

NUCLEAR ENGINEERING CALCULATION COVER SHEET
NEPM-QA-0221-1

1. Page 1 of 299
Total Pages 299

>2. TYPE: CALC >3. NUMBER: EC-RADN-1135 >4. REVISION: 0

*>5. UNIT 3 *>6. QUALITY CLASS: Q

>7. DESCRIPTION: Justification Of AST 60 Isotope RADTRAD Source Term For Direct Shine
Dose Calculations

8. SUPERSEDED BY: _____

9. Alternate Number: _____ 10. Cycle: _____

11. Computer Code/Model used: MICROSHIELDS.0 12. Discipline: R

>13. Are any results of this calculation described in the Licensing Documents?

Yes, Refer to NDAP-QA-0730 and NDAP-QA-0731 No

>14. Is this calculation changing any method of evaluation described in the FSAR and using the results to support or change the FSAR? (Refer to PPL Resource Manual for Definition of FSAR)

Yes, 50.59 screen or evaluation required. No

>15. Is this calculation Prepared by an External Organization?

Yes No

EG771 Qualifications may not be required for individuals from external organizations (see Section 7.4.3).

>16. Prepared by: Terrence F. Mackay *Terrence F. Mackay* 8/31/05
Print Name(EG771 Qualification Required) Signature Date

>17. Reviewed by: M. M. Waselus *M. M. Waselus* 8/31/05
Print Name(EG771 Qualification Required) Signature Date

>18. Verified by: M. M. Waselus *M. M. Waselus* 8/31/05
Print Name(EG771 Qualification Required) Signature Date

>19. Approved by: Richard L. Doty *Richard L. Doty* 9/1/2005
Print Name(Qualified per NEPM-QA-0241 and comply with Section 7.8 of NEPM-QA-0221) Signature Date

>20. Accepted by: _____
Print Name(EG771 Qualification Required) and comply with Section 7.9 of NEPM-QA-0221 Signature Date

ADD A NEW COVER PAGE FOR EACH REVISION
FORM NEPM-QA-0221-1, Revision 8, Page 1 of 1, ELECTRONIC FORM

Thomas Shadle

RECEIVED
* Verified Fields
SEP 6 2005
NUCLEAR REC. SVS

SEP 6 2005

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.
Date 08/19/2005
Designed By T.F. Mackay
Checked By M.M.Waselus

PROJECT
Justification Of AST 60 Isotope
RADTRAD Source Term For Direct
Shine Dose Calculations

Calc. No. EC-RADN-1135
Sh. No. 2

TABLE OF CONTENTS

Description	Page
1.0 OBJECTIVES	3
2.0 CONCLUSIONS AND RECOMMENDATIONS	3
3.0 ASSUMPTIONS / INPUTS	5
4.0 METHOD	7
5.0 RESULTS	12
6.0 REFERENCES	15
ATTACHMENT 1 MICROSHIELD OUTPUT AST DBA-LOCA LIQUID SOURCE	81
ATTACHMENT 2 MICROSHIELD OUTPUT AST DBA-LOCA AIRBORNE SOURCE	181
ATTACHMENT 3 MICROSHIELD OUTPUT, ADDITION OF ISOTOPES	257

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.

Date 08/19/2005

Designed By T.F. Mackay

Checked By M.M.Waselus

PROJECT

Justification Of AST 60 Isotope
RADTRAD Source Term For Direct
Shine Dose Calculations

Calc. No. EC-RADN-1135

Sh. No. 3

1.0 OBJECTIVES

AST source terms and offsite and control room doses for the DBA-LOCA are evaluated in calculation EC-RADN-1125 for the effluent plume and are based on 60 dose significant isotopes identified for use in the RADTRAD computer code. These 60 radionuclides were selected because they were determined to be the dominant contributors to immersion and inhalation doses from airborne activity released during a design basis LOCA. Consequently, these 60 radionuclides have the greatest impact on offsite doses and are major contributors to control room doses.

Plant personnel can also receive significant direct shine doses from airborne activity held-up in the reactor and turbine buildings and from piping that contains post-accident recirculating fluids (suppression pool water). The purpose of this analysis is to determine if the same 60 isotopes make the greatest contribution to the direct shine DBA-LOCA doses. The determination is made by performing several comparisons of the potential contributions from the entire set of core nuclides relative to a core inventory defined by the 60 radionuclide set. Where significant differences exist, this calculation will provide adjustment factors which may be used with the 60 isotope set to ensure conservatism when performing shielding calculations for the direct shine doses from DBA-LOCA sources.

2.0 CONCLUSIONS AND RECOMMENDATIONS

This work shows that the 60 isotopes used in RADTRAD for AST give reliable predictions of post-accident direct shine dose rates at ≥ 24 hours. The predicted dose rates of the 60 RADTRAD isotopes were determined to give essentially the same dose rates as a larger set of 183 isotopes released from fuel using AST assumptions.

There are noticeable differences between the predictions prior to 24 hours. Depending on the application, the dose rates based on the RADTRAD 60 isotope set may need to be increased to avoid non conservative predictions. These corrections are more important for post-accident times up to about 8 hours. The results also show that the amount of adjustment required is greater with increasing concrete shielding thicknesses.

Figures 1 through 5 provide adjustment factors that can be applied as a function of time and shield thickness. Observe that the sources used to obtain these adjustment factors are based on liquid and airborne activity distributions consistent with DBA-LOCA AST releases and source configurations that are representative of direct shine dose contributors to the control structure. The results of this analysis and the calculated adjustment factors are expected to be applicable to other DBA-LOCA sources with similar activity distributions and source configurations.

The results of this analysis and the calculated adjustment factors are expected to be applicable

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.

PROJECT

Calc. No. EC-RADN-1135

Date 08/19/2005

Justification Of AST 60 Isotope

Designed By T.F. Mackay

RADTRAD Source Term For Direct

Sh. No. 4

Checked By M.M.Waselus

Shine Dose Calculations

The airborne shine source in this comparison consisted of the two-zone reactor building volume. The results are expected to be applicable to other large airborne source regions such as the turbine building. Xe-135m and Xe-138 (and its Cs-138 daughter) are the significant contributors within 8 hours of a LOCA to the airborne shine dose rate of those nuclides not included in the 60 isotope RADTRAD.

The liquid source in this comparison is based on a 30 ft segment of nominal 14 inch pipe containing suppression pool water. The results given in Table 15 show that the adjustment factor increases significantly with shield thickness. Therefore, it is expected that the adjustment factors will be conservative for piping smaller than 14 inches due to less self attenuation within the pipe. The applicability of the results of this configuration to other piping configurations will need to be judged on a case by case basis. Cs138, Rb-88 and Br-84 are the significant contributors to the piping dose rate, especially within 8 hours of a LOCA, of those nuclides not included in the 60 isotope RADTRAD set.

Finally, this work has shown that the addition of Br-84, Cs-138 and Rb-88 to the RADTRAD 60 isotope set can give nearly the same dose rates from suppression pool sources as a much larger set of AST core sources. Similarly, addition of Xe-135m, and Xe-138 and its daughter Cs-138 to the RADTRAD set gives a good representation of reactor building shine dose rates. With judicious selection, inclusion of the isotopes is a practical approach to eliminating the need to perform multiple RADTRAD analyses using different isotope data files.

RADTRAD V3.03 has a limit of 63 isotopes. Hence, only three isotopes may be added to the original 60 isotope set. This may not be too limiting since multiple RADTRAD runs are often performed as part of the DBA-LOCA analysis in order to model the various source regions and leakage pathways.

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.

Date 08/19/2005

Designed By T.F. Mackay

Checked By M.M.Waselus

PROJECT

Justification Of AST 60 Isotope

RADTRAD Source Term For Direct

Shine Dose Calculations

Calc. No. **EC-RADN-1135**

Sh. No. **5**

3.0 ASSUMPTION AND DATA

The following assumptions and input data are used to evaluate the total DBA-LOCA control room doses:

- 3.1 All DBA-LOCA doses and source term comparisons in this calculation are based on a reactor core thermal power of 4032 MWt.
- 3.2 All DBA-LOCA doses in this calculation are based on full implementation of Alternate Source Terms as defined in USNRC Regulatory Guide 1.183 (Reference 6.1).
- 3.3 Reactor core activity inventories are evaluated in EC-FUEL-1615 (Reference 6.2).
- 3.4 The DBA-LOCA control room and offsite doses from the effluent radioactive plume are evaluated in EC-RADN-1125 (Reference 6.3). The DBA-LOCA activity source terms used in calculation EC-RADN-1125 are based on 60 dose significant isotopes identified in Reference 6.4, Table 1.4.3.2-3, for use in the RADTRAD computer code. From Reference 6.3 and 6.4, the 60 dose significant isotopes are as follows:

RADTRAD DBA-LOCA Activity Source Term 60 Dose Significant Isotopes			
Co-58	Zr-95	Te-131m	La-141
Co-60	Zr-97	Te-132	La-142
Kr-85	Nb-95	I-131	Ce-141
Kr-85m	Mo-99	I-132	Ce-143
Kr-87	Tc-99m	I-133	Ce-144
Kr-88	Ru-103	I-134	Pr-143
Rb-86	Ru-105	I-135	Nd-147
Sr-89	Ru-106	Xe-133	Np-239
Sr-90	Rh-105	Xe-135	Pu-238
Sr-91	Sb-127	Cs-134	Pu-239
Sr-92	Sb-129	Cs-136	Pu-240
Y-90	Te-27	Cs-137	Pu-241
Y-91	Te-127m	Ba-139	Am-241
Y-92	Te-129	Ba-140	Cm-242
Y-93	Te-129m	La-140	Cm-244

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.
 Date 08/19/2005
 Designed By T.F. Mackay
 Checked By M.M.Waselus

PROJECT
 Justification Of AST 60 Isotope
 RADTRAD Source Term For Direct
 Shine Dose Calculations

Calc. No. EC-RADN-1135

Sh. No. 6

3.5 From Regulatory Guide 1.183, Table 1, the BWR core inventory release fractions for DBA - LOCA analysis are as follows:

**Table 1 (RG 1.183)
 BWR Core Inventory Fraction
 Released Into Containment**

Group	Gap Release Phase	Early In-vessel Phase	Total
Noble Gases	0.05	0.95	1.0
Halogens	0.05	0.25	0.3
Alkali Metals	0.05	0.20	0.25
Tellurium Metals	0.00	0.05	0.05
Ba, Sr	0.00	0.02	0.02
Noble Metals	0.00	0.0025	0.0025
Cerium Group	0.00	0.0005	0.0005
Lanthanides	0.00	0.0002	0.0002

From Regulatory Guide 1.183, Table 5, the radionuclide groups that should be considered for design basis LOCA analysis are as follows:

**Table 5 (RG 1.183)
 Radionuclide Composition**

Group	Elements
Noble Gases	Xe, Kr
Halogens	I, Br
Alkali Metals	Cs, Rb
Tellurium Group	Te, Sb, Se, Ba, Sr
Noble Metals	Ru, Rh, Pd, Mo, Tc, Co
Lanthanides	La, Zr, Nd, Eu, Nb, Pm, Pr
	Sm, Y, Cm, Am
Cerium	Ce, Pu, Np

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.

PROJECT

Calc. No. EC-RADN-1135

Date 08/19/2005

Justification Of AST 60 Isotope

Designed By T.F. Mackay

RADTRAD Source Term For Direct

Sh. No. 7

Checked By M.M.Waselus

Shine Dose Calculations

- 3.6 The MICROSIELD Version 5.01 computer code is used to evaluate direct radiation dose rates. (Reference 6.5)
- 3.7 The total average photon energy per disintegration (kev/dis) for individual radionuclides is obtained from "Table of Radioactive Isotopes". (Reference 6.6)
- 3.8 Since the RADTRAD computer code and the EC-RADN-1125 dose analysis use 60 isotopes, the DBA-LOCA AST source term used in this comparative evaluation will be based on a representative AST LOCA source term obtained by multiplying the reactor core activity inventory by the Regulatory Guide 1.183 activity group release fractions.
- 3.9 Floor plans and dimensions for the control room located on elevation 729'-1" of the control structure and reactor building elevation 719'-1" are shown in the Reference 6.7 drawings.
- 3.10 Post-LOCA system contained radiation sources (e.g., piping, components) are identified in calculation EC-076-1003 (Reference 6.8).
- 3.11 Piping data is given in the M-199 piping specification sheets (Reference 6.9).

4.0 METHODOLOGY

The activity source terms used in this evaluation are based on Regulatory Guide 1.183 Alternative Source Term (AST) Methodology. AST source terms for the DBA-LOCA are evaluated in calculation EC-RADN-1125 and are based on 60 dose significant isotopes identified in Reference 6.4 for use in the RADTRAD computer code. The 60 radionuclides that are contained in the RADTRAD code were selected based upon a study that determined that those 60 radionuclides have the greatest impact on offsite dose. In order to use this same source term for direct shine dose calculations, an analysis is needed to justify that these same 60 isotopes have the greatest dose impact for direct doses and are appropriate for use in shielding calculations for the direct shine doses from external sources to the control room. This analysis will be performed by comparing the total activity, total energy release rate and source average energy, and calculated dose rates for liquid and airborne sources for the 60 isotope RADTRAD source term and the total AST isotopic source term. In addition, since the MICROSIELD computer code does not contain all of the isotopes identified for the AST source term, dose significant isotopic libraries used by the MICROSIELD computer code are also included in this evaluation.

A total of 428 radionuclides are given in EC-FUEL-1615 for those elements identified in RG 1.183, Table 5 as being released for the DBA-LOCA. Core activities for these isotopes are

A total of 428 radionuclides are given in EC-FUEL-1615 for those elements identified in RG

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.

PROJECT

Calc. No. EC-RADN-1135

Date 08/19/2005

Justification Of AST 60 Isotope

Designed By T.F. Mackay

RADTRAD Source Term For Direct

Sh. No. 8

Checked By M.M.Waselus

Shine Dose Calculations

shown in Table 1 as a function of time after discharge. Since the RG 1.183 activity releases from the fuel occur over a 1.5 hour period for a LOCA, the dose contribution from those isotopes with short half-lives can be neglected. From Table 1, the total core activity for all isotopes at 1 hour post-accident is 9.429E+09 Curies. Assuming that the dose contribution from those isotopes in the core that have decayed to less than 100 Curies at 1 hour is negligible with respect to the total dose, reduces the AST core activity source term to the 183 dose significant isotopes given in Table 2 with a total core activity of 9.421E+09 Curies. This assumption is reasonable since reducing the number of isotopes from 428 to 183 only reduces the total core activity by $(9.429E+09 - 9.421E+09) \times 100\% / 9.429E+09 = 0.085\%$. This assumption is even more applicable when considering long term integrated doses such as 30 day control room doses.

Table 3 converts core activity to an AST representative activity LOCA activity release distribution for the 183 dose significant isotopes by multiplying the Table 2 core activities by the RG 1.183 LOCA activity group release fractions from RG 1.183, Table 1. Table 3 also shows the 60 significant isotopes included in RADTRAD. The Table 3 activity release distribution serves as the base source term for comparative analyses using the 60 RADTRAD isotope source term vs. all 183 dose significant isotopes for AST.

In order to justify use of the 60 RADTRAD isotopes for direct shine doses from external sources, the following four source terms are evaluated:

1. Source term based on all 183 AST dose significant isotopes. (Obtained from Table 3)
2. Source term based on those isotopes of the 183 AST dose significant which can be input into the MICROSIELD radiation shielding analysis computer code using the default built-in GROVE isotopic library. (Obtained from Reference 6.4)
3. Source term based on those isotopes of the 183 AST dose significant which can be input into the MICROSIELD radiation shielding analysis computer code using the optional built-in ICRP38 isotopic library. (Obtained from Reference 6.4)
4. Source term based on RADTRAD 60 dose significant isotopes. (Obtained from Section 3.4)

The isotopic mix for each of the above four source terms is given in Table 3.

For each of the activity source terms identified above, total activity, the total source gamma energy release rate (Mev/sec) and the source average gamma energy (Mev/dis) will be compared to determine if the 60 RADTRAD dose significant isotopes are appropriate for use in calculating direct shine doses from external sources to the control room.

The total source gamma energy release rate for an isotopic mix is calculated as follows:

The total source gamma energy release rate for an isotopic mix is calculated as follows:

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.

PROJECT

Calc. No. EC-RADN-1135

Date 08/19/2005

Justification Of AST 60 Isotope

Designed By T.F. Mackay

RADTRAD Source Term For Direct

Sh. No. 9

Checked By M.M.Waselus

Shine Dose Calculations

$$Total\ Energy = \sum E'_{Avg} \times A' \times CF \quad Eq. (1)$$

where:

Total Energy = total energy release rate for isotopic mix (Mev/sec)

E'_{Avg} = total average photon energy per disintegration for isotope i (Mev/dis)

A' = activity of i in isotopic mix (Curies)

CF = conversion factor = $3.7E+10$ dis/sec/Curie

The source average energy for an isotopic mix is calculated as follows:

$$Source\ Average\ Energy = Total\ Energy / (Total\ Activity \times CF) \quad Eq. (2)$$

where:

Source Average Energy = average energy of isotopic mix (Mev/dis)

Total Energy = total energy release rate for isotopic mix, as calculated above in Equation 1 (Mev/sec)

Total Activity = total activity of isotopic mix (Curies)

CF = conversion factor = $3.7E+10$ dis/sec/Curie

Using the above methodology, total core inventory, total energy release rate and average energy are evaluated for each of the four source terms. This evaluation is given in Tables 4 thru 9 for post-accident times of 0, 1 hr, 8hr, 1 day, 4 days and 30 days. A comparison of these results for each source term is given in Table 10.

A comparative dose rate analysis is also performed to determine if energy dependence with respect to gamma attenuation and buildup factors would impact direct shine dose rates with respect to using the RADTRAD 60 isotope source term for AST. The MICROSIELD computer code is used to evaluate direct shine dose rates. The MICROSIELD nuclide data libraries do not contain all of the 183 AST potentially dose-significant isotopes identified for AST. Out of the 183 AST DBA-LOCA isotopes, 27 isotopes are not available in MICROSIELD (See Table 3). Tables 11 and 12 show that with respect to activity and gamma energy release rate for the 183 isotope AST source, these 27 isotopes are not significant dose contributors and can also be neglected for the dose analysis. (It is noted that these 27 isotopes are not listed in FGR 11 or FGR 12. The isotopes appear to be considered insignificant contributors to internal or immersion doses.)

Dose rates are evaluated for both a DBA-LOCA liquid and an airborne activity source. The Table 3 activity release distribution based on reactor core activity and RG 1.183 release

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.

Date 08/19/2005

Designed By T.F. Mackay

Checked By M.M.Waselus

PROJECT

Justification Of AST 60 Isotope
RADTRAD Source Term For Direct
Shine Dose Calculations

Calc. No. EC-RADN-1135

Sh. No. 10

fractions is used. The liquid source activity concentration is based on the Table 3 AST isotopic activity distribution divided by the suppression pool free volume of 132,000 ft³. The airborne source activity concentration is based on the Table 3 AST isotopic activity distribution divided by the reactor building free volume of 2,078,000 ft³ for two-zone reactor building mixing. Since this is a comparative analysis of dose rates for groups of isotopes from the same activity distribution, this analysis is not dependent on the actual source concentration, but on the relative distribution among the isotopic activities in the source term. The suppression pool volume and reactor building volumes are used to obtain activity concentrations reasonably representative of DBA-LOCA liquid and airborne sources and are obtained from Reference 6.3. As a result, dose rates calculated using these sources are for comparative purposes only and may not represent actual DBA-LOCA doses. DBA-LOCA AST liquid and airborne sources are evaluated in Tables 13 and 14.

The DBA-LOCA airborne source selected for the AST dose rate analysis is the reactor building floor elevation 719'-0" which is the reactor building direct shine contributor to the control room. Per the Reference 6.7 drawings, the reactor building source volume for shine into the control room is from floor to ceiling between column lines 26 and 29. Dimensions of the source volume are 63 feet wide by 131 ft long. The floor slab at elevation 749'-1" has a thickness of 1'-9". Therefore, the source height is (749'-1") - (719'-1") - (1'-9") = 28'-3". The MICROSIELD model is as follows:

Reactor Building MICROSIELD Model

Length = 131 ft

Width = 63 ft

Height = 28.25 ft

Dose Receiver Location:

$X = \text{Length} + 10 \text{ ft} = 131 \text{ ft} + 10 \text{ ft} = 141 \text{ ft}$

$Y = \text{Height} / 2 = 28.25 \text{ ft} / 2 = 14.125 \text{ ft}$

$Z = \text{Width} / 2 = 63 \text{ ft} / 2 = 31.5 \text{ ft}$

Activity Source: Table 14

Source Material: air

Shield: Unshielded; 0.5 ft, 1 ft, 2 ft & 3 ft concrete

Buildup: Source or shield material

The DBA-LOCA liquid source selected for the AST dose rate analysis is a 14 inch-core spray line. Per Reference 6.8, page 385, 14" GBB-101 is identified as a post-LOCA source in the reactor building and is a vertical length of pipe located adjacent to the 3 ft thick concrete wall between the control structure and the reactor building. From the piping specification sheets given in M-199 (Reference 6.9) 14 inch GBB is a nominal pipe with 0.375 wall thickness. Therefore, pipe outside diameter = 14 inches. A pipe length of 30 ft is selected since this pipe

given in M-199 (Reference 6.9) 14 inch GBB is a nominal pipe with 0.375 wall thickness. Therefore, pipe outside diameter = 14 inches. A pipe length of 30 ft is selected since this pipe

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.	PROJECT	Calc. No. EC-RADN-1135
Date 08/19/2005	Justification Of AST 60 Isotope	
Designed By T.F. Mackay	RADTRAD Source Term For Direct	Sh. No. 11
Checked By M.M.Waselus	Shine Dose Calculations	

runs from floor to ceiling between elevation 719'-1" and 749'-1" which is adjacent to the control room. The MICROSIELD model is as follows:

14" GBB-101 Core Spray Line

- Height = 30 ft = 390 inches
- Radius = (14 inches / 2) - 0.375 inches = 6.625 inches
- Wall Clad = 0.375 inches
- Dose Receiver Location:
 - X = 5 ft = 60 inches
 - Y = Height / 2 = 15 ft / 2 = 7.5 ft = 90 inches
 - Z = 0
- Activity Source: Table 13
- Source Material: water
- Shield: Unshielded; 0.5 ft, 1 ft, 2 ft & 3 ft concrete
- Buildup: Source or shield material

The MICROSIELD Version 5.01 computer code outputs for the DBA-LOCA AST liquid and airborne sources are given in Attachments 1 and 2, respectively. The default GROVE radionuclide library is used for this dose evaluation. For the 183 isotope AST source, isotopes not contained in the GROVE library are evaluated with a separate MICROSIELD run using the IRP38 radionuclide library and the results combined with the GROVE analysis to get the total dose. For the RADTRAD source, all of the isotopes are contained in the default GROVE library and a separate ICRP38 run is not required. Dose rate results are summarized in Table 15. Dose rate results are also plotted as a function time post-accident and radiation shield thickness and are given in Figures 1 through 5.

Of the isotopes not included in the RADTRAD 60 isotope set, inspection of Tables 5, 6, and 7 shows that Br-84, Cs-138 and Rb-88 have significant energy releases (MeV/sec). Similarly, the contributions from Xe-138 and Xe-135m are potentially significant noble gas isotopes not included in the RADTRAD set.

Table 16 examines the dose rate at 1, 8 and 24 hours for two representative shine configurations from Table 15 with the addition of the above identified isotopes. Table 16 shows that the addition of Br-84, Cs-138 and Rb-88 to the RADTRAD set will essentially duplicate dose rates from the 183 AST nuclide set for DBA-LOCA suppression pool sources. Similarly, addition of Xe-135m, and Xe-138 and its daughter Cs-138 to the RADTRAD set gives a good representation of DBA-LOCA airborne shine dose rates. This may permit the use of the basic RADTRAD isotope set with a few added isotopes to obtain shine dose rates well within in the accuracy of the analytical methods.

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.

Date 08/19/2005

Designed By T.F. Mackay

Checked By M.M.Waselus

PROJECT

Justification Of AST 60 Isotope
 RADTRAD Source Term For Direct
 Shine Dose Calculations

Calc. No. EC-RADN-1135

Sh. No. 12

5.0 RESULTS

A summary of total core inventory, total energy release rate and average source energy for the 183 AST isotopic source including the MICROSHIELD radionuclide isotopic libraries mixes and the 60 isotope RADTRAD source is given in Table 10. Results are summarized as follows:

COMPARISON OF AST SOURCE TERM PARAMETERS FOR 183 ISOTOPE AND 60 ISOTOPE RADTRAD AST SOURCES			
	Ratio Of Isotopic Source Parameters 183 Isotopes / 60 RADTRAD Isotopes		
Time Post-Accident (hrs)	Source Total Curie Activity	Source Total Mev/dis Energy Release Rate	Source Average Energy
1 hr	1.172	1.185	1.010
8 hrs	1.062	1.040	0.979
1 day	1.031	1.017	0.986
4 days	1.026	1.011	0.985
30 days	1.071	1.042	0.974

The above comparison of source term parameters indicates that use of the 60 isotope RADTRAD source term could underestimate direct shine doses by a factor of 1.07 to 1.18, depending on the time post-accident. These differences are significant and indicate that an actual comparison of dose rates is warranted and that any restrictions for use with the 60 RADTRAD source for direct shine dose calculations should be identified. Use of the 60 RADTRAD source direct shine doses may also require the use of dose correction factors, especially for short time periods following a LOCA.

The results of the dose rate comparison for AST DBA-LOCA liquid and airborne sources for the 183 AST isotopic source and the 60 isotope RADTRAD source are given in Table 15. Results are summarized as follows:

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.

PROJECT

Calc. No. EC-RADN-1135

Date 08/19/2005

Justification Of AST 60 Isotope

Designed By T.F. Mackay

RADTRAD Source Term For Direct

Sh. No. 13

Checked By M.M.Waselus

Shine Dose Calculations

AST LIQUID SOURCES --- COMPARISON OF DIRECT SHINE DOSE RESULTS FOR 183 ISOTOPE AND 60 ISOTOPE RADTRAD AST SOURCES

Time Post-Accident (hrs)	Ratio Of Dose Rates						
	183 Isotopes / 60 RADTRAD Isotopes						
	Unshielded	6 In Concrete	1 Ft Concrete	1.5 Ft Concrete	2 Ft Concrete	2.5 Ft Concrete	3 Ft Concrete
1	1.201	1.278	1.387	1.531	1.716	1.964	2.303
2	1.12	1.16	1.2	1.26	1.41	1.51	1.69
4	1.06	1.08	1.09	1.10	1.2	1.26	1.32
8	1.017	1.023	1.033	1.048	1.069	1.096	1.113
16	1.01	1.01	1.01	1.01	1.02	1.03	1.05
24	1.006	1.006	1.006	1.006	1.007	1.008	1.009

AST AIRBORNE SOURCES --- COMPARISON OF DIRECT SHINE DOSE RESULTS FOR 183 ISOTOPE AND 60 ISOTOPE RADTRAD AST SOURCES

Time Post-Accident (hrs)	Ratio Of Dose Rates						
	183 Isotopes / 60 RADTRAD Isotopes						
	Unshielded	6 In Concrete	1 Ft Concrete	1.5 Ft Concrete	2 Ft Concrete	2.5 Ft Concrete	3 Ft Concrete
1	1.185	1.207	1.237	1.271	1.302	1.332	1.364
2	1.13	1.13	1.15	1.16	1.17	1.17	1.25
4	1.07	1.07	1.10	1.11	1.09	1.1	1.15
8	1.040	1.037	1.033	1.034	1.041	1.052	1.065
16	1.02	1.01	1.01	1.01	1.01	1.01	1.02
24	1.016	1.012	1.010	1.008	1.007	1.007	1.008

Note: Values for post-accident time periods 1, 8 and 24 hours obtained from Table 15. Values for post-accident time periods of 2, 4 and 16 hours obtained from Figures 1 through 5.

