 MIN ACT  90% FILT
    2       6   1110 1 0011      0     1.0       0       0   0.24    0.01     1.0
    3      PRIMARY CONTAINMENT        3.00+5    0.0     0.0    0.0    0.04.38-4    0.0     0.0     0.0
    4      TURBINE BUILDING           1.20+7    0.0     0.0    0.0    0.0  48.0    0.0     0.0     0.0
    5      CONTROL ROOM               1.36+5    0.0     0.0    0.0    0.0 3193.   .896    .892     1.0
    6          0.00+0 5.47+7 7.93+7 9.06+7 1.17+8 9.25+7 0.00+0 0.00+0
    7          0.00+0 0.00+0 0.00+0 5.66+6 1.23+7 5.66+5 2.26+7 3.21+7
    8          3.77+7 3.40+5 3.77+5 1.06+8 3.21+7 1.85+7 0.00+0 8.30+7
    9      1           1     0     1     0     0 1.121 1.1213.12-4            1     1   0.25
   10      2           1     0     1     1     1     1     13.12-4            1     1    2.0
   11      3           1     0     1     1     1     1     11.22-8            1     1    8.0
   12      4           1     0     1     1     1     1     11.22-8            1     1   24.0
   13       5          1     0     1     1     1     1     11.22-8            1     1   96.0
   14       6          1     0     1     1     1     1     11.22-8            1     1  720.0
   15     **UNIT 1 LOCA 10 SCFH BP - NO PLATEOUT 50% MIX 20 MIN ACT  90% FILT
   16       6   1110 1 0011      0     1.0       0       0   0.24    0.01     1.0
   17      PRIMARY CONTAINMENT        3.00+5    0.0     0.0    0.0    0.04.38-4    0.0     0.0     0.0
   18      TURBINE BUILDING           1.20+7    0.0     0.0    0.0    0.0  49.0    0.0     0.0     0.0
   19      CONTROL ROOM               1.36+5    0.0     0.0    0.0    0.0 3193.   .896    .892     1.0
   20          0.00+0 5.47+7 7.93+7 9.06+7 1.17+8 9.25+7 0.00+0 0.00+0
   21          0.00+0 0.00+0 0.00+0 5.66+6 1.23+7 5.66+5 2.26+7 3.21+7
   22          3.77+7 3.40+5 3.77+5 1.06+8 3.21+7 1.85+7 0.00+0 8.30+7
   23      1           1     0     1     0     0 1.121 1.1213.12-4            1     1   0.33
   24      2           1     0     1     1     1     1     13.12-4            1     1    2.0
   25      3           1     0     1     1     1     1     11.22-8            1     1    8.0
   26      4           1     0     1     1     1     1     11.22-8            1     1   24.0
   27       5          1     0     1     1     1     1     11.22-8            1     1   96.0
   28       6          1     0     1     1     1     1     11.22-8            1     1  720.0

          12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
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APPENDIX A
DRAGON RUN #33
4/29/93

CRC-2500
BE100

NIAGARA MOHAWK NUCLEAR ENGINEERING	CALCULATION COVER SHEET	Page 1 (Next 2 ____) Total 30 Last 30

NINE MILE POINT NUCLEAR STATION Unit (1, 2 or 0=Both) : _1_ Discipline : HEALTH PHYSICS

Title	Calculation No.			
CONTROL ROOM VENTILATION MONITOR SETPOINT – MS&B	S18.9TB300D23U1.210			
	(Sub)system(s)	Building	Floor Elev.	Index No.
	210	TB	277'0"	N/A

Originator(s)
GOPAL J. PATEL (NUCORE CONSULTING SERVICES, INC.)

Checker(s) / Approver(s)
GLENN STINSON/T.G. KULCZYCKY

Rev	Description	Design Change No.	By	Date	Chk	Date	App	Date
00	CR MONITOR SETPOINT	N/A	TMK	4/20/89	RJK	4/21/89	NAB	4/21/89
03	REALISTIC SETPOINT	N1-98-009	GJP	4/30/98	[illegible]	4/30/98	TGK	4/30/98

Computer Output/Microfilm Filed Separately (Yes / No / NA): No Safety Class (SR / NSR / Qxx) : SR

Superseded Document(s) : S18.9TB300D23U1.210, REV 2 AND S10CR277.G36U1.000, REV 0.

Document Cross Reference(s) - For additional references see page(s) : 26 & 27

Ref No	Document No.	Doc Type	Index	Sheet	Rev

General Reference(s) :
See Pages 26 & 27

Remarks :
This calculation provides input to dispositions SP-RAM-210-42A-00A and SP-RAM-210-43A-00A.

Confirmation Required (Yes / No) : No See Page(s) : _____	Final Issue Status (APP / FIO / VOI) : APP	File Location (Calc / Hold) : Calc	Operations Acceptance Required (Yes / No) : No

Evaluation Number(s) / Revision : N/R
Copy of Applicability Review Attached (Yes / N/R)?Yes
AR - 27953

Component ID(s) / EPN(s) / Line Number(s) :
RAM-210-42A & RAM-210-43A

Key Words : CONTROL ROOM, VENTILATION AIR INTA
MONITOR, SETPOINT, DER: 1-98-0948

Post-It™ brand fax transmittal memo 7671 | # of pages ▸ 30

To D. Hood	From P. Trenca
Co.	Co.
Dept.	Phone # 315-349-1322
Fax # 301-415-2102	Fax #

Project Nine Mile Point Nuclear Station Unit 1 Disposition N/A

Originator/Date	Checker/Date	Calculation No.	Rev
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

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Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

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Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

OBJECTIVE OF CALCULATION

The objective of this calculation is to determine a realistic setpoint limit for control room (CR) ventilation air intake monitors RE-210-42 (channel 11) and RE-210-43 (channel 12) based on the radioactive concentration at the CR air intake due to the post-main steam line (MSLB) accident release. The current setpoint of ≤ 1,000 cpm is based on a maximum radioactivity concentration (puff release) resulting from a MSLB accident with the total reactor coolant iodine activity of 25 µCi/gm (REFs 6 & 2.c). While re-establishing the MSLB design basis accident, based on the as-built design information (an action required for the closure of DER 1-97-0329), it was noticed that the radioactive isotopic concentration at the CR air intake was less than the value required to reach the setpoint of the monitor and initiate the CR emergency ventilation (CREV) system. If the CREV is not credited for the removal of iodine during and after the MSLB accident, the CR thyroid dose will exceed the GDC 19 limit (REF 11) for the current Licensing basis (REFs 1, 2, & 15). Therefore, the CR vent monitor setpoints are re-established for the following two cases:

1. The total iodine concentration of 25 µCi/gm in the reactor coolant released during the MSLB accident.

2. The total iodine concentration of 10 µCi/gm in the reactor coolant released during the MSLB accident.

An additional case is analyzed with the CREV actuation and total iodine concentration of 25 µCi/gm in the reactor coolant released during the MSLB accident.

