

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) D. C. COOK UNIT ONE										DOCKET NUMBER (2) 0 5 0 0 0 3 1 1 5				PAGE (3) 1 OF 15	
TITLE (4) INOPERABLE CONTROL ROOM EMERGENCY VENTILATION SYSTEM															
EVENT DATE (5)			LER NUMBER (6)				REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)					
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES				DOCKET NUMBER(S)		
0 2	2 2	8 5	8 5	0 0 7	0 0	0 3	2 5	8 5					0 5 0 0 0		
THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11)															
OPERATING MODE (9)		1		20.402(b)		20.406(c)		50.73(a)(2)(iv)		73.71(b)					
POWER LEVEL (10)		1 1 0 1 0		20.406(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)					
				20.406(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vi)		OTHER (Specify in Abstract below and in Text, NRC Form 366A)					
				20.406(a)(1)(iii)		X 50.73(a)(2)(i)		50.73(a)(2)(vii)(A)							
				20.406(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)							
				20.406(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(ix)							
LICENSEE CONTACT FOR THIS LER (12)															
NAME A. A. BLIND TECHNICAL ENGINEERING SUPERINTENDENT										TELEPHONE NUMBER AREA CODE 6 1 6 4 6 5 - 5 9 0 1					
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)															
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDOS					
SUPPLEMENTAL REPORT EXPECTED (14)										EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR	
YES (If yes, complete EXPECTED SUBMISSION DATE)										X NO					
ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single space typewritten lines) (16)															
<p>ON FEBRUARY 22, AT 11:05 AM WITH UNIT 1 AT 100 PERCENT REACTOR THERMAL POWER, IT WAS DETERMINED THAT THE CONTROL ROOM PRESSURE COULD NOT BE MAINTAINED AT +1/16 INCHES WG RELATIVE TO THE OUTSIDE ATMOSPHERE AS REQUIRED BY TECHNICAL SPECIFICATION SURVEILLANCE REQUIREMENT 4.7.5.1.e.3. A CONTROLLED SHUTDOWN WAS INITIATED AT 12:00 PM PER TECHNICAL SPECIFICATION 3.0.3. THE CONTROL ROOM FLOW RATE WAS THEN INCREASED, THE +1/16 INCHES WG OBTAINED, AND FULL POWER OPERATION RESUMED (1830 HOURS, FEBRUARY 22, 1985). AN ANALYSIS WAS PERFORMED TO DETERMINE THE POTENTIAL RADIOLOGICAL CONSEQUENCES OF OPERATION AT THE HIGHER FLOW RATES. THE CONSEQUENCES WERE EVALUATED AND BELIEVED TO BE WITHIN APPLICABLE REGULATORY LIMITS. ADDITIONAL BALANCING OF THE CONTROL ROOM VENTILATION SYSTEM WAS CONDUCTED ON MARCH 9 AND 10, 1985. DURING THIS BALANCING, THE SYSTEM EXCEEDED PRE-ESTABLISHED ACCEPTANCE CRITERIA, AND ALTHOUGH A TECHNICAL SPECIFICATION WAS NOT VIOLATED, IT WAS DECIDED TO BEGIN A PLANT SHUTDOWN. THE FLOW RATES WERE SATISFACTORILY ADJUSTED AND BALANCED BY 0630 HOURS ON MARCH 10, AT WHICH TIME THE SHUTDOWN WAS TERMINATED AND THE UNIT RETURNED TO POWER.</p> <p>TO PREVENT RECURRENCE, MODIFICATIONS ARE BEING DEVELOPED TO IMPROVE THE OPERABILITY OF THE CONTROL ROOM HVAC SYSTEM. IN ADDITION, A TECHNICAL SPECIFICATION CHANGE REQUEST WILL BE SUBMITTED WHICH SHOULD MORE CONCISELY REFLECT THE REQUIREMENTS IN BOTH THE PRESSURIZATION AND RECIRCULATION MODES.</p>															
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TEXT (If more space is required, use additional NRC Form 366A's) (17)

EVENT DESCRIPTION

ON FEBRUARY 22, A SPECIAL ENGINEERING TEST WAS BEING CONDUCTED ON THE CONTROL ROOM VENTILATION SYSTEM (IEEE/VI). THE PURPOSE OF THE TEST WAS TO DETERMINE WHAT ACTIONS WERE NECESSARY TO OBTAIN A POSITIVE PRESSURE IN THE MECHANICAL EQUIPMENT ROOM. (THIS ROOM CONTAINS THE HVAC EQUIPMENT FOR CONTROL ROOM VENTILATION). TESTING WAS PERFORMED WITH THE SYSTEM IN BOTH THE NORMAL AND EMERGENCY CONFIGURATIONS. AT 11:05 AM, WHILE IN MODE 1 AT 100% POWER WITH THE CONTROL ROOM VENTILATION SYSTEM OPERATING IN THE EMERGENCY CONFIGURATION, THE CONTROL ROOM PRESSURE WAS DETERMINED TO BE $-.04$ TO $-.05$ INCHES WG. THIS WAS BELOW TECHNICAL SPECIFICATION $3/4.7.5$ MINIMUM REQUIREMENTS OF $1/16$ INCHES WG RELATIVE TO THE OUTSIDE ATMOSPHERE. A CONTROLLED SHUTDOWN WAS INITIATED AS PER TECHNICAL SPECIFICATION 3.0.3. ADJUSTMENTS WERE MADE TO THE VENTILATION SYSTEM TO PROVIDE MORE FILTERED OUTDOOR AIR FOR PRESSURIZATION. A POSITIVE PRESSURE OF $1/16$ INCHES WG WAS OBTAINED. AN ANALYSIS WAS PERFORMED TO DETERMINE THE POTENTIAL RADIOLOGICAL CONSEQUENCES OF OPERATION AT THE HIGHER FLOW RATES. THE CONSEQUENCES WERE EVALUATED AND BELIEVED TO BE WITHIN APPLICABLE REGULATORY LIMITS. ADDITIONAL TESTING ON MARCH 9-10, 1985 WAS PERFORMED TO BALANCE THE SYSTEM. DURING THIS BALANCING, THE SYSTEM EXCEEDED PRE-ESTABLISHED ACCEPTANCE CRITERIA, AND ALTHOUGH A TECHNICAL SPECIFICATION WAS NOT VIOLATED, IT WAS DECIDED TO NOTIFY THE NRC AND BEGIN A PLANT SHUTDOWN. THE FLOW RATES WERE SATISFACTORILY ADJUSTED AND BALANCED BY 0630 HOURS ON MARCH 10, AT WHICH TIME THE SHUTDOWN WAS TERMINATED AND THE UNIT RETURNED TO FULL POWER. A DETAILED DISCUSSION OF THE EVENTS DESCRIBED FOLLOWS.

