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AEP:NRC:03980
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and 67785

Donald C. Cook Nuclear Plant Units 1 and 2
Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74
CONTROL ROOM HABITABILITY ANALYSIS

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Attn: T. E. Murley

October 11, 1988

Dear Dr. Murley:

This letter and its attachments transmit for your information the results of a reanalysis of control room habitability that we committed to perform in our submittal AEP:NRC:0398N dated October 2, 1987. The reanalysis was recommended by the NRC based on a review of the Cook Nuclear Plant control room ventilation systems conducted in September 1986 by a survey team from NRR and the Argonne National Laboratory. The results of this survey were transmitted to us in a letter from B. J. Youngblood (NRC) to John E. Dolan (AEPSC) dated February 2, 1987.

The attachments to this letter provide the results of the analysis of radiation doses to an operator in the control room following a loss-of-coolant accident and the analysis of offsite toxic gas releases. These analyses also address items (3) and (6) of the February 2, 1987, letter. Attachment 1 to this letter describes the existing Cook Nuclear Plant control room ventilation system and operation of the system in normal radiological and toxic gas modes. Attachment 2 describes the analysis of the radiation dose to the control room operators including parameters, results, and single failure analysis. Attachment 3 describes our analysis of the most credible offsite toxic gas releases and the challenge it presents to control room habitability. Attachment 4 presents our plans for plant modifications and our schedule for submission of control room technical specification (T/S) changes. The T/S change letter will address the other applicable items in the February 2, 1987, letter.

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This letter has been reviewed by the Plant Nuclear Safety Review Committee. As the attachments indicate, the expected impact on control room habitability following postulated accidents is considered acceptable.

This document has been prepared following Corporate procedures which incorporate a reasonable set of controls to ensure its accuracy and completeness prior to the signature of the undersigned.

Sincerely,

M. P. Alexich
Vice President

ldp

Attachments

cc: D. H. Williams, Jr.
W. G. Smith, Jr. - Bridgman
R. C. Callen
G. Bruchmann
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NRC Resident Inspector - Bridgman
A. B. Davis - Region III

ATTACHMENT 1 TO AEP:NRC:03980

DESCRIPTION OF EXISTING CONTROL ROOM VENTILATION SYSTEM

AT DONALD C. COOK NUCLEAR PLANT

Description of Existing Control Room Ventilation System

The control room ventilation system is designed to maintain room air temperature within limits for operation, maintenance and testing of plant controls and uninterrupted safe occupancy following all design basis accident conditions.

Figure 1 is a simplified flow diagram of the control room ventilation system. Table 1 summarizes current equipment operation under normal, radiological and toxic gas conditions. Figure 1 also shows the layout of the various rooms that are served by the control room ventilation system. These rooms include the control room itself, the HVAC machine room (which houses the various ventilation equipment), and the P-250 computer room.

Normal Operation

During normal operation of the control room HVAC system, outdoor air is drawn into the system through the normal intake damper. The HVAC system supplies air to the P-250 computer room and to the control room. Air from the computer room flows to the machine room through a transfer grill. Air returns to the HVAC system from the control room and the machine room. The emergency intake damper is normally maintained open. The recirculation damper is normally maintained closed so that it is aligned for the toxic gas mode. The toilet room exhaust damper is normally maintained open.

Radiological Mode

In the event of a safety injection signal from either unit, the system would automatically be realigned in the recirculation/ cleanup mode. In this mode, the normal intake damper and the toilet exhaust damper would automatically close to prevent unfiltered air from being drawn into the system. The recirculation damper would automatically open to provide recirculation capability, and both pressurization fans would automatically start, drawing air through the filter unit. The operator would then turn off one of the redundant fans to ensure that air velocity through the filter unit will provide minimum iodine residence times of approximately 0.25 seconds. The filter unit includes roughing filters, high efficiency particulate air (HEPA) filters and charcoal filters enclosed in a filter housing.