The dose rate comparison shows that at time = 1 hour post-accident, depending on the source term and radiation shield thickness, using the RADTRAD 60 isotopes would result in direct shine dose rates that are approximately a factor of 1.18 to 2.3 lower than would result using the 183 isotope AST source term. At 8 hours post-accident, this factor would reduce to 1.02 to 1.13. At 24 hours post-accident the difference in dose rates would be less than 1.6%. These results are also supported by the source energy release and activity comparisons.

Use of the RADTRAD 60 isotope model for analyses using DBA-LOCA direct shine dose rates for post-accident time periods less than 24 hours post-accident require correction factors to account for the isotopes not considered. This is applicable to analyses such as vital area access and 30 day control room integrated doses. These correction factors should not only be

for post-accident time periods less than 24 hours post-accident require correction factors to account for the isotopes not considered. This is applicable to analyses such as vital area

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.
 Date 08/19/2005
 Designed By T.F. Mackay
 Checked By M.M.Waselus

PROJECT
 Justification Of AST 60 Isotope
 RADTRAD Source Term For Direct
 Shine Dose Calculations

Calc. No. EC-RADN-1135
 Sh. No. 14

based on time post-accident, but also on source material and thickness of radiation shielding material. The above Table and Figures 1 through 5 summarize correction factors based on Table 15 in a convenient form.

Finally, it should be possible to use results directly from RADTRAD runs for shine calculations if certain additional isotopes are added to the basic RADTRAD 60 isotope set. The addition of Br-84, Cs-138 and Rb-88 will essentially duplicate dose rates from the 183 AST nuclide set for suppression pool sources. Similarly, addition of Xe-135m, and Xe-138 and its daughter Cs-138 to the RADTRAD set gives a good representation of reactor building shine dose rates. Table 16 provides comparisons of dose rates with and without the above isotopes.

An evaluation of the dose adjustment factors for the suppression pool liquid source was also performed for 8 ft of concrete shielding. It is anticipated that the DBA-LOCA analysis of radiation shine inside the control structure from radioactive material in systems and components will require that doses be evaluated for large shield thicknesses to demonstrate that the direct shine dose contribution for such large concrete shield thicknesses would be negligible. The dose adjustment factors for 8 ft of concrete are as follows:

AST LIQUID SOURCES - COMPARISON OF DIRECT SHINE DOSE RESULTS FOR 183 ISOTOPE AND 60 ISOTOPE RADTRAD AST SOURCES	
Time Post-Accident (hrs)	Ratio Of Dose Rates 183 Isotopes / 60 RADTRAD Isotopes 8 Ft. Concrete Shielding
1	48.351
2	29
4	17.5
8	9.49
16	4
24	1.408
Note: Values for post-accident time periods 1, 8 and 24 hours obtained from Table 15. Values for post-accident time periods of 2, 4 and 16 hours obtained from Figures 1 through 5	

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.

Date 08/19/2005

Designed By T.F. Mackay

Checked By M.M.Waselus

PROJECT

Justification Of AST 60 Isotope

RADTRAD Source Term For Direct

Shine Dose Calculations

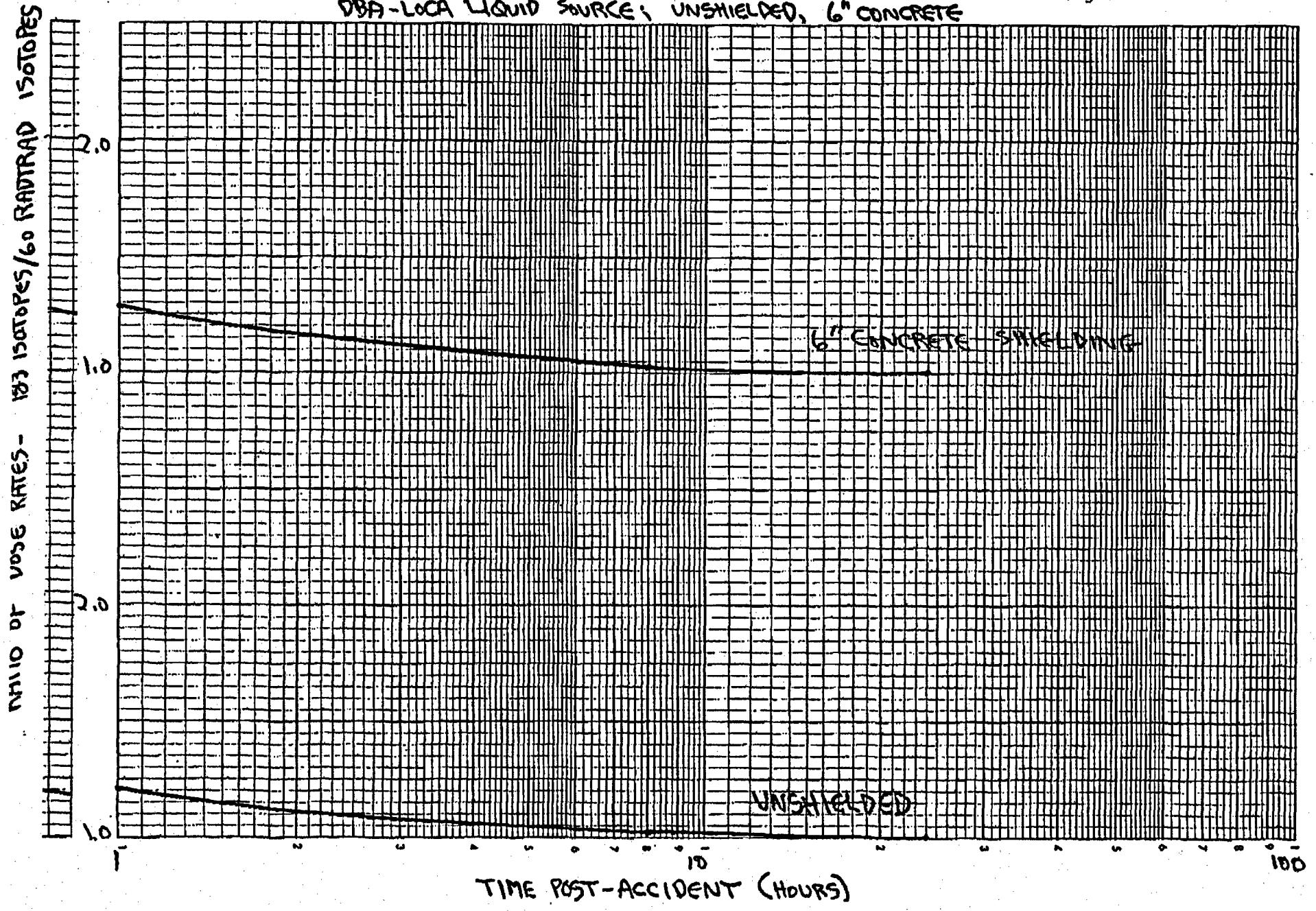
Calc. No. EC-RADN-1135

Sh. No. 15

6.0 REFERENCES

- 6.1. USNRC Regulatory Guide 1.183, "Alternate Radiological Source Terms For Evaluating Design Basis Accidents At Nuclear Power Reactors", July 2000.
- 6.2. SSES Calculation EC-FUEL-1615, "AREVA Alternate Source Term (AST) Fission Product Inventory For ATRIUM-10 Fuel", Revision 1
- 6.3. SSES Calculation EC-RADN-1125, "CRHE And Offsite DBA-LOCA Doses - Alternate Source Term", Revision 0, 8/23/2005.
- 6.4. NUREG/CR-6604, RADTRAD: A Simplified Model For RADionuclide Transport And Removal And Dose Estimation", and Supplement 1, 6/8/99.
- 6.5. SQAP-MICROSHIELD5-001-97079, "Software Quality Assurance Plan (SQAP) for MICROSHIELD Version 5.01", Revision 0, Code Version # 001-97079.
- 6.6. "Table Of Radioactive Isotopes", Edgardo Browne and Richard B. Firestone, Lawrence Berkeley Laboratory, 1986.
- 6.7. SSES Design Drawings:
 - a. E106308, General Arrangement Plan Of Operating Floor El. 729'-0" and 719'-0", Revision 4 (AE Drawing M-203)
 - b. E105005, Sheet 1, General Cross Section 'A', South Of Col. Line 29, Looking North, Revision 9 (AE Drawing No. A-18).
 - c. E105238, Reactor Building Unit 1 Floor Plan Elevation 749'-1" Area 27, Revision 6 (AE Drawing C-200).
- 6.8. SSES Calculation EC-076-1003, Post-LOCA Containment Radiation Sources HPCI, RCIC, RHR, Core Spray, Main Steam Drains, Process Radiation Monitoring, Revision 2.
- 6.9. SSES Drawing No. A106304, (AE Dwg No. M-199), Revision 66.

FIGURE 1. RATIO OF DOSE RATES VS. TIME POST-ACCIDENT
DBA-LOCA LIQUID SOURCE; UNSHIELDED, 6" CONCRETE



FIG

FIGURE 2. RATIO OF DOSE RATES VS TIME POST-ACCIDENT
DBA-LOCA LIQUID SOURCE, 1 FT & 1.5 FT CONCRETE

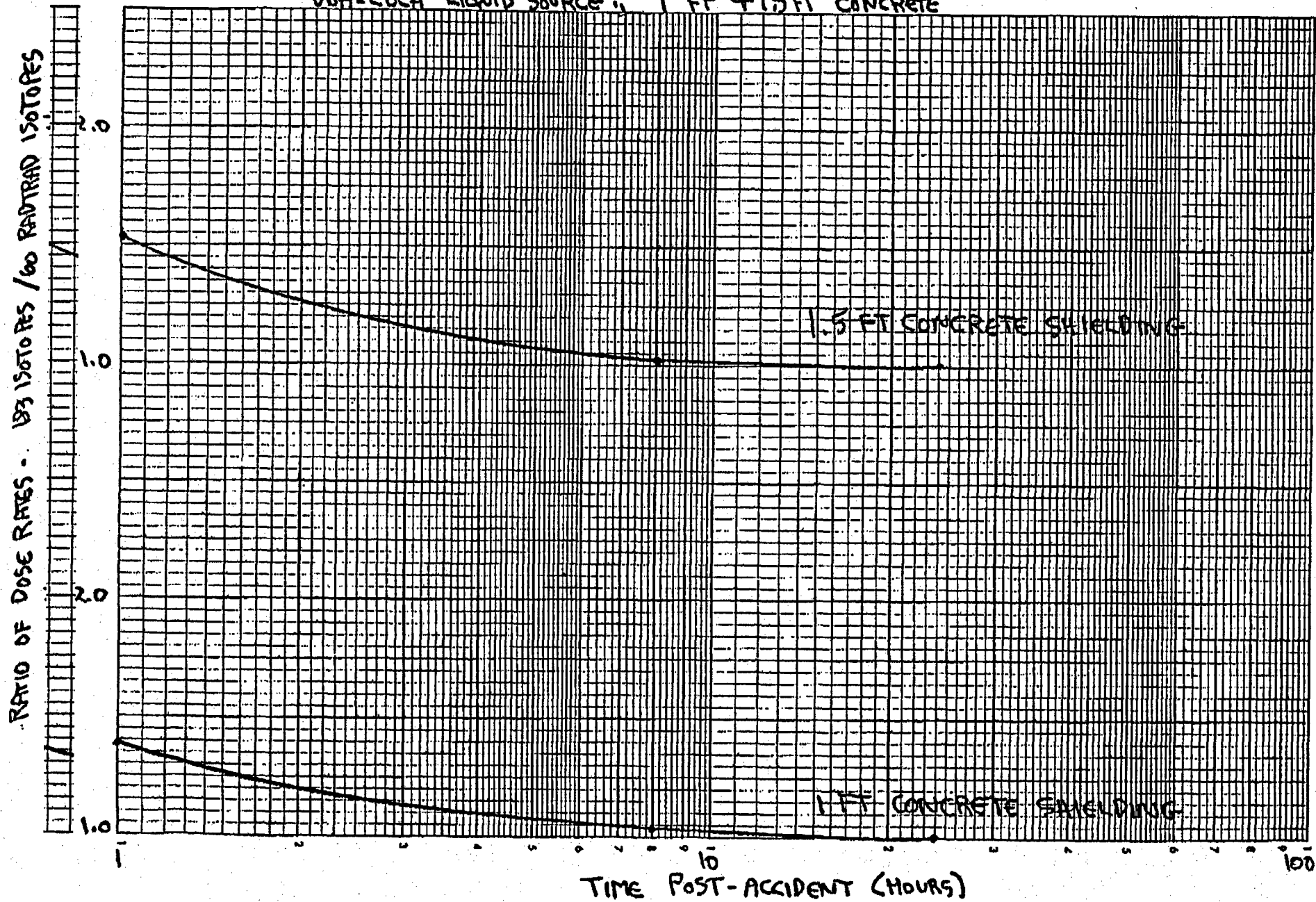


FIGURE 3. RATIO OF DOSE RATES VS. TIME POST-ACCIDENT
DBA-LOCA LIQUID SOURCE; 2 FT + 2.5 FT CONCRETE

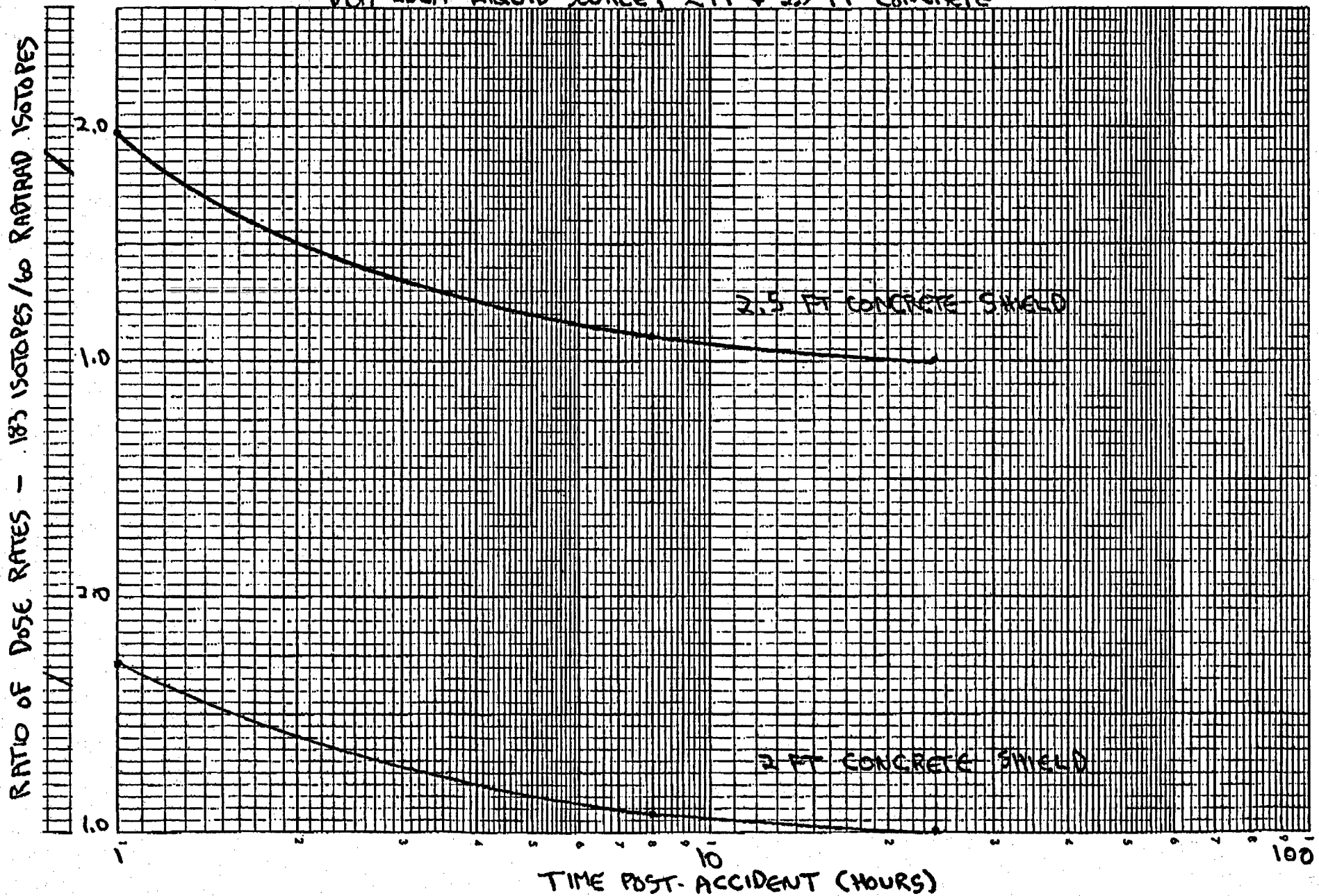
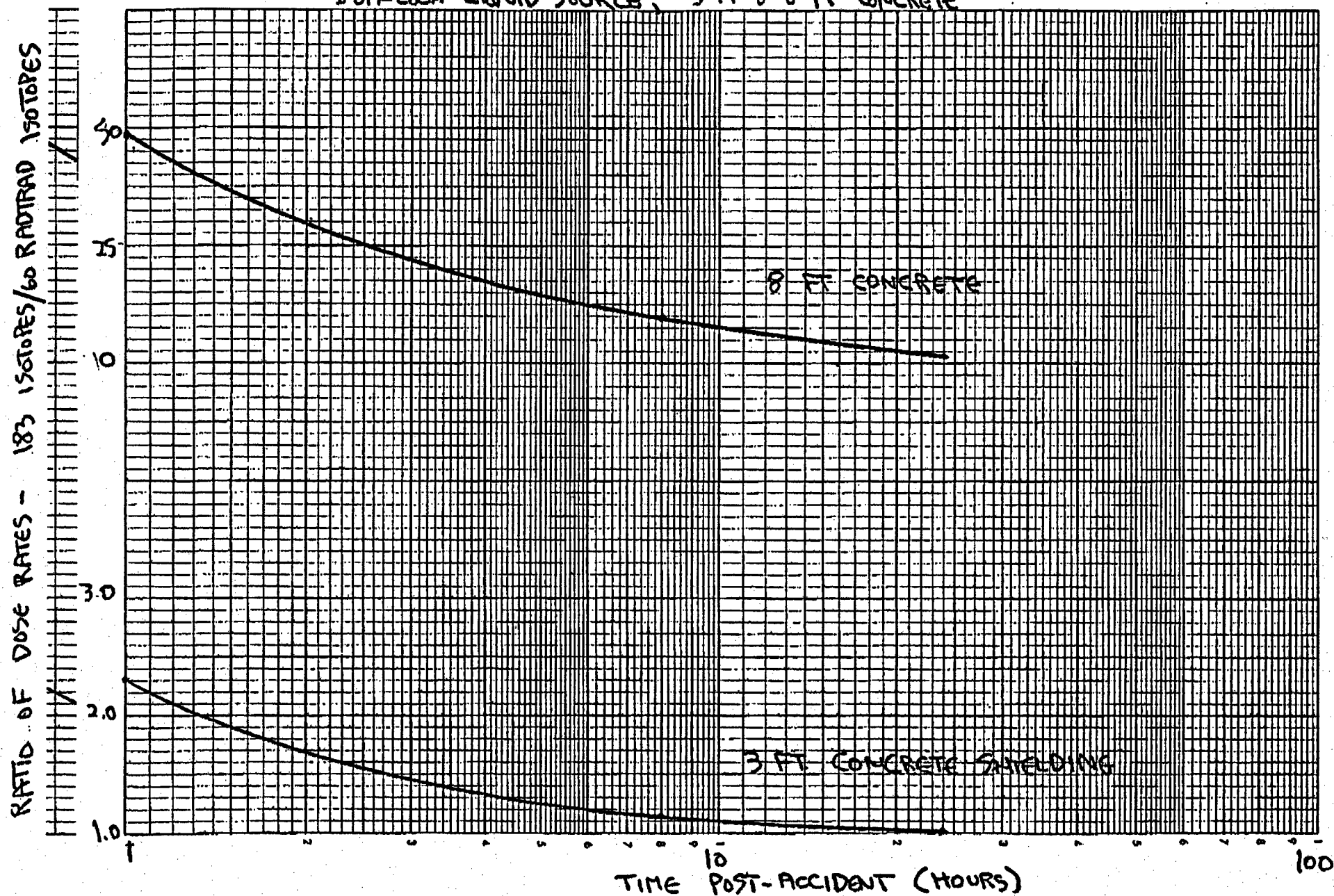


FIGURE 4. RATIO OF DOSE RATES VS. TIME POST-ACCIDENT

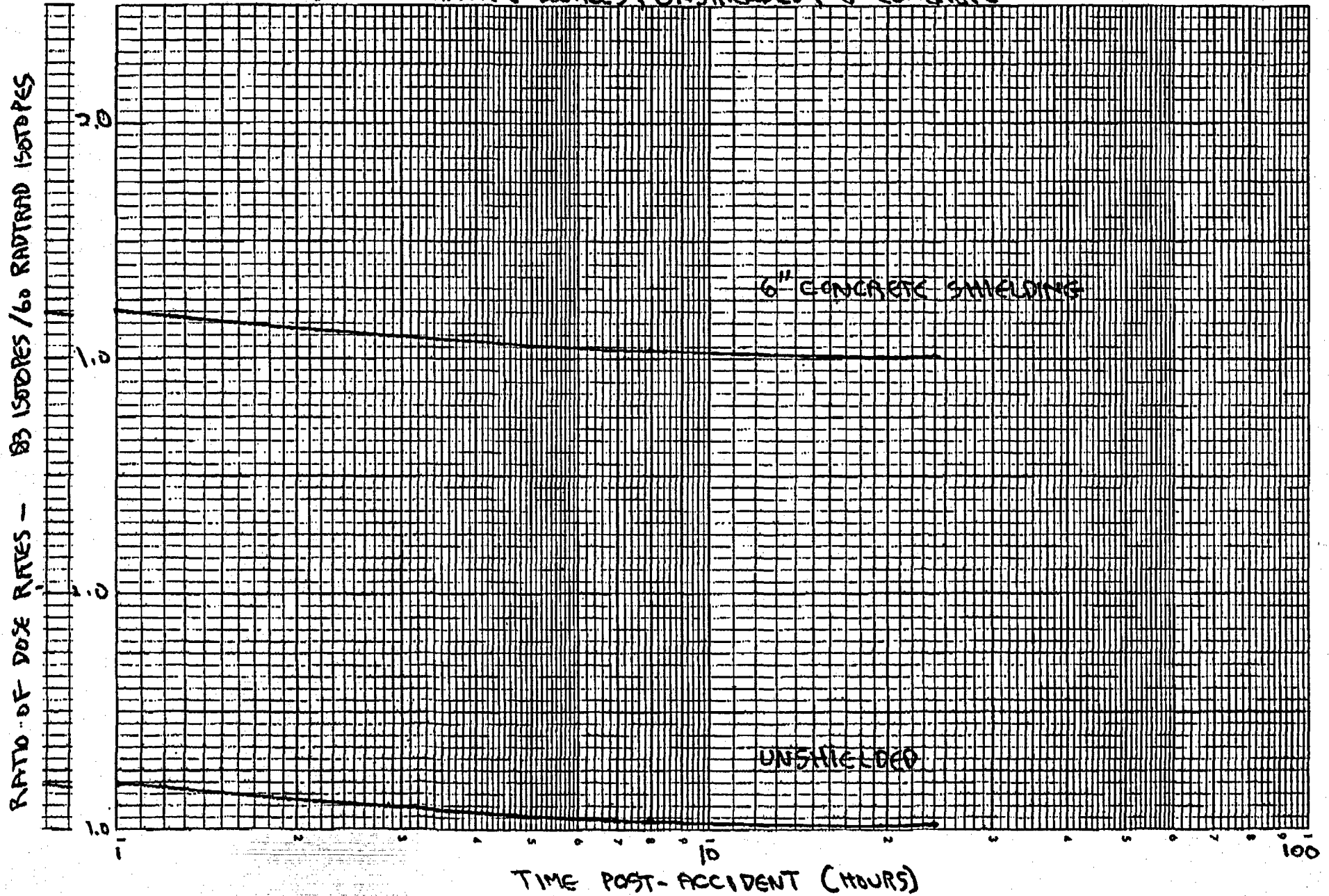
EC-RADN-1135

Page 19

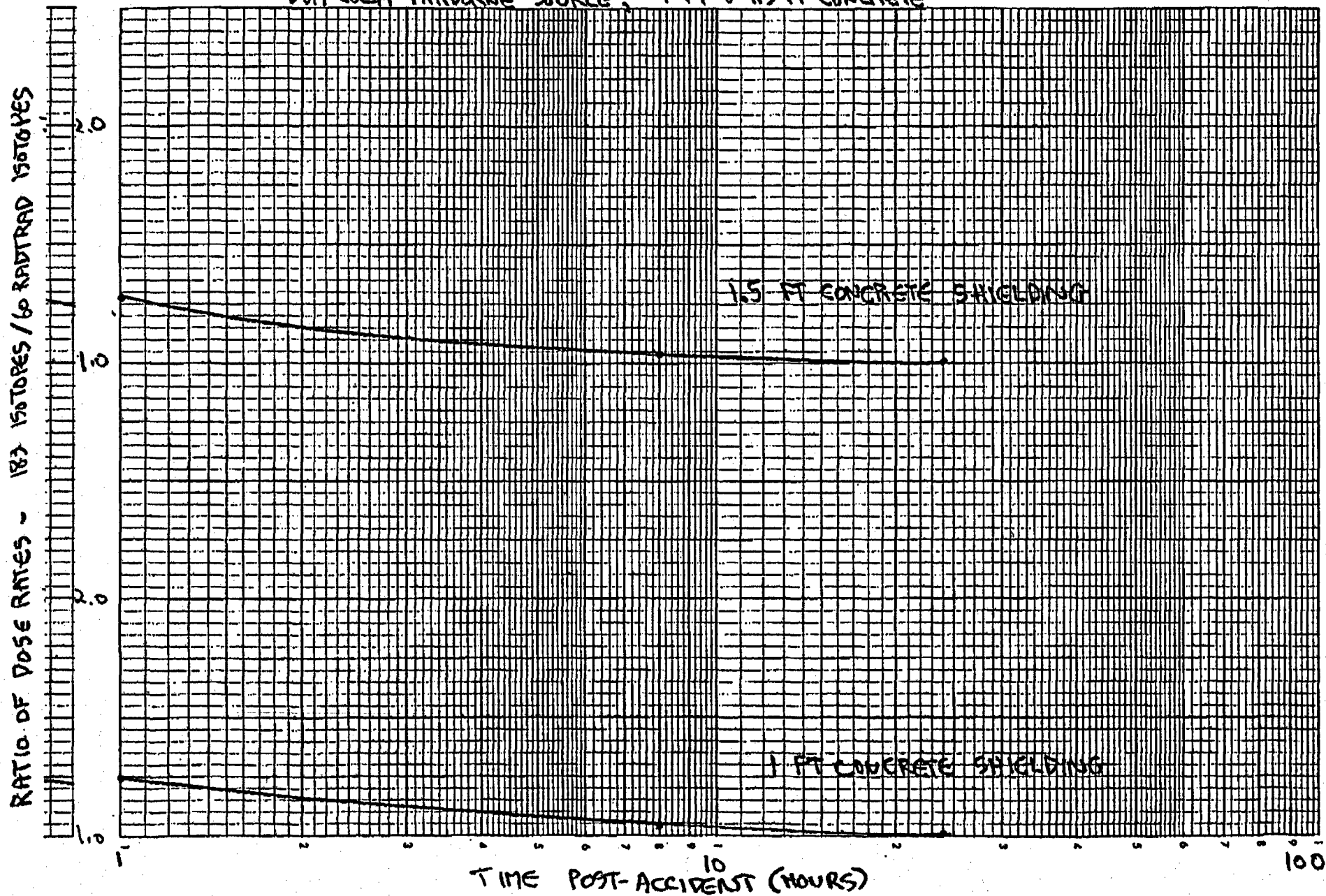
DBA-LOCA LIQUID SOURCE; 3 FT & 8 FT CONCRETE