CONTROL ROOM VENTILATION SYSTEM DESCRIPTION

DURING NORMAL OPERATION OF THE CONTROL ROOM HVAC SYSTEM, OUTDOOR AIR IS DRAWN INTO THE SYSTEM TO PROVIDE FRESH MAKEUP AIR. THE HVAC SYSTEM SUPPLIES AIR TO THE COMPUTER ROOM AND TO THE CONTROL ROOM (SEE FIGURE 1). AIR FROM THE COMPUTER ROOM TRANSFERS TO THE MECHANICAL EQUIPMENT ROOM THROUGH A TRANSFER GRILLE. AIR IS RETURNED TO THE HVAC SYSTEM FROM THE CONTROL ROOM AND THE MACHINE ROOM. UNDER EMERGENCY CONDITIONS, THIS SYSTEM CONTINUES TO OPERATE BUT THE ISOLATION DAMPER IN THE OUTDOOR AIR DUCT CLOSES. IN THE EMERGENCY MODE, THE CONTROL ROOM CLEANUP/PRESSURIZATION SYSTEM AUTOMATICALLY STARTS, THE CLEANUP/PRESSURIZATION OUTDOOR AIR INTAKE DAMPER PARTIALLY OPENS TO PROVIDE PRESSURIZATION, AND THE CLEANUP/PRESSURIZATION SYSTEM RECIRCULATION DAMPER OPENS COMPLETELY. THE ONLY COMMUNICATION BETWEEN THE CONTROL ROOM AND THE MACHINE ROOM IS THROUGH THE AIR CONDITIONING SYSTEM DUCTWORK. IT WAS ANTICIPATED THAT THE MACHINE ROOM WOULD BE AT A POSITIVE PRESSURE ALONG WITH THE CONTROL ROOM.

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CHRONOLOGY OF EVENTS

ON JANUARY 7, 1985, AN HVAC ENGINEER NOTICED WHEN HE OPENED THE DOOR TO THE MACHINE ROOM THAT THE ROOM WAS AT A SUBSTANTIAL NEGATIVE PRESSURE. AS A RESULT OF THE NEGATIVE PRESSURE CONDITION, NON COMPLIANCE REPORT (NCR) RHV-85-001-1 WAS WRITTEN. IN ORDER TO DETERMINE THE CAUSE OF THE PROBLEM, AND ANSWER THE NCR FIELD TESTING OF THE UNIT 1 SYSTEM WAS PERFORMED ON FEBRUARY 22, 1985. DURING TESTING IN THE NORMAL OPERATING MODE, A POSITIVE PRESSURE WAS ACHIEVED IN THE CONTROL ROOM AND THE MACHINE ROOM AFTER MAKING SOME ADJUSTMENTS TO AIR-FLOWS. THE TEST WAS THEN RUN IN THE EMERGENCY MODE AND A NEGATIVE CONTROL ROOM PRESSURE (-.04 TO -.05 INCHES WATER GAUGE) WAS MEASURED. THE MACHINE ROOM WAS ALSO OBSERVED TO BE UNDER A NEGATIVE PRESSURE. DURING THIS TEST, THE HATCH BETWEEN THE CONTROL ROOM AND THE CABLE VAULT WAS OPEN BUT SEALED WITH A PLEXIGLASS COVER AND DUCT TAPE. THE TEST WAS REPERFORMED AFTER REMOVING THE SEAL AND CLOSING THE HATCH BUT BOTH THE CONTROL ROOM AND MACHINE ROOM REMAINED UNDER A NEGATIVE PRESSURE.

AT THIS POINT, IT WAS DETERMINED WE WERE IN NON-CONFORMANCE WITH TECHNICAL SPECIFICATION 3/4.7.5 BECAUSE THAT SPECIFICATION REQUIRED THAT THE EMERGENCY VENTILATION SYSTEM BE CAPABLE OF MAINTAINING THE CONTROL ROOM AT A 1/16 INCHES WG POSITIVE PRESSURE.

THE DAMPER ON THE FILTERED AIR INTAKE WAS OPENED WIDE ENOUGH TO ACHIEVE A 1/16 INCHES WG POSITIVE PRESSURE IN THE CONTROL ROOM. FLOW WAS THEN MEASURED THROUGH THE EMERGENCY INTAKE AND WAS FOUND TO BE 320 CFM. FLOW WAS ALSO MEASURED THROUGH THE NORMAL FRESH AIR MAKEUP DUCT TO THE HVAC SYSTEM (THE ISOLATION DAMPER IN THIS DUCT WAS CLOSED) AND IT WAS DETERMINED THAT THERE WAS 50 CFM OF UNFILTERED AIR FLOW.

AN ANALYSIS WAS PERFORMED TO DETERMINE THE POTENTIAL RADIOLOGICAL CONSEQUENCES OF OPERATION WITH THE HIGHER FLOW RATES. THE CONSEQUENCES WERE EVALUATED AND FOUND ACCEPTABLE WHEN COMPARED TO REGULATORY LIMITS. AT THIS POINT, THE CONTROL ROOM EMERGENCY VENTILATION SYSTEM WAS DECLARED OPERABLE AND THE UNIT WAS RETURNED TO FULL POWER.

SUBSEQUENT TO THIS, A GRAPH WAS DEVELOPED WHICH PROVIDED A MATRIX OF COMBINATIONS OF FILTERED AND UNFILTERED INLEAKAGE WHICH PRODUCE DOSES BELOW NUREG 0737 LIMITS. WESTINGHOUSE ELECTRIC CORPORATION HAS REVIEWED OUR ANALYSIS AND FOUND OUR DOSE ENVELOPE ACCEPTABLE. THIS GRAPH, AS WELL AS A SYNOPSIS OF THE ANALYSIS, ARE INCLUDED AS THE "SUMMARY OF ANALYSIS" SECTION OF THIS REPORT.

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AT THIS POINT, IT WAS DECIDED THAT TESTING WOULD BE PERFORMED ON MARCH 9, 1985 TO OBTAIN FLOW READINGS USING MORE CONTROLLED TEST CONDITIONS. BECAUSE THE TEST HAD THE POTENTIAL TO PLACE THE PLANT IN A CONFIGURATION IN EXCESS OF TECHNICAL SPECIFICATION LIMITS, THE SPECIAL TEST WAS REVIEWED AND APPROVED BY BOTH NSDRG AND THE PNSRC. THE MATRIX GRAPH PREVIOUSLY DISCUSSED WAS CHOSEN AS THE ACCEPTANCE CRITERIA. DESCRIBED BELOW IS A CHRONOLOGY OF THE TESTING WHICH WAS PERFORMED ON MARCH 9 AND 10.