In the radiological mode, the system is designed to provide a flow rate through the filter unit of 6000 cfm $\pm$ 10%. This flow rate is a combination of air recirculated through the recirculation damper and drawn from the outside through the emergency intake damper. Pressurization of the control room envelope is provided by this outdoor air drawn by the pressurization fans. The design of the system is such that a minimum 1/16-inch W.G. pressure would be

maintained in the control room. Since the computer room and equipment rooms would see little or no personnel ingress and egress under accident conditions, they are designed to provide a pressure greater than ambient, but potentially lower than the control room itself.

Toxic Gas Mode

A chlorine gas detector is located in the normal air inlet duct. In the event that chlorine is detected, the ventilation system would be manually realigned from the control room in the isolation mode of operation. This is accomplished by closing the normal intake and the toilet exhaust dampers. The control room pressurization fans are not run, thereby limiting the amount of contaminated outdoor air that can enter the control room. The emergency intake damper cannot be closed from the control room beyond the setting for the recirculation/cleanup mode. Without the pressurization fans running, air entering through the emergency intake damper is limited to that amount driven by the small differential pressure that may exist between the control room and adjoining areas and the outside atmosphere. Maintaining the recirculation damper in the closed position ensures that air entering via the emergency intake damper passes through the charcoal adsorbers prior to entering the control room.

