

Client Commonwealth Edison Company
Project Zion
Proj. No. 7805-11 Equip. No. _____

Prepared by R. S. Fulmer Date 4/19/91
Reviewed by _____ Date _____
Approved by _____ Date _____

1. PURPOSE

The purpose of this revision is to provide control room 30 day thyroid inhalation doses for a specific control room model (Model D using ICRP-30 thyroid dose conversion factors, see Revision 0, Table 19). However, a make-up air flow rate of 1700 cfm and infiltration rates of both 450 cfm and 475 cfm are to be used

2. ASSUMPTIONS AND DATA

2.1 Assumptions

The assumptions are the same as those in Rev. 0, page 7, but with the following client directed assumptions (Reference 1 of this revision).

- (a) Make-up air flow rate is 1700 cfm
- (b) Use ICRP-30 dose conversion factors (thyroid assumed)
- (c) 11500 cfm recirculation flow rate (not required, see item (e))
- (d) Model D methodology (see Rev. 0)
- (e) 0% recirculation filter efficiency
- (f) IPF methodology
- (g) control room infiltration rates of both 450 cfm and 475 cfm

2.2 Data

The following thyroid inhalation 30 day dose is used in the IPF methodology

Thyroid Dose = 58.506 Rem from Table 19, page 80 of Rev. 0, for Model D with an infiltration rate of 1000 cfm, a make-up air flow rate of 1800 cfm, and no recirculation filtration).

Form G.O. 3.08 1 Rev. 2

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PDR ADOCK 05000295
P PDR

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Rev. <u>1</u>	Date
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Reviewed by	Date
Approved by	Date

3. METHOD

The method used for calculating 30 day control room thyroid inhalation dose is that described in Section 7 of Rev. 0 (Iodine Protection Factor Methodology). Specifically, the dose equation given on page 69 is used; however, that equation must have all occurrences of the consecutive digits 18 replaced by the digits 17. This change is required because the equation was developed for an air make-up flow rate of 1800 cfm, but results for a new air make-up flow rate of 1700 cfm are desired. The iodine protection factor that appears in the equation (value of 2.750491159) is unchanged because the known dose, $D_{1000} = 58.506$ Rem, was obtained from a POSTDBA calculation using a make-up air flow rate of 1800 cfm. The revised dose equation is

$$D = \frac{D_{1000} (2.750491159) (F_3 + 17)}{(F_3 + 11500\eta_2 + 1700)}$$

where

- $\eta_2 = 0.0$ (no recirculation filtration)
- $F_3 =$ control room infiltration rate, cfm
- $D_{1000} = 58.506$ Rem (see Section 2.2 of this revision)

Using these values for η_2 and D_{1000} , the dose equation becomes

$$D = 160.9202 \left(\frac{F_3 + 17}{F_3 + 1700} \right)$$

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Date

4. THYROID DOSE CALCULATIONS

4.1 Thyroid Dose for 450 cfm Infiltration

Using a control room infiltration rate of 450 cfm and the dose equation given at the end of Section 3 of this revision, the 30 day control room thyroid inhalation dose is

$$D = 160.9202 \left(\frac{450 + 17}{450 + 1700} \right)$$

$$D = 35.0 \text{ Rem}$$

This dose is based on Model D using ICRP-30 thyroid dose conversion factors and a single control room inlet.

4.2 Thyroid Dose for 475 cfm Infiltration

Using a control room infiltration rate of 475 cfm and the dose equation given at the end of Section 3 of this revision, the 30 day control room thyroid inhalation dose is

$$D = 160.9202 \left(\frac{475 + 17}{475 + 1700} \right)$$

$$D = 36.4 \text{ Rem}$$

This dose is based on Model D using ICRP-30 thyroid dose conversion factors and a single control room inlet.

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5. WHOLE BODY AND BETA SKIN DOSES

The whole body and beta skin 30 day control room doses are primarily from noble gases; thus, filtration has little effect. These doses are functions of the total air intake rate (make-up plus infiltration). Hence, these doses should fall within the Model D dose range reported in Table 19 of Rev. 0 which is considerably smaller than the regulatory limits as indicated in Table 19.

6. SUMMARY

Thyroid inhalation 30 day control room doses after LOCA were calculated based on the following model.

- Gap inventory released to containment } Rev. 0, Model D
- Plan view ($\sqrt{2}$) }
- ICRP-30 thyroid dose conversion factors
- No recirculation filtration
- Single control room inlet
- No iodine blockers

The results were

- 35.0 Rem for 450 cfm infiltration
- and
- 36.4 Rem for 475 cfm infiltration.

These results are also based on 1700 cfm control room make-up air flow rate.

Whole body and beta skin doses were not calculated (see Section 5 for comments).

Form GQ.3.00.1 Rev. 2



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Approved by	Date

7. REFERENCES

1. Zion Station Telecopy Message, "Zion Station - Units 1 & 2 Additional Information for Use in Parametric Analysis for Control Room Habitability," from W. C. Mammoser, PWR Projects Dept., Zion Station to B. C. Schwartz, Sargent & Lundy, NSLD, April 16, 1991; attached to this calculation as pages 107-108.