1. THE HVAC SYSTEM OF BOTH UNITS 1 AND 2 WERE SET UP IN THE CLEANUP MODE. THE NORMAL UNIT 1 HVAC SYSTEM OUTDOOR AIR INTAKE WAS BLANKED OFF.
2. THE UNIT 1 AND 2 EQUIPMENT ROOM RETURN DAMPERS WERE ADJUSTED TO ACHIEVE A SLIGHT POSITIVE PRESSURE IN BOTH THE MECHANICAL EQUIPMENT ROOM
3. THE CLEANUP SYSTEM OUTDOOR AIR INTAKE DAMPERS IN BOTH UNITS WERE ADJUSTED UNTIL PRESSURES OF BETWEEN 0.065 INCHES AND 0.075 INCHES WG WERE ACHIEVED IN BOTH UNITS 1 AND 2. THE CLEANUP SYSTEM AIR FLOW WAS THEN MEASURED AND FOUND TO BE IN EXCESS OF TECHNICAL SPECIFICATION LIMITS OF 6000 CFM + 10%. IT WAS FELT, HOWEVER, THAT DUE TO THE UNDESIRABLE LOCATION OF THE TEST PORTS, (WHICH WOULD CAUSE EXCESS TURBULENCE RESULTING IN HIGH READINGS) THAT THE MEASUREMENTS WERE IN ERROR. A MEASUREMENT OF THE PRESSURE DROP ACROSS THE CHARCOAL FILTERS INDICATED THAT WE WERE BELOW THE UPPER LIMIT OF THE TECHNICAL SPECIFICATION ENVELOPE.
4. THE AIR INTAKE FLOW TO UNIT 1 WAS MEASURED. THE ADJUSTED AIR FLOW DID NOT FALL WITHIN THE PRETEST CRITERIA. A CONTROLLED SHUTDOWN WAS INITIATED.
5. AT THIS POINT, LEAK PATHS WERE SEALED, AND DAMPERS READJUSTED. THE FLOW WAS THEN REMEASURED AND FOUND TO BE 640 CFM. THIS WAS WITHIN THE REQUIRED DOSE RATE ENVELOPE.
6. TESTING AS DESCRIBED ABOVE WAS REPEATED FOR THE CONTROL ROOM HVAC SYSTEM OF UNIT 2. THE FILTERED AIR INTAKE WAS MEASURED AT 210 CFM.
7. AN EMERGENCY RFC WAS INITIATED TO INSTALL A PERMANENT SEAL IN BOTH UNIT 1 AND 2 FRESH AIR MAKEUP DUCTS BECAUSE WE WERE NEAR THE ENVELOPE LIMITS OF THE DOSE RATE MATRIX ANALYSIS.
8. THIS PERMANENT SEAL WAS NOT INSTALLED IN UNIT 2 BECAUSE THE UNFILTERED LEAKAGE WAS SUBSEQUENTLY MEASURED AS 10 CFM AND THE COMBINATION OF FILTERED AND UNFILTERED INLEAKAGE FELL WELL WITHIN THE MATRIX.

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CONCLUSIONS AND ADDITIONAL ACTIONS

THE CONTROL ROOM HVAC SYSTEM IS PRESENTLY IN AN OPERABLE CONDITION FOR CONTROL ROOM HABITABILITY. MODIFICATIONS ARE BEING DEVELOPED TO IMPROVE HABITABILITY AND OPERABILITY OF THE SYSTEM. BUBBLE-TIGHT DAMPERS WILL BE PROVIDED IN THE NORMAL OUTDOOR AIR INTAKE. THIS WILL PROVIDE EMERGENCY SYSTEM OPERATION WITH NO UNFILTERED AIR, WHILE ALLOWING OUTDOOR AIR INTAKE DURING NORMAL SYSTEM OPERATION. THE RETURN DAMPERS FROM THE MECHANICAL EQUIPMENT ROOM WILL BE REPLACED WITH HEAVY DUTY DAMPERS WHICH WILL FACILITATE DAMPER BALANCING. AN AIR FLOW MONITORING STATION WILL BE PROVIDED IN THE CLEANUP/PRESSURIZATION SYSTEM TO ALLOW QUICK AND ACCURATE SYSTEM FLOW MEASUREMENT AND ADJUSTMENT. A PERMANENT SEAL WILL BE PROVIDED FOR THE FLOOR AND EQUIPMENT DRAIN SYSTEM. THE ABOVE DESCRIBED ADDITIONAL ACTIONS, WITH EXCEPTION OF THE MODIFICATION TO THE DRAIN SYSTEM, WILL BE COMPLETED FOR BOTH UNITS 1 AND 2 BY THE END OF THE RESPECTIVE UNITS REFUELING OUTAGE. THE DRAIN MODIFICATIONS ON BOTH THE UNITS WILL BE COMPLETED BY THE END OF THE UNIT 2 REFUELING OUTAGE. A CONTINUING EFFORT WILL BE MADE TO SEAL EXISTING PENETRATIONS. A TECHNICAL SPECIFICATION CHANGE REQUEST WILL BE SUBMITTED WHICH SHOULD MORE CONCISELY REFLECT THE REQUIREMENTS IN BOTH THE PRESSURIZATION AND RECIRCULATION MODES.

DOSE CALCULATIONSINTRODUCTION

THE LETTER AEP:NRC:0398C DATED FEBRUARY 9, 1981 REPORTED CALCULATED DOSES OF 0.65 REM WHOLE BODY, 27.3 REM THYROID, 27.7 REM SKIN. THESE DOSES WERE BASED ON A FILTERED INLEAKAGE OF 100 CFM AND AN UNFILTERED INLEAKAGE OF 0 CFM. THE FILTERED AND UNFILTERED INLEAKAGE RATES HAVE SINCE BEEN SHOWN TO BE UNDERESTIMATED; HOWEVER, A REVIEW OF THE DOSE CALCULATIONS SUPPORTING THE LETTER REVEAL THAT THE CALCULATIONS WERE OVERLY CONSERVATIVE WITH RESPECT TO REGULATORY GUIDE 1.4, THE FINAL SAFETY ANALYSIS REPORT, AND METHODOLOGY REFERENCED BY NUREG-0737.

A NEW DOSE CALCULATION HAS BEEN PERFORMED USING THESE NEW FLOW RATES. IN ALL CASES THE ACCEPTANCE CRITERIA REMAIN THOSE OF GENERAL DESIGN CRITERIA 19 OF 10 CFR 50, APPENDIX A. THESE ARE 5 REM WHOLE-BODY, 30 REM THYROID, AND 30 REM TO THE SKIN.