Figure 1 **CONTROL ROOM VENTILATION SYSTEM**

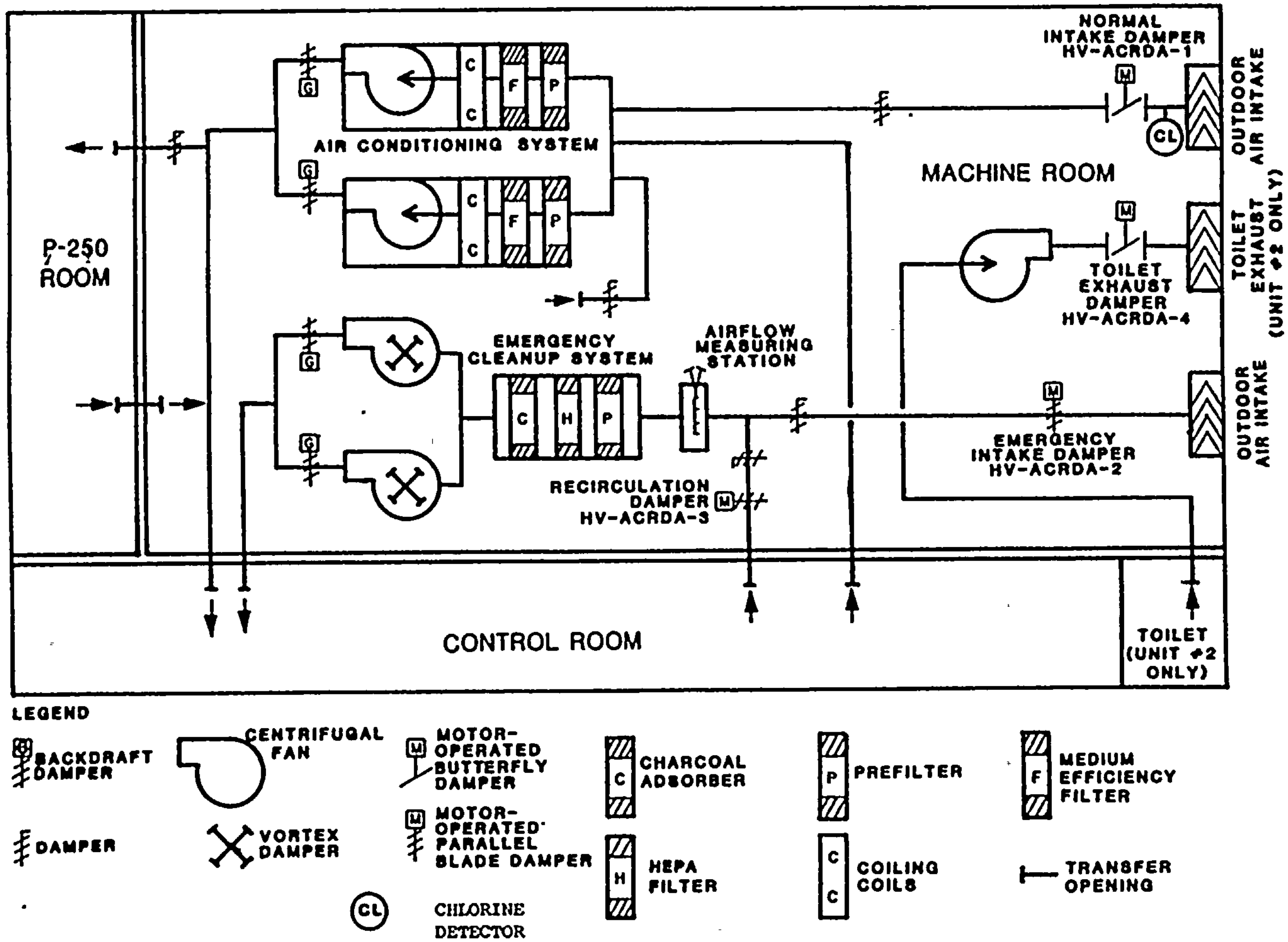

TABLE 1

CONTROL ROOM VENTILATION EQUIPMENT OPERATION

Normal Operation:

Equipment	Condition
Normal Intake Damper	Open
Emergency Intake Damper	Open
Recirculation Damper	Closed
Toilet Exhaust Damper	Closed or open
Pressurization/Recirculation fans	Not running
Air Conditioning System	Operating

Radiological (Recirculation/Cleanup)

Equipment	Condition
Normal Intake Damper	Closed
Emergency Intake Damper	Open
Recirculation Damper	Open
Toilet Exhaust Damper	Closed
Pressurization/Recirculation fans	1 running
Air Conditioning System	Operating

Toxic Gas (Isolation):

Equipment	Condition
Normal Intake Damper	Closed
Emergency Intake Damper	Open
Recirculation Damper	Closed
Toilet Exhause Damper	Closed
Pressurization/Recirculation fans	Not running
Air Conditioning System	Operating

ATTACHMENT 2 TO AEP:NRC:03980

ANALYSIS OF CONTROL ROOM DOSES DUE TO A LOCA

FOR DONALD C. COOK NUCLEAR PLANT

Purpose of New Control Room Dose Analysis

During the period of September 15-19, 1986, an NRC survey was conducted of the control room ventilation system at the Donald C. Cook Nuclear Plant. One of the purposes of the survey was to determine whether the actual operation of the control room ventilation system was consistent with the NUREG-0737 Item III.D.3.4 submittal for the facility (our submittal AEP:NRC:0398C dated February 9, 1981). The survey team also reviewed our control room ventilation and chlorine detection technical specification change submittal AEP:NRC:08560 dated July 10, 1986. (The latter submittal was withdrawn by our letter AEP:NRC:0398P dated April 29, 1988, in deference to the reanalysis of control room habitability described in this letter.)

The survey team concluded that the mode of operation for a radiological challenge to the control room ventilation system incorporated parameters that were different from those presented in the III.D.3.4 analysis. The team also stated that the present system (appeared to be) subject to single failure because of single normal intake, emergency recirculation and toilet exhaust dampers. In addition, NRC Region III has disagreed with the meteorological assumptions used in the III.D.3.4 analyses. The control room dose analysis described here addresses these issues.

Requirements

The requirement for protection of control room personnel is specified in Criterion 19 of 10 CFR 50, Appendix A. According to Criterion 19, adequate radiation protection shall be provided such that control room personnel do not receive radiation exposures in excess of 5 rem whole body for the duration of the accident.

Dose Assessment

The dose assessment involves modeling of radiological source terms, atmospheric transport of airborne activity and protection features of the control room ventilation system. The operators are exposed to both direct and internal radiation from activity buildup within the control room. The exposures consist of thyroid exposure due to radioactive iodine, whole body gamma and beta skin doses due to the presence of radioactive noble gases. External gamma radiation from activity outside the control room is limited by the concrete walls of the control room. Dose assessment due to activity inside the control room is the object of this analysis.

