



CALCULATION TITLE PAGE

Total Number of Pages: 17

MP-2 Fuel Handling Accident in the Spent Fuel Pool : 60 Day Decay, No Filtration

TITLE		
M2SFP60D-01252R2	I	N/A
CALCULATION #	REVISION No.	SYSTEM NAME
N/A	N/A	N/A

VENDOR CALCULATION NUMBER	Structure	System Number	N/A
<b>NUCLEAR INDICATOR:</b> <input checked="" type="checkbox"/> CAT1 <input type="checkbox"/> RWQA <input type="checkbox"/> SBOQA <input type="checkbox"/> FPQA <input type="checkbox"/> ATWSQA <input type="checkbox"/> NON-QA		<b>Calc. Supports DCR/MMOD?</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	<b>Calc. Supports Ind. Analysis?</b> <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
		↓	↓
		N/A	N/A
		DCR/MMOD No.	Reference

**INCORPORATES:**  
 CCN NO: \_\_\_\_\_ AGAINST REV. \_\_\_\_\_  
 N/A \_\_\_\_\_ N/A \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Executive Summary**

This calculation represents a reanalysis and complete rewrite of the MP2 FHA in the spent fuel pool with 60 days decay and EBFS not in operation to the EAB and LPZ. The changes in this calculation include: including the dose to the control room in the calculation, using conservative data so the calculation now also applies to containment, new atmospheric dispersion (X/Q's) factors, new MP-2 specific source term, the power level was increased by 2% for instrument uncertainty based on the guidance in Regulatory Guide 1.49 and the peaking factor is now 1.83. The results of the calculation are EAB thyroid: 6.059E-01 rem, EAB whole body: 8.960E-04 rem, LPZ thyroid: 7.949E-02 rem, LPZ whole body: 1.175E-04 rem, control room thyroid: 9.01 rem; control room whole body: 7.23E-04 rem and control room beta skin: 7.00E-01 rem. All calculated doses are with SRP 15.7.4 criteria off-site and GDC 19 criteria for the control room

<b>Approvals</b> (Print & Sign Name)		
Preparer: James L. Wheeler	<i>[Signature]</i>	Date: 9/27/98
Interdiscipline Reviewer: N/A	Discipline:	Date:
Interdiscipline Reviewer: N/A	Discipline:	Date:
Independent Reviewer: Stuart Torf	<i>[Signature]</i>	Date: 9/28/98
Supervisor: William Eakin	<i>[Signature]</i>	Date: 9/28/98
<b>Installation Verification</b>		
<input checked="" type="checkbox"/> Calculation accurately reflects plant configuration, OR		
<input type="checkbox"/> N/A does not affect plant configuration)		
Preparer/Designer Engineer: James L. Wheeler	<i>[Signature]</i>	Date: 9/28/98

C #4

SUBJECT: <u>Millstone Unit 2 Radiological</u>	BY	DWM	DATE	Aug 14, 1995
<u>Consequences of a Fuel Handling</u>	CHKD		DATE	
<u>Accident: 60 Days Decay, No Filtration</u>	CALC#	M2SFP60D-01252-R2	REV	0
	SHEET	1	OF	6

**Title Page**

Calculation #: M2SFP60D-01252-R2 Rev #: 0

A/E Calc #/ other \_\_\_\_\_

**TITLE:** Millstone Unit 2 Radiological Consequences of a Fuel Handling Accident: 60 Days Decay, No Filtration

Responsible discipline Radiological Assessment Branch  
 QA (y/n) Yes

Pages: 6

Total # of Alphanumeric Revision pages: —

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 Royce A. Crandall (printed)

<b>PMMS Code</b>	<b>Quality</b>	
Structure/System/Component	Software	Rev#/Level

_____	<u>TACT</u>	<u>III</u>
_____	_____	_____
_____	_____	_____

Method of Review: Full Review (plus non QA calc. in comments section. Reviewer's hand calc. and preparer's calc. match exactly)

Date CTP Entered:



PassPort DATABASE INPUTs

CH #4

Page 2

Calculation Number: M2SFP60D 01252 R2 Revision: 1  
(prefix) (sequence no.) (suffix)

Vendor Calculation Number/Other: N/A Revision: N/A

CCN # N/A QA  Yes  No Calc Voided:  Yes  No

Superseded By: N/A Supersedes Calc: N/A

Discipline (Up to 10) Z

Unit	Project Reference (EWA)	Component Id	Computer Code	Rev. No./ Level No.
2	N/A	N/A	TACTIII	83.0
			CRADLE	2/1

PMMS CODES\*

Structure	System	Component	Reference Calculation	Rev No.
N/A	N/A	N/A	NUC-181	0
			070771300.WM(B)-03	0
			M2LOCA98-02635R2	0
			07077.13-WM(B)-02	0

\*The codes required must be alpha codes designed for structure, system and component.

Reference Drawing	Sheet	Rev. No.
25203-26028	5	20

Comments:

SUBJECT	MP-2 Fuel Handling	BY	JLW	DATE	9/8/98
	Accident in the Spent	CHKED		DATE	
	Fuel Pool: 60 Days Decay	CALC #	M2SFP60D	01252R2	
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### I. Purpose/Objective:

1. The purpose of this calculation is to reanalyze the radiological consequences of a Fuel Handling Accident (FHA) in the Spent Fuel Pool (SFP) at Millstone Unit 2 with 60 days decay and without EBFS in operation using revised assumptions.
2. The calculation will also analyze the radiological consequences of a Fuel Handling Accident (FHA) in containment at Millstone Unit 2 with 60 days decay and without EBFS in operation.

### II. Summary of Results

The results in Table II-1 for the EAB and LPZ show that the thyroid and whole body doses calculated are all less than the Standard Review Plan 15.7.4 limits of 75 rem and 6 rem, respectively (Ref. 1). The results also show that the thyroid, whole body and beta skin dose to the MP-2 control room are less than the limits specified in GDC 19.

Table II-1

FHA DOSE (rem)			
	Thyroid	Whole Body	Beta Skin
EAB	6.059E-01	8.960E-04	N/A
LPZ	7.949E-02	1.175E-04	N/A
Control Room	9.01E+00	7.23E-04	7.00E-01

### III. References

- 1) Standard Review Plan 15.7.4, "Radiological Consequences of Fuel Handling Accidents", Rev. 1, July 1981.
- 2) MP2 Facility Operating License, Docket No 50-336, May 5, 1983
- 3) Regulatory Guide 1.25, Assumptions Used for Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors, Rev. 0, March 1972.
- 4) TACT III, Atmospheric Transport Code System, Oak Ridge National Laboratory, CCC-447, version 83.0.
- 5) Report of Committee II on Permissible Dose for Internal Radiation, ICRP Publication 2, Pergamon Press, New York, 1959.