METHOD

This section provides a brief discussion of the general methodology used in calculating the CR ventilation air intake monitor setpoints for the above two cases due to the MSLB accident releases. Additional details are provided in the specific calculation sections.

The DRAGON computer code (REF 14) is used to calculate isotopic activities in the turbine building (TB), the environment outside and inside the CR, and doses in the CR due to airborne activity. The initial noble gas and iodine isotopic activities released from the MSLB are taken from Tables 1, 2, & 3.

The break of a main steam line downstream of reactor building outboard isolation valve represents a potential escape route for reactor coolant from the vessel to the atmosphere until main steam line isolation valve closes within 11 seconds after the accident. The steam line break will be sensed by either increased pressure drop across the venturis or increased temperature in the main steam tunnel. The MSLB results in clad temperature no higher than the normal operating temperature, thus no clad perforations occur (REF 17, age 1-1). Therefore, the total iodine activity concentration in the reactor coolant mass release and noble gas tivity concentrations in the steam mass release are normalized to the maximum limits specified in the FSAR (REF 1.a, 1.b & 4) and Technical Specifications (REFs 2.a & 4) to obtain the initial activities releases during the MSLB accident (see Tables 1, 2, & 3).

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DATA / ASSUMPTIONS

SOURCE TERM PARAMETERS-

1. The reactor is assumed to be operating at full power and reactor scrams at the time of MSLB accident (REF 3).

2. Total mass of coolant released is that amount in the steam line and the connecting lines at the time of the break plus the amount that passes through the valves prior to closure (REF 3, Item C.3):

   Total mass of coolant = 80,900 lbs (REF 1.a, page XV-32 and REF 4, page 5)

3. Reactor coolant mass flashed into steam = 39,350 lbs (REF 1.a, page XV-34, and REF 4, page 6)

   Note: Iodine isotopic activities released during the MSLB accident are calculated in Reference 4, page 5, using the total coolant mass of 80,900 lbs. Only 39,350 lbs of coolant flashes into steam, thereby, releasing the corresponding amount of liquid-borne iodine in the environment. The information provided in the UFSAR page XV-32 (REF 1.a) is not transformed properly from the design basis document (REF 4). Therefore, the iodine isotopic activities in the flashed coolant are calculated in Tables 2 & 3 are used in this analysis.

4. Total mass of steam released during MSLB accident = 26,250 lbs (REF 1.a, page XV-33 and REF 4, page 4).

5. The isotopic noble gas activities in the steam released during MSLB accident are given in Reference 4, page 5. The total noble gas activity exceeds the limit of 70 Ci (REF 4 & 1.a), therefore, the noble gas activity in Table 1 is normalized to 70 Ci. The normalized noble gas isotopic activities are used in this analysis.

6. All of the iodine (no credit for plateout is allowed) from the released coolant are released to the atmosphere within 2 hours (REF 3 , Item C.5).

7. For the Licensing basis accident, the radioactivity in the coolant is assumed to be the maximum amount incorporated in the technical specifications provided that no further fuel failures are assumed to occur as a result of delay in valve closure (REF 3, Item C.4). The technical specification total iodine activity concentration limit is 25 μCi/gm (REF 2.a). For the radiation monitor setpoint, a value that results in acceptable CR doses without emergency filtration is used. Therefore, an additional case of total coolant iodine activity concentration of 10 μCi/gm is analyzed (predetermined to result in a thyroid dose of less than 30 Rem).

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8. The main steam line isolation valves (MSIV) close within the maximum time incorporated in the Technical Specifications. This closure times verified by suitable periodic testing. The MSIV closure time is assumed to be 11 sec (REF 1, page XV-32) and verified to be less than10 sec every cold shutdown by surveillance procedure N1-ST-V8 (REFs 1.d, 16). The MSLB accident results in clad temperatures no higher than the normal operating temperature and thus no clad perforations or damage occurs (REF 17, page 1-1).

9. The breathing rate is assumed to be 3.47E-04 m^3/s (REF 3, Item C.6.b).

10. It is assumed that the radioactive releases from the MSLB accident are released to the turbine building and finally released to the environment via the turbine building blowout panel (REFs 4 & 15).

11. Turbine building HVAC flow rate is 170,000 cfm (REF 1.c). This flow rate changes one volume of TB in one hour. Therefore, turbine building volume is calculated as follows:

$$170{,}000\ ft^3/min \times 60\ min/hr \times 1.0\ hr = 1.02E{+}07\ ft^3$$

12. Atmospheric dispersion factors is 1.93E-03 s/m^3 (REF 8).

CONTROL ROOM PARAMETERS

13. The free volume of the NMP 1 control room is 1.36E+5 ft^3. (REFs 13 & 18).

CR Gross volume = 169,700 ft^3 (REF 18)
Net CR Volume = 0.80 x 169,700 ft^3 = 1.36E+05 ft^3 (REF 13)

14. The control room normal intake rate is 3550 cfm unfiltered. This is calculated by taking the maximum flow rate of 16,300 minus the minimum recirc flow rate of 12,750 cfm (REF 1.c, Section III-B 2.2)

15. The iodine removal efficiency of the CREVS filter is assumed to be 99% for particulate iodine (REF 2.b, Sections 3.4.5.b and 3.4.5.c), and 90% for elemental and organic iodines. The weighted filter efficiencies are determined below to account for the 30 cfm unfiltered inleakage to the control room:

$$\text{Elemental \& Particulate Weighted Average} = \frac{(0.90*0.91) + (0.99*0.05)}{(0.91 + 0.05)} = 0.905$$

$$\text{Particulate \& Elemental Efficiency} = \frac{(3163\ cfm)(.905) + (30\ cfm)(0)}{3163\ cfm + 30\ cfm} = 0.896$$

$$\text{Methyl Efficiency} = \frac{(3163\ cfm)(.90) + (30\ cfm)(0)}{3163\ cfm + 30\ cfm} = 0.892$$

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16. The doors of the control room are weather-stripped and the penetrations sealed to maintain a positive pressure of approximately one-sixteenth of an inch of water (REF 1, page III-11), however, an unfiltered inleakage of 10 cfm to the control room is assumed per Reference 10, Section III.3.d.(2).(ii). An additional 20 cfm is assumed to account for an unfiltered inleakage through an unsealed drain (REF 19). This makes the total air intake rate 3,580 cfm (3550 cfm + 30 cfm = 3,580 cfm).

    NOTE: The Standard Review Plan, Section 6.4 (REF 10), specifies control room pressurization of 1/8 inch water gauge with respect to all surrounding air spaces, and requires periodic verification of the ability to maintain this pressurization. This 1/8 inch water gauge requirement was not part of the design basis for the Unit 1 control room.