Source Term

The original source terms used are consistent with TID-14844 and Regulatory Guide 1.4, and a Unit 2 power level that is conservative. Credit is taken in the analysis for reduction in iodine source terms that are available for leakage from containment. Elemental iodine is removed by the sodium hydroxide containment spray solution and by the ice condenser. Ice condenser iodine removal is assumed to start after the recirculation fans start and end prior to ice bed meltout. Particulate iodines are also assumed to be removed by the sprays. Instantaneous plateout of 50% of the iodines discharged to lower containment is also assumed. Additional radiation sources due to leakage of ECCS water are also included.

Atmospheric Transport/Meteorology

The term X/Q quantifies the degree of dispersion of activity as it is transported from the point of release (containment) to the receptor (control room air intakes). For dose assessment, the five percentile X/Q (X/Q exceeded five percent of the time) is determined and is used to calculate activity transport for the first post-accident time interval. A review of our internal documents and previous calculations for control room doses indicate that the equation used to calculate X/Q for control room doses was:

$$X/Q = \frac{1}{CAu}$$

where "C" is a shape factor equal to 1/2, "A" is the cross-sectional area of the containment and "u" is the mean wind speed. This equation was used in the original design bases of the plant. An NRC Region III inspector has disagreed with the use of this assumption for computing X/Q, and referred us to the method given in Standard Review Plan 6.4.

Our new analyses presented here use the X/Q equation for a diffuse-source/point-receptor model given in the Murphy and Campe paper (K. G. Murphy and K. M. Campe, "Nuclear Power Plant Control Room Ventilation System Design for Meeting GDC 19," 13th AEC Air Cleaning Conference, August 1974) wind speed and dispersion factor used in the analysis were based on the worst-case five percentile site meteorological data for the years 1982 through 1986. This equation is consistent with the recommendations of Standard Review Plan 6.4.

Protection Features

The control room ventilation system at Cook Nuclear Plant is the isolation type with filtered recirculation and pressurization. The actual system design determines the degree of protection

afforded by the removal of iodines from the pressurization air flow and the recirculation air flow by the charcoal filters. The advantage of pressurization is that it minimizes the amount of unfiltered air entering the control room envelope. The effect of filtering the iodines is modeled using the iodine protection factor given in the Murphy and Campe paper.

Dose Assessment Results Without Failure

The method used to calculate doses follows that recommended in the Murphy and Campe paper. The control room envelope is assumed to include the control room, the HVAC equipment room and the P-250 computer room. The control room ventilation system is assumed to function as designed with no failures. The parameters used in the dose assessment analysis are summarized in Table 2. The dose conversion factors used are shown in Table 3. The dose conversion factors used for computing thyroid doses due to inhalation of iodines were taken from "Limits for Intakes of Radionuclides by Workers," International Commission on Radiological Protection (ICRP) Publication 30, 1978.

The thyroid dose results are presented in Table 4. Standard Review Plan 6.4 recommends that, for a control room pressurized at 1/8-inch W. G. pressure, 10 cfm of unfiltered inleakage is assumed for ingress and egress to and from the control room following an accident. The Cook Nuclear Plant control room ventilation system is designed to pressurize the control room to a 1/16-inch W.G. pressure. Since the control room is pressurized to a 1/16-inch W.G. pressure, we have increased the assumed inleakage due to personnel ingress/egress to 15 cfm. For these analyses, the total unfiltered air inleakage is 20 cfm with 5 cfm being attributed to the bubble-tight normal intake damper. However, measured inleakage through the closed normal intake damper may be above or below 5 cfm. The measured damper inleakage and the measured filtered makeup flow rate will be used in determining the operability of the ventilation system.

Beta skin doses and gamma whole body doses due to activity in the control room following an accident are also shown in Table 4. Skin doses are slightly above 30 rem while whole body doses are well below 5 rem.

TABLE 2

(1 of 3)

PARAMETERS USED IN EVALUATING THE CONTROL ROOM DOSES

DUE TO A LOCA FOR THE COOK NUCLEAR PLANT

Source Term

The core iodine and noble gas inventories are based upon an 18-month cycle core, with power level consistent with Unit 2 (core at end of life).