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- 6) Annals of the ICRP, Limits for Intakes of Radionuclides by Workers, ICRP30 Supplement to Part 1, Volume 3, No. 1-4, Pergamon Press, New York, First Edition, 1980.
- 7) Millstone Nuclear Power Station Unit 2 Final Safety Analysis Report.
- 8) DiNunno, J.J. et. al., Calculation of Distance Factors for Power and Test Reactor Sites, TID-14844, U. S. Atomic Energy Commission, March 23, 1962.
- 9) Millstone Nuclear Power Station Unit 2 Technical Specifications
- 10) "MP-2 Design Basis Loss of Coolant Accident - Radiation Source Term", DES Calculation NUC-181, Rev. 0, June 1998.
- 11) Technical Evaluation M2-EV-98-0114, "Design Input for EQ Dose Calculations", Rev. 0, May 1998.
- 12) Siemens Document No. EMF-93-216(P), Millstone Unit 2 Mechanical Design Report for Reload Batch R (MIB-4)
- 13) "Normalized Concentrations (X/Q) at the EAB and LPZ for Gaseous Releases from the Unit 1 Stack and the Unit 2 Containment, Stack, PORV's/ADV's and MSLB", SWEC Calculation 070771300.WM(B)-03, Rev. 0, July 1998
- 14) P&ID 25203-26028, Sheet 5 of 5
- 15) Code of Federal Regulations, 10CFR Part 100 - Reactor Site Criteria.
- 16) M2LOCA98-02635R2, "EAB and LPZ Doses from a Millstone Unit 2 LOCA", Rev. 0, July 1998
- 17) "Assessment of the Use of Extended Burnup Fuel in Light Water Power Reactors", NUREG/CR-5009, 1988
- 18) ERC 25203-ER-98-0050, Rev. 2, "Control Room Filtration System Design Basis Parameters for Inputs to Revise Millstone Unit 2 Control Room Post-Accident Radiological Habitability Analyses", June, 1998.
- 19) CRADLE - Control Room Accident Dose Level Evaluations, QA Category 1 Calculation #XX-XXX-37 RA, Rev. 2, Donald Miller Nov. 22, 1982.
- 20) Bechtel Calc. 3D00-5, Containment Heat Sinks, dated 6/04/74
- 21) Normalized X/Qs at the Unit 2 & 3 Control Room and TSC for Releases from Unit 2, Calculation No. 07077.13-WM(B)-02, Rev. 0, July, 1998

#### IV. Assumptions

The assumptions used in this calculation are listed in Table IV-1.

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Table IV-1

FHA Assumptions

<u>ASSUMPTIONS</u>	<u>BASIS</u>
1) Power Level = 2754 MW	Ref. 2
2) Core Inventory	Ref. 10
3) Core Release Fractions:	Ref. 17 and conservative assumption for iodines
12% iodines	
10% noble gas	
30% Kr-85	
4) Iodine Chemical Form:	Ref. 3
75% elemental	
25% organic	
5) Offsite Breathing Rate ( $m^3/sec$ ):	Ref. 3
>24 hrs = 3.47E-4	
6) Decontamination Factor: iodines: 100	Ref 3
noble gasses: 1	
7) Release Point: Ground	Conservative assumption
8) Minimum time after shutdown for fuel transfer: 60 days	Ref. 9
9) Peaking Factor: 1.83	Ref. 12
10) Assemblies Damaged: Conservative - 1	Conservative Assumption
11) X/Q ( $SEC / m^3$ ): Ground:	
EAB (0-2) hr = 3.66E-4	Ref. 13
LPZ (0-4) hr = 4.80E-5	
Control Room (0-8) hr = 5.46E-3	Ref. 21
(8-24) hr = 3.45E-3	
(24-96) hr = 1.27E-3	
(96-720) hr = 3.98E-4	
12) Dose Conversion Factors	Ref. 6
13) All activity must be released within 2 hours	Ref. 3
14) Control Room Intake Flowrate: 800 cfm	Ref. 18
15) Control Room Volume: 35,650 ft <sup>3</sup>	Ref. 18

V. Method:

This reanalysis of the MP2 FHA dose calculation uses the assumptions as listed herein. The reason for this reanalysis is due to the following assumption changes:

- 1) The peaking factor is now 1.83.
- 2) A new MP-2 specific source term was calculated.
- 3) New atmospheric dispersion factors (X/Q's) were calculated.
- 4) The power level was increased by 2% for instrument uncertainty based on the guidance in Regulatory Guide 1.49.
- 5) This calculation also analyzes doses to the control room assuming it does not isolate.
- 6) This calculation also applies to a FHA in containment with no filtration and 60 days decay.

The TACT III (version 83.0) (Ref. 4) computer code was used in this analysis. TACT III (ver. 83) was validated per NEO 2.24/QS-3 and was last benchmarked on July, 1998. TACT III "simulates the movement of radioactivity released from a

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reactor core as it migrates through user-defined regions (nodes) of the containment, is immobilized by filters and sprays, and leaks to the outside environment... Outputs are shown for the end of each time interval and include the level of radioactivity in each node of the containment and in the environment, broken down as iodines, noble gases, and solids...; and the radiation dose to reference individuals at the exclusion radius, the boundary of the low population zone, and in the control room.", (Ref. 4).