ASSUMPTIONS

THE FOLLOWING DESCRIBES THE MAJOR PARAMETERS USED IN AEP:NRC:0398C AND OUR REVISED CALCULATIONS. PARAMETERS ARE EXPLAINED IN TABLE 1.

<u>DESCRIPTION</u>	<u>AEP:NRC:0398C</u>	<u>NEW NUMBER</u>
1. CONTROL ROOM VOLUME	39,600 FT ³	62,356 FT ³
2. \bar{X}/Q	8.26×10^{-4} SEC/m ³	5.97×10^{-4} sec/m ³

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2A. FRACTIONAL CORRECTION
FOR WIND SPEED

0-8 HRS	1.0	1.0
8-24 HRS	1.0	0.67
1-4 DAYS	0.67	0.50
4-30 DAYS	0.67	0.33

2B. FRACTIONAL CORRECTION
FOR WIND DIRECTION

0-8 HRS	1.0	1.0
8-24 HRS	1.0	0.88
1-4 DAYS	1.0	0.75
4-30 DAYS	1.0	0.50

2C. FRACTIONAL CORRECTION
FOR OCCUPANCY

0-24 HRS	1.0	1.0
1-4 DAYS	0.60	0.60
4-30 DAYS	0.40	0.40

3. PARTITIONING FACTOR
INORGANIC

INORGANIC	0.9975	0.91
ORGANIC	0.0025	0.04
PARTICULATE	NOT CONSIDERED	0.05

4. IODINE FILTER EFFICIENCY

INORGANIC	99%	99%
ORGANIC	90%	95%
PARTICULATE	--	99%

5. SPRAY FACTORS

NO CREDIT FOR SPRAY

FIGURE 14.3.5-1
OF UPDATED FSAR
(ATTACHED AS
FIGURE 2)

6. FLOW RATES

FILTERED MAKE-UP FLOW	100 CFM	732 CFM UNIT 1
		276 CFM UNIT 2

UNFILTERED MAKE-UP FLOW	0 CFM	0 CFM UNIT 1
		10 CFM UNIT 2

TOTAL FLOW THROUGH FILTRATION UNIT FILTER + RECIRCULATED	6000.0 CFM	5400.0 CFM
--	------------	------------

7. CONTAINMENT VOLUMETRIC
LEAK RATE

1-24 HRS	0.25%/DAY	0.25%/DAY
1-30 DAYS	0.125%/DAY	0.125%/DAY

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8. SOURCE TERM UPDATED FSAR UPDATED FSAR
 TABLE 14.3.5-2 TABLE 14.3.5-2

TABLE 1

THE DIFFERENCES BETWEEN AEP:NRC:0398C AND THE NEW ANALYSIS, ARE EXPLAINED AS FOLLOWS:

1. THE CONTROL ROOM VOLUME WAS INCREASED TO INCLUDE THE HVAC EQUIPMENT ROOM AND THE COMPUTER ROOM. THE ROOMS COMMUNICATE FREELY VIA THE HVAC SYSTEM.
2. λ/Q WAS RECALCULATED ASSUMING THE BUILDING WAKE EFFECTS WERE ATTRIBUTABLE TO THE ENTIRE CONTAINMENT BUILDING CROSS SECTIONAL AREA. FRACTIONAL CORRECTION VALUES ARE FROM TABLE 1 OF THE MURPHY, CAMPE REPORT "NUCLEAR POWER PLANT CONTROL ROOM VENTILATION SYSTEM DESIGN FOR MEETING GENERAL CRITERION 19" WHICH IS REFERENCED BY STANDARD REVIEW PLAN 6.4.
3. PARTITIONING FACTORS CHOSEN AS PER REGULATORY GUIDE 1.4.
4. THE NEW FILTER EFFICIENCIES WERE OBTAINED AS FOLLOWS:

INORGANIC	99% AS REQUIRED BY TECHNICAL SPECIFICATIONS
PARTICULATE	99% AS REQUIRED BY TECHNICAL SPECIFICATIONS
ORGANIC	RECENT TEST DATA SHOWED 98+% EFFICIENCY. 95% CHOSEN AS CONSERVATIVE
5. SPRAY FACTORS WERE OBTAINED FROM FIGURE 14.3.5-1 OF THE FSAR. FOR CONSERVATISM, 0% ICE CONDENSER EFFICIENCY WAS ASSUMED.
6. THE TECHNICAL SPECIFICATIONS LIMIT SYSTEM FLOW TO 6000 CFM \pm 10%. THE LOWER LIMIT OF 5400 CFM WAS CONSERVATIVELY CHOSEN.

RESULTS

THE RESULTS OF THE CALCULATIONS ARE:

1. THE THYROID DOSE BASED ON CURRENT SYSTEM OPERATION (UNIT 1 732 CFM FILTERED, 0 CFM UNFILTERED; UNIT 2 276 CFM FILTERED, 10 CFM UNFILTERED) IS BELOW 30 REM. THIS CAN BE SEEN ON THE ATTACHED FIGURE 3 WHICH GRAPHS DOSE AS A FUNCTION OF COMBINATIONS OF FILTERED AND UNFILTERED INLEAKAGE. WESTINGHOUSE CORPORATION HAS REVIEWED THE CALCULATION DETAILED IN THIS SECTION AND FOUND THE RESULTS TO BE CONSERVATIVE, EVEN WITH THE CHANGES DESCRIBED HEREIN. BECAUSE THE REANALYSIS ASSUMED 95% CHARCOAL FILTER EFFICIENCY FOR METHYL IODIDES, ADMINISTRATIVE CONTROLS WILL BE INITIATED PRIOR TO THE NEXT SCHEDULED SURVEILLANCE TO ESTABLISH 95% AS THE MINIMUM TEST ACCEPTANCE CRITERIA.

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2. THE WHOLE-BODY DOSE WILL NOT EXCEED 5 REM BASED ON VERY CONSERVATIVE RATIOING METHODS DESCRIBED IN THE METHODOLOGY SECTION.
3. THE SKIN DOSE WAS INITIALLY CALCULATED BY A RATIOING TECHNIQUE AS 74 REM. BECAUSE THIS WAS ABOVE NUREG 0737 LIMITS OF 30 REM, THE PLANT MANAGER WAS NOTIFIED THAT OPERATORS WOULD REQUIRE PROTECTIVE CLOTHING AT SOME POINT DURING THE ACCIDENT AS DETERMINED BY HEALTH PHYSICS PERSONNEL. SUBSEQUENT REANALYSIS BY WESTINGHOUSE ELECTRIC CORPORATION, HOWEVER HAS CONFIRMED THAT THE 74 REM VALUE WAS OVERLY CONSERVATIVE. THE MORE REFINED WESTINGHOUSE ANALYSIS DETERMINED VALUES OF 11.0 REM, BASED ON A CONSERVATIVE 800 CFM OF INLEAKAGE. THE WESTINGHOUSE ELECTRIC CORPORATION CALCULATION IS CURRENTLY UNDERGOING CORPORATE REVIEW. THE RECOMMENDATION FOR PROTECTIVE CLOTHING WILL BE WITHDRAWN WHEN THE CALCULATIONS ARE DEEMED ACCEPTABLE.