17. The control room recirculation air system has no iodine filter (REF 1, Fig III-14).

18. The maximum beta energies and percentage yield for isotopes decay by beta emission are obtained from Reference 9.

19. The KDB-1000 isotopic response to beta emission are obtained from Reference 7.

20. Activity release rate from TB:

    All of the iodine and noble gases from the released coolant are assumed to be released to the atmosphere within 2 hours (REF 3, Item C.5). Also, the initiation time of CREV is assumed to be 32 sec. If a puff release is assumed, all of the activity released will instantaneously be at the CR air intake during the initiation time which will result in a conservative dose, but a non-conservative setpoint. Therefore, a more realistic activity release rate is calculated in the following section, which distributes the release of 99.999% of activity from the TB in 2.0 hours:

    $A = A_0 e^{-\lambda t}$

    Where A = activity at given time (t)

    A_0 = initial activity

    λ = activity removal rate (fraction/hr)

    t = activity removal time (2 hrs)

    $A/A_0 = (1 - 0.99999) = 0.00001$

Substituting the values in the above equation results:

$A/A_0 = e^{-\lambda t}$

$0.00001 = e^{-\lambda t}$

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$-\lambda t = -\lambda 2 = \ln 0.00001 = -11.51$

$\lambda = 11.51/2 = 5.755$ per hour = 138.0 volume/day

Therefore, a release rate of 138 volume/day is used which will release 99.999% of the activity from the TB in 2 hours.

21. This 30 day dose does not include any adjustment for control room occupancy. The X/Q value used for this accident is 1.93E-03 s/m^3 which is for 0-8 hrs and does not include the occupancy factor.

Total expected control room occupancy:
(occupancy factors per REF 10)

100% occupancy for first 24 hours	= 24 hours
60% occupancy from 24 - 96 hours	= 43.2 hours
40% occupancy from 96-720 hours	= 249.6 hours

Total occupancy time = 24 + 43.2 + 249.6 = 316.8 hours
Total time in 30 days = 720 hours

Occupancy adjustment factor = 316.8 / 720 = 0.44 used to calculate the average gamma dose rate for 0-30 days.

22. The CR doses reach equilibrium before 24 hours (no additional dose contribution after 24 hours), the reduction of CR doses by applying the occupancy factors is not appropriate for the current analysis, therefore, the occupancy factors are utilized to calculate the average gamma dose rate only.

23. The activity released during the first 30 seconds is arbitrarily used to calculate initial activity release rate (Ci/sec). The activity release rate at time t = 0 sec will produce a very higher monitor response. The longer release time will produce lower monitor response. Since the TB blowout panel release rate is extremely high (138 volume/day), the radioactive cloud will travel to the CR air intake within a short time, therefore, the longer release time can not be justified. The use of activity release over 30 second provides reasonably good average distribution of activity and release rate.

Project Nine Mile Point Nuclear Station Unit 1 Disposition N/A

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Table 1

Post-MSLB Noble Gas Activity Released		
Isotopes	Gross * Isotopic Activity in Main Steam Ci	Activity Normalized to 70 Ci gm
Kr-83m	6.00E-01	4.34E-01
Kr-85m	1.10E+00	7.96E-01
Kr-85	5.10E-03	3.69E-03
Kr-87	3.30E+00	2.39E+00
Kr-88	3.30E+00	2.39E+00
Kr-89	1.40E+01	1.01E+01
Xe-131m	3.30E-03	2.39E-03
Xe-133m	5.10E-02	3.69E-02
Xe-133	1.40E+00	1.01E+00
Xe-135m	4.20E+00	3.04E+00
Xe-135	5.70E+00	4.13E+00
Xe-138	6.30E+01	4.56E+01
Total	9.67E+01	7.00E+01

* Gross activity released in total mass of steam

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Table 2

Post-MSLB Iodine Inventory Based on Total Iodine Activity of 25 uCi/gm				
Iodine Isotopes	Isotopic Activity uci/gm	Normalized Isotopic Activity uci/gm	Coolant Mass Released gm	Total Activity Released Ci
I-131	2.00E+00	1.67E+00	1.79E+07	2.98E+01
I-132	5.20E+00	4.33E+00	1.79E+07	7.74E+01
I-133	8.00E+00	6.67E+00	1.79E+07	1.19E+02
I-134	7.40E+00	6.17E+00	1.79E+07	1.10E+02
I-135	7.40E+00	6.17E+00	1.79E+07	1.10E+02
Total	3.00E+01	2.50E+01		4.46E+02

Project Nine Mile Point Nuclear Station Unit 1 Disposition N/A

Originator/Date	Checker/Date	Calculation No.	Rev
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

Table 3

Post-MSLB Iodine Inventory Based on Total Iodine Activity of 10 uCi/gm				
Iodine Isotopes	Isotopic Activity uci/gm	Normalized Isotopic Activity uci/gm	Coolant Mass Released gm	Total Activity Released Ci
I-131	2.00E+00	6.67E-01	1.79E+07	1.19E+01
I-132	5.20E+00	1.73E+00	1.79E+07	3.09E+01
I-133	8.00E+00	2.67E+00	1.79E+07	4.76E+01
I-134	7.40E+00	2.47E+00	1.79E+07	4.40E+01
I-135	7.40E+00	2.47E+00	1.79E+07	4.40E+01
Total	3.00E+01	1.00E+01		1.79E+02

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

CALCULATION

Post-MSLB Accident Concentration at CR Vent Monitor (Cases 1 & 2)

During a MSLB accident the noble gas activity from the steam release and iodine activity from the coolant that flashed into steam are assumed to be released in the turbine building (TB). The isotopic noble gas activities in Table 1 (DATA/ASUMPTION 5) and iodine isotopic activities in Table 2 & 3 (DATA/ASSUMPTIONS 3 & 7) are released during the MSLB accident. The post-MSLB activity is released to the environment via TB blowout panel and carried over to the CR air intake.

The DRAGON computer code (REF 14) is used to calculate the post-MSLB activity concentrations at the CR vent monitor with the following design inputs:

Isotopic activities from Tables 1, 2, & 3 : DATA/ASSUMPTIONS 2, 5, & 7.

Atmospheric dispersion factor of 1.93E-03 @ TB blowout panel : DATA/ASSUMPTIONS 12.