301 FIGURE 5. RATIO OF DOSE RATE VS TIME POST-ACCIDENT
PBA-LOCA AIRBORNE SOURCES: UNSHIELDED, 6" CONCRETE



6. FIGURE 6. RATIO OF DOSE RATES VS. TIME POST-ACCIDENT
DBA-LOCA AIRBORNE SOURCE; 1 FT & 1.5 FT CONCRETE



IGA FIGURE 7. RATIO OF DOSE RATES VS TIME POST-ACCIDENT
DPA-LOCA AIRBORNE SOURCE ; 2 FT + 2.5 FT CONCRETE

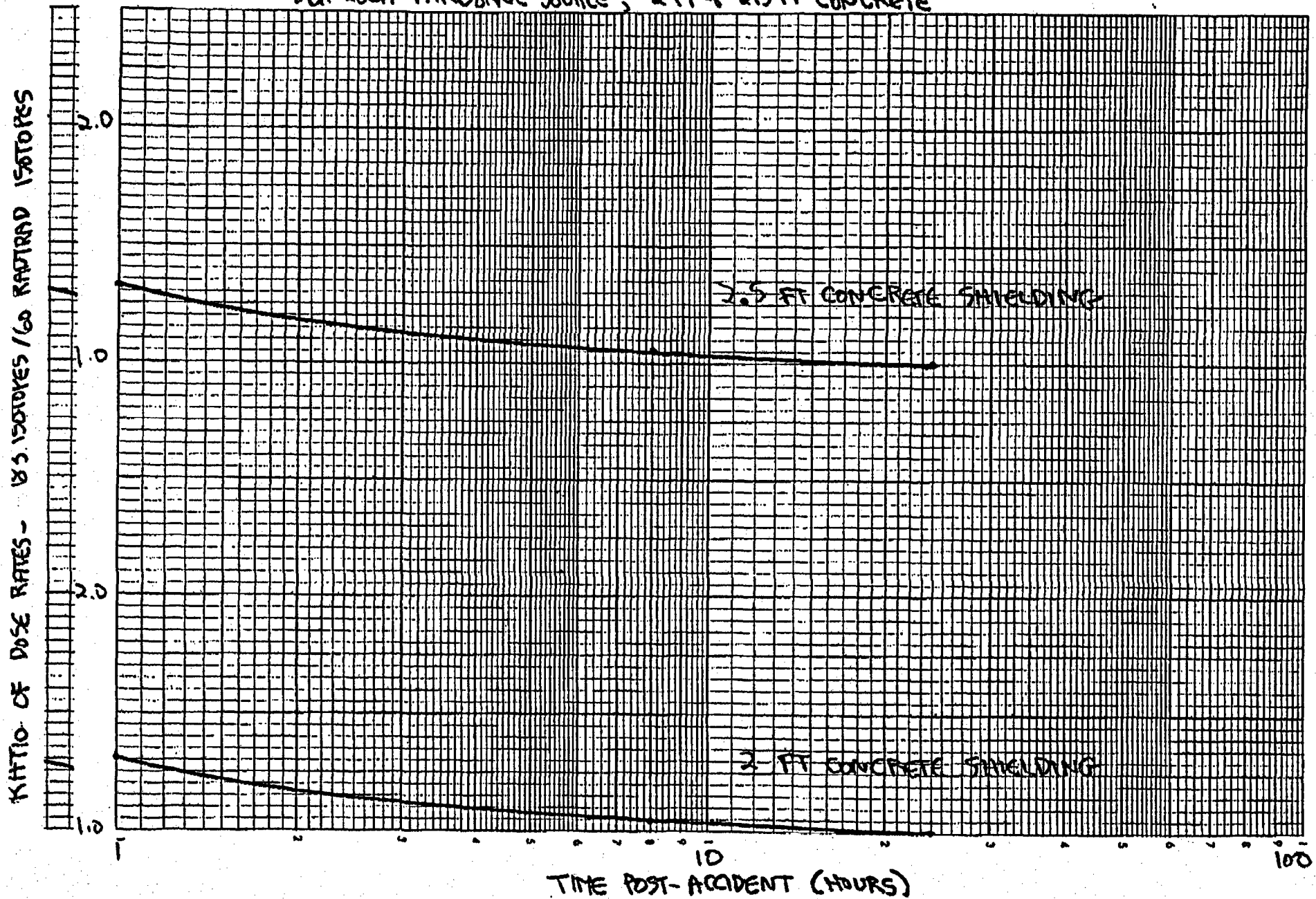


FIGURE 3. RATIO OF DOSE RATES VS. TIME POST-ACCIDENT
DPA-LOCA AIRBORNE SOURCE: UNSHIELDED TO 3F CONCRETE

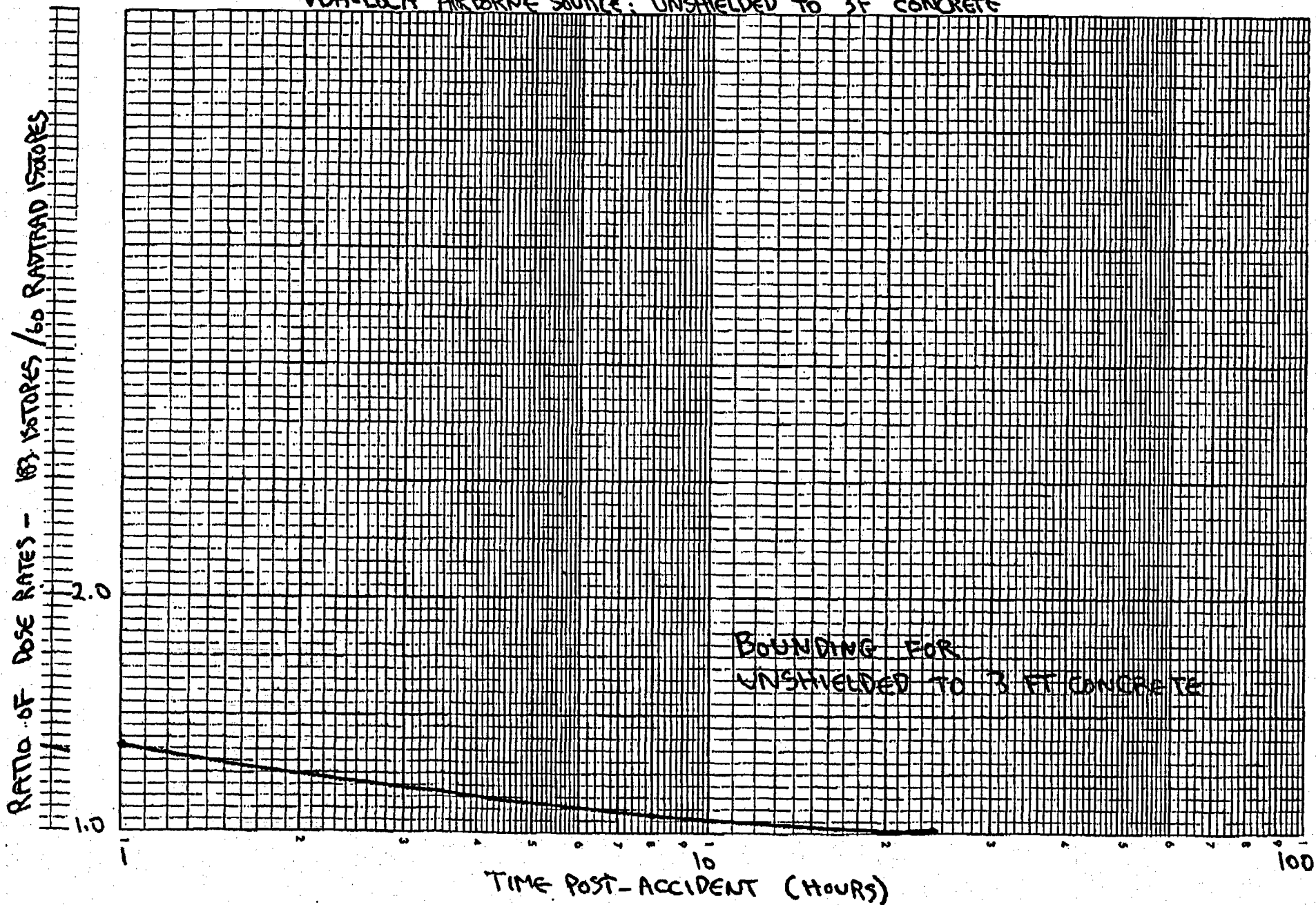


Table 1. Reactor Core Activity For DBA-LOCA Radionuclides Released Per Regulatory Guide 1.183, Table A5;
All Isotopes Given in Core Inventory Analysis

Reactor Core Inventory (Curies)		Time Post-Accident												
No.	Nuclide	0.0 d	1 sec	30 min	1 hr	8 hr	1.0 d	4.0 d	30.0 d	90.0 d	180.0 d	1 yr	3 yr	
1	Am-241	2.536E+04	2.536E+04	2.536E+04	2.536E+04	2.544E+04	2.552E+04	2.575E+04	2.789E+04	3.285E+04	4.019E+04	5.508E+04	1.108E+05	
2	Am-242	1.138E+07	1.138E+07	1.115E+07	1.093E+07	8.098E+06	4.042E+06	1.811E+05	1.650E+03	1.643E+03	1.643E+03	1.643E+03	1.620E+03	
3	Am-242m	1.658E+03	1.658E+03	1.658E+03	1.658E+03	1.658E+03	1.658E+03	1.658E+03	1.658E+03	1.650E+03	1.650E+03	1.650E+03	1.627E+03	
4	Am-243	3.125E+03	3.125E+03	3.125E+03	3.125E+03	3.125E+03	3.132E+03	3.132E+03	3.132E+03	3.132E+03	3.132E+03	3.132E+03	3.132E+03	
5	Am-244	1.383E+07	1.383E+07	1.329E+07	1.291E+07	7.948E+06	2.659E+06	1.902E+04	4.790E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
6	Ba-135m	4.187E+04	4.187E+04	4.133E+04	4.087E+04	3.453E+04	2.345E+04	4.118E+03	1.169E-03	9.168E-19	0.000E+00	0.000E+00	0.000E+00	
7	Ba-136m	8.404E+05	8.251E+05	8.175E+05	8.175E+05	8.098E+05	7.793E+05	6.682E+05	1.696E+05	7.182E+03	6.272E+01	3.629E-03	7.067E-20	
8	Ba-137m	1.650E+07	1.650E+07	1.643E+07	1.643E+07	1.643E+07	1.643E+07	1.643E+07	1.635E+07	1.835E+07	1.820E+07	1.604E+07	1.528E+07	
9	Ba-139	1.948E+08	1.948E+08	1.896E+08	1.845E+08	4.317E+06	1.658E+03	7.151E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
10	Ba-140	1.956E+08	1.956E+08	1.956E+08	1.956E+08	1.925E+08	1.857E+08	1.574E+08	3.835E+07	1.475E+08	1.108E+04	4.891E-01	2.689E-18	
11	Ba-141	1.785E+08	1.785E+08	5.781E+07	1.841E+07	2.208E+00	3.339E-16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
12	Ba-142	1.681E+08	1.681E+08	2.368E+07	3.323E+06	3.935E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
13	Ba-143	1.436E+08	1.383E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
14	Ba-144	1.115E+08	1.054E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
15	Ba-145	4.966E+07	4.248E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
16	Ba-146	2.544E+07	1.857E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
17	Ba-147	4.283E+06	1.581E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
18	Ba-148	8.328E+05	2.659E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
19	Ba-149	9.168E+04	3.377E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
20	Ba-150	8.251E+03	3.996E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
21	Br-82	3.812E+05	3.812E+05	3.782E+05	3.751E+05	3.270E+05	2.384E+05	5.806E+04	2.773E-01	1.459E-13	0.000E+00	0.000E+00	0.000E+00	
22	Br-82m	3.293E+05	3.285E+05	1.108E+04	3.721E+02	8.862E-19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
23	Br-83	1.291E+07	1.291E+07	1.177E+07	1.039E+07	1.368E+06	1.375E+04	1.284E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
24	Br-84	2.399E+07	2.399E+07	1.383E+07	7.187E+06	7.817E+02	6.219E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
25	Br-84m	6.426E+05	6.418E+05	2.009E+04	6.272E+02	5.317E-19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
26	Br-85	2.874E+07	2.666E+07	2.170E+04	1.543E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
27	Br-86	3.255E+07	3.247E+07	6.280E-03	9.168E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
28	Br-86m	6.211E+06	5.325E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
29	Br-87	4.240E+07	4.202E+07	8.251E-03	1.520E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
30	Br-88	4.087E+07	3.950E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
31	Br-89	2.834E+07	2.437E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
32	Br-90	1.543E+07	1.085E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
33	Br-91	5.035E+08	1.589E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
34	Br-92	8.557E+05	1.276E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
35	Br-93	2.598E+05	5.058E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
36	Br-94	1.230E+04	2.330E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
37	Ce-141	1.795E+08	1.795E+08	1.795E+08	1.795E+08	1.788E+08	1.755E+08	1.658E+08	9.550E-07	2.643E+07	3.881E+08	7.484E+04	1.276E-02	
38	Ce-143	1.666E+08	1.666E+08	1.658E+08	1.643E+08	1.421E+08	1.016E+08	2.239E+07	4.548E+01	3.323E-12	0.000E+00	0.000E+00	0.000E+00	
39	Ce-144	1.513E+08	1.513E+08	1.513E+08	1.513E+08	1.513E+08	1.505E+08	1.497E+08	1.406E+08	1.215E+08	9.779E+07	6.219E+07	1.054E+07	
40	Ce-145	1.131E+08	1.131E+08	1.306E+05	1.306E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
41	Ce-146	9.015E+07	9.015E+07	1.948E+07	4.187E+06	1.864E-03	7.869E-25	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
42	Ce-147	6.815E+07	6.761E+07	1.750E-02	4.294E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
43	Ce-148	4.821E+07	4.767E+07	1.024E-02	2.147E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
44	Ce-149	2.506E+07	2.216E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
45	Ce-150	1.138E+07	9.626E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
46	Ce-151	3.278E+06	1.681E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
47	Ce-152	4.255E+05	3.889E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
48	Ce-153	1.475E+05	9.168E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
49	Ce-154	1.505E+04	1.082E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
50	Cm-242	6.870E+06	6.870E+06	6.870E+06	6.870E+06	6.870E+06	6.862E+06	6.593E+06	5.906E+06	4.576E+06	3.117E+06	1.421E+06	6.471E+04	

Table 1. Reactor Core Activity For DBA-LOCA Radionuclides Released Per Regulatory Guide 1.183, Table A5;
 All Isotopes Given In Core Inventory Analysis

No.	Nuclide	Time Post-Accident												
		0.0 d	1 sec	30 min	1 hr	8 hr	1.0 d	4.0 d	30.0 d	90.0 d	180.0 d	1 yr	3 yr	
351	Tc-102m	1.772E+05	1.765E+05	1.490E+03	1.245E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
352	Tc-103	1.711E+08	1.711E+08	8.098E+00	7.840E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
353	Tc-104	1.413E+08	1.413E+08	4.798E+07	1.536E+07	1.895E+00	3.084E-16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
354	Tc-105	1.169E+08	1.169E+08	8.175E+06	5.279E+05	1.222E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
355	Tc-106	8.480E+07	8.404E+07	9.092E-08	8.022E-23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
356	Tc-107	5.829E+07	5.707E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
357	Tc-108	2.070E+07	1.841E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
358	Tc-109	6.891E+06	4.309E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
359	Tc-110	1.108E+06	4.997E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
360	Tc-111	2.109E+05	1.490E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
361	Tc-112	3.209E+04	6.593E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
362	Tc-113	6.769E+03	2.338E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
363	Te-123m	9.703E+02	9.703E+02	9.703E+02	9.703E+02	9.703E+02	9.626E+02	9.474E+02	8.175E+02	5.761E+02	3.423E+02	1.169E+02	1.704E+00	
364	Te-125m	3.026E+05	3.026E+05	3.026E+05	3.026E+05	3.026E+05	3.035E+05	3.041E+05	3.041E+05	3.041E+05	2.928E+05	2.609E+05	1.575E+05	
365	Te-127	9.321E+06	9.321E+06	9.321E+06	9.321E+06	9.244E+06	8.633E+06	5.776E+06	1.375E+06	9.082E+05	5.134E+05	1.581E+05	1.520E+03	
366	Te-127m	1.589E+06	1.589E+06	1.589E+06	1.589E+06	1.589E+06	1.589E+06	1.574E+06	1.360E+06	9.321E+05	6.249E+05	1.612E+05	1.551E+03	
367	Te-129	3.293E+07	3.293E+07	3.262E+07	3.194E+07	1.528E+07	5.096E+06	3.950E+06	2.315E+06	6.708E+05	1.047E+05	2.292E+03	6.540E-04	
368	Te-129m	6.662E+06	6.662E+06	6.662E+06	6.662E+06	6.636E+06	6.583E+06	6.185E+06	3.606E+06	1.047E+06	1.635E+05	3.576E+03	1.024E-03	
369	Te-131	9.092E+07	9.092E+07	6.983E+07	6.983E+07	4.424E+07	4.034E+08	2.789E+08	2.896E-01	1.024E-15	0.000E+00	0.000E+00	0.000E+00	
370	Te-131m	2.147E+07	2.147E+07	2.124E+07	2.109E+07	1.795E+07	1.238E+07	2.345E+06	1.284E+00	4.561E-15	0.000E+00	0.000E+00	0.000E+00	
371	Te-132	1.543E+08	1.543E+08	1.536E+08	1.528E+08	1.436E+08	1.245E+08	6.566E+07	2.605E+05	7.457E-01	3.806E-09	2.758E-28	0.000E+00	
372	Te-133	1.199E+08	1.199E+08	3.660E+07	1.459E+07	5.531E+04	1.452E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
373	Te-133m	9.856E+07	9.856E+07	6.823E+07	4.691E+07	2.445E+05	1.490E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
374	Te-134	1.948E+08	1.948E+08	1.184E+08	7.212E+07	6.815E+04	8.328E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
375	Te-135	1.082E+08	1.024E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
376	Te-136	4.699E+07	4.515E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
377	Te-137	1.566E+07	1.291E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
378	Te-138	3.812E+06	2.323E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
379	Te-139	5.868E+05	1.772E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
380	Te-140	8.404E+04	3.866E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
381	Xe-129m	5.157E+03	5.157E+03	5.149E+03	5.142E+03	5.027E+03	4.775E+03	3.774E+03	4.974E+02	4.622E+00	4.149E-03	2.208E-09	0.000E+00	
382	Xe-131m	1.467E+06	1.467E+06	1.467E+06	1.467E+06	1.467E+06	1.452E+06	1.375E+06	5.050E+05	2.002E+04	1.108E+02	2.292E-03	7.541E-22	
383	Xe-133	2.124E+08	2.124E+08	2.124E+08	2.124E+08	2.116E+08	2.056E+08	1.513E+08	4.989E+08	1.795E+03	1.222E-02	2.819E-13	0.000E+00	
384	Xe-133m	6.991E+08	6.991E+08	6.991E+08	6.983E+08	6.881E+08	6.288E+08	3.003E+08	8.480E+02	4.783E-06	2.032E-18	0.000E+00	0.000E+00	
385	Xe-134m	5.898E+06	9.932E+05	1.788E+03	6.356E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
386	Xe-135	7.029E+07	7.029E+07	7.556E+07	8.022E+07	1.008E+08	5.615E+07	4.003E+05	1.177E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
387	Xe-135m	4.630E+07	4.630E+07	3.578E+07	3.178E+07	1.482E+07	2.743E+06	1.375E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
388	Xe-137	2.017E+08	2.017E+08	9.244E+05	3.973E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
389	Xe-138	1.887E+08	1.887E+08	4.317E+07	9.856E+06	1.031E-02	3.087E-23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
390	Xe-139	1.398E+08	1.375E+08	3.132E-06	6.845E-20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
391	Xe-140	9.703E+07	9.244E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
392	Xe-141	3.713E+07	2.491E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
393	Xe-142	1.459E+07	8.251E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
394	Xe-143	2.193E+06	1.062E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
395	Xe-144	4.584E+05	2.437E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
396	Xe-145	4.589E+04	2.109E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
397	Xe-146	4.034E+03	1.177E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
398	Y-89m	1.675E+05	1.630E+05	6.425E+04	6.402E+04	6.074E+04	5.386E+04	3.247E+04	6.457E+03	2.796E+03	8.175E+02	6.425E+01	2.873E-03	
399	Y-90	1.363E+07	1.363E+07	1.363E+07	1.363E+07	1.354E+07	1.343E+07	1.321E+07	1.299E+07	1.299E+07	1.291E+07	1.268E+07	1.207E+07	
400	Y-91	1.345E+08	1.345E+08	1.345E+08	1.345E+08	1.337E+08	1.337E+08	1.291E+08	9.475E+07	4.653E+07	1.605E+07	1.780E+06	3.110E+02	

Table 1. Reactor Core Activity For DBA-LOCA Radionuclides Released Per Regulatory Guide 1.183, Table A5;

All Isotopes Given In Core Inventory Analysis

Reactor Core Inventory (Curie)		Time Post-Accident											
No.	Nuclide	0.0 d	1 sec	30 min	1 hr	8 hr	1.0 d	4.0 d	30.0 d	90.0 d	180.0 d	1 yr	3 yr
401	Y-91m	7.571E+07	7.571E+07	7.525E+07	7.403E+07	4.637E+07	1.444E+07	7.640E+04	1.413E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00
402	Y-92	1.398E+08	1.398E+08	1.391E+08	1.368E+08	6.532E+07	4.416E+08	4.042E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
403	Y-93	1.070E+08	1.070E+08	1.039E+08	1.008E+08	6.234E+07	2.076E+07	1.482E+05	3.744E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00
404	Y-94	1.696E+08	1.696E+08	5.952E+07	1.956E+07	3.392E+00	1.192E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
405	Y-95	1.765E+08	1.765E+08	2.521E+07	3.476E+08	3.163E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
406	Y-96	1.704E+08	1.597E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
407	Y-97	1.398E+08	1.184E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
408	Y-98	1.039E+08	4.301E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
409	Y-99	6.586E+07	4.210E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
410	Y-100	2.132E+07	8.404E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
411	Y-101	1.047E+07	2.636E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
412	Y-102	4.775E+06	2.208E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
413	Y-103	1.406E+08	9.703E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
414	Y-104	4.126E+04	1.854E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
415	Zr-89	5.524E+04	5.524E+04	5.501E+04	5.478E+04	5.149E+04	4.469E+04	2.368E+04	9.550E+01	2.842E-04	1.459E-12	1.742E-29	0.000E+00
416	Zr-90m	8.882E+03	3.787E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
417	Zr-93	2.972E+01	2.972E+01	2.972E+01	2.972E+01	2.972E+01	2.972E+01	2.972E+01	2.972E+01	2.972E+01	2.972E+01	2.972E+01	2.972E+01
418	Zr-95	1.916E+08	1.916E+08	1.916E+08	1.916E+08	1.908E+08	1.892E+08	1.836E+08	1.387E+08	7.233E+07	2.727E+07	3.673E+06	1.347E+03
419	Zr-97	1.897E+08	1.897E+08	1.856E+08	1.822E+08	1.365E+08	7.088E+07	3.702E+06	2.837E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
420	Zr-98	1.841E+08	1.818E+08	4.217E-10	9.244E-28	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
421	Zr-99	1.818E+08	1.452E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
422	Zr-100	1.788E+08	1.635E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
423	Zr-101	1.039E+08	7.518E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
424	Zr-102	7.197E+07	5.730E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
425	Zr-103	2.686E+07	1.574E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
426	Zr-104	8.022E+08	6.097E+06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
427	Zr-105	2.193E+06	5.348E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
428	Zr-106	1.115E+05	5.172E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
	TOTAL	2.121E+10	2.042E+10	1.040E+10	9.429E+09	7.129E+09	5.701E+09	3.557E+09	1.499E+09	8.728E+08	5.499E+08	3.295E+08	1.359E+08

Table 2. Reactor Core Activity For DBA-LOCA Radionuclides Released Per Regulatory Guide 1.183, Table 5;
All Isotopes With > 100 Curies At 1 Hour Post-Accident