1. THYROID

A SCHEMATIC OF THE CONTROL ROOM VENTILATION SYSTEM IS SHOWN IN FIGURE 4. USING THIS FIGURE, A REANALYSIS OF THE THYROID DOSE FROM RADIOACTIVE IODINE WAS PERFORMED BY CALCULATING THE SOURCE TERM JUST OUTSIDE THE CONTROL ROOM, RESULTING CONCENTRATION IN THE CONTROL ROOM, AND FINALLY THE DOSE. FIVE IODINE ISOTOPES WERE CONSIDERED; ELEMENTAL, ORGANIC, AND PARTICULATE FORMS OF THE IODINES WERE TREATED SEPARATELY. THE CONCENTRATION OF EACH ISOTOPE AT THE CONTROL ROOM OUTDOOR AIR INLET, $SC_{i,j}$, WAS CALCULATED USING THE FOLLOWING ALGORITHM:

$$SC_{i,j}(t) = S_i * P_j * e^{\lambda_i t} * [LR(t)] * [(SF)_j(t)] * [(\chi/Q)(t)]$$

WHERE SUBSCRIPT i REFERS TO ISOTOPE i , SUBSCRIPT j REFERS TO FORM OF ISOTOPE i , AND THE BALANCE OF THE TERMS ARE DESCRIBED IN TABLE 2.

THE VALUE OF (χ/Q) IN THE ABOVE EQUATION TAKES INTO ACCOUNT ATMOSPHERIC DISPERSION AS WELL AS FRACTIONAL CORRECTIONS FOR WIND SPEED, WIND DIRECTION, AND CONTROL ROOM OCCUPANCY AS SUGGESTED BY THE MURPHY, CAMPE REPORT CITED IN STANDARD REVIEW PLAN 6.4. THUS:

$$\frac{\chi}{Q} = \left(\frac{\chi}{Q}\right)_a * F_{ws} * F_{wd} * F_o$$

THE CONCENTRATION OF EACH FORM OF EACH ISOTOPE INSIDE THE CONTROL ROOM AT TIME t , $C_{i,j}(t)$, IS CALCULATED FROM:

$$\frac{dC_{i,j}(t)}{dt} = \frac{1}{V} [SC_{i,j}(t) * (F_u + F_f * (DRF)_j) - C_{i,j} * (F_r + F_u + F_f - F_r * (DRF)_j)]$$

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THE NOMENCLATURE IS DESCRIBED IN TABLE 2.

THE DOSE RATE OF EACH ISOTOPE IN THE CONTROL ROOM IS THEN CALCULATED FROM:

$$D_{i,j}(t) = (DCF)_i * [C_{i,j}(t)] * (BR)$$

TOTAL DOSE AT TIME t IS CALCULATED BY INTEGRATING THE ABOVE EQUATION AND SUMMING OVER ALL i 'S AND j 'S, OR:

$$DOSE = \sum_{i=1}^5 \sum_{j=1}^3 \int_0^t D_{i,j}(t) dt$$

AGAIN, ALL NOMENCLATURE IS DESCRIBED IN TABLE 2. IT IS NOTED THAT IN THE ABOVE MODEL, THE CONTROL ROOM, EQUIPMENT ROOM, AND COMPUTER ROOM ARE TREATED AS A SINGLE VOLUME. THIS ASSUMPTION IS BASED UPON THE LARGE AMOUNT OF AIR (APPROXIMATELY 2000 CFM) BEING RECIRCULATED BETWEEN THE THREE AREAS.

TABLE 2

NOMENCLATURE USED IN THYROID DOSE CALCULATION MODEL

<u>VARIABLE</u>	<u>DESCRIPTION</u>	<u>SOURCE OF VALUES OR VALUES USED IN CALCULATION</u>
SUBSCRIPT i	DENOTES IODINE ISOTOPE USED IN CALCULATION	I-131, I-132, I-133 I-134, I-135
SUBSCRIPT j	DENOTES FORM OF ISOTOPE	1 = ELEMENTAL IODINE 2 = ORGANIC IODINE 3 = PARTICULATE IODINE
(t)	INDICATES TIME DEPENDENCY OF VARIABLE	
S	TID - 14844 SOURCE TERM WITH PLATEOUT TAKEN INTO ACCOUNT	UPDATED FSAR TABLE 14.3.5-2
P	PARTITION FACTOR FOR EACH FORM OF IODINE	$P_1 = 0.91$ $P_2 = 0.04$ $P_3 = 0.05$
λ_i	RADIOACTIVE DECAY CONSTANT FOR ISOTOPE i	UPDATED FSAR TABLE 14.3.5-6

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

APPROVED OMB NO. 3150-0104

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		8 5	- 0 0 7	- 0 0	1 0	OF	1 5

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<u>VARIABLE</u>	<u>DESCRIPTION</u>	<u>SOURCE OF VALUES OR VALUES USED IN CALCULATION</u>
LR	LEAK RATE FROM CONTAINMENT	SEE ASSUMPTIONS
SF _j	SPRAY REDUCTION FACTOR FOR IODINE FORM j	FOR j = 1 SF = A CONSERVATIVE FIT OF UPDATED FSAR FIGURE 14.3.5-1: FOR j = 2, SF=1 FOR j = 3, SF=1
X/Q	TOTAL ATMOSPHERIC DISPERSION FACTOR TAKING INTO ACCOUNT REDUCTION FACTORS FOR WIND SPEED, WIND DIRECTION, AND CONTROL ROOM OCCUPANCY	SEE BELOW FOR INDIVIDUAL CONTRIBUTIONS
($\frac{X}{Q}$) _a	ATMOSPHERIC DISPERSION FACTOR BEFORE FRACTIONAL REDUCTIONS	5.97 X 10 ⁻⁴ sec/m ³
f _{ws}	WIND SPEED FACTOR	SEE "ASSUMPTIONS"
f _{wd}	WIND DIRECTION FACTOR	SEE "ASSUMPTIONS"
f _o	OCCUPANCY FACTOR	SEE "ASSUMPTIONS"
F _u	UNFILTERED INLEAKAGE INTO CONTROL ROOM	VARIES FROM 0 TO 60 CFM
F _f	FILTERED INLEAKAGE INTO CONTROL ROOM	VARIES UP TO 769 CFM
F _r	AIR RECIRCULATED THROUGH AIR CONDITIONING SYSTEM	5400 CFM
V	VOLUME OF CONTROL ROOM HVAC EQUIPMENT ROOM COMPUTER ROOM	62,356 FT ³
(DRF) _j	DOSE REDUCTION FACTOR FOR IODINE FORM j DUE TO FILTERS	=.01, j=1 =.05, j=2 =.01, j=3
BR	BREATHING RATE	1.25 m ³ /hr
DCF _i	DOSE CONVERSION FACTOR FOR IODINE ISOTOPE i	UPDATED FSAR TABLE 14.3.5-9