Turbine Building:
volume - 1.02E+7 ft^3 : DATA/ASSUMPTIONS 13
release rate 138.0 volume/day : DATA/ASSUMPTIONS 20

Control Room:
volume - 1.36E+5 cubic ft: DATA/ASSUMPTIONS 14
intake rate 0 to 720 days 3580 cfm : DATA/ASSUMPTIONS 15 & 17

Breathing rates DATA/ASSUMPTIONS 9

0-720 hrs 3.47E-04 m^3/sec

The activities released to the environment for are given in the following Tables:

Case 1: Total iodine activity of 25 µCi/gm

DRAGON run # 862 dated 4/21/98 - Table 4

Case 2: Total iodine activity of 10 µCi/gm

DRAGON run # 873 dated 4/21/98 - Table 4

Case 3: Total iodine activity of 25 µCi/gm with CREV Actuation

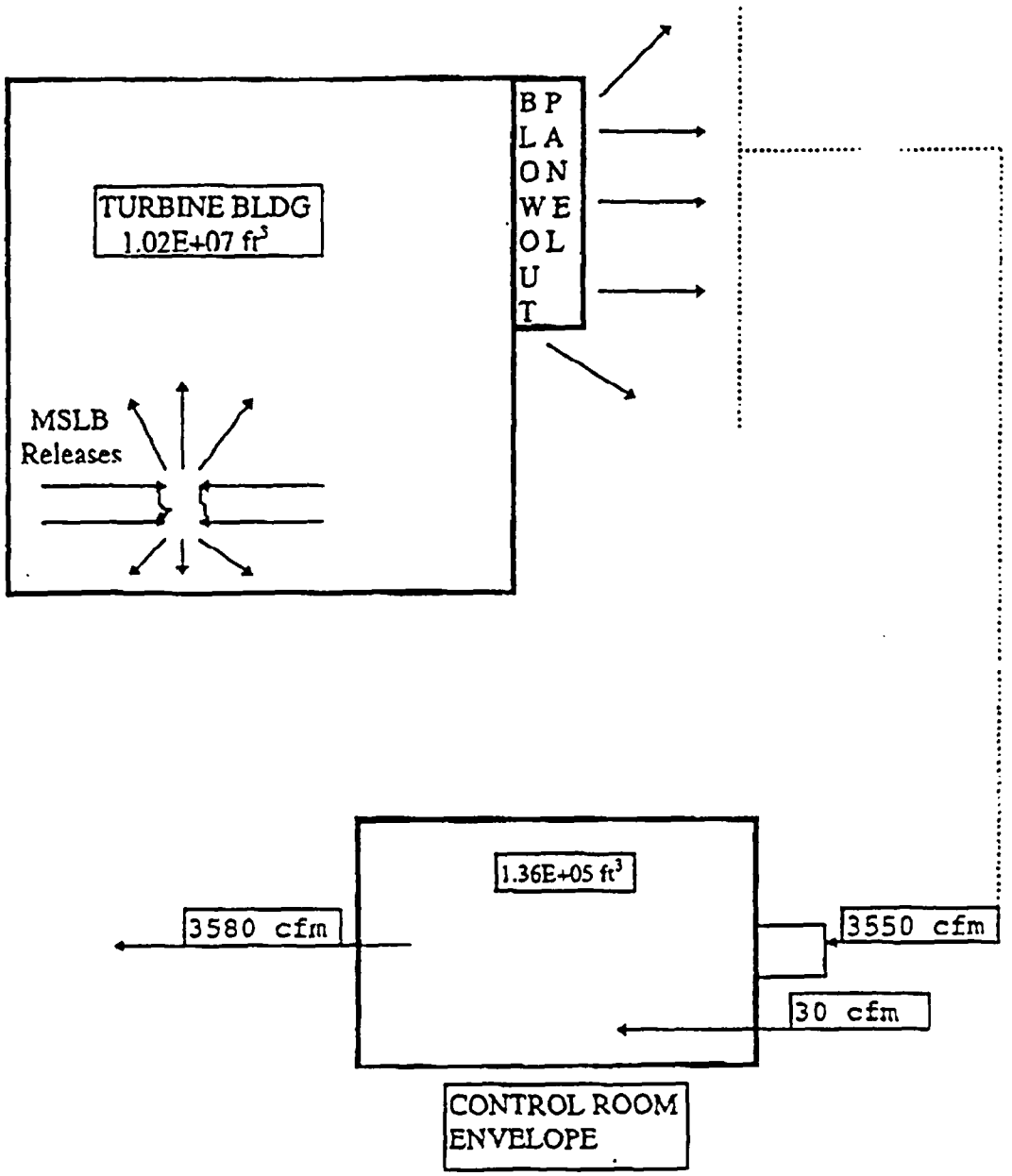
DRAGON run # 7876 dated 4/30/98 - Table 4

The card image of input to the DRAGON run is given APPENDIX A.

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

MSLB Accident Release Model



Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

Table 4		
Activity Released to Environment @ Time t = 30 sec		
ISOTOPE	ACTIVITY RELEASED TO ATMOSPHERE 25 uCi/gm Ci*	ACTIVITY RELEASED TO ATMOSPHERE 10 uCi/gm Ci**
I-131	1.39E+00	5.57E-01
I-132	3.62E+00	1.44E+00
I-133	5.56E+00	2.23E+00
I-134	5.13E+00	2.05E+00
I-135	5.14E+00	2.06E+00
KR-83M	2.03E-02	2.03E-02
KR-85M	3.72E-02	3.72E-02
KR-85	1.73E-04	1.73E-04
KR-87	1.12E-01	1.12E-01
KR-88	1.12E-01	1.12E-01
KR-89	4.48E-01	4.48E-01
XE-131M	1.12E-04	1.12E-04
XE-133M	1.73E-03	1.73E-03
XE-133	4.74E-02	4.73E-02
XE-135M	1.49E-01	1.44E-01
XE-135	1.95E-01	1.94E-01
XE-138	2.11E+00	2.11E+00
Total	2.41E+01	1.16E+01

* From Computer Run No. 862, Dated 04/21/98

** From Computer Run No. 873, Dated 04/21/98

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
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Determination Of CR Vent Monitor Isotopic Conversion Factor

The isotopic conversion factor for detector response is calculated in Table 5 for the isotopes present in the post-MSLB release. The detector is a beta scintillation detector (REF 7, PAGE 2), therefore, isotopes that do not decay by beta emission will not be considered as contributors to the detector response.

The percentage yield of beta emission is multiplied by the KDB-1000 response to obtain the isotopic conversion factor at the given energy level. The conversion factors at the different energy levels are summed to obtain the total isotopic conversion factor as shown in Tables 5 & 6.