Reactor Core Inventory (Curies)		Time Post-Accident												
No.	Nuclide	0.0 d	1 sec	30 min	1 hr	8 hr	1.0 d	4.0 d	30.0 d	90.0 d	180.0 d	1 Yr	3 Yr	
1	Am-241	2.536E+04	2.536E+04	2.536E+04	2.536E+04	2.544E+04	2.552E+04	2.575E+04	2.789E+04	3.285E+04	4.019E+04	5.508E+04	1.108E+05	
2	Am-242	1.138E+07	1.138E+07	1.115E+07	1.093E+07	6.068E+06	4.042E+06	1.811E+05	1.850E+03	1.843E+03	1.843E+03	1.843E+03	1.620E+03	
3	Am-242m	1.658E+03	1.658E+03	1.658E+03	1.658E+03	1.658E+03	1.658E+03	1.658E+03	1.658E+03	1.650E+03	1.650E+03	1.650E+03	1.627E+03	
4	Am-243	3.125E+03	3.125E+03	3.125E+03	3.125E+03	3.125E+03	3.132E+03	3.132E+03	3.132E+03	3.132E+03	3.132E+03	3.132E+03	3.132E+03	
5	Am-244	1.383E+07	1.383E+07	1.329E+07	1.291E+07	7.946E+06	2.659E+06	1.902E+04	4.790E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
6	Ba-135m	4.187E+04	4.187E+04	4.133E+04	4.087E+04	3.453E+04	2.345E+04	4.118E+03	1.169E-03	9.168E-19	0.000E+00	0.000E+00	0.000E+00	
7	Ba-136m	8.404E+05	8.251E+05	8.175E+05	8.175E+05	8.098E+05	7.793E+05	6.662E+05	1.698E+05	7.182E+03	6.272E+01	3.629E-03	7.067E-20	
8	Ba-137m	1.650E+07	1.650E+07	1.643E+07	1.643E+07	1.643E+07	1.643E+07	1.643E+07	1.835E+07	1.635E+07	1.620E+07	1.604E+07	1.528E+07	
9	Ba-139	1.948E+08	1.948E+08	1.896E+08	1.846E+08	4.317E+06	1.658E+03	7.151E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
10	Ba-140	1.956E+08	1.956E+08	1.956E+08	1.956E+08	1.956E+08	1.857E+08	1.574E+08	3.835E+07	1.475E+06	1.108E+04	4.891E-01	2.689E-18	
11	Ba-141	1.765E+08	1.765E+08	5.761E+07	1.841E+07	2.208E+00	3.399E-16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
12	Ba-142	1.681E+08	1.681E+08	2.368E+07	3.323E+06	3.935E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
13	Ba-82	3.812E+05	3.812E+05	3.782E+05	3.751E+05	3.270E+05	2.384E+05	5.806E+04	2.773E-01	1.459E-13	0.000E+00	0.000E+00	0.000E+00	
14	Ba-83	1.291E+07	1.291E+07	1.177E+07	1.039E+07	1.398E+06	1.375E+04	1.284E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
15	Ba-84	2.399E+07	2.399E+07	1.383E+07	7.197E+06	7.817E+02	6.219E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
16	Ce-141	1.795E+08	1.795E+08	1.795E+08	1.795E+08	1.788E-08	1.785E+08	1.658E+08	9.550E+07	2.643E+07	3.881E+06	7.464E+04	1.276E-02	
17	Ce-143	1.686E+08	1.686E+08	1.686E+08	1.643E+08	1.421E+08	1.016E+08	2.239E+07	4.948E+01	3.323E-12	0.000E+00	0.000E+00	0.000E+00	
18	Ce-144	1.513E+08	1.513E+08	1.513E+08	1.513E+08	1.513E+08	1.505E+08	1.497E+08	1.406E+08	1.215E+08	0.779E+07	6.219E+07	1.054E+07	
19	Ce-146	9.015E+07	9.015E+07	1.848E+07	4.187E+06	1.864E-03	7.869E-25	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
20	Cm-242	6.670E+06	6.670E+06	6.670E+06	6.670E+06	6.670E+06	6.662E+06	6.593E+06	5.906E+06	4.576E+06	3.117E+06	1.421E+06	6.471E+04	
21	Cm-243	2.873E+03	2.873E+03	2.873E+03	2.873E+03	2.873E+03	2.873E+03	2.873E+03	2.873E+03	2.857E+03	2.842E+03	2.804E+03	2.674E+03	
22	Cm-244	3.896E+05	3.896E+05	3.896E+05	3.896E+05	3.896E+05	3.904E+05	3.904E+05	3.896E+05	3.896E+05	3.828E+05	3.759E+05	3.484E+05	
23	Co-58	5.913E+05	5.913E+05	5.913E+05	5.913E+05	6.898E+05	5.660E+05	5.684E+05	4.408E+05	2.452E+05	1.016E+05	1.666E+04	1.322E+01	
24	Co-60	3.186E+05	3.186E+05	3.186E+05	3.186E+05	3.186E+05	3.186E+05	3.186E+05	3.155E+05	3.087E+05	2.987E+05	2.796E+05	2.147E+05	
25	Co-60m	5.272E+05	5.284E+05	7.235E+04	9.932E+03	8.328E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
26	Co-61	7.105E+03	7.105E+03	5.761E+03	4.668E+03	2.468E+02	2.972E-01	2.170E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
27	Cs-132	4.355E+03	4.355E+03	4.347E+03	4.332E+03	4.202E+03	3.912E+03	2.834E+03	1.757E+02	2.865E-01	1.887E-05	4.668E-14	0.000E+00	
28	Cs-134	2.300E+07	2.300E+07	2.300E+07	2.300E+07	2.300E+07	2.300E+07	2.292E+07	2.239E+07	2.116E+07	1.948E+07	1.643E+07	8.404E+06	
29	Cs-134m	4.813E+06	4.813E+06	4.271E+06	3.789E+06	7.159E+05	1.589E+04	5.692E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
30	Cs-135m	4.653E+06	4.645E+06	3.140E+06	2.124E+06	8.710E+03	3.079E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
31	Cs-136	7.342E+06	7.342E+06	7.334E+06	7.327E+06	7.212E+06	6.960E+06	5.944E+06	1.513E+06	6.410E+04	5.600E+02	3.239E-02	6.311E-19	
32	Cs-137	1.734E+07	1.734E+07	1.734E+07	1.734E+07	1.734E+07	1.734E+07	1.734E+07	1.734E+07	1.727E+07	1.719E+07	1.698E+07	1.620E+07	
33	Cs-138	2.048E+08	2.048E+08	1.513E+08	8.939E+07	1.146E+04	1.215E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
34	Cs-139	1.902E+08	1.902E+08	2.132E+07	2.281E+06	5.203E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
35	Eu-152m	2.475E+04	2.475E+04	2.364E+04	2.300E+04	1.368E+04	4.149E+03	1.983E+01	1.368E-19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
36	Eu-154	1.055E+06	1.055E+06	1.055E+06	1.055E+06	1.055E+06	1.055E+06	1.055E+06	1.055E+06	1.039E+06	1.016E+06	9.770E+05	8.286E+05	
37	Eu-155	4.340E+05	4.340E+05	4.340E+05	4.340E+05	4.340E+05	4.340E+05	4.340E+05	4.294E+05	4.184E+05	4.036E+05	3.748E+05	2.782E+05	
38	Eu-156	2.738E+07	2.738E+07	2.738E+07	2.731E+07	2.699E+07	2.622E+07	2.287E+07	8.978E+06	4.512E+05	7.414E+03	1.579E+00	5.204E-15	
39	Eu-157	2.628E+06	2.628E+06	2.590E+06	2.529E+06	1.834E+06	8.862E+05	3.308E+04	1.398E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
40	Eu-158	9.474E+05	9.474E+05	6.738E+05	4.301E+05	7.571E+02	3.828E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
41	Eu-159	4.806E+05	4.806E+05	1.719E+05	5.455E+04	5.639E-03	6.097E-19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
42	I-128	1.192E+06	1.184E+06	5.172E+05	2.246E+05	1.956E+00	5.295E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
43	I-130	2.636E+06	2.636E+06	2.582E+06	2.506E+06	1.696E+06	6.807E+05	1.222E-04	7.793E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
44	I-130m	1.406E+08	1.406E+08	1.398E+05	1.383E+04	1.238E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
45	I-131	1.070E+08	1.070E+08	1.070E+08	1.070E+08	1.047E+08	1.001E+08	7.899E+07	8.404E+06	4.760E+04	2.032E-01	2.353E-06	0.000E+00	
46	I-132	1.574E+08	1.574E+08	1.565E+08	1.559E+08	1.482E+08	1.284E+08	1.284E+08	1.288E+08	1.288E+08	1.288E+08	1.288E+08	1.288E+08	
47	I-133	2.216E+08	2.216E+08	2.200E+08	2.177E+08	1.742E+08	1.024E+08	9.244E+06	8.633E-03	1.245E-23	0.000E+00	0.000E+00	0.000E+00	
48	I-133m	1.696E+07	1.643E+07	6.983E+06	4.798E+06	2.506E+04	1.520E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
49	I-134	2.452E+08	2.452E+08	2.154E+08	1.750E+08	1.528E+08	5.715E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
50	I-135	2.109E+06	2.109E+06	2.002E+06	1.902E+06	9.082E+07	1.681E+07	8.404E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
51	Kr-83m	1.306E+07	1.306E+07	1.281E+07	1.281E+07	3.637E+06	5.272E+04	5.394E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
52	Kr-85	1.482E+06	1.482E+06	1.482E+06	1.482E+06	1.482E+06	1.482E+06	1.482E+06	1.475E+06	1.459E+06	1.436E+06	1.390E+06	1.222E+06	
53	Kr-85m	2.682E+07	2.682E+07	2.514E+07	2.323E+07	7.869E+06	6.816E+05	9.626E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
54	Kr-87	5.371E+07	5.371E+07	4.133E+07	3.148E+07	6.937E+05	1.131E+02	1.031E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	

Table 2. Reactor Core Activity For DBA-LOCA Radionuclides Released Per Regulatory Guide 1.183, Table 5;
All Isotopes With > 100 Curies At 1 Hour Post-Accident

No.	Nuclide	Time Post-Accident											
		0.0 d	1 sec	30 min	1 hr	8 hr	1.0 d	4.0 d	30.0 d	90.0 d	180.0 d	1 Yr	3 Yr
110	Rh-107	6.983E+07	6.983E+07	3.285E+07	1.261E+07	1.879E+01	9.092E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
111	Rh-108	4.561E+07	4.563E+07	5.004E+05	5.172E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
112	Ru-103	1.719E+08	1.719E+08	1.719E+08	1.711E+08	1.704E+08	1.688E+08	1.597E+08	1.006E+08	3.499E+07	7.151E+06	2.712E+05	6.800E-01
113	Ru-105	1.192E+08	1.192E+08	1.131E+08	1.047E+08	3.514E+07	2.888E+08	3.782E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
114	Ru-106	6.853E+07	6.853E+07	6.853E+07	6.845E+07	6.845E+07	6.838E+07	6.800E+07	6.479E+07	5.791E+07	4.897E+07	3.469E+07	8.882E+06
115	Ru-107	6.968E+07	6.960E+07	2.980E+05	1.161E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
116	Ru-108	4.492E+07	4.485E+07	4.699E+05	4.859E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
117	Sb-122	2.132E+05	2.132E+05	2.124E+05	2.116E+05	1.963E+05	1.649E+05	7.648E+04	9.657E+01	1.979E-05	1.828E-15	0.000E+00	0.000E+00
118	Sb-124	9.720E+04	9.720E+04	9.720E+04	9.720E+04	9.718E+04	9.637E+04	9.313E+04	8.885E+04	3.450E+04	1.223E+04	1.450E+03	3.224E-01
119	Sb-125	1.371E+06	1.371E+06	1.371E+06	1.371E+06	1.371E+06	1.371E+06	1.371E+06	1.351E+06	1.295E+06	1.212E+06	1.071E+06	6.433E+05
120	Sb-126	4.844E+04	4.844E+04	4.837E+04	4.636E+04	4.562E+04	4.388E+04	3.711E+04	8.878E+03	3.148E+02	1.360E+01	1.161E+01	1.161E+01
121	Sb-126m	5.447E+04	5.446E+04	1.831E+04	8.179E+03	8.328E+01	8.328E+01	8.328E+01	8.328E+01	8.328E+01	8.328E+01	8.328E+01	8.328E+01
122	Sb-127	9.397E+06	9.397E+06	9.397E+06	9.321E+06	8.939E+06	7.946E+06	4.815E+06	4.278E+04	8.710E-01	7.846E-08	2.598E-22	0.000E+00
123	Sb-128	1.612E+08	1.612E+08	1.574E+08	1.528E+08	1.528E+08	1.528E+08	1.528E+08	1.497E+08	0.000E+00	0.000E+00	0.000E+00	0.000E+00
124	Sb-128m	1.604E+07	1.604E+07	1.261E+07	9.092E+06	6.609E+04	8.480E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
125	Sb-129	3.469E+07	3.469E+07	3.247E+07	3.003E+07	9.932E+06	8.022E+05	9.474E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
126	Sb-130	1.154E+07	1.154E+07	8.823E+06	4.026E+06	2.536E+03	1.222E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
127	Sb-130m	4.821E+07	4.813E+07	3.499E+06	1.352E+05	1.161E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
128	Sb-131	8.404E+07	8.404E+07	3.453E+07	1.398E+07	4.446E+01	1.215E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
129	Sb-132	5.081E+07	5.065E+07	3.598E+05	2.544E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
130	Se-79m	1.337E+08	1.337E+08	2.368E+05	2.407E+04	2.239E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
131	Se-81	5.394E+06	5.394E+06	2.017E+06	8.022E+05	1.711E+03	1.638E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
132	Se-81m	3.866E+05	3.866E+05	2.705E+05	1.879E+05	1.161E+03	1.039E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
133	Se-83	6.104E+06	6.104E+06	2.414E+06	9.474E+05	2.032E+00	2.231E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
134	Sm-151	6.800E+04	6.800E+04	6.800E+04	6.800E+04	6.815E+04	6.830E+04	6.868E+04	6.868E+04	6.861E+04	6.853E+04	6.823E+04	6.716E+04
135	Sm-153	5.310E+07	5.310E+07	5.272E+07	5.233E+07	4.714E+07	3.705E+07	1.261E+07	1.100E+03	4.729E-07	4.210E-21	0.000E+00	0.000E+00
136	Sm-155	4.103E+06	4.103E+06	1.673E+06	6.678E+05	1.406E+00	1.543E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
137	Sm-156	2.587E+08	2.587E+08	2.475E+08	2.384E+08	1.421E+06	4.378E+05	2.162E+03	2.246E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00
138	Sm-157	1.620E+06	1.620E+06	1.322E+05	1.001E+04	2.154E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
139	Sr-89	1.031E+08	1.031E+08	1.031E+08	1.031E+08	1.031E+08	1.019E+08	9.790E+07	8.846E+07	3.010E+07	8.786E+06	6.907E+05	3.087E+01
140	Sr-90	1.306E+07	1.306E+07	1.306E+07	1.306E+07	1.306E+07	1.306E+07	1.306E+07	1.299E+07	1.299E+07	1.291E+07	1.268E+07	1.207E+07
141	Sr-91	1.306E+08	1.306E+08	1.261E+08	1.215E+08	7.304E+07	2.277E+07	1.207E+05	2.231E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00
142	Sr-92	1.390E+08	1.390E+08	1.222E+08	1.077E+08	1.795E+07	2.995E+05	3.010E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
143	Sr-93	1.574E+08	1.566E+08	8.626E+06	5.837E+05	5.424E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
144	Tc-99	2.208E+03	2.208E+03	2.208E+03	2.208E+03	2.208E+03	2.208E+03	2.208E+03	2.216E+03	2.216E+03	2.216E+03	2.216E+03	2.216E+03
145	Tc-99m	1.788E+08	1.788E+08	1.788E+08	1.788E+08	1.734E+08	1.513E+08	7.136E+07	1.008E+05	2.697E-02	3.721E-12	0.000E+00	0.000E+00
146	Tc-100	5.050E+07	4.829E+07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
147	Tc-101	1.834E+08	1.834E+08	1.062E+08	3.998E+07	4.179E-01	1.184E-20	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
148	Tc-102	1.742E+08	1.742E+08	2.798E+07	4.431E+06	2.673E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
149	Tc-104	1.413E+08	1.413E+08	4.798E+07	1.536E+07	1.895E+00	3.084E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
150	Tc-105	1.169E+08	1.169E+08	8.175E+06	5.279E+05	1.222E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
151	Tc-123m	9.703E+02	9.703E+02	9.703E+02	9.703E+02	9.703E+02	9.626E+02	9.474E+02	8.175E+02	5.761E+02	3.423E+02	1.169E+02	1.704E+00
152	Tc-125m	3.026E+05	3.026E+05	3.026E+05	3.026E+05	3.026E+05	3.035E+05	3.035E+05	3.061E+05	3.041E+05	2.828E+05	2.609E+05	1.575E+05
153	Tc-127	9.321E+06	9.321E+06	9.321E+06	9.321E+06	9.244E+06	8.833E+06	5.776E+06	1.375E+06	9.092E+05	5.134E+05	1.581E+05	1.520E+03
154	Tc-127m	1.589E+08	1.589E+08	1.589E+08	1.589E+08	1.589E+08	1.589E+08	1.574E+08	1.360E+08	9.321E+05	5.249E+05	1.612E+05	1.551E+03
155	Tc-129	3.293E+07	3.293E+07	3.262E+07	3.194E+07	1.528E+07	5.096E+06	3.950E+06	2.315E+06	6.708E+05	1.047E+05	2.292E+03	6.540E-04
156	Tc-129m	6.662E+06	6.662E+06	6.662E+06	6.662E+06	6.639E+06	6.583E+06	6.165E+06	3.006E+06	1.047E+06	1.024E+05	1.835E+05	3.576E+03
157	Tc-131	9.092E+07	9.092E+07	6.883E+07	4.424E+07	4.034E+06	2.789E+06	5.279E+05	2.896E-01	1.024E-15	0.000E+00	0.000E+00	0.000E+00
158	Tc-131m	2.147E+07	2.147E+07	2.124E+07	2.109E+07	1.795E+07	1.735E+07	1.238E+07	1.284E+00	4.561E-15	0.000E+00	0.000E+00	0.000E+00
159	Tc-132	1.543E+08	1.543E+08	1.538E+08	1.528E+08	1.436E+08	1.245E+08	6.586E+07	2.805E+05	7.457E-01	3.806E-09	2.758E-28	0.000E+00
160	Tc-133	1.199E+08	1.199E+08	3.860E+07	1.459E+07	5.531E+04	3.362E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
161	Tc-133m	8.856E+07	8.856E+07	6.823E+07	4.691E+07	2.445E+05	1.490E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
162	Tc-134	1.948E+08	1.948E+08	1.184E+08	7.212E+07	6.815E+04	8.328E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
163	Xe-129m	5.157E+03	5.157E+03	5.149E+03	5.142E+03	4.775E+03	3.774E+03	4.974E+02	4.822E+00	4.149E-03	2.292E-03	2.292E-03	7.541E-22
164	Xe-131m	1.467E+06	1.467E+06	1.467E+06	1.467E+06	1.467E+06	1.452E+06	1.375E+06	5.050E+05	2.002E+04	1.108E+02	2.292E-03	7.541E-22

Table 2. Reactor Core Activity For DBA-LOCA Radionuclides Released Per Regulatory Guide 1.183, Table 5;
All Isotopes With > 100 Curies At 1 Hour Post-Accident

No.	Nuclide	Time Post-Accident											
		0.0 d	1 sec	30 min	1 hr	8 hr	1.0 d	4.0 d	30.0 d	90.0 d	180.0 d	1 Yr	3 Yr
165	Xe-133	2.124E+08	2.124E+08	2.124E+08	2.124E+08	2.116E+08	2.055E+08	1.513E+08	4.989E+06	1.795E+03	1.222E-02	2.819E-13	0.000E+00
166	Xe-133m	6.991E+06	6.991E+06	6.991E+06	6.963E+06	6.661E+06	6.288E+06	3.003E+06	8.480E+02	4.783E-06	2.032E-18	0.000E+00	0.000E+00
167	Xe-134m	5.898E+08	9.932E+05	1.786E+03	6.356E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
168	Xe-135	7.029E+07	7.029E+07	7.556E+07	8.022E+07	1.008E+08	5.615E+07	4.003E+05	1.177E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00
169	Xe-135m	4.630E+07	4.830E+07	3.576E+07	3.178E+07	1.482E+07	2.743E+06	1.375E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
170	Xe-137	2.017E+08	2.017E+08	9.244E+05	3.973E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
171	Xe-138	1.887E+08	1.887E+08	4.317E+07	9.856E+08	1.031E-02	3.087E-23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
172	Y 89m	1.675E+05	1.830E+05	6.425E+04	6.402E+04	6.074E+04	5.386E+04	3.247E+04	6.457E+03	2.796E+03	8.175E+02	6.425E+01	2.873E-03
173	Y 90	1.383E+07	1.383E+07	1.383E+07	1.383E+07	1.354E+07	1.343E+07	1.321E+07	1.299E+07	1.298E+07	1.291E+07	1.268E+07	1.207E+07
174	Y 91	1.345E+08	1.345E+08	1.345E+08	1.345E+08	1.337E+08	1.337E+08	1.291E+08	9.475E+07	4.653E+07	1.605E+07	1.780E+06	3.110E+02
175	Y 91m	7.571E+07	7.571E+07	7.525E+07	7.403E+07	4.637E+07	1.444E+07	7.640E+04	1.413E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00
176	Y 92	1.398E+08	1.398E+08	1.391E+08	1.368E+08	6.532E+07	4.418E+06	4.042E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
177	Y 93	1.070E+08	1.070E+08	1.039E+08	1.008E+08	6.234E+07	2.078E+07	1.482E+05	3.744E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00
178	Y 94	1.696E+08	1.696E+08	5.952E+07	1.956E+07	3.392E+00	1.192E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
179	Y 95	1.765E+08	1.765E+08	2.521E+07	3.476E+06	3.163E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
180	Zr- 89	5.524E+04	5.524E+04	5.501E+04	5.478E+04	5.149E+04	4.469E+04	2.368E+04	9.550E+01	2.842E-04	1.459E-12	1.742E-29	0.000E+00
181	Zr- 93	2.972E+01	2.972E+01	2.972E+01	2.972E+01	2.972E+01	2.972E+01	2.972E+01	2.972E+01	2.972E+01	2.972E+01	2.972E+01	2.972E+01
182	Zr- 95	1.916E+08	1.916E+08	1.916E+08	1.916E+08	1.906E+08	1.892E+08	1.836E+08	1.387E+08	7.233E+07	2.727E+07	3.673E+06	1.347E+03
183	Zr- 97	1.697E+08	1.697E+08	1.856E+08	1.822E+08	1.365E+08	7.088E+07	3.702E+06	2.837E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
		1.352E+10	1.351E+10	1.037E+10	9.421E+09	7.129E+09	5.701E+09	3.557E+09	1.499E+09	8.728E+08	5.499E+08	3.295E+08	1.359E+08

Table 3. DBA-LOCA Activity Release Distribution; Regulatory Guide 1.183, Table 1 AST Activity Release Fractions

Core Inventory From Table 2 (Curies) x RG 1.183, Table 1 Activity Group Release Fractions																	
No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	Time Post-Accident											
						0.0 d	1 sec	30 min	1 hr	8 hr	1.0 d	4.0 d	30.0 d	90.0 d	180.0 d	1 Yr	3 Yr
1	Am-241	Y	Y	Y	5490	5.073E+00	5.073E+00	5.073E+00	5.073E+00	5.088E+00	5.104E+00	5.149E+00	5.577E+00	6.570E+00	8.037E+00	1.102E+01	2.216E+01
2	Am-242	Y	Y		18	2.277E+03	2.277E+03	2.231E+03	2.185E+03	1.620E+03	8.083E+02	3.621E+01	3.300E-01	3.285E-01	3.285E-01	3.285E-01	3.239E-01
3	Am-242m	Y	Y		23.2	3.316E-01	3.316E-01	3.316E-01	3.316E-01	3.316E-01	3.316E-01	3.316E-01	3.316E-01	3.300E-01	3.300E-01	3.300E-01	3.255E-01
4	Am-243	Y	Y		5265	6.250E-01	6.250E-01	6.250E-01	6.250E-01	6.250E-01	6.250E-01	6.265E-01	6.265E-01	6.265E-01	6.265E-01	6.265E-01	6.265E-01
5	Am-244	Y	Y		806	2.766E+03	2.766E+03	2.859E+03	2.582E+03	1.589E+03	6.317E+02	3.805E+00	9.581E-19	0.000E+00	0.000E+00	0.000E+00	0.000E+00
6	Ba-135m	Y	Y		60	2.093E+03	2.093E+03	2.087E+03	2.044E+03	1.727E+03	1.173E+03	2.059E+02	5.845E-05	4.584E-20	0.000E+00	0.000E+00	0.000E+00
7	Ba-136m	Y	Y		1923	4.202E+04	4.126E+04	4.087E+04	4.087E+04	4.049E+04	3.896E+04	3.331E+04	8.480E+03	3.591E+02	3.135E+00	1.815E-04	3.534E-21
8	Ba-137m	Y	Y		599	8.251E+05	8.251E+05	8.213E+05	8.213E+05	8.213E+05	8.213E+05	8.213E+05	8.175E+05	8.175E+05	8.098E+05	8.022E+05	7.840E+05
9	Ba-139	Y	Y		43.5	9.741E+06	9.741E+06	8.480E+06	8.723E+06	2.158E+05	8.288E+01	3.576E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
10	Ba-140	Y	Y	Y	182.8	9.779E+08	9.779E+08	9.779E+08	9.779E+08	9.626E+08	9.626E+08	7.869E+08	1.916E+08	7.373E+04	5.539E+02	2.345E-02	1.345E-19
11	Ba-141	Y	Y		845	8.824E+06	8.824E+06	2.880E+06	9.208E+05	1.104E-01	1.669E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
12	Ba-142	Y	Y		1038	8.404E+06	8.404E+06	1.184E+06	1.662E+05	1.967E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
13	Br-82	Y	Y		2642	1.144E+05	1.144E+05	1.135E+05	1.125E+05	8.810E+04	7.151E+04	1.742E+04	8.320E-02	4.378E-14	0.000E+00	0.000E+00	0.000E+00
14	Br-83	Y	Y		7.44	3.873E+06	3.873E+06	3.530E+06	3.117E+06	4.128E+05	4.194E+05	3.851E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
15	Br-84	Y	Y		1720	7.197E+08	7.197E+08	4.149E+08	2.159E+08	2.285E+02	1.866E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
16	Ce-141	Y	Y		77	8.977E+04	8.977E+04	8.977E+04	8.977E+04	8.839E+04	8.824E+04	8.289E+04	4.775E+04	1.322E+04	1.941E+03	3.732E+01	8.379E-08
17	Ce-143	Y	Y	Y	274	8.328E+04	8.328E+04	8.288E+04	8.213E+04	7.105E+04	5.081E+04	1.119E+04	2.273E-02	1.662E-15	0.000E+00	0.000E+00	0.000E+00
18	Ce-144	Y	Y	Y	19.2	7.564E+04	7.564E+04	7.564E+04	7.564E+04	7.564E+04	7.525E+04	7.487E+04	7.029E+04	6.074E+04	4.890E+04	3.109E+04	5.272E+03
19	Ce-146	Y	Y		289	4.508E+04	4.508E+04	9.741E+03	2.093E+03	9.321E-07	3.935E-28	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	Cm-242	Y	Y	Y	6043	1.334E+03	1.334E+03	1.334E+03	1.334E+03	1.334E+03	1.334E+03	1.319E+03	1.181E+03	9.153E+02	6.234E+02	2.842E+02	1.294E+01
21	Cm-243	Y	Y		5838	5.745E-01	5.745E-01	5.745E-01	5.745E-01	5.745E-01	5.745E-01	5.745E-01	5.745E-01	5.745E-01	5.745E-01	5.745E-01	5.348E-01
22	Cm-244	Y	Y	Y	5796	7.793E+01	7.793E+01	7.793E+01	7.793E+01	7.793E+01	7.806E+01	7.808E+01	7.778E+01	7.732E+01	7.655E+01	7.518E+01	6.968E+01
23	Co-58	Y	Y		824	1.478E+03	1.478E+03	1.478E+03	1.478E+03	1.478E+03	1.468E+03	1.421E+03	1.102E+03	6.131E+02	2.540E+02	4.164E+01	3.304E-02
24	Co-60	Y	Y	Y	2504.4	7.965E+02	7.965E+02	7.965E+02	7.965E+02	7.965E+02	7.965E+02	7.965E+02	7.965E+02	7.716E+02	7.468E+02	6.991E+02	5.367E+02
25	Co-60m	Y	Y		8.6	1.318E+03	1.318E+03	1.318E+03	1.318E+03	1.318E+03	1.318E+03	1.318E+03	1.318E+03	1.318E+03	1.318E+03	1.318E+03	1.318E+03
26	Co-61	Y	Y		98.4	1.776E+01	1.776E+01	1.440E+01	1.187E+01	6.169E-01	7.430E-01	5.424E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
27	Cs-132	Y	Y		712.1	1.089E+03	1.089E+03	1.087E+03	1.083E+03	1.051E+03	9.779E+02	7.086E+02	4.393E+01	7.163E-02	4.716E-06	1.167E-14	0.000E+00
28	Cs-134	Y	Y	Y	1555	5.749E+06	5.749E+06	5.749E+06	5.749E+06	5.749E+06	5.749E+06	5.730E+06	5.596E+06	5.291E+06	4.817E+06	4.107E+06	2.101E+06
29	Cs-134m	Y	Y		26.8	1.203E+06	1.203E+06	1.068E+06	9.474E+05	1.780E+05	3.973E+03	1.423E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
30	Cs-135m	Y	Y		1590	1.163E+06	1.161E+06	7.650E+05	5.310E+05	2.177E+03	7.697E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
31	Cs-136	Y	Y	Y	2171	1.836E+06	1.836E+06	1.834E+06	1.832E+06	1.803E+06	1.740E+06	1.486E+06	3.782E+05	1.602E+04	1.400E+02	8.068E-03	1.578E-19
32	Cs-137	Y	Y	Y	566	4.336E+06	4.336E+06	4.336E+06	4.336E+06	4.336E+06	4.336E+06	4.336E+06	4.336E+06	4.317E+06	4.288E+06	4.240E+06	4.048E+06
33	Cs-138	Y	Y		2361	5.119E+07	5.119E+07	3.782E+07	2.235E+07	2.865E+03	3.037E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
34	Cs-139	Y	Y		329	4.756E+07	4.756E+07	5.329E+06	5.854E+05	1.301E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
35	Eu-152m	Y	Y		308	4.951E+00	4.951E+00	4.767E+00	4.599E+00	2.735E+00	8.297E-01	3.927E-03	2.735E-23	0.000E+00	0.000E+00	0.000E+00	0.000E+00
36	Eu-154	Y	Y		1253	2.111E+02	2.111E+02	2.111E+02	2.111E+02	2.111E+02	2.111E+02	2.110E+02	2.110E+02	2.110E+02	2.079E+02	2.032E+02	1.954E+02
37	Eu-155	Y	Y		63	8.681E+01	8.681E+01	8.681E+01	8.681E+01	8.681E+01	8.681E+01	8.681E+01	8.587E+01	8.369E+01	8.072E+01	7.496E+01	5.564E+01
38	Eu-156	Y	Y		1324	5.477E+03	5.477E+03	5.477E+03	5.477E+03	5.399E+03	5.243E+03	4.574E+03	3.396E+03	9.024E+01	1.483E+00	3.159E-04	1.041E-18
39	Eu-157	Y	Y		0	5.256E+02	5.256E+02	5.180E+02	5.058E+02	3.687E+02	1.772E+02	6.616E+00	2.786E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00
40	Eu-158	Y	Y		1081	1.895E+02	1.895E+02	1.348E+02	8.603E+01	1.514E-01	7.855E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
41	Eu-159	Y	Y		0	9.611E+01	9.611E+01	3.438E+01	1.091E+01	1.128E-06	1.219E-22	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
42	I-128	Y	Y		90	3.576E+05	3.553E+05	1.552E+05	6.738E+04	5.668E-01	1.588E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
43	I-130	Y	Y		2139	7.907E+05	7.907E+05	7.747E+05	7.518E+05	5.088E+05	2.072E+05	3.667E+03	2.338E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00
44	I-130m	Y	Y		121	4.217E+05	4.217E+05	4.184E+04	4.149E+03	3.713E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
45	I-131	Y	Y	Y	382	3.209E+07	3.209E+07	3.209E+07	3.209E+07	3.140E+07	3.003E+07	2.361E+07	2.521E+06	1.428E+04	6.097E-07	7.059E-07	0.000E+00
46	I-132	Y	Y		2290	4.722E+07	4.722E+07	4.696E+07	4.676E+07	4.446E+07	3.851E+07	2.035E+07	6.068E+04	2.315E-01	1.114E-09	8.528E-27	0.000E+00
47	I-133	Y	Y	Y	607	6.647E+07	6.647E+07	6.601E+07	6.532E+07	5.226E+07	3.071E+07	2.773E+06	2.590E-03	3.736E-24	0.000E+00	0.000E+00	0.000E+00
48	I-133m	Y	Y		1573	5.088E+06	4.928E+06	2.095E+06	1.439E+06	7.518E+03	4.561E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
49	I-134	Y	Y	Y	2811	7.357E+07	7.357E+07	7.357E+07	7.357E+07	7.357E+07	7.357E+07	7.357E+07	7.357E+07	7.357E+07	7.357E+07	7.357E+07	7.357E+07
50	I-135	Y	Y	Y	1647	6.326E+07	6.326E+07	6.005E+07	5.707E+07	2.727E+07	5.042E+06	2.521E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