Fifty percent of the core iodine is assumed to be uniformly distributed in the lower containment at time zero (TID-14844/Regulatory Guide 1.4).

	Curies
I-131	4.65×10^7
I-132	6.8×10^7
I-133	9.6×10^7
I-134	1.1×10^8
I-135	8.9×10^7

Iodine Plateout Factor 0.5

Iodine Species Fractions

Elemental	0.955
Organic	0.020
Particulate	0.025

100 Percent of the Core Noble Gases Are Released to Containment.

	Curies
Kr-85m	2.57×10^7
Kr-85	6.30×10^5
Kr-87	4.74×10^7
Kr-88	6.75×10^7

TABLE 2

(2 of 3)

PARAMETERS USED IN EVALUATING THE CONTROL ROOM DOSES

DUE TO A LOCA FOR THE COOK NUCLEAR PLANT

Xe-131m	6.58×10^5
Xe-133m	2.75×10^7
Xe-133	1.85×10^8
Xe-135m	3.80×10^7
Xe-135	4.23×10^7
Xe-138	1.50×10^8

Containment Leak Rate

0-24 hr., percent/day	0.25
>24 hr.	0.125

Control, HVAC and Computer Rooms

Free volume, ft^3	62,356
Unfiltered infiltration rate, ft^3/min	20
Pressurization flow rate, ft^3/min	900 to 1200
Total filter flow rate, ft^3/min	5400 (min)
Iodine removal efficiency for charcoal adsorber (elemental and methyl), percent	95
HEPA filter efficiency for particulates, percent	99

TABLE 2

(3 of 3)

PARAMETERS USED IN EVALUATING THE CONTROL ROOM DOSES

DUE TO A LOCA FOR THE COOK NUCLEAR PLANT

Containment iodine removal

Elemental iodine spray, lambda, hr^{-1}	10
Elemental iodine decontamination factor (DF)	200 (max)
Particulate iodine spray lambda, hr^{-1}	6.7
Particulate iodine DF	100 (max)
Ice condenser elemental iodine removal efficiency, percent	30%

Atmospheric dispersion factors at the control room air intake (sec/m^3)

The 0-8 hour X/Q of 2.41×10^{-3} sec/m^3 is adjusted for wind speed, wind direction and occupancy according to the following table*:

	Wind Speed	Direction	Occupancy	Overall Factor
0-8 hr.	1	1	1	1
8-24 hr.	.67	.88	1	.59
1-4 days	.5	.75	.6	.23
4-30 days	.33	.5	.4	.066

The overall X/Q factors are as follows:

0- 8 hr	2.41×10^{-3} sec/m^3
8- 24	1.42×10^{-3}
24- 96	5.54×10^{-4}
96-720	1.59×10^{-4}

Breathing rate, m^3/sec	3.47×10^{-4}*
Dose conversion factors	See Table 3
Finite cloud gamma dose reduction factor*	28

*K. G. Murphy, K. M. Campe, "Nuclear Power Plant Control Room Ventilation System Design for Meeting GDC 19, "13th AEC Air Cleaning Conference

TABLE 3

DOSE CONVERSION FACTORS USED IN ACCIDENT ANALYSIS

Nuclide	Total Body $\frac{mrem\text{-}m^3}{pCi\text{-}yr}$	Beta Skin $\frac{mrem\text{-}m^3}{pCi\text{-}yr}$	Thyroid (rem/Ci)
I-131[a]	NA	NA	1.07E+06
I-132[a]	NA	NA	6.29E+03
I-133[a]	NA	NA	1.81E+05
I-134[a]	NA	NA	1.07E+03
I-135[a]	NA	NA	3.14E+04
Kr-85m[b]	1.17E-03	1.46E-03	NA
Kr-85[b]	1.61E-05	1.34E-03	NA
Kr-87[b]	5.92E-03	9.73E-03	NA
Kr-88[b]	1.47E-02	2.37E-03	NA
Xe-131m[b]	9.15E-05	4.76E-04	NA
Xe-133m[b]	2.51E-04	9.94E-04	NA
Xe-133[b]	2.94E-04	3.06E-04	NA
Xe-135m[b]	3.12E-03	7.11E-04	NA
Xe-135[b]	1.81E-03	1.86E-03	NA
Xe-138[b]	8.83E-03	4.13E-03	NA

[a] "Limits for Intakes of Radionuclides by Workers," The International Commission on Radiological Protection, ICRP Publication 30, Supplement to Part 1, July 1978.