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

Table 5

Control Room Vent Monitor Isotopic Conversion Factor

Isotope	Beta Energy B_{max} (Mev)	% Yield	KDB-1000 Response cpm/uCi/cc	Conversion Factor (CF) cpm/uCi/cc	Total CF cpm/uCi/cc
Kr-83m	0	0	0.00E+00	0.00E+00	0.00E+00
Kr-85m	0.84	78.6	2.40E+05	1.89E+05	1.89E+05
Kr-85	0.687	99.6	2.00E+05	1.99E+05	1.99E+05
Kr-87	0.928	4.4	2.60E+05	1.14E+04	3.70E+05
	1.334	9.5	3.30E+05	3.14E+04	
	1.475	5.51	3.40E+05	1.87E+04	
	>2.27	78	3.90E+05	3.04E+05	
Kr-88	0.365	2.65	7.60E+04	2.01E+03	1.86E+05
	0.521	67	1.40E+05	9.38E+04	
	0.681	9.1	2.00E+05	1.82E+04	
	1.198	1.92	3.00E+05	5.76E+03	
	2.051	1.3	3.80E+05	4.94E+03	
	>2.27	15.8	3.90E+05	6.16E+04	
Kr-89	1.25	2.36	3.10E+05	7.32E+03	3.45E+05
	1.44	1.49	3.40E+05	5.07E+03	
	1.61	1.55	3.60E+05	5.58E+03	
	1.6	2.09	3.50E+05	7.32E+03	
	1.64	2	3.60E+05	7.20E+03	
	2.1	4	3.90E+05	1.56E+04	
	2.19	1.51	3.90E+05	5.89E+03	
	>2.27	74.62	3.90E+05	2.91E+05	
Xe-131m	0	0	0.00E+00	0.00E+00	0.00E+00
Xe-133m	0	0	0.00E+00	0.00E+00	0.00E+00
Xe-133	0.346	99.3	6.90E+04	6.85E+04	6.85E+04
Xe-135m	0	0	0.00E+00	0.00E+00	0.00E+00
Xe-135	0.909	96.1	2.60E+05	2.50E+05	2.55E+05
	0.551	3.13	1.60E+05	5.01E+03	
Xe-138	0.4	3.06	9.40E+04	2.88E+03	2.90E+05
	0.48	9.5	1.30E+05	1.24E+04	
	0.71	32.6	2.10E+05	6.85E+04	
	>2.27	53	3.90E+05	2.07E+05	
I-131	0.2479	2.12	2.90E+04	6.15E+02	1.66E+05
	0.3338	7.36	6.60E+04	4.86E+03	
	0.6063	89.3	1.80E+05	1.61E+05	

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

Table 5 (Cont'd)

Control Room Vent Monitor Isotopic Conversion Factor

Isotope	Beta Energy (Mev)	% Yield	KDB-1000 Response cpm/uCi/cc	Conversion Factor (CF) cpm/uCi/cc	Total CF cpm/uCi/cc
I-132	0.741	12.4	2.20E+05	2.73E+04	2.97E+05
	0.74	1.9	2.20E+05	4.18E+03	
	0.91	3.55	2.60E+05	9.23E+03	
	0.966	8.1	2.70E+05	2.19E+04	
	0.991	2.75	2.70E+05	7.43E+03	
	0.996	3.36	2.70E+05	9.07E+03	
	1.155	2.49	2.90E+05	7.22E+03	
	1.185	18.9	2.90E+05	5.48E+04	
	1.413	1.7	3.40E+05	5.78E+03	
	1.47	10.1	3.40E+05	3.43E+04	
	1.468	2	3.40E+05	6.80E+03	
	1.617	12.4	3.60E+05	4.46E+04	
	2.14	16.9	3.80E+05	6.42E+04	
I-133	0.37	1.24	7.90E+04	9.80E+02	2.88E+05
	0.46	3.75	1.20E+05	4.50E+03	
	0.52	3.13	1.40E+05	4.38E+03	
	0.88	4.16	2.50E+05	1.04E+04	
	1.02	1.81	2.70E+05	4.89E+03	
	1.23	83.5	3.10E+05	2.59E+05	
	1.53	1.07	3.40E+05	3.64E+03	
I-134	0.77	1.48	2.30E+05	3.40E+03	3.37E+05
	1.07	1.22	2.90E+05	3.54E+03	
	1.28	32.5	3.10E+05	1.01E+05	
	1.5	8.1	3.40E+05	2.75E+04	
	1.56	16.3	3.50E+05	5.71E+04	
	1.6	3.67	3.50E+05	1.28E+04	
	1.74	7.6	3.60E+05	2.74E+04	
	1.8	11.2	3.60E+05	4.03E+04	
	1.85	1.12	3.70E+05	4.14E+03	
	2.23	3.7	3.90E+05	1.44E+04	
	2.42	11.5	3.90E+05	4.49E+04	
I-135	0.3	1.08	4.80E+04	5.18E+02	2.60E+05
	0.35	1.39	6.90E+04	9.59E+02	
	0.46	4.73	1.20E+05	5.68E+03	
	0.48	7.33	1.20E+05	8.80E+03	
	0.62	1.57	1.80E+05	2.83E+03	
	0.67	1.1	2.00E+05	2.20E+03	
	0.74	7.9	2.20E+05	1.74E+04	
	0.92	8.7	2.70E+05	2.35E+04	
	1.03	21.8	2.80E+05	6.10E+04	
	1.15	7.9	2.90E+05	2.29E+04	
	1.25	7.4	3.10E+05	2.29E+04	
	1.45	23.5	3.40E+05	8.02E+04	
	1.58	1.2	3.50E+05	4.20E+03	
	2.18	1.9	3.80E+05	7.22E+03	

Project Nine Mile Point Nuclear Station Unit 1 Disposition N/A

Originator/Date	Checker/Date	Calculation No.	Rev
Gopal J. Patel (NUCORE)	Glenn Sunson	S18.9-TB300D23U1.210	03

Table 6

Control Room Vent Monitor Response	
ISOTOPE	CONVERSION FACTOR cpm/uc/cc
I-131	1.66E+05
I-132	2.97E+05
I-133	2.88E+05
I-134	3.37E+05
I-135	2.60E+05
KR-83M	0.00E+00
KR-85M	1.89E+05
KR-85	1.99E+05
KR-87	3.70E+05
KR-88	1.86E+05
KR-89	3.45E+05
Xe-131M	0.00E+00
XE-133M	0.00E+00
XE-133	6.85E+05
XE-135M	0.00E+00
XE-135	2.55E+05
XE-138	2.90E+05

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

Determination of CR Vent Monitor Setpoint

The activities released to the environment during the MSLB accident are listed in Table 4 for both cases for the first 30 sec releases. The isotopic activity (Ci) is divided by 30 sec to obtain the release rate of activity in Ci/sec which is further multiplied by the atmospheric dispersion factor or X/Q (sec/m^3) to calculate the isotopic concentration (µCi/cc) at the CR vent monitor (see Tables 7 & 8). The isotopic concentration (µCi/cc) is multiplied by the applicable isotopic conversion factor (cpm/µCi/cc) to obtain the monitor response in count per minute (cpm). The isotopic responses in cpm are summed to get the total monitor response which becomes the basis for the CR ventilation air intake monitor setpoint. The CR vent monitor setpoints are 443 cpm and 213 cpm for total iodine concentrations of 25 µCi/cc and 10 µCi/cc respectively (Tables 7 & 8). Since the current CR monitor setpoint of ≤ 1,000 cpm is higher than 443 cpm and 213 cpm, the CREV system will not be actuated during or following the MSLB accident. Therefore, the CR doses in Case 1 & 2 are analyzed without taking credit of the CREV system.