Table 3. DBA-LOCA Activity Release Distribution; Regulatory Guide 1.183, Table 1 AST Activity Release Fractions

Core Inventory From Table 2 (Curies) x RG 1.183, Table 1 Activity Group Release Fractions																		
No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dia)	Time Post-Accident												
						0.0 d	1 sec	30 min	1 hr	8 hr	1.0 d	4.0 d	30.0 d	90.0 d	180.0 d	1 Yr	3 Yr	
151	Te-123m	Y	Y		148.1	4.851E+01	4.851E+01	4.851E+01	4.851E+01	4.851E+01	4.813E+01	4.737E+01	4.087E+01	2.880E+01	1.711E+01	5.845E+00	8.519E-02	
152	Te-125m	Y	Y		36	1.513E+04	1.513E+04	1.513E+04	1.513E+04	1.513E+04	1.517E+04	1.518E+04	1.531E+04	1.521E+04	1.464E+04	1.305E+04	7.873E+03	
153	Te-127	Y	Y	Y	4.8	4.660E+05	4.660E+05	4.660E+05	4.660E+05	4.622E+05	4.317E+05	2.888E+05	6.876E+04	4.546E+04	2.567E+04	7.907E+03	7.602E+01	
154	Te-127m	Y	Y	Y	11.1	7.946E+04	7.946E+04	7.946E+04	7.946E+04	7.946E+04	7.946E+04	7.869E+04	6.800E+04	4.660E+04	2.624E+04	8.060E+03	7.766E+01	
155	Te-129	Y	Y	Y	62.4	1.646E+08	1.646E+08	1.631E+08	1.597E+08	7.640E+05	2.548E+05	1.975E+05	1.157E+05	3.354E+04	5.233E+03	1.146E+02	3.270E-05	
156	Te-129m	Y	Y	Y	37	3.331E+05	3.331E+05	3.331E+05	3.331E+05	3.320E+05	3.281E+05	3.083E+05	1.803E+05	5.233E+04	8.175E+03	1.788E+02	5.119E-05	
157	Te-131	Y	Y	Y	421	4.546E+06	4.546E+06	3.491E+06	2.212E+06	2.017E+05	1.394E+05	2.640E+04	7.448E-02	5.119E-17	0.000E+00	0.000E+00	0.000E+00	
158	Te-131m	Y	Y	Y	1423	1.073E+08	1.073E+08	1.062E+08	1.054E+08	6.977E+05	6.166E+05	1.173E+05	6.418E-02	2.281E-16	0.000E+00	0.000E+00	0.000E+00	
159	Te-132	Y	Y	Y	234	7.716E+06	7.716E+06	7.878E+06	7.640E+06	7.182E+06	6.227E+06	3.293E+06	1.303E+04	3.728E-02	1.803E-10	1.379E-27	0.000E+00	
160	Te-133	Y	Y	Y	962	5.997E+08	5.997E+08	1.830E+06	7.296E+05	2.766E+03	1.681E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
161	Te-133m	Y	Y	Y	1698	4.928E+06	4.928E+06	3.411E+06	2.345E+06	1.222E+04	7.449E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
162	Te-134	Y	Y	Y	858	9.741E+06	9.741E+06	5.921E+06	3.808E+06	3.407E+03	4.164E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
163	Xe-129m	Y	Y	Y	51.3	5.157E+03	5.157E+03	5.149E+03	5.142E+03	5.027E+03	4.775E+03	3.774E+03	4.974E+02	4.622E+00	4.149E-03	2.208E-09	0.000E+00	
164	Xe-131m	Y	Y	Y	20	1.467E+06	1.467E+06	1.467E+06	1.467E+06	1.467E+06	1.452E+06	1.375E+06	5.050E+05	2.002E+04	1.108E+02	2.292E-03	7.541E-22	
165	Xe-133	Y	Y	Y	45.9	2.124E+08	2.124E+08	2.124E+08	2.124E+08	2.116E+08	2.055E+08	1.513E+08	4.989E+06	1.795E+03	1.222E-02	2.819E-13	0.000E+00	
166	Xe-133m	Y	Y	Y	41.4	6.991E+06	6.991E+06	6.991E+06	6.983E+06	6.841E+06	6.288E+06	3.003E+06	8.480E+02	4.783E-06	2.032E-18	0.000E+00	0.000E+00	
167	Xe-134m	Y	Y	Y	1896	5.898E+06	9.932E+05	1.788E+03	6.356E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
168	Xe-135	Y	Y	Y	249	7.029E+07	7.029E+07	7.566E+07	8.022E+07	1.008E+08	5.615E+07	4.003E+05	1.177E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
169	Xe-135m	Y	Y	Y	432	4.630E+07	4.630E+07	3.576E+07	3.178E+07	1.482E+07	2.743E+06	1.375E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
170	Xe-137	Y	Y	Y	190.8	2.017E+08	2.017E+08	9.244E+05	3.973E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
171	Xe-138	Y	Y	Y	1126	1.887E+08	1.887E+08	4.317E+07	8.856E+06	1.031E-02	3.087E-23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
172	Y 89m	Y	Y	Y	901.4	3.351E+01	3.250E+01	1.285E+01	1.280E+01	1.280E+01	1.077E+01	6.494E+00	1.291E+00	5.593E-01	1.635E-01	1.285E-02	5.745E-07	
173	Y 90	Y	Y	Y	0.00031	2.726E+03	2.726E+03	2.725E+03	2.725E+03	2.707E+03	2.687E+03	2.641E+03	2.596E+03	2.598E+03	2.582E+03	2.536E+03	2.414E+03	
174	Y 91	Y	Y	Y	3.6	2.690E+04	2.690E+04	2.690E+04	2.690E+04	2.674E+04	2.674E+04	2.543E+04	1.895E+04	9.307E+03	3.209E+03	3.541E+02	6.220E-02	
175	Y 91m	Y	Y	Y	527.7	1.514E+04	1.514E+04	1.505E+04	1.481E+04	9.275E+03	2.888E+03	1.528E+01	2.827E-19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
176	Y 92	Y	Y	Y	253	2.796E+04	2.796E+04	2.781E+04	2.735E+04	1.306E+04	8.832E+02	8.083E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
177	Y 93	Y	Y	Y	88.9	2.139E+04	2.139E+04	2.078E+04	2.017E+04	1.247E+04	4.156E+03	2.964E+01	7.487E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
178	Y 94	Y	Y	Y	772	3.392E+04	3.392E+04	1.190E+04	3.912E+03	6.784E-04	2.384E-19	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
179	Y 95	Y	Y	Y	1287	3.530E+04	3.530E+04	5.042E+03	6.952E+02	6.326E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
180	Zr-89	Y	Y	Y	925.7	1.105E+01	1.105E+01	1.100E+01	1.096E+01	1.030E+01	8.936E+00	4.737E+00	1.810E-02	5.684E-08	2.918E-16	3.484E-33	0.000E+00	
181	Zr-93	Y	Y	Y	1.84	5.944E-03	5.944E-03	5.944E-03	5.944E-03	5.944E-03	5.944E-03	5.944E-03	5.944E-03	5.944E-03	5.944E-03	5.944E-03	5.944E-03	
182	Zr-95	Y	Y	Y	773	3.832E+04	3.832E+04	3.832E+04	3.832E+04	3.817E+04	3.765E+04	3.672E+04	2.774E+04	1.447E+04	5.453E+03	7.345E+02	2.694E-01	
183	Zr-97	Y	Y	Y	869	3.794E+04	3.794E+04	3.712E+04	3.644E+04	2.729E+04	1.418E+04	7.405E+02	5.875E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	
TOTAL						1.459E+09	1.454E+09	9.575E+08	8.482E+08	5.681E+08	4.203E+08	2.371E+08	2.835E+07	1.506E+07	1.303E+07	1.153E+07	8.846E+06	

Table 4. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Energy (Mev/dls)
For RG 1.183 DBA-LOCA Source; Time = 0.0 = Shutdown

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
1	Am-241	Y	Y	Y	5480	5.073E+00	5.073E+00	5.073E+00	5.073E+00	1.029E+12	1.029E+12	1.029E+12	1.029E+12
2	Am-242	Y	Y		18	2.277E+03	2.277E+03	2.277E+03		1.516E+12	1.516E+12	1.516E+12	
3	Am-242m	Y	Y		23.2	3.316E-01	3.316E-01	3.316E-01		2.846E+08	2.846E+08	2.846E+08	
4	Am-243	Y	Y		5265	6.250E-01	6.250E-01	6.250E-01		1.217E+11	1.217E+11	1.217E+11	
5	Am-244	Y	Y		808	2.766E+03	2.766E+03	2.766E+03		8.248E+13	8.248E+13	8.248E+13	
6	Ba-135m	Y	Y		60	2.093E+03	2.093E+03	2.093E+03		4.647E+12	4.647E+12	4.647E+12	
7	Ba-136m				1923	4.202E+04				2.990E+15			
8	Ba-137m	Y	Y		599	8.251E+05	8.251E+05	8.251E+05		1.829E+16	1.829E+16	1.829E+16	
9	Ba-139	Y	Y	Y	43.5	9.741E+08	9.741E+08	9.741E+08	9.741E+08	1.568E+16	1.568E+16	1.568E+16	1.568E+16
10	Ba-140	Y	Y	Y	182.6	9.779E+08	9.779E+08	9.779E+08	9.779E+08	6.607E+16	6.607E+16	6.607E+16	6.607E+16
11	Ba-141	Y	Y		845	8.824E+06	8.824E+06	8.824E+06		2.759E+17	2.759E+17	2.759E+17	
12	Ba-142	Y	Y		1038	8.404E+08	8.404E+08	8.404E+08		3.228E+17	3.228E+17	3.228E+17	
13	Br- 82	Y	Y		2642	1.144E+05	1.144E+05	1.144E+05		1.118E+16	1.118E+16	1.118E+16	
14	Br- 83	Y	Y		7.44	3.873E+06	3.873E+06	3.873E+06		1.066E+15	1.066E+15	1.066E+15	
15	Br- 84	Y	Y		1720	7.197E+06	7.197E+06	7.197E+06		4.580E+17	4.580E+17	4.580E+17	
16	Ce-141	Y	Y	Y	77	8.977E+04	8.977E+04	8.977E+04	8.977E+04	2.558E+14	2.558E+14	2.558E+14	2.558E+14
17	Ce-143	Y	Y	Y	274	8.328E+04	8.328E+04	8.328E+04	8.328E+04	8.443E+14	8.443E+14	8.443E+14	8.443E+14
18	Ce-144	Y	Y	Y	19.2	7.564E+04	7.564E+04	7.564E+04	7.564E+04	5.373E+13	5.373E+13	5.373E+13	5.373E+13
19	Ce-146				289	4.508E+04				4.820E+14			
20	Cm-242	Y	Y	Y	6043	1.334E+03	1.334E+03	1.334E+03	1.334E+03	2.983E+14	2.983E+14	2.983E+14	2.983E+14
21	Cm-243	Y	Y		5838	5.745E-01	5.745E-01	5.745E-01		1.241E+11	1.241E+11	1.241E+11	
22	Cm-244	Y	Y	Y	5796	7.793E+01	7.793E+01	7.793E+01	7.793E+01	1.671E+13	1.671E+13	1.671E+13	1.671E+13
23	Co-58	Y	Y	Y	824	1.478E+03	1.478E+03	1.478E+03	1.478E+03	4.507E+13	4.507E+13	4.507E+13	4.507E+13
24	Co-60	Y	Y	Y	2504.4	7.965E+02	7.965E+02	7.965E+02	7.965E+02	7.380E+13	7.380E+13	7.380E+13	7.380E+13
25	Co-60m	Y	Y		6.6	1.318E+03	1.318E+03	1.318E+03		3.218E+11	3.218E+11	3.218E+11	
26	Co-81	Y	Y		98.4	1.776E+01	1.776E+01	1.776E+01		6.467E+10	6.467E+10	6.467E+10	
27	Ce-132	Y	Y		712.1	1.089E+03	1.089E+03	1.089E+03		2.868E+13	2.868E+13	2.868E+13	
28	Ce-134	Y	Y	Y	1555	5.749E+06	5.749E+06	5.749E+06	5.749E+06	3.308E+17	3.308E+17	3.308E+17	3.308E+17
29	Ce-134m	Y	Y		26.8	1.203E+06	1.203E+06	1.203E+06		1.193E+15	1.193E+15	1.193E+15	
30	Ce-135m	Y	Y		1690	1.163E+06	1.163E+06	1.163E+06		6.843E+16	6.843E+16	6.843E+16	
31	Ce-136	Y	Y	Y	2171	1.836E+06	1.836E+06	1.836E+06	1.836E+06	1.474E+17	1.474E+17	1.474E+17	1.474E+17
32	Ce-137	Y	Y	Y	566	4.336E+06	4.336E+06	4.336E+06	4.336E+06	9.080E+16	9.080E+16	9.080E+16	9.080E+16
33	Ce-138	Y	Y		2381	5.119E+07	5.119E+07	5.119E+07		4.472E+18	4.472E+18	4.472E+18	
34	Ce-139	Y	Y		329	4.756E+07	4.756E+07	4.756E+07		5.789E+17	5.789E+17	5.789E+17	
35	Eu-152m	Y	Y		308	4.951E+00	4.951E+00	4.951E+00		5.805E+10	5.805E+10	5.805E+10	
36	Eu-154	Y	Y		1253	2.111E+02	2.111E+02	2.111E+02		9.785E+12	9.785E+12	9.785E+12	
37	Eu-155	Y	Y		63	8.681E+01	8.681E+01	8.681E+01		2.023E+11	2.023E+11	2.023E+11	
38	Eu-156	Y	Y		1324	5.477E+03	5.477E+03	5.477E+03		2.683E+14	2.683E+14	2.683E+14	
39	Eu-157				0	5.256E+02		5.256E+02		0.000E+00		0.000E+00	
40	Eu-158		Y		1081	1.895E+02		1.895E+02		7.578E+12		7.578E+12	
41	Eu-159				0	9.611E+01				0.000E+00			
42	I-128	Y	Y		90	3.576E+05	3.576E+05	3.576E+05		1.191E+15	1.191E+15	1.191E+15	
43	I-130	Y	Y		2139	7.907E+05	7.907E+05	7.907E+05		6.258E+16	6.258E+16	6.258E+16	
44	I-130m				121	4.217E+05				1.688E+15			
45	I-131	Y	Y	Y	382	3.209E+07	3.209E+07	3.209E+07	3.209E+07	4.535E+17	4.535E+17	4.535E+17	4.535E+17
46	I-132	Y	Y	Y	2290	4.722E+07	4.722E+07	4.722E+07	4.722E+07	4.001E+18	4.001E+18	4.001E+18	4.001E+18
47	I-133	Y	Y	Y	607	6.647E+07	6.647E+07	6.647E+07	6.647E+07	1.493E+18	1.493E+18	1.493E+18	1.493E+18
48	I-133m				1573	5.088E+06				2.961E+17			

Table 4. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Energy (Mev/dls)
For RG 1.183 DBA-LOCA Source; Time = 0.0 = Shutdown

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
49	I-134	Y	Y	Y	2611	7.357E+07	7.357E+07	7.357E+07	7.357E+07	7.108E+18	7.108E+18	7.108E+18	7.108E+18
50	I-135	Y	Y	Y	1647	6.326E+07	6.326E+07	6.326E+07	6.326E+07	3.855E+18	3.855E+18	3.855E+18	3.855E+18
51	Kr-83m	Y			2.57	1.308E+07	1.308E+07			1.242E+15	1.242E+15		
52	Kr-85	Y	Y	Y	2.2	1.482E+06	1.482E+06	1.482E+06	1.482E+06	1.206E+14	1.206E+14	1.206E+14	1.206E+14
53	Kr-85m	Y	Y	Y	156	2.682E+07	2.682E+07	2.682E+07	2.682E+07	1.548E+17	1.548E+17	1.548E+17	1.548E+17
54	Kr-87	Y	Y	Y	792	5.371E+07	5.371E+07	5.371E+07	5.371E+07	1.574E+18	1.574E+18	1.574E+18	1.574E+18
55	Kr-88	Y	Y	Y	1955	7.449E+07	7.449E+07	7.449E+07	7.449E+07	5.388E+18	5.388E+18	5.388E+18	5.388E+18
56	La-140	Y	Y	Y	2315	4.187E+04	4.187E+04	4.187E+04	4.187E+04	3.586E+15	3.586E+15	3.586E+15	3.586E+15
57	La-141	Y	Y	Y	0	3.560E+04	3.560E+04	3.560E+04	3.560E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
58	La-142	Y	Y	Y	2485	3.484E+04	3.484E+04	3.484E+04	3.484E+04	3.203E+15	3.203E+15	3.203E+15	3.203E+15
59	La-143		Y		93	3.300E+04		3.300E+04		1.136E+14		1.136E+14	
60	Mo-99	Y	Y	Y	272	5.043E+05	5.043E+05	5.043E+05	5.043E+05	5.075E+15	5.075E+15	5.075E+15	5.075E+15
61	Mo-101	Y	Y		1514	4.584E+05	4.584E+05	4.584E+05		2.568E+16	2.568E+16	2.568E+16	
62	Mo-102				18.5	4.355E+05				2.981E+14			
63	Nb-95	Y	Y	Y	784.31	3.846E+04		3.846E+04	3.846E+04	1.088E+15		1.088E+15	1.088E+15
64	Nb-95m	Y	Y		71.2	4.265E+02	4.265E+02	4.265E+02		1.123E+12	1.123E+12	1.123E+12	
65	Nb-98	Y	Y		2482	8.236E+01	8.236E+01	8.236E+01		5.680E+12	5.680E+12	5.680E+12	
66	Nb-97	Y	Y		666.8	3.825E+04	3.825E+04	3.825E+04		9.436E+14	9.436E+14	9.436E+14	
67	Nb-97m	Y	Y		728.3	3.609E+04	3.609E+04	3.609E+04		9.726E+14	9.726E+14	9.726E+14	
68	Nb-98m				2711	2.934E+02				2.943E+13			
69	Nd-147	Y	Y	Y	141	1.447E+04	1.447E+04	1.447E+04	1.447E+04	7.549E+13	7.549E+13	7.549E+13	7.549E+13
70	Nd-149	Y	Y		384	8.312E+03	8.312E+03	8.312E+03		1.181E+14	1.181E+14	1.181E+14	
71	Nd-151		Y		916	4.294E+03		4.294E+03		1.455E+14		1.455E+14	
72	Nd-152				0	2.888E+03				0.000E+00			
73	Np-236m	Y	Y		49.7	2.422E-01	2.422E-01	2.422E-01		4.454E+08	4.454E+08	4.454E+08	
74	Np-238	Y	Y		647	2.349E+04	2.349E+04	2.349E+04		5.624E+14	5.624E+14	5.624E+14	
75	Np-239	Y	Y	Y	174	1.062E+06	1.062E+06	1.062E+06	1.062E+06	6.837E+15	6.837E+15	6.837E+15	6.837E+15
76	Np-240	Y	Y		1193	1.967E+03	1.967E+03	1.967E+03		8.684E+13	8.684E+13	8.684E+13	
77	Pd-109	Y	Y		11.7	1.035E+05	1.035E+05	1.035E+05		4.481E+13	4.481E+13	4.481E+13	
78	Pd-111				45	1.666E+04				2.773E+13			
79	Pd-111m				359	7.087E+02				9.387E+12			
80	Pd-112				0	7.545E+03				0.000E+00			
81	Pm-147	Y	Y		0.00439	5.012E+03	5.012E+03	5.012E+03		8.141E+08	8.141E+08	8.141E+08	
82	Pm-148	Y	Y		574	4.049E+03	4.049E+03	4.049E+03		8.600E+13	8.600E+13	8.600E+13	
83	Pm-148m	Y	Y		1986	7.762E+02	7.762E+02	7.762E+02		5.704E+13	5.704E+13	5.704E+13	
84	Pm-149	Y	Y		10.7	1.291E+04	1.291E+04	1.291E+04		5.112E+12	5.112E+12	5.112E+12	
85	Pm-150		Y		1491	1.106E+02		1.106E+02		6.103E+12		6.103E+12	
86	Pm-151	Y	Y		321	4.340E+03	4.340E+03	4.340E+03		5.154E+13	5.154E+13	5.154E+13	
87	Pm-152				151	2.995E+03				1.673E+13			
88	Pm-152m				1508	1.074E+02				5.994E+12			
89	Pm-153				0	1.986E+03				0.000E+00			
90	Pr-142	Y	Y		58.4	1.467E+03	1.467E+03	1.467E+03		3.170E+12	3.170E+12	3.170E+12	
91	Pr-143	Y	Y	Y	0	3.224E+04	3.224E+04	3.224E+04	3.224E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
92	Pr-144	Y	Y		28.9	3.041E+04	3.041E+04	3.041E+04		3.251E+13	3.251E+13	3.251E+13	
93	Pr-144m	Y	Y		12.1	4.248E+02	4.248E+02	4.248E+02		1.902E+11	1.902E+11	1.902E+11	
94	Pr-145		Y		14.78	2.261E+04		2.261E+04		1.235E+13		1.235E+13	
95	Pr-146				1018	1.818E+04				6.849E+14			
96	Pr-147		Y		883	1.435E+04		1.435E+04		4.581E+14		4.581E+14	

Table 4. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Energy (Mev/dis)
For RG 1.183 DBA-LOCA Source; Time = 0.0 = Shutdown

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
97	Pu-237	Y	Y		53.6	3.354E-01	3.354E-01	3.354E-01		6.652E+08	6.652E+08	6.652E+08	
98	Pu-238	Y	Y	Y	1.76	2.281E+02	2.281E+02	2.281E+02	2.281E+02	1.485E+10	1.485E+10	1.485E+10	1.485E+10
99	Pu-239	Y	Y	Y	5101	2.414E+01	2.414E+01	2.414E+01	2.414E+01	4.557E+12	4.557E+12	4.557E+12	4.557E+12
100	Pu-240	Y	Y	Y	0.0286	3.896E+01	3.896E+01	3.896E+01	3.896E+01	4.123E+07	4.123E+07	4.123E+07	4.123E+07
101	Pu-241	Y	Y	Y	0.001354	9.588E+03	9.588E+03	9.588E+03	9.588E+03	4.803E+08	4.803E+08	4.803E+08	4.803E+08
102	Pu-243	Y	Y		28	2.093E+04	2.093E+04	2.093E+04		2.014E+13	2.014E+13	2.014E+13	
103	Rb-86	Y	Y	Y	94.5	5.424E+04	5.424E+04	5.424E+04	5.424E+04	1.897E+14	1.897E+14	1.897E+14	1.897E+14
104	Rb-88	Y	Y		629	1.910E+07	1.910E+07	1.910E+07		4.445E+17	4.445E+17	4.445E+17	
105	Rh-103m	Y	Y		1.65	4.278E+05	4.278E+05	4.278E+05		2.812E+13	2.812E+13	2.812E+13	
106	Rh-105	Y	Y	Y	77	2.770E+05	2.770E+05	2.770E+05	2.770E+05	7.890E+14	7.890E+14	7.890E+14	7.890E+14
107	Rh-105m	Y			34.5	8.442E+04	8.442E+04			1.078E+14	1.078E+14		
108	Rh-106	Y	Y		206	1.845E+05		1.845E+05		1.406E+15	1.406E+15	1.406E+15	
109	Rh-106m		Y		2682	5.978E+03		5.978E+03		8.375E+14		6.375E+14	
110	Rh-107		Y		313	1.746E+05		1.746E+05		2.022E+15		2.022E+15	
111	Rh-108				2264	1.140E+05				9.552E+15			
112	Ru-103	Y	Y	Y	485	4.298E+05	4.298E+05	4.298E+05	4.298E+05	7.712E+15	7.712E+15	7.712E+15	7.712E+15
113	Ru-105	Y	Y	Y	738	2.980E+05	2.980E+05	2.980E+05	2.980E+05	8.136E+15	8.136E+15	8.136E+15	8.136E+15
114	Ru-106	Y	Y	Y	0	1.713E+05	1.713E+05	1.713E+05	1.713E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
115	Ru-107				206	1.742E+05				1.328E+15			
116	Ru-108				0	1.123E+05				0.000E+00			
117	Sb-122	Y	Y		433	1.066E+04	1.066E+04	1.066E+04		1.707E+14	1.707E+14	1.707E+14	
118	Sb-124	Y	Y		1852	4.860E+03	4.860E+03	4.860E+03		3.330E+14	3.330E+14	3.330E+14	
119	Sb-125	Y	Y		443	6.857E+04	6.857E+04	6.857E+04		1.124E+15	1.124E+15	1.124E+15	
120	Sb-126	Y	Y		2749	2.322E+03	2.322E+03	2.322E+03		2.362E+14	2.362E+14	2.362E+14	
121	Sb-126m	Y	Y		1548	2.723E+03	2.723E+03	2.723E+03		1.560E+14	1.560E+14	1.560E+14	
122	Sb-127	Y	Y	Y	664	4.699E+05	4.699E+05	4.699E+05	4.699E+05	1.154E+16	1.154E+16	1.154E+16	1.154E+16
123	Sb-128		Y		3108	8.060E+04		8.060E+04		9.269E+15		9.269E+15	
124	Sb-128m		Y		1909	8.022E+05		8.022E+05		5.666E+16		5.666E+16	
125	Sb-129	Y	Y	Y	1356	1.734E+06	1.734E+06	1.734E+06	1.734E+06	8.701E+16	8.701E+16	8.701E+16	8.701E+16
126	Sb-130		Y		3265	5.768E+05		5.768E+05		6.968E+16		6.968E+16	
127	Sb-130m				2653	2.410E+06				2.366E+17			
128	Sb-131		Y		1809	4.202E+06		4.202E+06		2.813E+17		2.813E+17	
129	Sb-132				2583	2.540E+06				2.428E+17			
130	Se-79m				13.7	6.685E+04				3.389E+13			
131	Se-81		Y		9.9	2.697E+05		2.697E+05		9.879E+13		9.879E+13	
132	Se-81m		Y		15	1.933E+04		1.933E+04		1.073E+13		1.073E+13	
133	Se-83		Y		955	3.052E+05		3.052E+05		1.078E+16		1.078E+16	
134	Sm-151	Y	Y		0.0131	1.360E+01	1.360E+01	1.360E+01		6.592E+06	6.592E+06	6.592E+06	
135	Sm-153	Y	Y		62.8	1.062E+04	1.062E+04	1.062E+04		2.468E+13	2.468E+13	2.468E+13	
136	Sm-155		Y		103	8.205E+02		8.205E+02		3.127E+12		3.127E+12	
137	Sm-156		Y		0	5.134E+02		5.134E+02		0.000E+00		0.000E+00	
138	Sm-157				0	3.239E+02				0.000E+00			
139	Sr-89	Y	Y	Y	0.086	5.157E+06	5.157E+06	5.157E+06	5.157E+06	1.641E+13	1.641E+13	1.641E+13	1.641E+13
140	Sr-90	Y	Y	Y	0	6.532E+05	6.532E+05	6.532E+05	6.532E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
141	Sr-91	Y	Y	Y	1047	6.532E+06	6.532E+06	6.532E+06	6.532E+06	2.531E+17	2.531E+17	2.531E+17	2.531E+17
142	Sr-92	Y	Y	Y	1339	6.952E+06	6.952E+06	6.952E+06	6.952E+06	3.444E+17	3.444E+17	3.444E+17	3.444E+17
143	Sr-93	Y			2214	7.869E+06	7.869E+06			6.446E+17		6.446E+17	
144	Tc-99	Y			0	5.520E+00	5.520E+00			0.000E+00		0.000E+00	