[b] "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 20 Appendix I," USNRC Regulatory Guide 1.109, Rev. 1, October 1977.

TABLE 4

30-DAY DOSES TO CONTROL ROOM PERSONNEL

DUE TO A LOCA

(No Failure)

THYROID DOSES - REM

Unfiltered Inleakage - cfm	Filtered Makeup - cfm			
	900	1000	1100	1200
20	27.0	29.0	31.1	33.1

BETA-SKIN AND GAMMA WHOLE-BODY DOSES - REM

Makeup-Air Flow Rate	Beta Skin	Gamma Body Adjusted for Finite Cloud
920	30.7	1.62
1020	31.2	1.65
1120	31.6	1.68
1220	31.9	1.70

Single-Failure Analysis

The Cook Nuclear Plant control room ventilation system was not specifically designed against single failure criteria. As such, redundant dampers do not exist in the normal or pressurization intake lines or the recirculation line. In the current system, as described in Attachment 1 to this letter, three (3) dampers are expected to be repositioned in response to a radiological accident. (The normal air intake damper closes, the recirculation damper opens, and the toilet exhaust damper [Unit 2 only] closes).

Notwithstanding the initial design criteria for the control room ventilation system, an examination of the impact of a single failure in the system was conducted. Since the emergency intake damper is repositioned only slightly in response to a safety injection signal and since the failure of the toilet exhaust damper to close has little impact on the control room pressure, the single failure analysis concentrated on the impacts of misoperation of the normal intake damper and the recirculation dampers. Further, since the two dampers are powered from different safety busses, only one was assumed to fail following the radiation release. Additionally, since both dampers are within the control room envelope and are accessible from the control room and since they each have hand wheels to allow local operation, consideration was given to the single failure analysis to allow the operator to position the damper following the single failure.

The single failure assumed in the analysis was a loss of a diesel generator, which would result in either the normal intake damper failing to close or the recirculation damper failing to open. Analyses were performed assuming that the dampers were closed within two hours following the accident. The normal intake flow rate was assumed to be 200 cfm. Table 5 shows the expected doses for the case of the normal intake being open for two hours with a flow rate of 200 cfm. As can be seen from the table, the thyroid and beta-skin doses do not exceed 50 rem. Justification for the 50 rem maximum is provided later in this attachment. Isolation of normal intake flow would have to be demonstrated at 1.5 hours after the accident, allowing a 0.5 hour margin as suggested in Standard Review Plan 6.4.

The doses calculated for the failure of the recirculation damper to open resulted in slightly higher expected dose valves. However, we will show in Attachment 3 that the recirculation damper can be maintained normally open which is the correct position for the radiological mode.

Justification for Exceeding 30 rem Tissue Limit

As can be seen from Tables 4 and 5, the calculated doses exceed 30 rem. The recommended dose limit of 30 rem per year to the

thyroid was based on the report of Committee II on the Permissible Dose for Internal Radiation (ICRP 2) in 1959. A new study of permissible doses was completed in 1977. As a result, the ICRP released Publications 26 and 30 to replace ICRP 2. The more recent ICRP studies established a recommended dose-equivalent limit of 50 rem in a year to all tissues including the thyroid and skin. This limit applies whether the tissues are exposed singly or together with other organs. Therefore, a 50 rem thyroid or skin dose is equivalent to 5 rem whole body, and the requirements of Criterion 19 of 10 CFR 50, Appendix A are met in terms of radiation protection for the control room.