Project Nine Mile Point Nuclear Station Unit 1 Disposition N/A

Originator/Date	Checker/Date	Calculation No.	Rev
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

Table 7
CR Air Intake Monitor Setpoint Based on Total Iodine Activity of 25 uCi/gm

ISOTOPE	ACTIVITY RELEASED TO ATMOSPHERE Ci*	ACTIVITY RELEASE RATE Ci/sec	X/Q (sec/m3)	ACTIVITY AT CR AIR INTAKE uci/cc	MONITOR CONVERSION FACTOR cpm/uCi/cc	MONITOR RESPONSE cpm
I-131	1.39E+00	4.63E-02	1.93E-03	8.94E-05	1.66E+05	1.48E+01
I-132	3.62E+00	1.21E-01	1.93E-03	2.33E-04	2.97E+05	6.92E+01
I-133	5.56E+00	1.85E-01	1.93E-03	3.58E-04	2.88E+05	1.03E+02
I-134	5.13E+00	1.71E-01	1.93E-03	3.30E-04	3.37E+05	1.11E+02
I-135	5.14E+00	1.71E-01	1.93E-03	3.31E-04	2.60E+05	8.60E+01
BR-83	0.00E+00	0.00E+00	1.93E-03	0.00E+00	0.00E+00	0.00E+00
BR-84	0.00E+00	0.00E+00	1.93E-03	0.00E+00	0.00E+00	0.00E+00
KR-83M	2.03E-02	6.77E-04	1.93E-03	1.31E-06	0.00E+00	0.00E+00
KR-85M	3.72E-02	1.24E-03	1.93E-03	2.39E-06	1.89E+05	4.52E-01
KR-85	1.73E-04	5.77E-06	1.93E-03	1.11E-08	1.99E+05	2.21E-03
KR-87	1.12E-01	3.73E-03	1.93E-03	7.21E-06	3.70E+05	2.67E+00
KR-88	1.12E-01	3.73E-03	1.93E-03	7.21E-06	1.86E+05	1.34E+00
KR-89	4.48E-01	1.49E-02	1.93E-03	2.88E-05	3.45E+05	9.94E+00
XE-131M	1.12E-04	3.73E-06	1.93E-03	7.21E-09	0.00E+00	0.00E+00
XE-133M	1.73E-03	5.77E-05	1.93E-03	1.11E-07	0.00E+00	0.00E+00
XE-133	4.74E-02	1.58E-03	1.93E-03	3.05E-06	6.85E+05	2.09E+00
XE-135M	1.49E-01	4.97E-03	1.93E-03	9.59E-06	0.00E+00	0.00E+00
XE-135	1.95E-01	6.50E-03	1.93E-03	1.25E-05	2.55E+05	3.20E+00
XE-137	0.00E+00	0.00E+00	1.93E-03	0.00E+00	0.00E+00	0.00E+00
XE-138	2.11E+00	7.03E-02	1.93E-03	1.36E-04	2.90E+05	3.94E+01
Total	2.41E+01				TOTAL	4.43E+02

* 30 second release

Set Point is Calculated Based on Total Iodine Activity of 25 uCi/gm

Project Nine Mile Point Nuclear Station Unit 1 Disposition N/A

Originator/Date	Checker/Date	Calculation No.	Rev
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

Table 8
CR Air Intake Monitor Setpoint Based on Total Iodine Activity of 10 uCi/gm

ISOTOPE	ACTIVITY RELEASED TO ATMOSPHERE Ci*	ACTIVITY RELEASE RATE Ci/sec	X/Q (sec/m3)	ACTIVITY AT CR AIR INTAKE uci/cc	MONITOR CONVERSION FACTOR cpm/uCi/cc	MONITOR RESPONSE cpm
I-131	5.57E-01	1.86E-02	1.93E-03	3.58E-05	1.66E+05	5.95E+00
I-132	1.44E+00	4.80E-02	1.93E-03	9.26E-05	2.97E+05	2.75E+01
I-133	2.23E+00	7.43E-02	1.93E-03	1.43E-04	2.88E+05	4.13E+01
I-134	2.05E+00	6.83E-02	1.93E-03	1.32E-04	3.37E+05	4.44E+01
I-135	2.06E+00	6.87E-02	1.93E-03	1.33E-04	2.60E+05	3.45E+01
BR-83	0.00E+00	0.00E+00	1.93E-03	0.00E+00	0.00E+00	0.00E+00
BR-84	0.00E+00	0.00E+00	1.93E-03	0.00E+00	0.00E+00	0.00E+00
KR-83M	2.03E-02	6.77E-04	1.93E-03	1.31E-06	0.00E+00	0.00E+00
KR-85M	3.72E-02	1.24E-03	1.93E-03	2.39E-06	1.89E+05	4.52E-01
KR-85	1.73E-04	5.77E-06	1.93E-03	1.11E-08	1.99E+05	2.21E-03
KR-87	1.12E-01	3.73E-03	1.93E-03	7.21E-06	3.70E+05	2.67E+00
KR-88	1.12E-01	3.73E-03	1.93E-03	7.21E-06	1.86E+05	1.34E+00
KR-89	4.48E-01	1.49E-02	1.93E-03	2.88E-05	3.45E+05	9.94E+00
XE-131M	1.12E-04	3.73E-06	1.93E-03	7.21E-09	0.00E+00	0.00E+00
XE-133M	1.73E-03	5.77E-05	1.93E-03	1.11E-07	0.00E+00	0.00E+00
XE-133	4.73E-02	1.58E-03	1.93E-03	3.04E-06	6.85E+05	2.08E+00
XE-135M	1.44E-01	4.80E-03	1.93E-03	9.26E-06	0.00E+00	0.00E+00
XE-135	1.94E-01	6.47E-03	1.93E-03	1.25E-05	2.55E+05	3.18E+00
XE-137	0.00E+00	0.00E+00	1.93E-03	0.00E+00	0.00E+00	0.00E+00
XE-138	2.11E+00	7.03E-02	1.93E-03	1.36E-04	2.90E+05	3.94E+01
Total	1.16E+01				TOTAL	2.13E+02

* 30 second release

Set Point is Calculated Based on Total Iodine Activity of 10 uCi/gm

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

RESULTS

The calculated control room doses from post-MSLB accident releases for Case 1 (25 µCi/gm) and Case 2 (10 µCi/gm) are given in Table 9 and the corresponding monitor set points are given in Table 10. The total number of curies released to the environment is given in Table 11. The CR thyroid dose for Case 1 (25 µCi/gm) exceeds the GDC allowable limit of 30 Rem (Table 9).

The post-MSLB accident control room gamma dose calculated in Table 9 is divided by the number of hours of expected control room occupancy to determine the **average gamma dose rate** to control room workers for the assumed 30-day duration of the LOCA.

Case 1

Total 30-day gamma dose in control room = 1.22E-02 Rem

Total expected control room occupancy, calculated previously using occupancy factors from REF. 10 = 316.8 hrs DATA/ASSUMPTIONS 21.

average gamma dose rate = 1.22E-02/316.8 hrs = 3.85E-05 Rem/hr = 3.85E-02 mRem/hr.

Case 2

Total 30-day gamma dose in control room = 5.09E-03 Rem

Total expected control room occupancy, calculated previously using occupancy factors from REF. 10 = 316.8 hrs DATA/ASSUMPTIONS 21.

average gamma dose rate = 5.09E-03/316.8 hrs = 1.61E-05 Rem/hr = 1.61E-02 mRem/hr.