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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DEFINITION OF CALCULATED VALUES

$SC_{i,j}(t)$ SOURCE TERM (C_i/ft^3) AT
CONTROL ROOM INLET ISOTOPE i ,
FORM j AT TIME t .

$C_{i,j}(t)$ CONCENTRATION OF ISOTOPE i ,
FORM j IN CONTROL ROOM AT TIME t .

$D_{i,j}(t)$ DOSE RATE OF ISOTOPE i ,
FORM j AT TIME t .

DOSE TOTAL DOSE UP TO TIME t
RESULTING FROM ALL ISOTOPES
AND ALL FORMS OF THE ISOTOPES.

METHODOLOGY

2. WHOLE-BODY AND SKIN DOSE

THE WHOLE-BODY AND SKIN DOSES WERE INITIALLY CONSERVATIVELY CALCULATED BY RATIOING THE DOSES REPORTED IN AEP:NRC:0398C TO THE 100 CFM INLEAKAGE REPORTED IN THAT LETTER. THE 5 REM WHOLE-BODY LIMIT ESTABLISHED AN UPPER LIMIT OF 769 CFM AS SEEN IN FIGURE 3.

WHOLE-BODY AND SKIN DOSES ARE DUE PRIMARILY TO NOBLE GASES. SINCE NOBLE GASES ARE NOT REMOVED BY FILTRATION, THEIR CONCENTRATION IN THE CONTROL ROOM (NEGLECTING DECAY) WILL BUILD TO AN EQUILIBRIUM VALUE OVER TIME. THIS EQUILIBRIUM WAS NEGLECTED IN THE ABOVE CALCULATIONS.

2A. WESTINGHOUSE WHOLE-BODY AND SKIN DOSE METHODOLOGY

THE WESTINGHOUSE ELECTRIC CORPORATION MODEL CALCULATED CONCENTRATIONS OF THE NOBLE GASES IN THE CONTROL ROOM AT TIME t , AND RELATED THESE CONCENTRATIONS TO DOSE BY USE OF DOSE CONVERSION FACTORS FROM REGULATORY GUIDE 1.109. THE METHODOLOGY IS VERY SIMILAR TO THAT EMPLOYED FOR THYROID DOSE WHICH WAS DESCRIBED PREVIOUSLY.

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

FACILITY NAME (1)

DOCKET NUMBER (2)

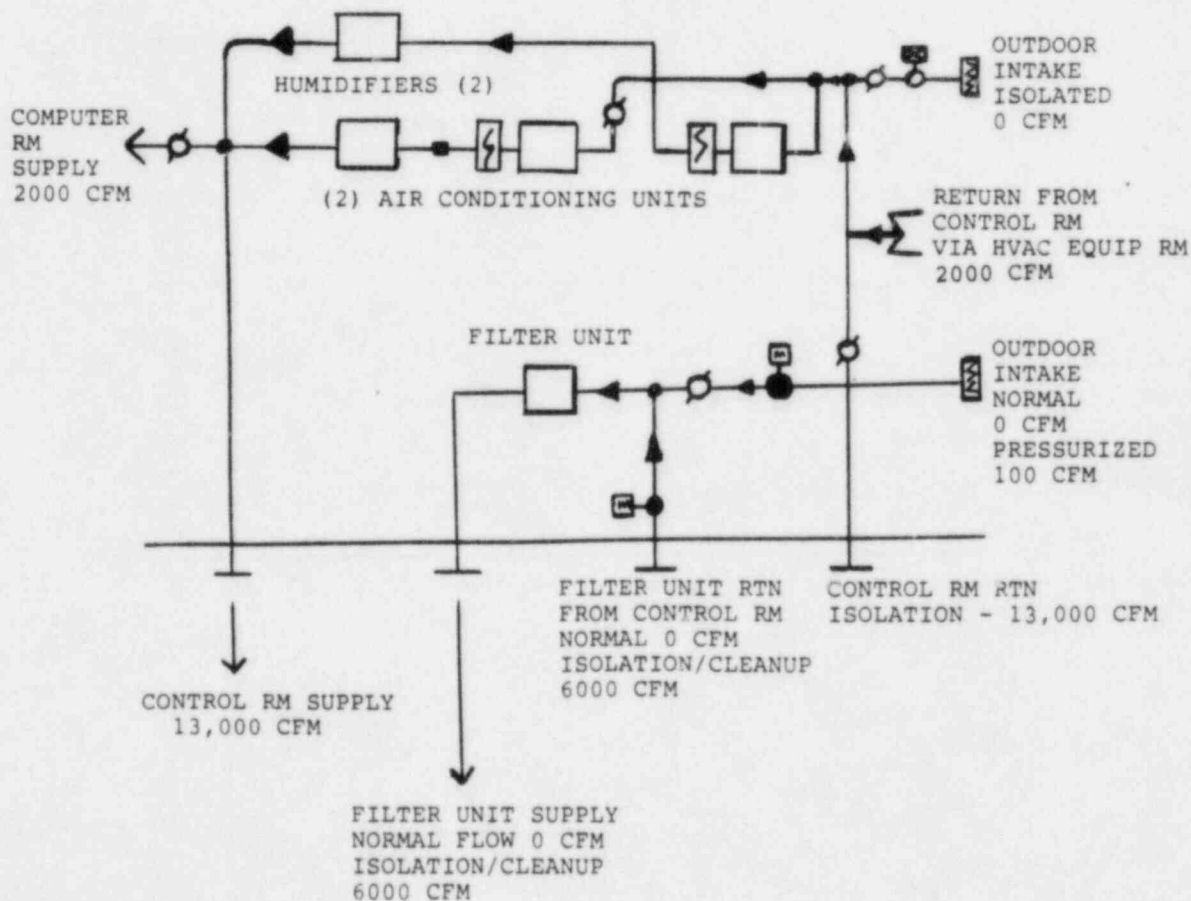
LER NUMBER (6)