Table 4. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Energy (Mev/dls)
For RG 1.183 DBA-LOCA Source; Time = 0.0 = Shutdown

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
145	Tc-99m	Y		Y	123.9	4.469E+05	4.469E+05		4.469E+05	2.049E+15	2.049E+15		2.049E+15
146	Tc-100				83	1.263E+05				3.877E+14			
147	Tc-101	Y	Y		337	4.584E+05	4.584E+05	4.584E+05		5.716E+15	5.716E+15	5.716E+15	
148	Tc-102				81	4.355E+05				1.305E+15			
149	Tc-104				1999	3.534E+05			3.534E+05	2.613E+16		2.613E+16	
150	Tc-105				535	2.922E+05				5.785E+15			
151	Te-123m	Y	Y		148.1	4.851E+01	4.851E+01	4.851E+01		2.658E+11	2.658E+11	2.658E+11	
152	Te-125m	Y	Y		38	1.513E+04	1.513E+04	1.513E+04		2.015E+13	2.015E+13	2.015E+13	
153	Te-127	Y	Y	Y	4.8	4.660E+05	4.660E+05	4.660E+05	4.660E+05	8.277E+13	8.277E+13	8.277E+13	8.277E+13
154	Te-127m	Y	Y	Y	11.1	7.946E+04	7.946E+04	7.946E+04	7.946E+04	3.263E+13	3.263E+13	3.263E+13	3.263E+13
155	Te-129	Y	Y	Y	62.4	1.646E+06	1.646E+06	1.646E+06	1.646E+06	3.801E+15	3.801E+15	3.801E+15	3.801E+15
156	Te-129m	Y	Y	Y	37	3.331E+05	3.331E+05	3.331E+05	3.331E+05	4.560E+14	4.560E+14	4.560E+14	4.560E+14
157	Te-131	Y	Y		421	4.546E+06	4.546E+06	4.546E+06		7.081E+16	7.081E+16	7.081E+16	
158	Te-131m	Y	Y	Y	1423	1.073E+06	1.073E+06	1.073E+06	1.073E+06	5.652E+16	5.652E+16	5.652E+16	5.652E+16
159	Te-132	Y	Y	Y	234	7.716E+06	7.716E+06	7.716E+06	7.716E+06	6.681E+16	6.681E+16	6.681E+16	6.681E+16
160	Te-133	Y	Y		952	5.997E+06	5.997E+06	5.997E+06		2.113E+17	2.113E+17	2.113E+17	
161	Te-133m	Y	Y		1696	4.928E+06	4.928E+06	4.928E+06		3.092E+17	3.092E+17	3.092E+17	
162	Te-134	Y	Y		858	9.741E+06	9.741E+06	9.741E+06		3.092E+17	3.092E+17	3.092E+17	
163	Xe-129m	Y	Y		51.3	5.157E+03	5.157E+03	5.157E+03		9.789E+12	9.789E+12	9.789E+12	
164	Xe-131m	Y	Y		20	1.467E+06	1.467E+06	1.467E+06		1.085E+15	1.085E+15	1.085E+15	
165	Xe-133	Y	Y	Y	45.9	2.124E+08	2.124E+08	2.124E+08	2.124E+08	3.607E+17	3.607E+17	3.607E+17	3.607E+17
166	Xe-133m	Y	Y		41.4	6.991E+06	6.991E+06	6.991E+06		1.071E+16	1.071E+16	1.071E+16	
167	Xe-134m				1896	5.898E+06				4.138E+17			
168	Xe-135	Y	Y	Y	249	7.029E+07	7.029E+07	7.029E+07	7.029E+07	6.476E+17	6.476E+17	6.476E+17	6.476E+17
169	Xe-135m	Y	Y		432	4.630E+07	4.630E+07	4.630E+07		7.400E+17	7.400E+17	7.400E+17	
170	Xe-137	Y			190.8	2.017E+08	2.017E+08			1.424E+18	1.424E+18		
171	Xe-138	Y	Y		1128	1.887E+08	1.887E+08	1.887E+08		7.862E+18	7.862E+18	7.862E+18	
172	Y-89m				901.4	3.351E+01				1.118E+12			
173	Y-90	Y	Y	Y	0.00031	2.726E+03	2.726E+03	2.726E+03	2.726E+03	3.126E+07	3.126E+07	3.126E+07	3.126E+07
174	Y-91	Y	Y	Y	3.6	2.690E+04	2.690E+04	2.690E+04	2.690E+04	3.583E+12	3.583E+12	3.583E+12	3.583E+12
175	Y-91m	Y	Y		527.7	1.514E+04	1.514E+04	1.514E+04		2.957E+14	2.957E+14	2.957E+14	
176	Y-92	Y	Y	Y	253	2.796E+04	2.796E+04	2.796E+04	2.796E+04	2.818E+14	2.818E+14	2.818E+14	2.818E+14
177	Y-93	Y	Y	Y	88.9	2.139E+04	2.139E+04	2.139E+04	2.139E+04	7.036E+13	7.036E+13	7.036E+13	7.036E+13
178	Y-94	Y	Y		772	3.382E+04				9.689E+14			
179	Y-95	Y	Y		1287	3.530E+04				1.681E+15			
180	Zr-89	Y	Y		925.7	1.105E+01	1.105E+01	1.105E+01		3.784E+11	3.784E+11	3.784E+11	
181	Zr-93	Y	Y		1.84	5.944E-03	5.944E-03	5.944E-03		4.047E+05	4.047E+05	4.047E+05	
182	Zr-95	Y	Y	Y	773	3.832E+04	3.832E+04	3.832E+04	3.832E+04	1.096E+15	1.096E+15	1.096E+15	1.096E+15
183	Zr-97	Y	Y	Y	869	3.794E+04	3.794E+04	3.794E+04	3.794E+04	1.220E+15	1.220E+15	1.220E+15	1.220E+15
					TOTAL	1.459E+09	1.433E+09	1.218E+09	7.899E+08	4.656E+19	4.482E+19	4.328E+19	2.655E+19
					Average Energy Mev/dls					8.826E-01	8.456E-01	9.606E-01	9.085E-01

Table 5. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Source Energy (Mev/dis)
For RG 1.183 DBA-LOCA Source, Time = 1 Hour

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
1	Am-241	Y	Y	Y	5480	5.073E+00	5.073E+00	5.073E+00	5.073E+00	1.029E+12	1.029E+12	1.029E+12	1.029E+12
2	Am-242	Y	Y		18	2.185E+03	2.185E+03	2.185E+03		1.455E+12	1.455E+12	1.455E+12	
3	Am-242m	Y	Y		23.2	3.316E-01	3.316E-01	3.316E-01		2.846E+08	2.846E+08	2.846E+08	
4	Am-243	Y	Y		5265	6.250E-01	6.250E-01	6.250E-01		1.217E+11	1.217E+11	1.217E+11	
5	Am-244	Y	Y		808	2.582E+03	2.582E+03	2.582E+03		7.701E+13	7.701E+13	7.701E+13	
6	Ba-135m	Y	Y		60	2.044E+03	2.044E+03	2.044E+03		4.537E+12	4.537E+12	4.537E+12	
7	Ba-136m				1923	4.087E+04				2.908E+15			
8	Ba-137m	Y	Y		599	8.213E+05	8.213E+05	8.213E+05		1.820E+16	1.820E+16	1.820E+16	
9	Ba-139	Y	Y	Y	43.5	6.723E+06	6.723E+06	6.723E+06	6.723E+06	1.082E+16	1.082E+16	1.082E+16	1.082E+16
10	Ba-140	Y	Y	Y	182.6	9.779E+06	9.779E+06	9.779E+06	9.779E+06	6.607E+16	6.607E+16	6.607E+16	6.607E+16
11	Ba-141	Y	Y		845	9.206E+05	9.206E+05	9.206E+05		2.878E+16	2.878E+16	2.878E+16	
12	Ba-142	Y	Y		1038	1.662E+05	1.662E+05	1.662E+05		6.382E+15	6.382E+15	6.382E+15	
13	Br-82	Y	Y		2642	1.125E+05	1.125E+05	1.125E+05		1.100E+16	1.100E+16	1.100E+16	
14	Br-83	Y	Y		7.44	3.117E+06	3.117E+06	3.117E+06		8.581E+14	8.581E+14	8.581E+14	
15	Br-84	Y	Y		1720	2.159E+06	2.159E+06	2.159E+06		1.374E+17	1.374E+17	1.374E+17	
16	Ce-141	Y	Y	Y	77	8.977E+04	8.977E+04	8.977E+04	8.977E+04	2.558E+14	2.558E+14	2.558E+14	2.558E+14
17	Ce-143	Y	Y	Y	274	8.213E+04	8.213E+04	8.213E+04	8.213E+04	8.326E+14	8.326E+14	8.326E+14	8.326E+14
18	Ce-144	Y	Y	Y	19.2	7.564E+04	7.564E+04	7.564E+04	7.564E+04	5.373E+13	5.373E+13	5.373E+13	5.373E+13
19	Ce-146				289	2.083E+03				2.238E+13			
20	Cm-242	Y	Y	Y	6043	1.334E+03	1.334E+03	1.334E+03	1.334E+03	2.983E+14	2.983E+14	2.983E+14	2.983E+14
21	Cm-243	Y	Y		5838	5.745E-01	5.745E-01	5.745E-01		1.241E+11	1.241E+11	1.241E+11	
22	Cm-244	Y	Y	Y	6796	7.793E+01	7.793E+01	7.793E+01	7.793E+01	1.671E+13	1.671E+13	1.671E+13	1.671E+13
23	Co-58	Y	Y	Y	824	1.478E+03	1.478E+03	1.478E+03	1.478E+03	4.507E+13	4.507E+13	4.507E+13	4.507E+13
24	Co-60	Y	Y	Y	2504.4	7.965E+02	7.965E+02	7.965E+02	7.965E+02	7.380E+13	7.380E+13	7.380E+13	7.380E+13
25	Co-60m	Y	Y		6.6	2.483E+01	2.483E+01	2.483E+01		6.063E+09	6.063E+09	6.063E+09	
26	Co-81	Y	Y		98.4	1.167E+01	1.167E+01	1.167E+01		4.249E+10	4.249E+10	4.249E+10	
27	Cs-132	Y	Y		712.1	1.083E+03	1.083E+03	1.083E+03		2.853E+13	2.853E+13	2.853E+13	
28	Cs-134	Y	Y	Y	1555	5.749E+06	5.749E+06	5.749E+06	5.749E+06	3.308E+17	3.308E+17	3.308E+17	3.308E+17
29	Cs-134m	Y	Y		26.8	9.474E+05	9.474E+05	9.474E+05		9.394E+14	9.394E+14	9.394E+14	
30	Cs-135m	Y	Y		1590	5.310E+05	5.310E+05	5.310E+05		3.124E+16	3.124E+16	3.124E+16	
31	Cs-136	Y	Y	Y	2171	1.832E+06	1.832E+06	1.832E+06	1.832E+06	1.471E+17	1.471E+17	1.471E+17	1.471E+17
32	Cs-137	Y	Y	Y	566	4.336E+06	4.336E+06	4.336E+06	4.336E+06	9.080E+16	9.080E+16	9.080E+16	9.080E+16
33	Cs-138	Y	Y		2361	2.235E+07	2.235E+07	2.235E+07		1.952E+18	1.952E+18	1.952E+18	
34	Cs-139	Y	Y		329	5.654E+05	5.654E+05	5.654E+05		6.882E+15	6.882E+15	6.882E+15	
35	Eu-152m	Y	Y		306	4.599E+00	4.599E+00	4.599E+00		5.207E+10	5.207E+10	5.207E+10	
36	Eu-154	Y	Y		1253	2.111E+02	2.111E+02	2.111E+02		9.785E+12	9.785E+12	9.785E+12	
37	Eu-155	Y	Y		83	8.681E+01	8.681E+01	8.681E+01		2.023E+11	2.023E+11	2.023E+11	
38	Eu-156	Y	Y		1324	5.461E+03	5.461E+03	5.461E+03		2.675E+14	2.675E+14	2.675E+14	
39	Eu-157				0	5.058E+02	5.058E+02	5.058E+02		0.000E+00	0.000E+00	0.000E+00	
40	Eu-158				1081	8.603E+01	8.603E+01	8.603E+01		3.441E+12	3.441E+12	3.441E+12	
41	Eu-159				0	1.091E+01				0.000E+00			
42	I-128	Y	Y		90	6.738E+04	6.738E+04	6.738E+04		2.244E+14	2.244E+14	2.244E+14	
43	I-130	Y	Y		2139	7.518E+05	7.518E+05	7.518E+05		5.950E+16	5.950E+16	5.950E+16	
44	I-130m				121	4.149E+03				1.857E+13			
45	I-131	Y	Y	Y	382	3.209E+07	3.209E+07	3.209E+07	3.209E+07	4.535E+17	4.535E+17	4.535E+17	4.535E+17
46	I-132	Y	Y	Y	2290	4.676E+07	4.676E+07	4.676E+07	4.676E+07	3.962E+18	3.962E+18	3.962E+18	3.962E+18
47	I-133	Y	Y	Y	607	6.532E+07	6.532E+07	6.532E+07	6.532E+07	1.467E+18	1.467E+18	1.467E+18	1.467E+18
48	I-133m				1573	1.439E+06				8.377E+16			

Table 5. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Source Energy (Mev/dls)
For RG 1.183 DBA-LOCA Source, Time = 1 Hour

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
49	I-134	Y	Y	Y	2611	5.249E+07	5.249E+07	5.249E+07	5.249E+07	5.071E+18	5.071E+18	5.071E+18	5.071E+18
50	I-135	Y	Y	Y	1847	5.707E+07	5.707E+07	5.707E+07	5.707E+07	3.478E+18	3.478E+18	3.478E+18	3.478E+18
51	Kr-83m	Y			2.67	1.281E+07	1.281E+07			1.199E+15	1.199E+15		
52	Kr-85	Y	Y	Y	2.2	1.482E+08	1.482E+08	1.482E+08	1.482E+08	1.206E+14	1.206E+14	1.206E+14	1.206E+14
53	Kr-85m	Y	Y	Y	158	2.323E+07	2.323E+07	2.323E+07	2.323E+07	1.341E+17	1.341E+17	1.341E+17	1.341E+17
54	Kr-87	Y	Y	Y	782	3.148E+07	3.148E+07	3.148E+07	3.148E+07	9.224E+17	9.224E+17	9.224E+17	9.224E+17
55	Kr-88	Y	Y	Y	1955	5.845E+07	5.845E+07	5.845E+07	5.845E+07	4.228E+18	4.228E+18	4.228E+18	4.228E+18
56	La-140	Y	Y	Y	2315	4.187E+04	4.187E+04	4.187E+04	4.187E+04	3.586E+15	3.586E+15	3.586E+15	3.586E+15
57	La-141	Y	Y	Y	0	3.209E+04	3.209E+04	3.209E+04	3.209E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
58	La-142	Y	Y	Y	2485	2.475E+04	2.475E+04	2.475E+04	2.475E+04	2.276E+15	2.276E+15	2.276E+15	2.276E+15
59	La-143		Y		93	1.772E+03		1.772E+03		8.099E+12		8.099E+12	
60	Mo-99	Y	Y	Y	272	5.004E+05	5.004E+05	5.004E+05	5.004E+05	5.036E+15	5.036E+15	5.036E+15	5.036E+15
61	Mo-101	Y	Y		1514	2.674E+04	2.674E+04	2.674E+04		1.498E+15	1.498E+15	1.498E+15	
62	Mo-102				18.5	1.100E+04				7.531E+12			
63	Nb-95	Y	Y	Y	784.31	3.846E+04		3.846E+04	3.846E+04	1.088E+15		1.088E+15	1.088E+15
64	Nb-95m	Y	Y		71.2	4.265E+02	4.265E+02	4.265E+02		1.123E+12	1.123E+12	1.123E+12	
65	Nb-96	Y	Y		2462	6.046E+01	6.046E+01	6.046E+01		5.508E+12	5.508E+12	5.508E+12	
66	Nb-97	Y	Y		668.8	3.760E+04	3.760E+04	3.760E+04		9.278E+14	9.278E+14	9.278E+14	
67	Nb-97m	Y	Y		728.3	3.461E+04	3.461E+04	3.461E+04		9.326E+14	9.326E+14	9.326E+14	
68	Nb-98m				2711	1.303E+02				1.307E+13			
69	Nd-147	Y	Y	Y	141	1.444E+04	1.444E+04	1.444E+04	1.444E+04	7.533E+13	7.533E+13	7.533E+13	7.533E+13
70	Nd-149	Y	Y		384	5.684E+03	5.684E+03	5.684E+03		8.076E+13	8.076E+13	8.076E+13	
71	Nd-151		Y		916	1.543E+02		1.543E+02		5.230E+12		5.230E+12	
72	Nd-152				0	7.518E+01				0.000E+00			
73	Np-238m	Y	Y		49.7	2.349E-01	2.349E-01	2.349E-01		4.320E+08	4.320E+08	4.320E+08	
74	Np-238	Y	Y		647	2.319E+04	2.319E+04	2.319E+04		5.551E+14	5.551E+14	5.551E+14	
75	Np-239	Y	Y	Y	174	1.054E+06	1.054E+06	1.054E+06	1.054E+06	6.788E+15	6.788E+15	6.788E+15	6.788E+15
76	Np-240	Y	Y		1193	1.005E+03	1.005E+03	1.005E+03		4.435E+13	4.435E+13	4.435E+13	
77	Pd-109	Y	Y		11.7	9.856E+04	9.856E+04	9.856E+04		4.266E+13	4.266E+13	4.266E+13	
78	Pd-111				45	3.228E+03				5.374E+12			
79	Pd-111m				359	8.227E+02				8.271E+12			
80	Pd-112				0	7.296E+03				0.000E+00			
81	Pm-147	Y	Y		0.00439	5.012E+03	5.012E+03	5.012E+03		8.141E+08	8.141E+08	8.141E+08	
82	Pm-148	Y	Y		574	4.019E+03	4.019E+03	4.019E+03		8.535E+13	8.535E+13	8.535E+13	
83	Pm-148m	Y	Y		1988	7.747E+02	7.747E+02	7.747E+02		5.693E+13	5.693E+13	5.693E+13	
84	Pm-149	Y	Y		10.7	1.284E+04	1.284E+04	1.284E+04		5.081E+12	5.081E+12	5.081E+12	
85	Pm-150		Y		1491	8.542E+01	8.542E+01	8.542E+01		4.712E+12	4.712E+12	4.712E+12	
86	Pm-151	Y	Y		321	4.283E+03	4.283E+03	4.283E+03		5.063E+13	5.063E+13	5.063E+13	
87	Pm-152				151	1.175E+02				6.565E+11			
88	Pm-152m				1508	4.283E-01				2.379E+10			
89	Pm-153				0	1.100E+00				0.000E+00			
90	Pr-142	Y	Y		58.4	1.415E+03	1.415E+03	1.415E+03		3.057E+12	3.057E+12	3.057E+12	
91	Pr-143	Y	Y	Y	0	3.224E+04	3.224E+04	3.224E+04	3.224E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
92	Pr-144	Y	Y		28.9	3.025E+04	3.025E+04	3.025E+04		3.235E+13	3.235E+13	3.235E+13	
93	Pr-144m	Y	Y		12.1	4.233E+02	4.233E+02	4.233E+02		1.895E+11	1.895E+11	1.895E+11	
94	Pr-145		Y		14.76	2.048E+04	2.048E+04	2.048E+04		1.118E+13	1.118E+13	1.118E+13	
95	Pr-146				1018	6.311E+03				2.377E+14			
96	Pr-147		Y		863	7.227E+02		7.227E+02		2.308E+13		2.308E+13	

Table 5. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Source Energy (Mev/dls)
For RG 1.183 DBA-LOCA Source, Time = 1 Hour

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
97	Pu-237	Y	Y		53.6	3.350E-01	3.350E-01	3.350E-01		6.644E+08	6.644E+08	6.644E+08	
98	Pu-238	Y	Y	Y	1.76	2.281E+02	2.281E+02	2.281E+02	2.281E+02	1.485E+10	1.485E+10	1.485E+10	1.485E+10
99	Pu-239	Y	Y	Y	5101	2.414E+01	2.414E+01	2.414E+01	2.414E+01	4.557E+12	4.557E+12	4.557E+12	4.557E+12
100	Pu-240	Y	Y	Y	0.0286	3.896E+01	3.896E+01	3.896E+01	3.896E+01	4.123E+07	4.123E+07	4.123E+07	4.123E+07
101	Pu-241	Y	Y	Y	0.001354	9.588E+03	9.588E+03	9.588E+03	9.588E+03	4.803E+08	4.803E+08	4.803E+08	4.803E+08
102	Pu-243	Y	Y		26	1.818E+04	1.818E+04	1.818E+04		1.749E+13	1.749E+13	1.749E+13	
103	Rb-88	Y	Y	Y	84.5	5.405E+04	5.405E+04	5.405E+04	5.405E+04	1.890E+14	1.890E+14	1.890E+14	1.890E+14
104	Rb-88	Y	Y		629	1.614E+07	1.614E+07	1.614E+07		3.756E+17	3.756E+17	3.756E+17	
105	Rh-103m	Y	Y		1.65	4.278E+05	4.278E+05	4.278E+05		2.812E+13	2.812E+13	2.812E+13	
106	Rh-105	Y	Y	Y	77	2.789E+05	2.789E+05	2.789E+05	2.789E+05	7.945E+14	7.945E+14	7.945E+14	7.945E+14
107	Rh-105m	Y			34.5	7.468E+04	7.468E+04			9.533E+13	9.533E+13		
108	Rh-106	Y	Y		206	1.711E+05		1.711E+05		1.304E+15		1.304E+15	
109	Rh-106m		Y		2882	4.355E+03		4.355E+03		4.644E+14		4.644E+14	
110	Rh-107		Y		313	3.152E+04		3.152E+04		3.650E+14		3.650E+14	
111	Rh-108				2264	1.293E+01				1.083E+12			
112	Ru-103	Y	Y	Y	485	4.278E+05	4.278E+05	4.278E+05	4.278E+05	7.678E+15	7.678E+15	7.678E+15	7.678E+15
113	Ru-105	Y	Y	Y	738	2.617E+05	2.617E+05	2.617E+05	2.617E+05	7.145E+15	7.145E+15	7.145E+15	7.145E+15
114	Ru-106	Y	Y	Y	0	1.711E+05	1.711E+05	1.711E+05	1.711E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
115	Ru-107				206	2.903E+00				2.213E+10			
116	Ru-108				0	1.215E+01				0.000E+00			
117	Sb-122	Y	Y		433	1.058E+04	1.058E+04	1.058E+04		1.695E+14	1.695E+14	1.695E+14	
118	Sb-124	Y	Y		1852	4.860E+03	4.860E+03	4.860E+03		3.330E+14	3.330E+14	3.330E+14	
119	Sb-125	Y	Y		443	6.857E+04	6.857E+04	6.857E+04		1.124E+15	1.124E+15	1.124E+15	
120	Sb-126	Y	Y		2749	2.318E+03	2.318E+03	2.318E+03		2.358E+14	2.358E+14	2.358E+14	
121	Sb-126m	Y	Y		1548	3.090E+02	3.090E+02	3.090E+02		1.770E+13	1.770E+13	1.770E+13	
122	Sb-127	Y	Y	Y	664	4.660E+05	4.660E+05	4.660E+05	4.660E+05	1.145E+16	1.145E+16	1.145E+16	1.145E+16
123	Sb-128		Y		3108	7.640E+04		7.640E+04		8.786E+15		8.786E+15	
124	Sb-128m		Y		1909	4.546E+05		4.546E+05		3.211E+16		3.211E+16	
125	Sb-129	Y	Y	Y	1356	1.501E+06	1.501E+06	1.501E+06	1.501E+06	7.532E+16	7.532E+16	7.532E+16	7.532E+16
126	Sb-130		Y		3265	2.013E+05		2.013E+05		2.432E+16		2.432E+16	
127	Sb-130m				2653	6.761E+03				6.637E+14			
128	Sb-131		Y		1809	6.991E+05		6.991E+05		4.679E+16		4.679E+16	
129	Sb-132				2583	1.272E+02				1.216E+13			
130	Se-79m				13.7	1.203E+03				6.100E+11			
131	Se-81		Y		9.9	4.011E+04		4.011E+04		1.469E+13		1.469E+13	
132	Se-81m		Y		15	9.397E+03		9.397E+03		5.215E+12		5.215E+12	
133	Se-83		Y		956	4.737E+04		4.737E+04		1.674E+15		1.674E+15	
134	Sm-151	Y	Y		0.0131	1.360E+01	1.360E+01	1.360E+01		6.592E+08	6.592E+08	6.592E+08	
135	Sm-153	Y	Y		62.8	1.047E+04	1.047E+04	1.047E+04		2.432E+13	2.432E+13	2.432E+13	
136	Sm-155		Y		103	1.316E+02		1.316E+02		5.014E+11		5.014E+11	
137	Sm-156		Y		0	4.787E+02		4.787E+02		0.000E+00		0.000E+00	
138	Sm-157				0	2.002E+00				0.000E+00			
139	Sr-89	Y	Y	Y	0.086	5.157E+06	5.157E+06	5.157E+06	5.157E+06	1.641E+13	1.641E+13	1.641E+13	1.641E+13
140	Sr-90	Y	Y	Y	0	6.532E+05	6.532E+05	6.532E+05	6.532E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
141	Sr-91	Y	Y	Y	1047	6.074E+06	6.074E+06	6.074E+06	6.074E+06	2.353E+17	2.353E+17	2.353E+17	2.353E+17
142	Sr-92	Y	Y	Y	1339	5.386E+06	5.386E+06	5.386E+06	5.386E+06	2.668E+17	2.668E+17	2.668E+17	2.668E+17
143	Sr-93	Y			2214	2.918E+04	2.918E+04			2.391E+15	2.391E+15		
144	Tc-99	Y			0	5.520E+00	5.520E+00			0.000E+00	0.000E+00		

Table 5. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Source Energy (Mev/dis)
For RG 1.183 DBA-LOCA Source, Time = 1 Hour