Case 3

Total 30-day gamma dose in control room = 3.86E-03 Rem

Total expected control room occupancy, calculated previously using occupancy factors from REF. 10 = 316.8 hrs DATA/ASSUMPTIONS 21.

average gamma dose rate = 3.86E-03/316.8 hrs = 1.22E-05 Rem/hr = 1.22E-02 mRem/hr.

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

Table 9			
Dose In Control Room			
Release Path	Dose (Rem)		
	Thyroid	Gamma	Beta Skin
Case 1 25 (uCi/cc)	7.22E+01	1.22E-02	7.81E-02
Allowable Limit	3.00E+01	5.00E+00	3.00E+01
Case 2 10 (uCi/cc)	2.89E+01	5.09E-03	3.39E-02
Allowable Limit	3.00E+01	5.00E+00	3.00E+01
Case 3 25 (uCi/cc)	1.12E+01	3.86E-03	2.99E-02
Allowable Limit	3.00E+01	5.00E+00	3.00E+01

Table 10	
Control Room Vent Monitor	
Setpoint (cpm)	
Case 1 25 uCi/gm	4.43E+02
Case 2 10 uCi/gm	2.13E+02

Project Nine Mile Point Nuclear Station Unit 1 Disposition N/A

Originator/Date	Checker/Date	Calculation No.	Rev
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

TABLE 11		
Activity Released To Environment		
Curie		
Isotope	Case 1* 25 uCi/gm	Case 2** 10 uCi/gm
I-129	0.00E+00	0.00E+00
I-131	2.98E+01	1.19E+01
I-132	7.35E+01	2.94E+01
I-133	1.18E+02	4.73E+01
I-134	9.67E+01	3.87E+01
I-135	1.08E+02	4.32E+01
Br-83	0.00E+00	0.00E+00
Br-84	0.00E+00	0.00E+00
Br-85	0.00E+00	0.00E+00
Br-87	0.00E+00	0.00E+00
Kr-83m	4.07E-01	4.07E-01
Ke-85m	7.75E-01	7.75E-01
Kr-85	3.69E-03	3.69E-03
Kr-87	2.18E+00	2.18E+00
Kr-88	2.29E+00	2.29E+00
Kr-89	3.08E+00	3.08E+00
Xe-131m	2.53E-03	2.44E-03
Xe-133m	4.47E-02	4.00E-02
Xe-133	1.12E+00	1.05E+00
X-135m	7.41E+00	4.20E+00
Xe-135	5.37E+00	4.61E+00
Xe-137	0.00E+00	0.00E+00
Xe-137	3.02E+01	3.02E+01
Total	4.79E+02	2.19E+02

* From Computer Run No. 862, Dated 04/21/98
** From Computer Run No. 873, Dated 04/21/98
Activity Release for 0 - 30 days

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

CONCLUSIONS

As shown Table 9, the post-MSLB control room thyroid dose exceeds the GDC allowable limit of 30 Rem for Case 1 with the total reactor coolant iodine activity of 25 µCi/gm and no emergency ventilation actuation. The thyroid dose for case 2, with 10 µCi/gm is within the GDC allowable limit. The setpoint should be within the low detectable range of the monitor to avoid spurious alarm, and at or below the point where emergency ventilation is required to maintain the doses in the CR below GDC 19 limits. The analytical limit for the setpoint should be established including the total loop uncertainty associated with the detection and measurement based on the monitor response, sampling, and functions of other components which generate a signal for final controlling function. The resulting CR ventilation air intake monitor setpoint limit due to the post-MSLB accident releases is 213 cpm above the background for the total reactor coolant iodine activity concentration of 10 µCi/gm (Table 10). Use the setpoint of 210 cpm which equals to a thyroid dose of 28.5 Rem (95% of limit). This setpoint is less than the current setpoint of ≤ 1,000 cpm. Since the activity concentration at CR air intake during the MSLB accident does not reach the monitor setpoint value, the credit for CR emergency filtration is not taken in the analyses.

The results of Case 3,analyzed with the Tech Spec total reactor coolant iodine activity of 25 µCi/gm and automatic actuation of emergency ventilation (damper closed at 32 seconds) show that the CR doses are within the GDC 19 limits.

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

COMPUTER RUN LOG

JOB #	DATE	DESCRIPTION OF RUN
DRAGON RUNS:		
862	04/21/98	MSLB accident release - reactor coolant iodine activity at 25 µCi/gm.
873	04/21/98	MSLB accident release - reactor coolant iodine activity at 10 µCi/gm.
7876	04/30/98	MSLB accident release - reactor coolant iodine activity at 25 µCi/gm with actuation of emergency filtration.

Run on SWEC Mainframe Computer

Note: Card images of computer runs listed above are given in APPENDIX A

Project Nine Mile Point Nuclear Station Unit 1 Disposition N/A

Originator/Date	Checker/Date	Calculation No.	Rev
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

REFERENCES

1. Nine Mile Point Unit 1 Final Safety Analysis Report Revision 14.
   a. Chapter XV, Section C.1.3.1 "Radioactivity Releases."
   b. Table XV-6, "Iodine Concentrations (µCi/gm)"
   c. Chapter III, Section 2.2, Page III-6.
   d. Table VI-3a, "Reactor Coolant System Isolation Valves."
   e. Section III.B.2.2, "Control Room Heating Ventilation and Air Conditioning System."
2. Nine Mile Point Unit 1 Technical Specifications.
   a. Section 3.2.4.a, "Limiting Condition for Operation of Reactor Coolant Activity Specification."
   b. Section 3.4.5.b. 3.4.5.c, and 3.4.5.d, "Limiting Condition for Operation of Control Room Air Treatment System."
   c. Section 3.6.2, Table 3.6.2l, "Control Room Air Treatment System Initiation."
3. Regulatory Guide 1.5, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Steam Line Break Accident for Boiling Water Reactors.
4. G&H Calculation No. N83-2, Rev 0, "MSLB - CR, TSC & EOF Doses."
5. Not Used.
6. DER No. 1-98-0948, "Control Room Vent radiation monitor will not automatically initiate emergency ventilation during a main steam line break accident."
7. Nine Mile Point Unit 1 In-Duct Noble Gas Detector Primary Calibration Assessment Technical Report ASI 460052-003, February15, 1989.
8. Internal Correspondence From R. Caiazza to S. Karpen, Dated 03/07/84. "Control Room Habitability."
9. Radioactive Decay Data Tables, By Kocher, 1981.
10. NUREG-0800, Standard Review Plan 6.4, "Control Room Habitability System."
11. 10 Codes of Federal Regulation, Part 50, Appendix A, General Design Criteria 19.

12. NUREG-0737, Section III.D.3.4, "Control Room Habitability Requirements."

13. NMPC Internal Correspondence, R.J. Cazzolli to Distribution, Dated 08/30/91. Subject: DBD Input, File Code: SM-HP91-0115.