Although reference 17 states that 10% of the iodines are available for release (except I-131 which is 12%), 12% will be used for all iodines for simplicity.

The thyroid dose conversion factors (DCF)s currently used in the TACT III code date back to Reg. Guide 1.109, Rev. 1, (Ref. 4 & 5). ICRP 30 adult thyroid DCF's will be used in this analysis because they are more up-to-date and realistic. Table VI-5 lists both the TACT III and ICRP 30 thyroid dose conversion factors and TACT-to-ICRP30 conversion ratios for each iodine isotope. In Table VI-7 the TACT III thyroid dose for each isotope is converted to ICRP 30 dose using the ratios as listed in Table VI-5.

The CRADLE (version 2) (Ref. 19) computer code was used for the control room exposure calculations in this analysis. CRADLE was validated per NEO 2.24/QS-3 and was last benchmarked on July 1998. CRADLE calculates the activity which enters the control room after an accident. The effects of filtration, buildup, decay and plateout are taken into account in the transport of activity from the core into containment to the environment and eventually to the control room. From the activity in the control room, CRADLE calculates the resulting thyroid, whole body and beta doses to the control room operators.

The thyroid dose conversion factors (DCF)s currently used in the CRADLE code date back to Reg. Guide 1.109, Rev. 1, (Ref. 5). ICRP 30 adult thyroid DCF's will be used in this analysis because they are more up-to-date and realistic. Table VI-5 lists both the Reg. Guide 1.109 and ICRP 30 thyroid dose conversion factors and Reg. Guide 1.109-to-ICRP30 conversion ratios for each iodine isotope. In Table VI-8 the CRADLE thyroid dose for each isotope is converted to ICRP 30 dose using the ratios as listed in Table VI-5.

## VI. Analysis

### A. Release Activity

Rather than use the inventories in TACT III based on TID 14844, the source core activity was taken from Reference 10. The equation for calculating the core release fraction is:

$$F_c = (1/N) * P * (1/DF) * F_g$$

where:

F<sub>c</sub> = isotopic release fraction of core, by path

N = number of fuel assemblies in core, 217

P = peaking factor, 1.83

DF = decontamination factor, 100 for iodines, 1 for noble gasses



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Fg = fraction of fuel in the gap, 12% iodines, 10% noble gasses, additional 20% Kr-85

Therefore:

Fc(iodines)	=	1.01E-05
Fc(noble gas)	=	8.43E-04
Fc(Kr-85 add)	=	1.69E-03

Table VI-1 lists full core activity according to reference 10 multiplied by the above release fractions. These release fractions were also used in CRADLE.

Table VI-1

Instantaneous Release Activity

Radionuclide	Inventory	Release Fraction	Release Inventory
I-129	4.137E+00	1.01E-05	4.178E-05
I-130	5.101E+06	1.01E-05	5.152E+01
I-131	7.719E+07	1.01E-05	7.796E+02
I-132	1.105E+08	1.01E-05	1.116E+03
I-133	1.504E+08	1.01E-05	1.519E+03
I-134	1.666E+08	1.01E-05	1.683E+03
I-135	1.407E+08	1.01E-05	1.421E+03
Kr-83m	1.080E+07	8.43E-04	9.104E+03
Kr-85	1.194E+06	8.43E-04	1.007E+03
Kr-85m	2.451E+07	8.43E-04	2.066E+04
Kr-87	4.860E+07	8.43E-04	4.097E+04
Kr-88	6.865E+07	8.43E-04	5.787E+04
Kr-89	8.593E+07	8.43E-04	7.244E+04
Xe-131m	8.615E+05	8.43E-04	7.262E+02
Xe-133	1.569E+08	8.43E-04	1.323E+05
Xe-133m	4.808E+06	8.43E-04	4.053E+03
Xe-135	5.658E+07	8.43E-04	4.770E+04
Xe-135m	3.104E+07	8.43E-04	2.617E+04
Xe-137	1.316E+08	8.43E-04	1.109E+05
Xe-138	1.316E+08	8.43E-04	1.109E+05
Kr-85 (20%)	1.194E+06	1.69E-03	2.018E+03

B. Control Room

The control room is either isolated by a SIAS signal or the control room inlet radiation monitor. In this calculation it will be assumed that the control room does not isolate and continues with a intake flow rate of 800 cfm for the duration of the accident. Due to control room emergency ventilation not starting up, there also is no cleanup in the control room.