Form CO-3.06.1 Rev. 2

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Page 107
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ZION STATION TELECOPY

To: Barry Schwartz

Location: SFL

Telecopy Number: 8-176-3600, 3596
~~9-1-311-209-3600, 3596~~

Verification Number: 8-176-3529
9-1-311-209-3529

From: Bill Masterson

Dept: ENC

Extension: 2157

Zion Generating Station
101 Shiloh Blvd
Zion Illinois 60099
(708) 746-2084

Request Sheet plus 1 pages.

CRHABANL.FLO

April 16, 1991

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To: B.C. Schwartz

Subject: Zion Station-Units 1&2
Additional Information for Use in
Parametric Analysis for Control Room Habitability

In addition to the calculations performed to date for the various parametric analyses relating to Control Room Habitability, please include the calculated the thyroid doses to the Control Room operating personnel following a LOCA assuming the following:

- Emergency make-up filter unit flow rate of 1700 CFM
- Use of ICRP-30 Dose Conversion factors
- 11,500 CFM recirculation flow rate
- Calculational parameters from Model D Methodology
- 0% recirculation filter efficiency
- Use of IPF methodology
- Control Room unfiltered inleakage rate of 450 CFM. (An additional calculation should be performed with a Control Room unfiltered inleakage rate of 475 CFM).

The actual flow rate for the Emergency Make-up Air Filter Unit as determined during Control Room unfiltered inleakage testing performed under TSSP 002-91 will be verified once the formal test results are received. I will inform you if the actual flow rate differs from 1700 CFM.

W.C. Mammoser
W.C. Mammoser
PWR Projects Dept.
Zion Station

REVIEW METHOD SHEET

Calc. No. ZI-5-91
 Revision 1
 Page 109, LAST of Rev. 1
 Proj. No. 7805-11
 Safety-Related

This calculation has been reviewed by me according to the method(s) checked below.

1. Computer Aided Calculations

a	Review to determine that the computer program(s) has been validated and documented, is suitable to the problem being analyzed, and that the calculation contains all necessary information for reconstruction at a later date.
b	Review to determine that the input data as specified for program execution is consistent with the design input, correctly defines the problem for the computer algorithm and is sufficiently accurate to produce results within any numerical limitations of the program.
c	Review to verify that the results obtained from the program are correct and within stated assumptions and limitations of the program and are consistent with the input.
d	Review validation documentation for temporary changes to listed, or developmental, or unique single application programs, to assure that methods used adequately validate the program for the intended application.
e	Review of code input only, since the computer program has sufficient history of use at Sargent & Lundy in similar calculations.
f	Review arithmetic necessary to prepare code input data.
g	Other:

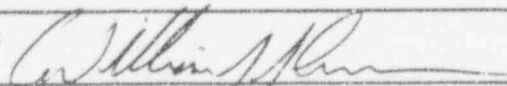
2. Hand Prepared Design Calculations

a <input checked="" type="checkbox"/>	Detailed review of the original calculations.
b	Review by an alternate, simplified, or approximate method of calculation.
c	Review of a representative sample of repetitive calculations.
d	Review of the calculation against a similar calculation previously performed.

3. Revisions

a	Editorial changes only.
b	Elimination of unapproved input data without altering calculated results.
c	Other:

4. Other

Reviewer:  Date: 4/20/91

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Document Category 08

DBD reference number 08-1041
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Document Identification ZI-5-91

Title/Subject CONTROL ROOM INFILTRATION
STUDY

Revision 1

Create Date 04 - 23 - 91
M D Y

Vendor Code

Originating Organization S+L

Department NSLD

Person R HUBNER

In reference manual? Format

Proprietary?

Quantity of Pages 0110
(Including Coding Forms)

Abstract:
The purpose of this calculation was to calculate control room
30 day thyroid inhalation doses for control room model D
using ICRP-30 thyroid dose conversion factors a 1700 cfm
make-up air flow rate and infiltration rates of both 450 and 47
cfm were used. The results were calculated to be 35.0 Rem
Abstract continued? Y/N for 450 cfm infiltration and 36.4 Rem for 475 cfm
infiltration.

Calc. For Control Room Infiltration Study
 Calc. No. ZI-5-91
 Client Commonwealth Edison Company
 Project Name Zion
 Project No. 7805-11 System CR
 Division NSLD File 4C4-A1
 Safety Related Non-Safety Related

Preparer/Date <u>R.F. Huber</u> <u>4/2/91</u>		Reviewer/Date <u>William Miller</u> <u>4/10/91</u>		Approver/Date <u>Robert Jahnke</u> <u>23 April 91</u>		Rev. <u>0</u>
Pages Affected		Reason for Change				
<u>A1</u> <u>1-101</u>		<u>New calculation.</u>				
Method of Review <u>See page 101.</u>						
Preparer/Date <u>R.F. Huber</u> <u>4/19/91</u>		Reviewer/Date <u>William Miller</u> <u>4/20/91</u>		Approver/Date <u>Robert Jahnke</u> <u>23 April 91</u>		Rev. <u>1</u>
Pages Affected		Reason for Change				
<u>A1</u> <u>102-109</u>		<u>Rev. 1 added.</u> <u>Results for a specific model were requested.</u>				
Method of Review <u>See page 109.</u>						
Preparer/Date		Reviewer/Date		Approver/Date		Rev. _____
Pages Affected		Reason for Change				
Method of Review						

QA Serial No.

QA Serial No.

QA Serial No.

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