Possible Mode Failure Due to Interconnection of Drains

In the letter, Youngblood (NRC) to Dolan (AEPSC) dated February 2, 1987, transmitting the results of the control room ventilation survey, a concern was expressed that the interconnection of drains between the air handlers of each unit created the possibility of common mode failure. The concern about the drains has been incorporated into our testing. All drains from each air handler tie into a single 4" drain. The drains from each unit then tie into a common 4" drain which is trapped outside the room. The survey team witnessed air transfer into the drains at a time when both units were running. A small quantity of cross flow from room to room is of no consequence under that circumstance. Our technical specification testing is performed with only one unit operating. Therefore, our testing ensures that flow through the embedded drains is from the pressurized control room to the unpressurized control room.

TABLE 5

30-DAY DOSES TO CONTROL ROOM PERSONNEL

DUE TO A LOCA

SINGLE FAILURE CASE

NORMAL INTAKE DAMPER OPEN 2.0 HOUR WITH 200 CFM FLOW

(1.5 HOUR CLOSING TIME WITH 0.5 HOUR MARGIN)

THYROID DOSES - REM

Unfiltered	Filtered Makeup - cfm			
Inleakage - cfm	900	1000	1100	1200
20	43.1	45.1	47.1	49.1

BETASKIN AND GAMMA WHOLEBODY DOSES - REM

Makeup-Air Flow Rate	Beta Skin	Gamma Body Adjusted for Finite Cloud
1120	31.6	1.68
1220	31.9	1.70
1320	32.2	1.72
1420	32.5	1.74

ATTACHMENT 3 TO AEP:NRC:03980

ANALYSIS OF TOXIC GAS RELEASES

CONTROL ROOM HABITABILITY

Purpose of Toxic Gas Analysis

During the period of September 15-19, 1986, the NRC sponsored a survey of the control room ventilation system at the Donald C. Cook Nuclear Plant. During this survey, it was stated that it appeared that the toxic gas analysis of the control room ventilation system presented as part of the NUREG-0737 Item III.D.3.4 submittal (AEP:NRC:398C dated February 9, 1981) did not reflect the actual system operation and that the chlorine detectors in each unit were not redundant.

Operation of the control room ventilation system following detection of chlorine is described in Attachment 1 to this letter. Our III.D.3.4 submittal stated that the emergency filter train including pressurization fans would be operated during a chlorine challenge. Actual operation of the control room in the toxic gas mode does not have the pressurization fans running thereby limiting the amount of contaminated outside air which can enter the control room.

The purpose of this attachment is to address these issues by providing the results of an analysis which was performed to show that the probability of potential off-site accidents which could affect control room habitability is sufficiently low so that they need not be considered in the design and operation of the Donald C. Cook Nuclear Plant control room ventilation system.

Probability Analysis

Standard Review Plan 2.2.3, "Evaluation of Potential Accidents," states that "off-site hazards which have the potential for causing on-site accidents leading to the release of significant quantities of radioactive fission products, and thus pose an undue risk of public exposure, should have a sufficiently low probability of occurrence and be within the scope of the low probability of occurrence criterion of 10 CFR Part 100, 100.10." It further states, "...the expected rate of occurrence of potential exposures in excess of the 10 CFR Part 100 guidelines of approximately 10^{-6} per year is acceptable if, when combined with reasonable qualitative arguments, the realistic probability can be shown to be lower." Therefore, we performed a probability analysis of the most credible offsite hazard to demonstrate that the probability is sufficiently low as described in the above criteria.

Description of Analysis

The most credible offsite toxic gas hazard identified was the transport of hazardous materials by railroad tank car. Approximately 1.25 miles away from the plant runs a main branch of the Chesapeake and Ohio (C&O) Railroad line, connecting the C&O station in Grand Rapids, Michigan, to the station in Chicago, Illinois. A survey of the actual number of tank cars transporting

hazardous chemicals on this track was performed to determine the shipping frequency per year of hazardous chemicals by rail.