PAGE (3)

D. C. COOK PLANT - UNIT 1

0 5 0 0 0 3 1 5 8 5 - 0 0 7 - 0 0 1 2 OF 1 5

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CONTROL ROOM HVAC
FIGURE 1

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		8 5	0 0 7	0 0	1 3	OF	1 5

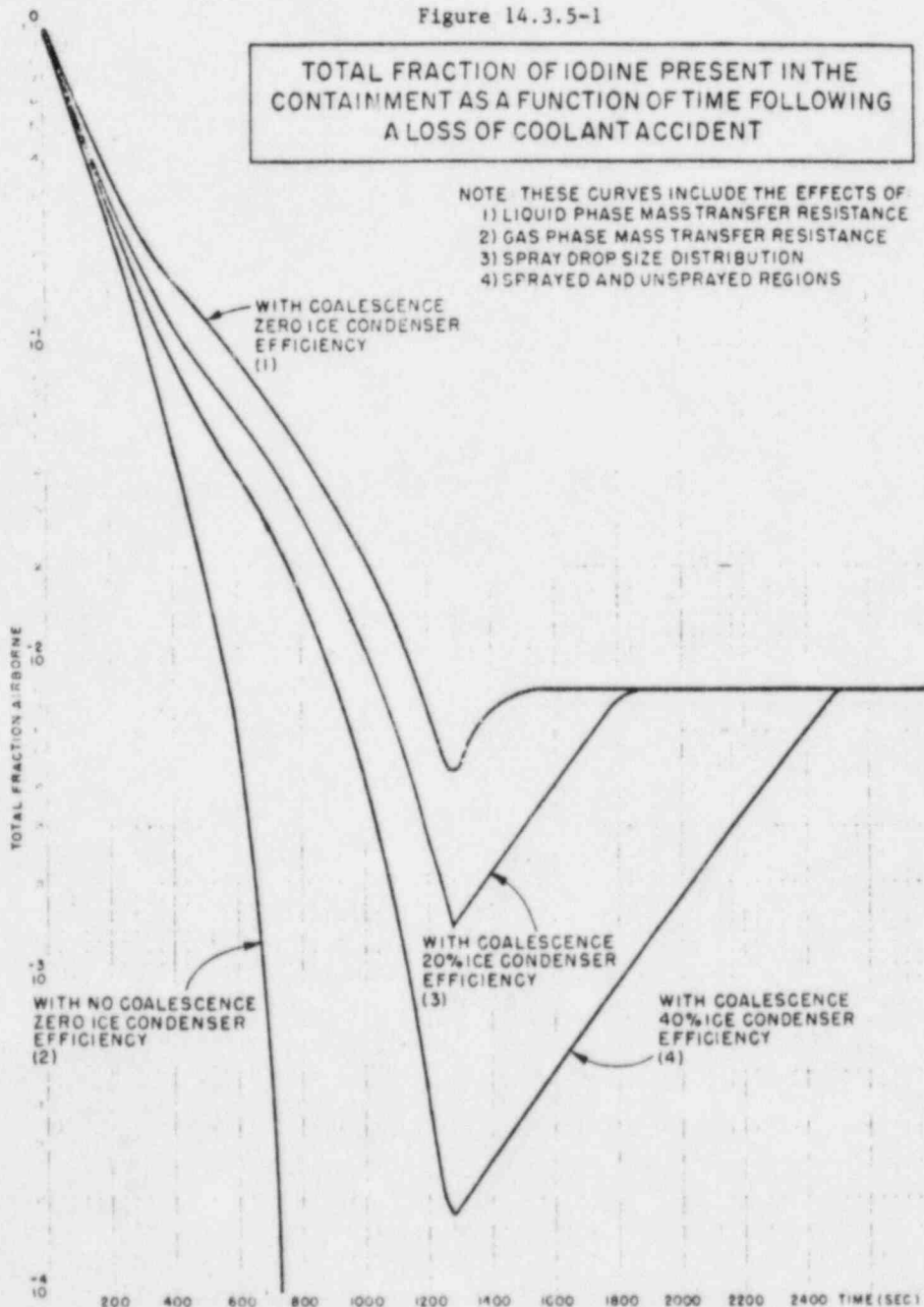
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FIGURE 2

Figure 14.3.5-1

TOTAL FRACTION OF IODINE PRESENT IN THE CONTAINMENT AS A FUNCTION OF TIME FOLLOWING A LOSS OF COOLANT ACCIDENT

NOTE: THESE CURVES INCLUDE THE EFFECTS OF:
1) LIQUID PHASE MASS TRANSFER RESISTANCE
2) GAS PHASE MASS TRANSFER RESISTANCE
3) SPRAY DROP SIZE DISTRIBUTION
4) SPRAYED AND UNSPRAYED REGIONS