C. Computer Code Input Data Sets

The input data set to the TACT III (version 83.0) and CRADLE computer codes are given in Tables VI-2 thru VI-4.

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Table VI-2

TACTIII Input Dataset

```

***** Top of Data *****
MP2 FHA; 12% IODINES, 10% NOBLE GASSES, 30% KR-85
1 1 1 21 9 8 98 0 0
2754. 0.0 1.01E-5 2.53E-3 0.0 7.50E-1 2.50E-1 0.0
1 2 0 1.440E+03 1.442E+03
2 1 1 4.178E-05
2 1 2 7.796E+02
2 1 3 1.116E+03
2 1 4 1.519E+03
2 1 5 1.683E+03
2 1 6 1.421E+03
2 1 8 5.152E+01
2 1 9 9.104E+03
2 1 10 2.066E+04
2 1 11 3.025E+03
2 1 12 4.097E+04
2 1 13 5.787E+04
2 1 14 7.244E+04
2 1 15 7.262E+02
2 1 16 4.053E+03
2 1 17 1.323E+05
2 1 18 2.617E+04
2 1 19 4.770E+04
2 1 20 1.109E+05
2 1 21 1.109E+05
3 1 0 1.000E+03
10 2 1 1.000E+08 0.0
17 6 0 3.660E-04 4.800E-05 3.470E-04 0.0 0.0 0.000E+00
0/
***** Bottom of Data *****

```



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Table VI-4

CRADLE Input Dataset (10% Noble Gasses)

***** Top of Data *****					
MP-2 CR FROM FHA (12% I; 10% NG)					1
2754.	3.565E+4	1.	0	5	
0.0	1.44E3	1.448E3	1.464E3	1.536E3	2.160E3
1.01E-5	8.43E-4				
0.0	0.0				
0.0	0.0				
0.0	0.0				
0.0	0.0				
800.0	800.0	800.0	800.0	800.0	800.0
0.0	0.0	0.0	0.0	0.0	0.0
800.0	800.0	800.0	800.0	800.0	800.0
0.0	0.0	0.0			
0.0	0.0	0.0			
0.0	0.0	0.0			
0.0	0.0	0.0			
0.0	0.0	0.0			
0.0	0.0	0.0			
0.0	5.46E-3	3.45E-3	1.27E-3	3.98E-4	
0.0	1.0E+8	1.0E+8	1.0E+8	0.0	
0.0	0.0	0.0			
0.0	0.0	0.0			
0.0	0.0	0.0			
0.0	0.0	0.0			
0.0	0.0	0.0			
0.0	0.0	0.0			
0.0	0.0	0.0			
0.0	0.0	0.0			
0.0	0.0	0.0			
0.0	0.0	0.0			
***** Bottom of Data *****					

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### C. Results of Computer Runs

TACT III thyroid results will be adjusted using the ICRP 30 thyroid dose conversion factors by utilizing the equation given below.

$$D_{Thy_i}^{ICRP30} = D_{Thy_i}^{TACT} * F_i * R_i$$

where,

$D_{Thy_i}^{ICRP30}$  = Thyroid dose for isotope i adjusted for ICRP 30 DCF's.

$D_{Thy_i}^{TACT}$  = Total Thyroid dose from TACT III for isotope i

$F_i$  = Fraction of total iodine.

$R_i$  = Ratio of ICRP 30 to TACT III and CRADLE dose conversion factors (see Table VI-5).