Hazardous chemicals considered were those specified in Regulatory Guide (R.G.) 1.78, "Assumptions for Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release," and the Department of Transportation publication cited in R.G. 1.78. R.G. 1.78 recommends that chemicals shipped more than 30 times per year via railroad tank car, within a five-mile radius of the plant, should be considered for impact on control room habitability. Based on this list of frequently shipped hazardous chemicals, an analysis was performed estimating the probability that a railroad tank car rupture will result in a toxic gas concentration in the control room that incapacitates the operators and an accident occurs which results in a 10 CFR 100 radiation release. This hazardous chemical list included chlorine. The probabilistic model takes into account the frequency with which releases of hazardous chemicals are released from railroad tank cars, the frequency with which the tank cars are transported past Cook Nuclear Plant and the frequency at which atmospheric conditions exist which would lead to a concentration greater than the toxicity limit at the control room air intake. Statistics used to determine the release frequencies for railroad tank cars containing hazardous materials are based on data compiled by the Association of American Railroads (AAR).

The results of the analysis confirm that the frequency of a 10 CFR 100 radiation release following a rupture of a railroad tank car within a five-mile radius of the plant is less than 10^{-6} per year for all chemicals shipped. The realistic probability of a release is actually lower than 10^{-6} per year because of the following reasons. First, cumulative railroad tank car accident-release statistics for the years 1978 through 1986 were used in the analysis. Yearly accident trends showed a significant reduction in railroad tank-car accident releases per year from 1978-1982. The lower number of release accidents after 1982 is expected to continue as older tank cars are replaced by those of improved and safer designs. Finally, the analysis itself is conservative because it assumes a 100% puff release of all the contents of the tank car following an accident when determining the probability that the toxic limits are exceeded at the control room air intakes. The realistic probability of a 10 CFR 100 radiation release following the rupture of a railroad tank is, therefore, lower than the values computed in the analysis, which were lower than 10^{-6} per year.

On-Site Chlorine Storage

Small quantities of chlorine gas in 100 lb. containers are stored in the chlorine house on the Cook Nuclear Plant site. An analysis performed for a release from a chlorine container showed that toxic levels would not exist at the control room air intakes.

Conclusions

Based on the analyses described above, the probability of the most credible accidental hazardous chemical releases is sufficiently low to preclude consideration of an offsite release of a toxic gas that would result in toxic levels reaching the control room air intakes. This includes releases of chlorine. A new analysis of operation of the control room in the toxic gas mode of operation is therefore not required, because of the low probability of the event. Therefore, since an offsite chlorine release is an improbable event and any onsite release of chlorine would not result in an incapacitating concentration reaching the control room air intakes, it is not necessary to have redundant chlorine detectors in the control room ventilation system of each unit. Further, since isolation from toxic gas releases is not required, the recirculation damper can be maintained open, which is the correct position for the radiological mode.

ATTACHMENT 4 TO AEP:NRC:03980

PROPOSED PLANT CHANGES AND

TECHNICAL SPECIFICATION CHANGE SCHEDULE

Proposed Plant Changes

In our letter AEP:NRC:0398N dated October 2, 1987, we committed to perform a reanalysis of control room habitability in response to the NRC staff report on a survey of the Donald C. Cook Nuclear Plant control room ventilation systems (Youngblood [NRC] to Dolan [AEPSC] dated February 2, 1987). The purpose of this attachment is to describe plant changes and modifications that will be implemented based on the results of the analyses described in Attachments 2 and 3 of this letter, and to provide a schedule for submission of technical specification changes.

Based on the results of the analyses, the following changes are proposed:

1) The recirculation damper will be procedurally maintained in the open position. This will ensure that the damper is in the correct position for the radiological mode of operation.

2) The normal outside air intake will be reduced to 200 cfm.

3) The necessary procedural, hardware and training changes will be made to ensure that the normal intake flowpath will be isolated within 1.5 hours in the event of a failure to isolate automatically following the radiological accident that threatens control room habitability. The damper is located within the HVAC equipment room which is accessible from the control room without leaving the protected boundary.

These items will be implemented by the end of the refueling outages anticipated for each unit in 1990.

T/S changes to address ANSI-N510 (1980) testing standards, laboratory testing of charcoal absorbent, control room pressure boundary, limits on outside air makeup, clarifications of control room system operation, filter leak testing and changes to the control room ventilation system bases will be submitted by June 30, 1989.