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
145	Tc-99m	Y		Y	123.9	4.469E+05	4.469E+05		4.469E+05	2.049E+15	2.049E+15		2.049E+15
146	Tc-100				83	0.000E+00				0.000E+00			
147	Tc-101	Y	Y		337	9.989E+04	9.989E+04	9.989E+04		1.246E+15	1.246E+15	1.246E+15	
148	Tc-102				81	1.108E+04				3.320E+13			
149	Tc-104				1999	3.839E+04		3.839E+04		2.840E+15		2.840E+15	
150	Tc-105				535	1.320E+03				2.813E+13			
151	Te-123m	Y	Y		148.1	4.851E+01	4.851E+01	4.851E+01		2.658E+11	2.658E+11	2.658E+11	
152	Te-125m	Y	Y		36	1.513E+04	1.513E+04	1.513E+04		2.015E+13	2.015E+13	2.015E+13	
153	Te-127	Y	Y	Y	4.8	4.660E+05	4.660E+05	4.660E+05	4.660E+05	8.277E+13	8.277E+13	8.277E+13	8.277E+13
154	Te-127m	Y	Y	Y	11.1	7.946E+04	7.946E+04	7.946E+04	7.946E+04	3.263E+13	3.263E+13	3.263E+13	3.263E+13
155	Te-129	Y	Y	Y	62.4	1.597E+06	1.597E+06	1.597E+06	1.597E+06	3.687E+15	3.687E+15	3.687E+15	3.687E+15
156	Te-129m	Y	Y	Y	37	3.331E+05	3.331E+05	3.331E+05	3.331E+05	4.560E+14	4.560E+14	4.560E+14	4.560E+14
157	Te-131	Y	Y		421	2.212E+08	2.212E+08	2.212E+08		3.445E+16	3.445E+16	3.445E+16	
158	Te-131m	Y	Y	Y	1423	1.054E+06	1.054E+06	1.054E+06	1.054E+06	5.551E+16	5.551E+16	5.551E+16	5.551E+16
159	Te-132	Y	Y	Y	234	7.640E+06	7.640E+06	7.640E+06	7.640E+06	6.615E+18	6.615E+18	6.615E+18	6.615E+18
160	Te-133	Y	Y		952	7.296E+05	7.296E+05	7.296E+05		2.570E+16	2.570E+16	2.570E+16	
161	Te-133m	Y	Y		1696	2.345E+06	2.345E+06	2.345E+06		1.472E+17	1.472E+17	1.472E+17	
162	Te-134	Y	Y		858	3.606E+06	3.606E+06	3.606E+06		1.145E+17	1.145E+17	1.145E+17	
163	Xe-129m	Y	Y		51.3	5.142E+03	5.142E+03	5.142E+03		9.759E+12	9.759E+12	9.759E+12	
164	Xe-131m	Y	Y		20	1.467E+06	1.467E+06	1.467E+06		1.085E+15	1.085E+15	1.085E+15	
165	Xe-133	Y	Y	Y	45.9	2.124E+08	2.124E+08	2.124E+08	2.124E+08	3.607E+17	3.607E+17	3.607E+17	3.607E+17
166	Xe-133m	Y	Y		41.4	6.983E+06	6.983E+06	6.983E+06		1.070E+16	1.070E+16	1.070E+16	
167	Xe-134m				1896	6.356E+00				4.459E+11			
168	Xe-135	Y	Y	Y	249	8.022E+07	8.022E+07	8.022E+07	8.022E+07	7.391E+17	7.391E+17	7.391E+17	7.391E+17
169	Xe-135m	Y	Y		432	3.178E+07	3.178E+07	3.178E+07		5.080E+17	5.080E+17	5.080E+17	
170	Xe-137	Y	Y		190.8	3.973E+03	3.973E+03			2.805E+13	2.805E+13		
171	Xe-138	Y	Y		1126	9.856E+06	9.856E+06	9.856E+06		4.106E+17	4.106E+17	4.106E+17	
172	Y-89m				901.4	1.260E+01				4.271E+11			
173	Y-90	Y	Y	Y	0.00031	2.725E+03	2.725E+03	2.725E+03	2.725E+03	3.126E+07	3.126E+07	3.126E+07	3.126E+07
174	Y-91	Y	Y	Y	3.6	2.690E+04	2.690E+04	2.690E+04	2.690E+04	3.583E+12	3.583E+12	3.583E+12	3.583E+12
175	Y-91m	Y	Y		527.7	1.481E+04	1.481E+04	1.481E+04		2.891E+14	2.891E+14	2.891E+14	
176	Y-92	Y	Y	Y	253	2.735E+04	2.735E+04	2.735E+04	2.735E+04	2.560E+14	2.560E+14	2.560E+14	2.560E+14
177	Y-93	Y	Y	Y	68.9	2.017E+04	2.017E+04	2.017E+04	2.017E+04	6.634E+13	6.634E+13	6.634E+13	6.634E+13
178	Y-94		Y		772	3.912E+03		3.912E+03		1.117E+14		1.117E+14	
179	Y-95		Y		1287	6.952E+02		6.952E+02		3.311E+13		3.311E+13	
180	Zr-89	Y	Y		925.7	1.096E+01	1.096E+01	1.096E+01		3.752E+11	3.752E+11	3.752E+11	
181	Zr-93	Y	Y		1.84	5.944E-03	5.944E-03	5.944E-03		4.047E+05	4.047E+05	4.047E+05	
182	Zr-95	Y	Y	Y	773	3.832E+04	3.832E+04	3.832E+04	3.832E+04	1.096E+15	1.096E+15	1.096E+15	1.096E+15
183	Zr-97	Y	Y	Y	869	3.644E+04	3.644E+04	3.644E+04	3.644E+04	1.172E+15	1.172E+15	1.172E+15	1.172E+15
					TOTAL	8.482E+08	8.445E+08	8.335E+08	7.236E+08	2.632E+19	2.608E+19	2.622E+19	2.222E+19
					Average Energy Mev/dis					6.385E-01	6.346E-01	6.502E-01	6.298E-01

Table 6. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Source Energy (Mev/dls)
For RG 1.183 DBA-LOCA Source; Time = 8 Hours

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
1	Am-241	Y	Y	Y	5480	5.088E+00	5.088E+00	5.088E+00	5.088E+00	1.032E+12	1.032E+12	1.032E+12	1.032E+12
2	Am-242	Y	Y		18	1.620E+03	1.620E+03	1.620E+03		1.078E+12	1.078E+12	1.078E+12	
3	Am-242m	Y	Y		23.2	3.316E-01	3.316E-01	3.316E-01		2.846E+08	2.846E+08	2.846E+08	
4	Am-243	Y	Y		5265	6.250E-01	6.250E-01	6.250E-01		1.217E+11	1.217E+11	1.217E+11	
5	Am-244	Y	Y		806	1.589E+03	1.589E+03	1.589E+03		4.739E+13	4.739E+13	4.739E+13	
6	Ba-135m	Y	Y		60	1.727E+03	1.727E+03	1.727E+03		3.833E+12	3.833E+12	3.833E+12	
7	Ba-138m				1923	4.049E+04				2.881E+15			
8	Ba-137m	Y	Y		599	8.213E+05	8.213E+05	8.213E+05		1.820E+16	1.820E+16	1.820E+16	
9	Ba-139	Y	Y	Y	43.5	2.158E+05	2.158E+05	2.158E+05	2.158E+05	3.474E+14	3.474E+14	3.474E+14	3.474E+14
10	Ba-140	Y	Y	Y	182.8	9.826E+06	9.826E+06	9.826E+06	9.826E+06	6.504E+16	6.504E+16	6.504E+16	6.504E+16
11	Ba-141	Y	Y		845	1.104E-01	1.104E-01	1.104E-01		3.452E+09	3.452E+09	3.452E+09	
12	Ba-142	Y	Y		1038	1.967E-07	1.967E-07	1.967E-07		7.556E+03	7.556E+03	7.556E+03	
13	Br-82	Y	Y		2642	9.810E+04	9.810E+04	9.810E+04		9.589E+15	9.589E+15	9.589E+15	
14	Br-83	Y	Y		7.44	4.194E+05	4.194E+05	4.194E+05		1.155E+14	1.155E+14	1.155E+14	
15	Br-84	Y	Y		1720	2.285E+02	2.285E+02	2.285E+02		1.454E+13	1.454E+13	1.454E+13	
16	Ce-141	Y	Y	Y	77	8.939E+04	8.939E+04	8.939E+04	8.939E+04	2.547E+14	2.547E+14	2.547E+14	2.547E+14
17	Ce-143	Y	Y	Y	274	7.105E+04	7.105E+04	7.105E+04	7.105E+04	7.203E+14	7.203E+14	7.203E+14	7.203E+14
18	Ce-144	Y	Y	Y	19.2	7.584E+04	7.584E+04	7.584E+04	7.584E+04	5.373E+13	5.373E+13	5.373E+13	5.373E+13
19	Ce-146				289	9.321E-07				9.967E+03			
20	Cm-242	Y	Y	Y	6043	1.334E+03	1.334E+03	1.334E+03	1.334E+03	2.983E+14	2.983E+14	2.983E+14	2.983E+14
21	Cm-243	Y	Y		5838	5.745E-01	5.745E-01	5.745E-01		1.241E+11	1.241E+11	1.241E+11	
22	Cm-244	Y	Y	Y	5798	7.793E+01	7.793E+01	7.793E+01	7.793E+01	1.671E+13	1.671E+13	1.671E+13	1.671E+13
23	Co-58	Y	Y	Y	824	1.475E+03	1.475E+03	1.475E+03	1.475E+03	4.496E+13	4.496E+13	4.496E+13	4.496E+13
24	Co-60	Y	Y	Y	2504.4	7.965E+02	7.965E+02	7.965E+02	7.965E+02	7.380E+13	7.380E+13	7.380E+13	7.380E+13
25	Co-60m	Y	Y		6.6	2.082E-11	2.082E-11	2.082E-11		5.084E-03	5.084E-03	5.084E-03	
26	Co-61	Y	Y		98.4	6.169E-01	6.169E-01	6.169E-01		2.246E+09	2.246E+09	2.246E+09	
27	Cs-132	Y	Y		712.1	1.051E+03	1.051E+03	1.051E+03		2.768E+13	2.768E+13	2.768E+13	
28	Cs-134	Y	Y	Y	1555	5.749E+06	5.749E+06	5.749E+06	5.749E+06	3.308E+17	3.308E+17	3.308E+17	3.308E+17
29	Cs-134m	Y	Y		26.8	1.790E+05	1.790E+05	1.790E+05		1.775E+14	1.775E+14	1.775E+14	
30	Cs-135m	Y	Y		1590	2.177E+03		2.177E+03		1.281E+14		1.281E+14	
31	Cs-136	Y	Y	Y	2171	1.803E+06	1.803E+06	1.803E+06	1.803E+06	1.448E+17	1.448E+17	1.448E+17	1.448E+17
32	Cs-137	Y	Y	Y	566	4.336E+06	4.336E+06	4.336E+06	4.336E+06	9.080E+16	9.080E+16	9.080E+16	9.080E+16
33	Cs-138	Y	Y		2381	2.865E+03	2.865E+03	2.865E+03		2.503E+14	2.503E+14	2.503E+14	
34	Cs-139	Y	Y		329	1.301E-08	1.301E-08	1.301E-08		1.583E+02	1.583E+02	1.583E+02	
35	Eu-152m	Y	Y		308	2.735E+00	2.735E+00	2.735E+00		3.097E+10	3.097E+10	3.097E+10	
36	Eu-154	Y	Y		1253	2.111E+02	2.111E+02	2.111E+02		9.785E+12	9.785E+12	9.785E+12	
37	Eu-155	Y	Y		63	8.681E+01	8.681E+01	8.681E+01		2.023E+11	2.023E+11	2.023E+11	
38	Eu-156	Y	Y		1324	5.399E+03	5.399E+03	5.399E+03		2.645E+14	2.645E+14	2.645E+14	
39	Eu-157		Y		0	3.667E+02		3.667E+02		0.000E+00		0.000E+00	
40	Eu-158		Y		1081	1.514E-01		1.514E-01		6.057E+09		6.057E+09	
41	Eu-159		Y		0	1.128E-06				0.000E+00			
42	I-128	Y	Y		90	5.868E-01	5.868E-01	5.868E-01		1.954E+09	1.954E+09	1.954E+09	
43	I-130	Y	Y		2139	5.088E+05	5.088E+05	5.088E+05		4.027E+16	4.027E+16	4.027E+16	
44	I-130m				121	3.713E-11				1.662E-01			
45	I-131	Y	Y	Y	382	3.140E+07	3.140E+07	3.140E+07	3.140E+07	4.438E+17	4.438E+17	4.438E+17	4.438E+17
46	I-132	Y	Y	Y	2290	4.446E+07	4.446E+07	4.446E+07	4.446E+07	3.768E+18	3.768E+18	3.768E+18	3.768E+18
47	I-133	Y	Y	Y	607	5.226E+07	5.226E+07	5.226E+07	5.226E+07	1.174E+18	1.174E+18	1.174E+18	1.174E+18
48	I-133m				1573	7.518E+03				4.375E+14			

Table 6. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Source Energy (Mev/dls)
For RG 1.183 DBA-LOCA Source; Time = 8 Hours

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
49	I-134	Y	Y	Y	2611	4.584E+05	4.584E+05	4.584E+05	4.584E+05	4.428E+16	4.428E+16	4.428E+16	4.428E+16
50	I-135	Y	Y	Y	1847	2.727E+07	2.727E+07	2.727E+07	2.727E+07	1.662E+18	1.662E+18	1.662E+18	1.662E+18
51	Kr-83m	Y			2.57	3.637E+08	3.637E+08			3.458E+14	3.458E+14		
52	Kr-85	Y	Y	Y	2.2	1.482E+06	1.482E+06	1.482E+06	1.482E+06	1.206E+14	1.206E+14	1.206E+14	1.206E+14
53	Kr-85m	Y	Y	Y	156	7.869E+08	7.869E+08	7.869E+08	7.869E+08	4.542E+16	4.542E+16	4.542E+16	4.542E+16
54	Kr-87	Y	Y	Y	792	6.937E+05	6.937E+05	6.937E+05	6.937E+05	2.033E+16	2.033E+16	2.033E+16	2.033E+16
55	Kr-88	Y	Y	Y	1955	1.054E+07	1.054E+07	1.054E+07	1.054E+07	7.626E+17	7.626E+17	7.626E+17	7.626E+17
56	La-140	Y	Y	Y	2315	4.156E+04	4.156E+04	4.156E+04	4.156E+04	3.560E+15	3.560E+15	3.560E+15	3.560E+15
57	La-141	Y	Y	Y	0	9.397E+03	9.397E+03	9.397E+03	9.397E+03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
58	La-142	Y	Y	Y	2485	1.019E+03	1.019E+03	1.019E+03	1.019E+03	9.371E+13	9.371E+13	9.371E+13	9.371E+13
59	La-143	Y	Y		93	2.032E-06		2.032E-06		6.993E+03	6.993E+03	6.993E+03	
60	Mo-99	Y		Y	272	4.642E+05	4.642E+05		4.642E+05	4.671E+15	4.671E+15		4.671E+15
61	Mo-101	Y	Y		1514	5.864E-05	5.864E-05	5.864E-05		3.285E+06	3.285E+06		3.285E+06
62	Mo-102				18.5	7.124E-08				4.877E+01			
63	Nb-95	Y	Y	Y	784.31	3.846E+04		3.846E+04	3.846E+04	1.088E+15	1.088E+15		1.088E+15
64	Nb-95m	Y	Y		71.2	4.285E+02	4.265E+02	4.265E+02		1.123E+12	1.123E+12		1.123E+12
65	Nb-96	Y	Y		2462	4.909E+01	4.909E+01	4.909E+01		4.472E+12	4.472E+12		4.472E+12
66	Nb-97	Y	Y		666.8	2.929E+04	2.929E+04	2.929E+04		7.227E+14	7.227E+14		7.227E+14
67	Nb-97m	Y	Y		728.3	2.596E+04	2.596E+04	2.596E+04		6.996E+14	6.996E+14		6.996E+14
68	Nb-98m				2711	4.477E-01				4.491E+10			
69	Nd-147	Y	Y	Y	141	1.418E+04	1.418E+04	1.418E+04	1.418E+04	7.398E+13	7.398E+13	7.398E+13	7.398E+13
70	Nd-149	Y	Y		384	3.407E+02	3.407E+02	3.407E+02		4.841E+12	4.841E+12		4.841E+12
71	Nd-151		Y		916	1.059E-08		1.059E-08		3.589E+02	3.589E+02		
72	Nd-152				0	6.112E-10				0.000E+00			
73	Np-236m	Y	Y		49.7	1.891E-01	1.891E-01	1.891E-01		3.477E+08	3.477E+08		3.477E+08
74	Np-238	Y	Y		647	2.109E+04	2.109E+04	2.109E+04		5.048E+14	5.048E+14		5.048E+14
75	Np-239	Y	Y	Y	174	9.665E+05	9.665E+05	9.665E+05	9.665E+05	6.222E+15	6.222E+15	6.222E+15	6.222E+15
76	Np-240	Y	Y		1193	9.092E+00	9.092E+00	9.092E+00		4.013E+11	4.013E+11		4.013E+11
77	Pd-109	Y	Y		11.7	6.914E+04	6.914E+04	6.914E+04		2.993E+13	2.993E+13		2.993E+13
78	Pd-111				45	2.025E+02				3.371E+11			
79	Pd-111m				359	2.579E+02				3.425E+12			
80	Pd-112				0	6.806E+03				0.000E+00			
81	Pm-147	Y	Y		0.00439	5.012E+03	5.012E+03	5.012E+03		8.141E+08	8.141E+08		8.141E+08
82	Pm-148	Y	Y		574	3.881E+03	3.881E+03	3.881E+03		8.243E+13	8.243E+13		8.243E+13
83	Pm-148m	Y	Y		1988	7.716E+02	7.716E+02	7.716E+02		5.670E+13	5.670E+13		5.670E+13
84	Pm-149	Y	Y		10.7	1.187E+04	1.187E+04	1.187E+04		4.700E+12	4.700E+12		4.700E+12
85	Pm-150		Y		1491	1.398E+01		1.398E+01		7.713E+11			7.713E+11
86	Pm-151	Y	Y		321	3.591E+03	3.591E+03	3.591E+03		4.265E+13	4.265E+13		4.265E+13
87	Pm-152				151	9.535E-10				5.327E+00			
88	Pm-152m				1508	6.555E-18				3.657E-07			
89	Pm-153				0	0.000E+00				0.000E+00			
90	Pr-142	Y	Y		58.4	1.097E+03	1.097E+03	1.097E+03		2.371E+12	2.371E+12		2.371E+12
91	Pr-143	Y	Y	Y	0	3.224E+04	3.224E+04	3.224E+04	3.224E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
92	Pr-144	Y	Y		28.9	3.025E+04	3.025E+04	3.025E+04		3.235E+13	3.235E+13		3.235E+13
93	Pr-144m	Y	Y		12.1	4.233E+02	4.233E+02	4.233E+02		1.895E+11	1.895E+11		1.895E+11
94	Pr-145		Y		14.76	9.081E+03		9.081E+03		4.948E+12			4.948E+12
95	Pr-146				1018	4.294E-02				1.617E+09			
96	Pr-147		Y		863	3.652E-07		3.652E-07		1.166E+04		1.166E+04	

Table 6. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Source Energy (Mev/dis)
For RG 1.183 DBA-LOCA Source; Time = 8 Hours

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
97	Pu-237	Y	Y		53.6	3.335E-01	3.335E-01	3.335E-01		6.814E+08	6.814E+08	6.814E+08	
98	Pu-239	Y	Y	Y	1.76	2.281E+02	2.281E+02	2.281E+02	2.281E+02	1.485E+10	1.485E+10	1.485E+10	1.485E+10
99	Pu-239	Y	Y	Y	5101	2.414E+01	2.414E+01	2.414E+01	2.414E+01	4.557E+12	4.557E+12	4.557E+12	4.557E+12
100	Pu-240	Y	Y	Y	0.0288	3.896E+01	3.896E+01	3.896E+01	3.896E+01	4.123E+07	4.123E+07	4.123E+07	4.123E+07
101	Pu-241	Y	Y	Y	0.001354	9.588E+03	9.588E+03	9.588E+03	9.588E+03	4.803E+08	4.803E+08	4.803E+08	4.803E+08
102	Pu-243	Y	Y		28	6.838E+03	6.838E+03	6.838E+03		6.578E+12	6.578E+12	6.578E+12	
103	Rb-88	Y	Y	Y	94.5	5.348E+04	5.348E+04	5.348E+04	5.348E+04	1.870E+14	1.870E+14	1.870E+14	1.870E+14
104	Rb-88	Y	Y		629	2.961E+06	2.961E+06	2.961E+06		6.890E+16	6.890E+16	6.890E+16	
105	Rh-103m	Y	Y		1.65	4.259E+05	4.259E+05	4.259E+05		2.600E+13	2.600E+13	2.600E+13	
106	Rh-105	Y	Y	Y	77	2.617E+05	2.617E+05	2.617E+05	2.617E+05	7.455E+14	7.455E+14	7.455E+14	7.455E+14
107	Rh-105m	Y	Y		34.5	2.502E+04	2.502E+04			3.194E+13	3.194E+13		
108	Rh-108	Y	Y		206	1.711E+05	1.711E+05	1.711E+05		1.304E+15	1.304E+15	1.304E+15	
109	Rh-106m		Y		2882	4.622E+02	4.622E+02	4.622E+02		4.929E+13	4.929E+13	4.929E+13	
110	Rh-107		Y		313	4.699E-02	4.699E-02	4.699E-02		5.441E+08	5.441E+08	5.441E+08	
111	Rh-108		Y		2284	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
112	Ru-103	Y	Y	Y	485	4.259E+05	4.259E+05	4.259E+05	4.259E+05	7.643E+15	7.643E+15	7.643E+15	7.643E+15
113	Ru-105	Y	Y	Y	738	8.786E+04	8.786E+04	8.786E+04	8.786E+04	2.399E+15	2.399E+15	2.399E+15	2.399E+15
114	Ru-106	Y	Y	Y	0	1.711E+05	1.711E+05	1.711E+05	1.711E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
115	Ru-107		Y		206	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
116	Ru-108		Y		0	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
117	Sb-122	Y	Y		433	9.817E+03	9.817E+03	9.817E+03		1.573E+14	1.573E+14	1.573E+14	
118	Sb-124	Y	Y		1652	4.859E+03	4.859E+03	4.859E+03		3.330E+14	3.330E+14	3.330E+14	
119	Sb-125	Y	Y		443	6.857E+04	6.857E+04	6.857E+04		1.124E+15	1.124E+15	1.124E+15	
120	Sb-126	Y	Y		2749	2.281E+03	2.281E+03	2.281E+03		2.320E+14	2.320E+14	2.320E+14	
121	Sb-126m	Y	Y		1548	4.164E+00	4.164E+00	4.164E+00		2.385E+11	2.385E+11	2.385E+11	
122	Sb-127	Y	Y	Y	684	4.489E+05	4.489E+05	4.489E+05	4.489E+05	1.098E+16	1.098E+16	1.098E+16	1.098E+16
123	Sb-128		Y		3108	4.584E+04	4.584E+04	4.584E+04		5.271E+15	5.271E+15	5.271E+15	
124	Sb-128m		Y		1909	3.304E+03	3.304E+03	3.304E+03		2.334E+14	2.334E+14	2.334E+14	
125	Sb-129	Y	Y	Y	1356	4.966E+05	4.966E+05	4.966E+05	4.966E+05	2.492E+16	2.492E+16	2.492E+16	2.492E+16
126	Sb-130		Y		3265	1.288E+02	1.288E+02	1.288E+02		1.532E+13	1.532E+13	1.532E+13	
127	Sb-130m		Y		2653	5.806E-17	5.806E-17	5.806E-17		5.700E-06	5.700E-06	5.700E-06	
128	Sb-131		Y		1809	2.223E+00	2.223E+00	2.223E+00		1.488E+11	1.488E+11	1.488E+11	
129	Sb-132		Y		2583	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
130	Se-79m		Y		13.7	1.119E-11	1.119E-11	1.119E-11		5.674E-03	5.674E-03	5.674E-03	
131	Se-81		Y		9.9	8.557E+01	8.557E+01	8.557E+01		3.134E+10	3.134E+10	3.134E+10	
132	Se-81m		Y		15	5.806E+01	5.806E+01	5.806E+01		3.223E+10	3.223E+10	3.223E+10	
133	Se-83		Y		955	1.016E-01	1.016E-01	1.016E-01		3.590E+09	3.590E+09	3.590E+09	
134	Sm-151	Y	Y		0.0131	1.363E+01	1.363E+01	1.363E+01		6.606E+06	6.606E+06	6.606E+06	
135	Sm-153	Y	Y		62.8	9.428E+03	9.428E+03	9.428E+03		2.191E+13	2.191E+13	2.191E+13	
136	Sm-155		Y		103	2.812E-04	2.812E-04	2.812E-04		1.071E+06	1.071E+06	1.071E+06	
137	Sm-156		Y		0	2.842E+02	2.842E+02	2.842E+02		0.000E+00	0.000E+00	0.000E+00	
138	Sm-157		Y		0	4.309E-16	4.309E-16	4.309E-16		0.000E+00	0.000E+00	0.000E+00	
139	Sr-89	Y	Y	Y	0.086	5.157E+06	5.157E+06	5.157E+06	5.157E+06	1.841E+13	1.841E+13	1.841E+13	1.841E+13
140	Sr-90	Y	Y	Y	0	6.532E+05	6.532E+05	6.532E+05	6.532E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
141	Sr-91	Y	Y	Y	1047	3.652E+06	3.652E+06	3.652E+06	3.652E+06	1.415E+17	1.415E+17	1.415E+17	1.415E+17
142	Sr-92	Y	Y	Y	1339	8.977E+05	8.977E+05	8.977E+05	8.977E+05	4.447E+16	4.447E+16	4.447E+16	4.447E+16
143	Sr-93	Y	Y		2214	2.712E-13	2.712E-13	2.712E-13		2.222E-02	2.222E-02	2.222E-02	
144	Tc-99	Y	Y		0	5.520E+00	5.520E+00	5.520E+00		0.000E+00	0.000E+00	0.000E+00	

Table 6. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Source Energy (Mev/dls)
For RG 1.183 DBA-LOCA Source; Time = 8 Hours