The TACT III input data sets in Table VI-2 were run on the Wethersfield IBM 3090 mainframe computer. The thyroid doses adjusted for ICRP 30 DCF's in each time interval are listed in Table VI-7 with corresponding data. The summary of both thyroid and whole body dose results appear in Table II-1.

TABLE VI-5

THYROID DOSE CONVERSION FACTORS  
(rem/Ci - inhaled)

ISOTOPE	TACT III and CRADLE	ICRP 30 *	DCF RATIO (ICRP 30/TACTIII or CRADLE)
I-129	5.54E+6	5.920E+6	1.068
I-130	1.42E+5	7.400E+4	0.521
I-131	1.49E+6	1.073E+6	0.718
I-132	1.43E+4	6.290E+3	0.440
I-133	2.69E+5	1.813E+5	0.674
I-134	3.73E+3	1.073E+3	0.288
I-135	5.60E+4	3.145E+4	0.562

The results from CRADLE must be adjusted for thyroid dose as described above. The results also must be adjusted for the difference in the source term. Since CRADLE does not have an option to input a plant specific source term, another ratio must be calculated. The ratio will be the total source as calculated in reference 10 to the total source as listed in reference 19 (CRADLE). The doses per time step will be multiplied by this ratio and then summed. The ratios are listed and calculated in Table VI-6 below.

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Table VI-6

	Ref. 12 (NUC-181) Full	Ref. 24 (CRADLE) Full	Ratio
	Core Activity	Core Activity	
I-131	7.72E+07	6.91E+07	1.1177
I-132	1.11E+08	1.05E+08	1.0544
I-133	1.50E+08	1.55E+08	0.9714
I-134	1.67E+08	1.81E+08	0.9201
I-135	1.41E+08	1.41E+08	1.0013
Kr-83M	1.08E+07	1.14E+07	0.9445
Kr-85	1.19E+06	1.13E+06	1.0569
Kr-85M	2.45E+07	3.57E+07	0.6862
Kr-87	4.86E+07	6.43E+07	0.7558
Kr-88	6.87E+07	8.81E+07	0.7790
Kr-89	8.59E+07	1.10E+08	0.7842
Xe-131M	8.62E+05	7.15E+05	1.2055
Xe-133M	4.81E+06	3.81E+06	1.2614
Xe-133	1.57E+08	1.55E+08	1.0134
Xe-135M	3.10E+07	4.29E+07	0.7239
Xe-135	5.66E+07	1.48E+08	0.3831
Xe-137	1.32E+08	1.41E+08	0.9364
Xe-138	1.32E+08	1.32E+08	1.0007

The CRADLE input data sets in Table VI-3 and VI-4 were run on the Wethersfield IBM 3090 mainframe computer. The thyroid doses adjusted for ICRP 30 DCF's in each time interval is listed in Table VI-8 with corresponding data. The thyroid, beta skin and whole body doses adjusted for the source term correction in each time interval, using the ratios developed in Table VI-6, are also listed in Table VI-8 with corresponding data. The summary of thyroid, beta skin and whole body dose results appear in Table II-1.

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	No Filtration, Rev. 1	SHEET	14		

**TABLE VI-7**

FHA; 60 Day Decay; No EBFS

DCF Ratio						
I-129	I-130	I-131	I-132	I-133	I-134	I-135
1.068	0.521	0.718	0.440	0.674	0.288	0.562

Release Type	TACT III Iodine Dose Fraction							Combined Factor
	I-129	I-130	I-131	I-132	I-133	I-134	I-135	
12% Iodine	3.49E-05	9.339E-36	1.000E+00	0.000E+00	1.192E-19	0.000E+00	4.611E-64	7.1804E-01

Combined Factor(t) = Summation of [DCF Ratio(i) x Iodine Dose Fraction(i)] over i for time interval (t), where i=iodine isotope.

Release Type	Filtered Release Thyroid Doses (Rem)			
	TACT III		ICRP 30	
	EAB	LPZ	EAB	LPZ
12% Iodine	8.438E-01	1.107E-01	6.059E-01	7.949E-02
			6.059E-01	7.949E-02

ICRP 30 EAB(t), or LPZ(t) = TACT III EAB(t), or LPZ(t), x Combined Factor(t) for time interval (t).