14. DRAGON Computer Code, SWEC Number NU-115, Version 5, Level 0.

15. NMPC Letter to NRC, Dated 03/19/84, "Response to TMI Action Item III.D.3.4 - Control Room Habitability."

16. NMP1 Surveillance Test Procedure N-ST-08, Rev 7.

17. NEDO - 10045, July 1969, Class I, "Consequences of a Steam Line Break in a General Electric Boiling Water Reactor."

18. NMPC Letter to G&H, From Sandra Karpen (NMPC) to Siva Kumar (G&H), Dated 09/02/83.

19. NMPC Calculation No. S10-CR277.A-U1.210

Project Nine Mile Point Nuclear Station Unit 1 Disposition N/A

Originator/Date	Checker/Date	Calculation No.	Rev
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

APPENDIX A

Card Image Of Input to DRAGON run # 862 04/21/98

```
***** PROGRAM --    DRAGON    -- NUI15.VE*05.LEV00--  4/30/86 -- *****

* * * * * * * * * CARD IMAGE OF INPUT SUBMITTED TO DRAGON   * * * * * * * * *

CARD COLUMNS            1         2         3         4         5         6         7         8
                 12345678901234567890123456789012345678901234567890123456789012345678901234567890
CARD NO.
    1            **NMPI CR MONITOR SETPOINT DUE TO MSLB ACCIDENT RELEASE-25 UCI/CM
    2              7   1011 1   11       0       0       0       0   0.96    0.04       1
    3             TURBINE BUILDING          1.02+7      0       0       0       0 138.0      0       0       0
    4             CONTROL ROOM              1.36+5      0       0       0       0   1.0      0       0 1.93-3
    5                0.00+0 2.98+1 7.74+1 1.19+2 1.10+2 1.10+2 0.00+0 0.00+0
    6                0.00+0 0.00+0 0.00+0 4.34-1 7.96-1 3.69-3 2.39+0 2.39+0
    7                1.01+1 2.39-3 3.69-2 1.01+0 3.04+0 4.13+0 0.00+0 4.56+1
    8             1           1       0       0       0       0 3580. 3590.       1           1       1 8.33-3
    9             2           1       0       0       0       0 3580. 3580.       1           1       1   1.0
   10             3           1       0       0       0       0 3580. 3580.       1           1       1   2.0
   11             4           0       0       0       0       0 3580. 3580.       0           1       1   9.0
   12             5           0       0       0       0       0 3580. 3580.       0           1       1  24.0
   13             6           0       0       0       0       0 3580. 3580.       0           1       1  96.0
   14             7           0       0       0       0       0 3580. 3580.       0           1       1 720.0

                 12345678901234567890123456789012345678901234567890123456789012345678901234567890
```

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

APPENDIX A

Card Image Of Input to DRAGON run # 873 04/21/98

```
***** PROGRAM --     DRAGON    -- NUIIS.VERDS.LEVDO--   4/30/96 -- *****

* * * * * * * * * CARD IMAGE OF INPUT SUBMITTED TO DRAGON   * * * * * * * * *

CARD COLUMNS            1         2         3         4         5         6         7         8
                 12345678901234567890123456789012345678901234567890123456789012345678901234567890
CARD NO.
    1            **NMD1 CR MONITOR SETPOINT DUE TO MSLB ACCIDENT RELEASE-10 UCI/CM
    2              7   1011 1   11       0       0       0       0   0.96    0.04       1
    3             TURBINE BUILDING          1.02+7     0       0       0       0 138.0      0       0       0
    4             CONTROL ROOM              1.36+5     0       0       0       0   1.0      0       01.93-3
    5                0.00+0 1.19+1 3.09+1 8.76+1 4.40+1 4.40+1 0.00+0 0.00+0
    6                0.00+0 0.00+0 0.00+0 4.34-1 7.96-1 3.69-3 2.39+0 2.39+0
    7                1.01+1 2.39-3 3.69-2 1.01+0 3.04+0 4.13+0 0.00+0 4.56+1
    8             1           1     0     0     0     0 3580. 3580.     1           1     18.33-3
    9             2           1     0     0     0     0 3580. 3580.     1           1     1   1.0
   10             3           1     0     0     0     0 3580. 3580.     1           1     1   2.0
   11             4           0     0     0     0     0 3580. 3580.     0           1     1   9.0
   12             5           0     0     0     0     0 3580. 3580.     0           1     1  24.0
   13             6           0     0     0     0     0 3580. 3580.     0           1     1  96.0
   14             7           0     0     0     0     0 3580. 3580.     0           1     1 720.0

                 12345678901234567890123456789012345678901234567890123456789012345678901234567890
```

Project Nine Mile Point Nuclear Station *Unit* 1 *Disposition* N/A

Originator/Date	*Checker/Date*	*Calculation No.*	*Rev*
Gopal J. Patel (NUCORE)	Glenn Stinson	S18.9-TB300D23U1.210	03

APPENDIX A

Card Image Of Input to DRAGON run # 7876 04/30/98

```
***** PROGRAM --    DRAGON    -- NU115.VERO5.LEV00--  4/30/96 -- *****

* * * * * * * * * CARD IMAGE OF INPUT SUBMITTED TO DRAGON   * * * * * * * * *

CARD COLUMNS            1         2         3         4         5         6         7         8
                 12345678901234567890123456789012345678901234567890123456789012345678901234567890
CARD NO.
    1            **NMPI POST-MSLP DOSES TO CONTROL ROOM/INTAKE FILTER STARTS @ 32 SEC
    2              7   1011 1   11       0       0       0       0   0.96    0.04       1
    3            TURBINE BUILDING          1.0E+7     0       0       0       0 13*.0     0       0       0
    4            CONTROL ROOM              1.3E+5     0       0       0       0   1.0 0.896 0.8921.93-3
    5               0.0E+0 7.98E+1 7.7E+1 1.1E+2 1.1E+2 1.1E+2 0.0E+0 0.0E+0
    6               0.0E+0 0.0E+0 0.0E+0 4.34-1 7.95-1 3.69-3 2.39E+0 2.39E+0
    7               1.01E+1 2.39-3 3.69-2 1.01E+0 3.04E+0 4.13E+0 0.0E+0 4.56E+1
    8            1          1       0       0       0       0 3580.  3580.      1           1      18.99-3
    9            2          1       0       0       1       1 3193.  3193.      1           1      1   1.0
   10            3          1       0       0       1       1 3193.  3193.      1           1      1   2.0
   11            4          0       0       0       1       1 3193.  3193.      0           1      1   9.0
   12            5          0       0       0       1       1 3193.  3193.      0           1      1  24.0
   13            6          0       0       0       1       1 3193.  3193.      0           1      1  96.0
   14            7          0       0       0       1       1 3193.  3193.      0           1      1 720.0

                 12345678901234567890123456789012345678901234567890123456789012345678901234567890
```