UNIT 1

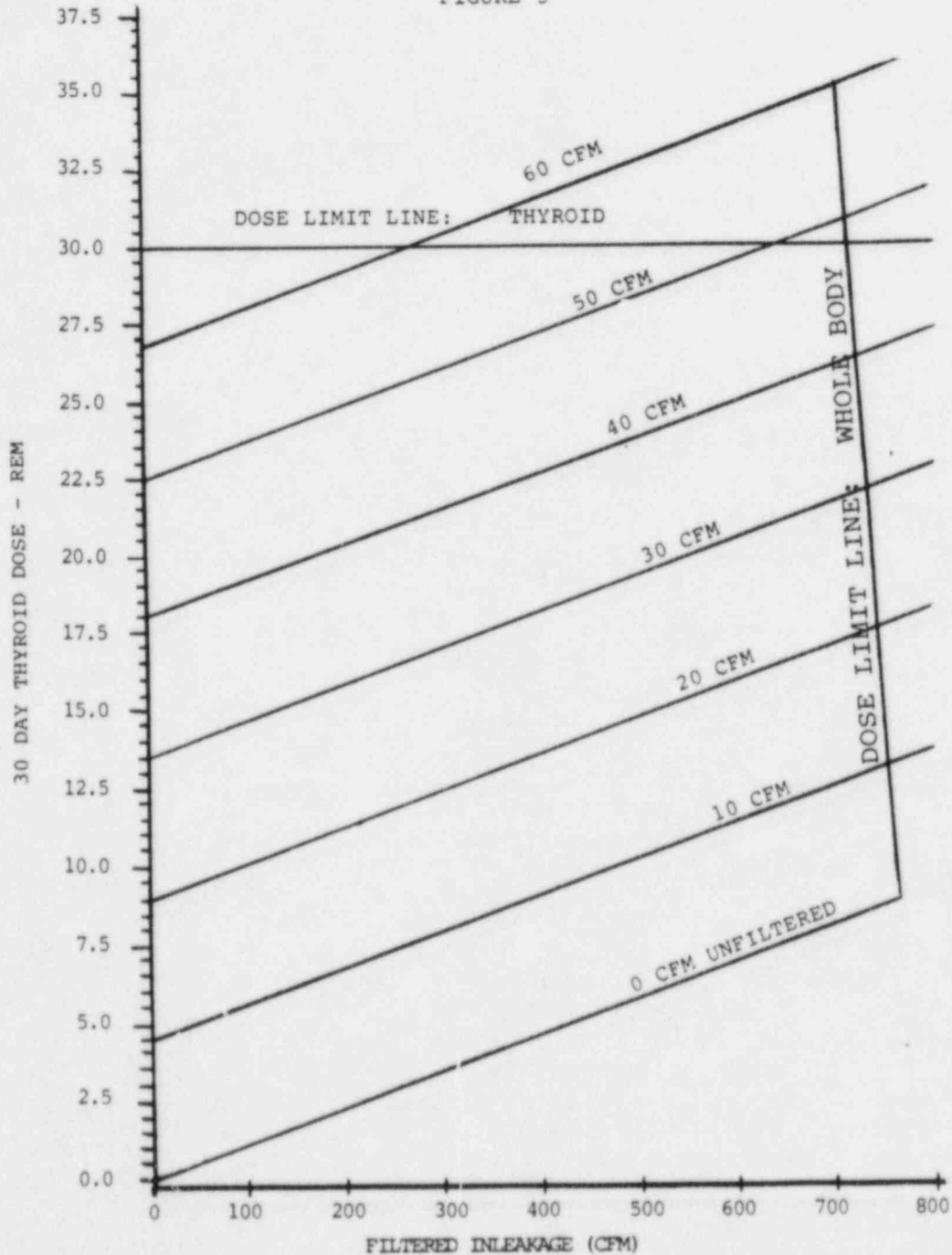
July, 1982

LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
		8 5	- 0 0 7	- 0 0	1 4	OF	1 5

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DOSE ENVELOPE
FIGURE 3



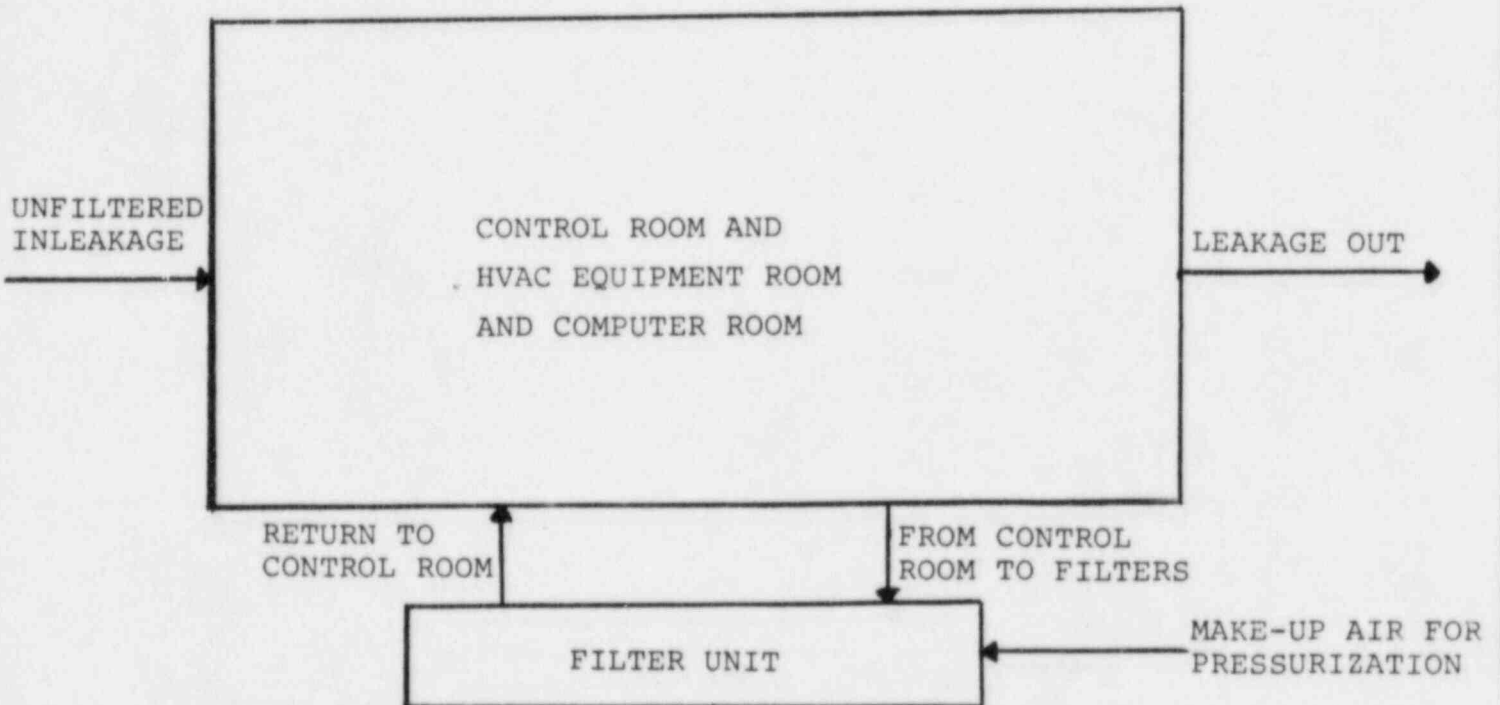
LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			
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CONTROL ROOM MODEL

FIGURE 4





INDIANA & MICHIGAN ELECTRIC COMPANY

DONALD C. COOK NUCLEAR PLANT
P.O. Box 458, Bridgman, Michigan 49106
(616) 465-5901

March 25, 1985

United States Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555

Operating License DPR-58
Docket No. 50-315

Document Control Manager:

In accordance with the criteria established by 10CFR50.73
entitled Licensee Event Reporting System, the following
report/s are being submitted:

RO 85-007-0

Sincerely,

W.G. Smith, Jr.
W.G. Smith, Jr.
Plant Manager

/cbm

Attachment

cc: John E. Dolan
J.G. Keppler, RO:III
M.P. Alexich
R.F. Kroeger
H.B. Brugger
R.W. Jurgensen
NRC Resident Inspector
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