SUBJECT	MP-2 Fuel Handling	BY	JLW	DATE	9/8/98
	Accident in the Spent	CHKED		DATE	
	Fuel Pool: 60 Days Decay	CALC #	M2SFP60D	01252R2	
	No Filtration, Rev. 1	SHEET	15		

TABLE VI-8

Control Room Dose Adjustments

CRADLE Thyroid Correction

	Source Term Correction	1440 - 1448 hrs	1448 - 1464 hrs	Integrated Dose rem	R.G. 1.109 to ICRP 30 DCF Corr.	Corrected Dose (rem)
I-131 ELEM	1.1177	1.02E+01	2.09E-04	1.02E+01	7.18E-01	8.20E+00
I-131 ORG.	1.1177	4.49E-01	9.16E-06	4.49E-01	7.18E-01	3.61E-01
I-131 PART.	1.1177	5.62E-01	1.15E-05	5.62E-01	7.18E-01	4.51E-01
					Total:	9.01E+00

CRADLE Whole Body Correction

	Source Term Correction	1440 - 1448 hrs	1448 - 1464 hrs	Integrated Dose rem	Corrected Dose (rem)
I-131 ELEM	1.1177	1.93E-03	3.93E-08	1.93E-03	2.15E-03
I-131 ORG.	1.1177	8.47E-05	1.73E-09	8.47E-05	9.47E-05
I-131 PART.	1.1177	1.06E-04	2.16E-09	1.06E-04	1.18E-04
10% KR-85	1.0569	2.83E-03	5.94E-08	2.83E-03	2.99E-03
XE-131M	1.2055	5.17E-04	1.06E-08	5.17E-04	6.23E-04
XE-133	1.0134	3.05E-03	6.12E-08	3.05E-03	3.09E-03
20% Kr-85	1.0569	5.67E-03	1.19E-07	5.67E-03	6.00E-03
				1.42E-02	1.51E-02
				6.80E-04	7.23E-04

CRADLE Beta Correction

	Source Term Correction	1440 - 1448 hrs	1448 - 1464 hrs	Integrated Dose rem	Corrected Dose (rem)
I-131 ELEM	1.1177	8.69E-04	1.77E-08	8.69E-04	9.71E-04
I-131 ORG.	1.1177	3.82E-05	7.79E-10	3.82E-05	4.27E-05
I-131 PART.	1.1177	4.77E-05	9.74E-10	4.77E-05	5.33E-05
10% KR-85	1.0569	2.19E-01	4.59E-06	2.19E-01	2.31E-01
XE-131M	1.2055	1.55E-03	3.20E-08	1.55E-03	1.87E-03
XE-133	1.0134	2.60E-03	5.23E-08	2.60E-03	2.64E-03
20% Kr-85	1.0569	4.38E-01	9.20E-06	4.38E-01	4.63E-01
					7.00E-01



APPENDIX A

# Calculation Review Comment and Resolution Form

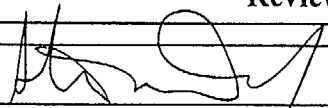
(Sheet 1 of 1)

Calculation Number: M2SFP60D-01252R2      Revision: 1      Calculation Title: MP-2 FUEL HANDLING ACCIDENT IN THE SPENT FUEL POOL: 60 DAY DECAY; NO FILTRATION

Calc. Originator: James L. Wheeler      Reviewer (PRINT): Stuart Torf

**This form is intended to document significant comments and their resolutions. Typographical errors and other editorial recommendations may be marked up in the calculation text and presented to the originator**

Review Type  Interdiscipline     Independent

Reviewer (SIGN)       Date: 9/28/98

(signature signifies all comments have been resolved to your satisfaction)

Item	Page/Section	Comments	Response
1	1/TITLE	In the executive summary, change beta to beta skin	Done
2	2/Passport	Change CRADLE to level 1	Done
3	4/Table II-1	Change beta to beta skin	Done