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
145	Tc-99m	Y		Y	123.9	4.336E+05	4.336E+05		4.336E+05	1.988E+15	1.988E+15		1.988E+15
146	Tc-100				83	0.000E+00				0.000E+00			
147	Tc-101	Y	Y		337	1.045E-03	1.045E-03	1.045E-03		1.303E+07	1.303E+07	1.303E+07	
148	Tc-102				81	7.182E-08				2.152E+02			
149	Tc-104				1999	4.737E-03		4.737E-03		3.503E+08		3.503E+08	
150	Tc-105				535	3.056E-14				6.049E-04			
151	Tc-123m	Y	Y		148.1	4.851E+01	4.851E+01	4.851E+01		2.658E+11	2.658E+11		
152	Tc-125m	Y	Y		36	1.513E+04	1.513E+04	1.513E+04		2.015E+13	2.015E+13	2.015E+13	
153	Tc-127	Y	Y	Y	4.8	4.622E+05	4.622E+05	4.622E+05	4.622E+05	8.209E+13	8.209E+13	8.209E+13	8.209E+13
154	Tc-127m	Y	Y	Y	11.1	7.946E+04	7.946E+04	7.946E+04	7.946E+04	3.263E+13	3.263E+13	3.263E+13	3.263E+13
155	Tc-129	Y	Y	Y	62.4	7.640E+05	7.640E+05	7.640E+05	7.640E+05	1.764E+15	1.764E+15	1.764E+15	1.764E+15
156	Tc-129m	Y	Y	Y	37	3.320E+05	3.320E+05	3.320E+05	3.320E+05	4.545E+14	4.545E+14	4.545E+14	4.545E+14
157	Tc-131	Y	Y		421	2.017E+05	2.017E+05	2.017E+05		3.142E+15	3.142E+15	3.142E+15	
158	Tc-131m	Y	Y	Y	1423	8.977E+05	8.977E+05	8.977E+05	8.977E+05	4.726E+16	4.726E+16	4.726E+16	4.726E+16
159	Tc-132	Y	Y	Y	234	7.182E+06	7.182E+06	7.182E+06	7.182E+06	6.218E+16	6.218E+16	6.218E+16	6.218E+16
160	Tc-133	Y	Y		952	2.766E+03	2.766E+03	2.766E+03		9.742E+13	9.742E+13	9.742E+13	
161	Tc-133m	Y	Y		1698	1.222E+04	1.222E+04	1.222E+04		7.671E+14	7.671E+14	7.671E+14	
162	Tc-134	Y	Y		858	3.407E+03	3.407E+03	3.407E+03		1.082E+14	1.082E+14	1.082E+14	
163	Xe-129m	Y	Y		51.3	5.027E+03	5.027E+03	5.027E+03		9.542E+12	9.542E+12	9.542E+12	
164	Xe-131m	Y	Y		20	1.487E+06	1.487E+06	1.487E+06		1.085E+15	1.085E+15	1.085E+15	
165	Xe-133	Y	Y	Y	45.9	2.116E+08	2.116E+08	2.116E+08	2.116E+08	3.594E+17	3.594E+17	3.594E+17	3.594E+17
166	Xe-133m	Y	Y		41.4	6.661E+06	6.661E+06	6.661E+06		1.051E+16	1.051E+16	1.051E+16	
167	Xe-134m				1898	0.000E+00				0.000E+00			
168	Xe-135	Y	Y	Y	249	1.008E+08	1.008E+08	1.008E+08	1.008E+08	9.291E+17	9.291E+17	9.291E+17	9.291E+17
169	Xe-135m	Y	Y		432	1.482E+07	1.482E+07	1.482E+07		2.369E+17	2.369E+17	2.369E+17	
170	Xe-137	Y			190.8	0.000E+00	0.000E+00			0.000E+00			
171	Xe-138	Y	Y		1126	1.031E-02	1.031E-02	1.031E-02		4.297E+08	4.297E+08	4.297E+08	
172	Y 89m				901.4	1.215E+01				4.051E+11			
173	Y 90	Y	Y	Y	0.00031	2.707E+03	2.707E+03	2.707E+03	2.707E+03	3.105E+07	3.105E+07	3.105E+07	3.105E+07
174	Y 91	Y	Y	Y	3.6	2.674E+04	2.674E+04	2.674E+04	2.674E+04	3.562E+12	3.562E+12	3.562E+12	3.562E+12
175	Y 91m	Y	Y		527.7	9.275E+03	9.275E+03	9.275E+03		1.811E+14	1.811E+14	1.811E+14	
176	Y 92	Y	Y	Y	253	1.306E+04	1.306E+04	1.306E+04	1.306E+04	1.223E+14	1.223E+14	1.223E+14	1.223E+14
177	Y 93	Y	Y	Y	68.9	1.247E+04	1.247E+04	1.247E+04	1.247E+04	4.101E+13	4.101E+13	4.101E+13	4.101E+13
178	Y 94		Y		772	6.784E-04		6.784E-04		1.938E+07		1.938E+07	
179	Y 95		Y		1287	6.326E-10		6.326E-10		3.012E+01		3.012E+01	
180	Zr-89	Y	Y		925.7	1.030E+01	1.030E+01	1.030E+01		3.527E+11	3.527E+11	3.527E+11	
181	Zr-93	Y	Y		1.84	5.944E-03	5.944E-03	5.944E-03		4.047E+05	4.047E+05	4.047E+05	
182	Zr-95	Y	Y	Y	773	3.817E+04	3.817E+04	3.817E+04	3.817E+04	1.092E+15	1.092E+15	1.092E+15	1.092E+15
183	Zr-97	Y	Y	Y	869	2.729E+04	2.729E+04	2.729E+04	2.729E+04	8.775E+14	8.775E+14	8.775E+14	8.775E+14
					TOTAL	5.681E+08	5.680E+08	5.640E+08	5.350E+08	1.061E+19	1.060E+19	1.061E+19	1.021E+19
					Average Energy Mev/dls					5.048E-01	5.045E-01	5.083E-01	5.155E-01

Table 7. Evaluation Of Total Energy Release Rate (Mev/dls) And Average Source Energy (Mev/dls)
For RG 1.183 DBA-LOCA Source; Time = 1 Day

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
1	Am-241	Y	Y	Y	5480	5.104E+00	5.104E+00	5.104E+00	5.104E+00	1.035E+12	1.035E+12	1.035E+12	1.035E+12
2	Am-242	Y	Y		18	8.083E+02	8.083E+02	8.083E+02		5.383E+11	5.383E+11	5.383E+11	
3	Am-242m	Y	Y		23.2	3.316E-01	3.316E-01	3.316E-01		2.846E+08	2.846E+08	2.846E+08	
4	Am-243	Y	Y		5285	8.265E-01	8.265E-01	8.265E-01		1.220E+11	1.220E+11	1.220E+11	
5	Am-244	Y	Y		806	5.317E+02	5.317E+02	5.317E+02		1.586E+13	1.586E+13	1.586E+13	
6	Ba-135m	Y	Y		60	1.173E+03	1.173E+03	1.173E+03		2.603E+12	2.603E+12	2.603E+12	
7	Ba-136m				1923	3.896E+04				2.772E+15			
8	Ba-137m	Y	Y		599	8.213E+05	8.213E+05	8.213E+05		1.820E+16	1.820E+16	1.820E+16	
9	Ba-139	Y	Y	Y	43.5	8.289E+01	8.289E+01	8.289E+01	8.289E+01	1.334E+11	1.334E+11	1.334E+11	1.334E+11
10	Ba-140	Y	Y	Y	182.6	9.283E+06	9.283E+06	9.283E+06	9.283E+06	6.272E+16	6.272E+16	6.272E+16	6.272E+16
11	Ba-141	Y	Y		845	1.669E-17	1.669E-17	1.669E-17		5.219E-07	5.219E-07	5.219E-07	
12	Ba-142	Y	Y		1038	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
13	Br-82	Y	Y		2642	7.151E+04	7.151E+04	7.151E+04		6.890E+15	6.890E+15	6.890E+15	
14	Br-83	Y	Y		7.44	4.126E+03	4.126E+03	4.126E+03		1.136E+12	1.136E+12	1.136E+12	
15	Br-84	Y	Y		1720	1.866E-07	1.866E-07	1.866E-07		1.187E+04	1.187E+04	1.187E+04	
16	Ce-141	Y	Y	Y	77	8.824E+04	8.824E+04	8.824E+04	8.824E+04	2.514E+14	2.514E+14	2.514E+14	2.514E+14
17	Ce-143	Y	Y	Y	274	5.081E+04	5.081E+04	5.081E+04	5.081E+04	5.151E+14	5.151E+14	5.151E+14	5.151E+14
18	Ce-144	Y	Y	Y	19.2	7.525E+04	7.525E+04	7.525E+04	7.525E+04	5.346E+13	5.346E+13	5.346E+13	5.346E+13
19	Ce-146				289	3.935E-28				4.207E-18			
20	Cm-242	Y	Y	Y	6043	1.332E+03	1.332E+03	1.332E+03	1.332E+03	2.979E+14	2.979E+14	2.979E+14	2.979E+14
21	Cm-243	Y	Y		5638	5.745E-01	5.745E-01	5.745E-01		1.241E+11	1.241E+11	1.241E+11	
22	Cm-244	Y	Y	Y	5798	7.808E+01	7.808E+01	7.808E+01	7.808E+01	1.874E+13	1.874E+13	1.874E+13	1.874E+13
23	Co-58	Y	Y	Y	824	1.465E+03	1.465E+03	1.465E+03	1.465E+03	4.466E+13	4.466E+13	4.466E+13	4.466E+13
24	Co-60	Y	Y	Y	2504.4	7.965E+02	7.965E+02	7.965E+02	7.965E+02	7.380E+13	7.380E+13	7.380E+13	7.380E+13
25	Co-60m	Y	Y		6.6	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
26	Co-61	Y	Y		98.4	7.430E-04	7.430E-04	7.430E-04		2.705E+06	2.705E+06	2.705E+06	
27	Cs-132	Y	Y		712.1	9.779E+02	9.779E+02	9.779E+02		2.577E+13	2.577E+13	2.577E+13	
28	Cs-134	Y	Y	Y	1555	5.749E+06	5.749E+06	5.749E+06	5.749E+06	3.308E+17	3.308E+17	3.308E+17	3.308E+17
29	Cs-134m	Y	Y		26.8	3.973E+03	3.973E+03	3.973E+03		3.939E+12	3.939E+12	3.939E+12	
30	Cs-135m	Y	Y		1590	7.697E-03				4.528E+08			
31	Cs-136	Y	Y	Y	2171	1.740E+06	1.740E+06	1.740E+06	1.740E+06	1.398E+17	1.398E+17	1.398E+17	1.398E+17
32	Cs-137	Y	Y	Y	566	4.336E+06	4.336E+06	4.336E+06	4.336E+06	9.080E+16	9.080E+16	9.080E+16	9.080E+16
33	Cs-138	Y	Y		2381	3.037E-06	3.037E-06	3.037E-06		2.653E+05	2.653E+05	2.653E+05	
34	Cs-139	Y	Y		329	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
35	Eu-152m	Y	Y		306	8.297E-01	8.297E-01	8.297E-01		9.394E+09	9.394E+09	9.394E+09	
36	Eu-154	Y	Y		1253	2.110E+02	2.110E+02	2.110E+02		9.784E+12	9.784E+12	9.784E+12	
37	Eu-155	Y	Y		83	8.681E+01	8.681E+01	8.681E+01		2.023E+11	2.023E+11	2.023E+11	
38	Eu-156	Y	Y		1324	5.243E+03	5.243E+03	5.243E+03		2.569E+14	2.569E+14	2.569E+14	
39	Eu-157				0	1.772E+02				0.000E+00			
40	Eu-158		Y		1081	7.655E-08		7.655E-08		3.062E+03		3.062E+03	
41	Eu-159				0	1.219E-22				0.000E+00			
42	I-128	Y	Y		90	1.588E-12	1.588E-12	1.588E-12		5.289E-03	5.289E-03	5.289E-03	
43	I-130	Y	Y		2139	2.072E+05	2.072E+05	2.072E+05		1.840E+16	1.840E+16	1.840E+16	
44	I-130m				121	0.000E+00				0.000E+00			
45	I-131	Y	Y	Y	382	3.003E+07	3.003E+07	3.003E+07	3.003E+07	4.244E+17	4.244E+17	4.244E+17	4.244E+17
46	I-132	Y	Y	Y	2290	3.851E+07	3.851E+07	3.851E+07	3.851E+07	3.263E+18	3.263E+18	3.263E+18	3.263E+18
47	I-133	Y	Y	Y	607	3.071E+07	3.071E+07	3.071E+07	3.071E+07	6.898E+17	6.898E+17	6.898E+17	6.898E+17
48	I-133m				1573	4.561E-02				2.655E+09			

Table 7. Evaluation Of Total Energy Release Rate (Mev/dis) And Average Source Energy (Mev/dis)
For RG 1.183 DBA-LOCA Source; Time = 1 Day

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
49	I-134	Y	Y	Y	2811	1.714E+00	1.714E+00	1.714E+00	1.714E+00	1.656E+11	1.656E+11	1.656E+11	1.656E+11
50	I-135	Y	Y	Y	1647	5.042E+06	5.042E+06	5.042E+06	5.042E+06	3.073E+17	3.073E+17	3.073E+17	3.073E+17
51	Kr-83m	Y			2.57	5.272E+04	5.272E+04			5.013E+12	5.013E+12		
52	Kr-85	Y	Y	Y	2.2	1.482E+06	1.482E+06	1.482E+06	1.482E+06	1.206E+14	1.206E+14	1.206E+14	1.206E+14
53	Kr-85m	Y	Y	Y	156	6.616E+05	6.616E+05	6.616E+05	6.616E+05	3.819E+15	3.819E+15	3.819E+15	3.819E+15
54	Kr-87	Y	Y	Y	792	1.131E+02	1.131E+02	1.131E+02	1.131E+02	3.313E+12	3.313E+12	3.313E+12	3.313E+12
55	Kr-88	Y	Y	Y	1955	2.124E+05	2.124E+05	2.124E+05	2.124E+05	1.536E+16	1.536E+16	1.536E+16	1.536E+16
56	La-140	Y	Y	Y	2315	4.064E+04	4.064E+04	4.064E+04	4.064E+04	3.481E+15	3.481E+15	3.481E+15	3.481E+15
57	La-141	Y	Y	Y	0	5.547E+02	5.547E+02	5.547E+02	5.547E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00
58	La-142	Y	Y	Y	2485	6.845E-01	6.845E-01	6.845E-01	6.845E-01	6.294E+10	6.294E+10	6.294E+10	6.294E+10
59	La-143		Y		93	7.411E-27		7.411E-27		2.550E-17		2.550E-17	
60	Mo-99	Y	Y	Y	272	3.916E+05	3.916E+05	3.916E+05	3.916E+05	3.941E+15	3.941E+15	3.941E+15	3.941E+15
61	Mo-101	Y	Y		1514	9.416E-25	9.416E-25	9.416E-25		5.275E-14	5.275E-14	5.275E-14	
62	Mo-102				18.5	0.000E+00				0.000E+00			
63	Nb-95	Y	Y	Y	764.31	3.846E+04		3.846E+04	3.846E+04	1.088E+15		1.088E+15	1.088E+15
64	Nb-95m	Y	Y		71.2	4.249E+02	4.249E+02	4.249E+02		1.119E+12	1.119E+12	1.119E+12	
65	Nb-96	Y	Y		2462	3.062E+01	3.062E+01	3.062E+01		2.790E+12	2.790E+12	2.790E+12	
66	Nb-97	Y	Y		668.8	1.426E+04	1.426E+04	1.426E+04		3.518E+14	3.518E+14	3.518E+14	
67	Nb-97m	Y	Y		728.3	1.346E+04	1.346E+04	1.346E+04		3.628E+14	3.628E+14	3.628E+14	
68	Nb-98m				2711	1.041E-08				1.044E+05			
69	Nd-147	Y	Y	Y	141	1.360E+04	1.360E+04	1.360E+04	1.360E+04	7.095E+13	7.095E+13	7.095E+13	7.095E+13
70	Nd-149	Y	Y		384	5.501E-01	5.501E-01	5.501E-01		7.816E+09	7.816E+09	7.816E+09	
71	Nd-151		Y		916	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
72	Nd-152				0	0.000E+00				0.000E+00			
73	Np-236m	Y	Y		49.7	1.157E-01	1.157E-01	1.157E-01		2.128E+08	2.128E+08	2.128E+08	
74	Np-238	Y	Y		647	1.696E+04	1.696E+04	1.696E+04		4.060E+14	4.060E+14	4.060E+14	
75	Np-239	Y	Y	Y	174	7.946E+05	7.946E+05	7.946E+05	7.946E+05	5.115E+15	5.115E+15	5.115E+15	5.115E+15
76	Np-240	Y	Y		1193	1.952E-04	1.952E-04	1.952E-04		8.816E+08	8.816E+08	8.816E+08	
77	Pd-109	Y	Y		11.7	3.075E+04	3.075E+04	3.075E+04		1.331E+13	1.331E+13	1.331E+13	
78	Pd-111				45	2.693E+01				4.484E+10			
79	Pd-111m				359	3.438E+01				4.587E+11			
80	Pd-112				0	3.419E+03				0.000E+00			
81	Pm-147	Y	Y		0.00439	5.027E+03	5.027E+03	5.027E+03		8.166E+08	8.166E+08	8.166E+08	
82	Pm-148	Y	Y		574	3.560E+03	3.560E+03	3.560E+03		7.581E+13	7.581E+13	7.581E+13	
83	Pm-148m	Y	Y		1986	7.625E+02	7.625E+02	7.625E+02		5.603E+13	5.603E+13	5.603E+13	
84	Pm-149	Y	Y		10.7	9.642E+03	9.642E+03	9.642E+03		3.817E+12	3.817E+12	3.817E+12	
85	Pm-150		Y		1491	2.231E-01		2.231E-01		1.231E+10		1.231E+10	
86	Pm-151	Y	Y		321	2.430E+03	2.430E+03	2.430E+03		2.886E+13	2.886E+13	2.886E+13	
87	Pm-152				151	0.000E+00				0.000E+00			
88	Pm-152m				1508	0.000E+00				0.000E+00			
89	Pm-153				0	0.000E+00				0.000E+00			
90	Pr-142	Y	Y		58.4	6.143E+02	6.143E+02	6.143E+02		1.327E+12	1.327E+12	1.327E+12	
91	Pr-143	Y	Y	Y	0	3.194E+04	3.194E+04	3.194E+04	3.194E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
92	Pr-144	Y	Y		28.9	3.010E+04	3.010E+04	3.010E+04		3.219E+13	3.219E+13	3.219E+13	
93	Pr-144m	Y	Y		12.1	4.217E+02	4.217E+02	4.217E+02		1.888E+11	1.888E+11	1.888E+11	
94	Pr-145		Y		14.78	1.421E+03		1.421E+03		7.781E+11		7.781E+11	
95	Pr-146				1018	4.630E-14				1.744E-03			
96	Pr-147		Y		863	2.063E-28		2.063E-28		6.587E-18		6.587E-18	

Table 7. Evaluation Of Total Energy Release Rate (Mev/dls) And Average Source Energy (Mev/dis)
For RG 1.183 DBA-LOCA Source; Time = 1 Day

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
97	Pu-237	Y	Y		53.6	3.300E-01	3.300E-01	3.300E-01		6.546E+08	6.546E+08	6.546E+08	
98	Pu-238	Y	Y	Y	1.78	2.284E+02	2.284E+02	2.284E+02	2.284E+02	1.488E+10	1.488E+10	1.488E+10	1.488E+10
99	Pu-239	Y	Y	Y	5101	2.418E+01	2.418E+01	2.418E+01	2.418E+01	4.584E+12	4.584E+12	4.584E+12	4.584E+12
100	Pu-240	Y	Y	Y	0.0288	3.896E+01	3.896E+01	3.896E+01	3.896E+01	4.123E+07	4.123E+07	4.123E+07	4.123E+07
101	Pu-241	Y	Y	Y	0.001354	9.588E+03	9.588E+03	9.588E+03	9.588E+03	4.803E+08	4.803E+08	4.803E+08	4.803E+08
102	Pu-243	Y	Y		28	7.296E+02	7.296E+02	7.296E+02		7.019E+11	7.019E+11	7.019E+11	
103	Rb-86	Y	Y	Y	94.5	5.214E+04	5.214E+04	5.214E+04	5.214E+04	1.823E+14	1.823E+14	1.823E+14	1.823E+14
104	Rb-88	Y	Y		629	5.940E+04	5.940E+04	5.940E+04		1.382E+15	1.382E+15	1.382E+15	
105	Rh-103m	Y	Y		1.65	4.202E+05	4.202E+05	4.202E+05		2.565E+13	2.565E+13	2.565E+13	
106	Rh-105	Y	Y	Y	77	2.006E+05	2.006E+05	2.006E+05	2.006E+05	5.714E+14	5.714E+14	5.714E+14	5.714E+14
107	Rh-105m	Y	Y		34.5	2.063E+03	2.063E+03	2.063E+03		2.633E+12	2.633E+12	2.633E+12	
108	Rh-106	Y	Y		208	1.709E+05	1.709E+05	1.709E+05		1.303E+15	1.303E+15	1.303E+15	
109	Rh-106m		Y		2882	2.770E+00	2.770E+00	2.770E+00		2.953E+11	2.953E+11	2.953E+11	
110	Rh-107		Y		313	2.273E-15	2.273E-15	2.273E-15		2.632E-05	2.632E-05	2.632E-05	
111	Rh-108		Y		2264	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
112	Ru-103	Y	Y	Y	485	4.221E+05	4.221E+05	4.221E+05	4.221E+05	7.575E+15	7.575E+15	7.575E+15	7.575E+15
113	Ru-105	Y	Y	Y	738	7.220E+03	7.220E+03	7.220E+03	7.220E+03	1.971E+14	1.971E+14	1.971E+14	1.971E+14
114	Ru-106	Y	Y	Y	0	1.709E+05	1.709E+05	1.709E+05	1.709E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
115	Ru-107		Y		208	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
116	Ru-108		Y		0	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
117	Sb-122	Y	Y		433	8.247E+03	8.247E+03	8.247E+03		1.321E+14	1.321E+14	1.321E+14	
118	Sb-124	Y	Y		1852	4.819E+03	4.819E+03	4.819E+03		3.302E+14	3.302E+14	3.302E+14	
119	Sb-125	Y	Y		443	6.857E+04	6.857E+04	6.857E+04		1.124E+15	1.124E+15	1.124E+15	
120	Sb-126	Y	Y		2749	2.194E+03	2.194E+03	2.194E+03		2.232E+14	2.232E+14	2.232E+14	
121	Sb-126m	Y	Y		1548	4.164E+00	4.164E+00	4.164E+00		2.385E+11	2.385E+11	2.385E+11	
122	Sb-127	Y	Y	Y	664	3.973E+05	3.973E+05	3.973E+05	3.973E+05	9.760E+15	9.760E+15	9.760E+15	9.760E+15
123	Sb-128		Y		3108	1.333E+04	1.333E+04	1.333E+04		1.533E+15	1.533E+15	1.533E+15	
124	Sb-128m		Y		1909	4.240E-02	4.240E-02	4.240E-02		2.995E+09	2.995E+09	2.995E+09	
125	Sb-129	Y	Y	Y	1358	4.011E+04	4.011E+04	4.011E+04	4.011E+04	2.012E+15	2.012E+15	2.012E+15	2.012E+15
126	Sb-130		Y		3265	6.112E-06	6.112E-06	6.112E-06		7.384E+05	7.384E+05	7.384E+05	
127	Sb-130m		Y		2653	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
128	Sb-131		Y		1809	6.074E-13	6.074E-13	6.074E-13		4.065E-02	4.065E-02	4.065E-02	
129	Sb-132		Y		2583	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
130	Se-78m		Y		13.7	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
131	Se-81		Y		9.9	7.678E-04	7.678E-04	7.678E-04		2.813E+05	2.813E+05	2.813E+05	
132	Se-81m		Y		15	5.195E-04	5.195E-04	5.195E-04		2.883E+05	2.883E+05	2.883E+05	
133	Se-83		Y		955	1.115E-14	1.115E-14	1.115E-14		3.941E-04	3.941E-04	3.941E-04	
134	Sm-151	Y	Y		0.0131	1.366E+01	1.366E+01	1.366E+01		6.621E+08	6.621E+08	6.621E+08	
135	Sm-153	Y	Y		62.8	7.411E+03	7.411E+03	7.411E+03		1.722E+13	1.722E+13	1.722E+13	
136	Sm-155		Y		103	3.087E-17	3.087E-17	3.087E-17		1.176E-07	1.176E-07	1.176E-07	
137	Sm-156		Y		0	8.755E+01	8.755E+01	8.755E+01		0.000E+00	0.000E+00	0.000E+00	
138	Sm-157		Y		0	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
139	Sr-89	Y	Y	Y	0.086	5.081E+06	5.081E+06	5.081E+06	5.081E+06	1.617E+13	1.617E+13	1.617E+13	1.617E+13
140	Sr-90	Y	Y	Y	0	6.532E+05	6.532E+05	6.532E+05	6.532E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
141	Sr-91	Y	Y	Y	1047	1.138E+06	1.138E+06	1.138E+06	1.138E+06	4.410E+16	4.410E+16	4.410E+16	4.410E+16
142	Sr-92	Y	Y	Y	1339	1.497E+04	1.497E+04	1.497E+04	1.497E+04	7.419E+14	7.419E+14	7.419E+14	7.419E+14
143	Sr-93	Y	Y		2214	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
144	Tc-98	Y	Y		0	5.520E+00	5.520E+00	5.520E+00		0.000E+00	0.000E+00	0.000E+00	

Table 7. Evaluation Of Total Energy Release Rate (Mev/dls) And Average Source Energy (Mev/dls)
For RG 1.183 DBA-LOCA Source; Time = 1 Day

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
145	Tc-99m	Y		Y	123.9	3.782E+05	3.782E+05		3.782E+05	1.734E+15	1.734E+15		1.734E+15
146	Tc-100				83	0.000E+00				0.000E+00			
147	Tc-101	Y	Y		337	2.961E-23	2.961E-23	2.961E-23		3.691E-13	3.691E-13	3.691E-13	
148	Tc-102				81	0.000E+00				0.000E+00			
149	Tc-104				1999	7.659E-19		7.659E-19		5.665E-08		5.665E-08	
150	Tc-105				535	0.000E+00				0.000E+00			
151	Te-123m	Y	Y		148.1	4.813E+01	4.813E+01	4.813E+01		2.637E+11	2.637E+11	2.637E+11	
152	Te-125m	Y	Y		36	1.517E+04	1.517E+04	1.517E+04		2.021E+13	2.021E+13	2.021E+13	
153	Te-127	Y	Y	Y	4.8	4.317E+05	4.317E+05	4.317E+05	4.317E+05	7.666E+13	7.666E+13	7.666E+13	7.666E+13
154	Te-127m	Y	Y	Y	11.1	7.946E+04	7.946E+04	7.946E+04	7.946E+04	3.263E+13	3.263E+13	3.263E+13	3.263E+13
155	Te-129	Y	Y	Y	62.4	2.548E+05	2.548E+05	2.548E+05	2.548E+05	5.883E+14	5.883E+14	5.883E+14	5.883E+14
156	Te-129m	Y	Y	Y	37	3.281E+05	3.281E+05	3.281E+05	3.281E+05	4.492E+14	4.492E+14	4.492E+14	4.492E+14
157	Te-131	Y	Y		421	1.394E+05	1.394E+05	1.394E+05		2.172E+15	2.172E+15	2.172E+15	
158	Te-131m	Y	Y	Y	1423	6.188E+05	6.188E+05	6.188E+05	6.188E+05	3.258E+16	3.258E+16	3.258E+16	3.258E+16
159	Te-132	Y	Y	Y	234	6.227E+06	6.227E+06	6.227E+06	6.227E+06	5.391E+16	5.391E+16	5.391E+16	5.391E+16
160	Te-133	Y	Y		952	1.681E-02	1.681E-02	1.681E-02		5.920E+08	5.920E+08	5.920E+08	
161	Te-133m	Y	Y		1698	7.449E-02	7.449E-02	7.449E-02		4.674E+09	4.674E+09	4.674E+09	
162	Te-134	Y	Y		858	4.164E-04	4.164E-04	4.164E-04		1.322E+07	1.322E+07	1.322E+07	
163	Xe-129m	Y	Y		51.3	4.775E+03	4.775E+03	4.775E+03		9.083E+12	9.083E+12	9.083E+12	
164	Xe-131m	Y	Y		20	1.452E+08	1.452E+08	1.452E+08		1.074E+15	1.074E+15	1.074E+15	
165	Xe-133	Y	Y	Y	45.9	2.055E+08	2.055E+08	2.055E+08	2.055E+08	3.490E+17	3.490E+17	3.490E+17	3.490E+17
166	Xe-133m	Y	Y		41.4	6.288E+06	6.288E+06	6.288E+06		9.632E+15	9.632E+15	9.632E+15	
167	Xe-134m				1896	0.000E+00				0.000E+00			
168	Xe-135	Y	Y	Y	249	5.615E+07	5.615E+07	5.615E+07	5.615E+07	5.173E+17	5.173E+17	5.173E+17	5.173E+17
169	Xe-135m	Y	Y		432	2.743E+06	2.743E+06	2.743E+06		4.384E+16	4.384E+16	4.384E+16	
170	Xe-137	Y			190.8	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
171	Xe-138	Y	Y		1126	3.087E-23	3.087E-23	3.087E-23		1.266E-12	1.266E-12	1.266E-12	
172	Y 89m				901.4	1.077E+01				3.593E+11			
173	Y 90	Y	Y	Y	0.00031	2.687E+03	2.687E+03	2.687E+03	2.687E+03	3.082E+07	3.082E+07	3.082E+07	3.082E+07
174	Y 91	Y	Y	Y	3.6	2.674E+04	2.674E+04	2.674E+04	2.674E+04	3.562E+12	3.562E+12	3.562E+12	3.562E+12
175	Y 91m	Y	Y		527.7	2.888E+03	2.888E+03	2.888E+03		5.839E+13	5.839E+13	5.839E+13	
176	Y 92	Y	Y	Y	253	8.832E+02	8.832E+02	8.832E+02	8.832E+02	8.268E+12	8.268E+12	8.268E+12	8.268E+12
177	Y 93	Y	Y	Y	88.9	4.156E+03	4.156E+03	4.156E+03	4.156E+03	1.367E+13	1.367E+13	1.367E+13	1.367E+13
178	Y 94		Y		772	2.384E-19		2.384E-19		6.809E-09		6.809E-09	
179	Y 95		Y		1287	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
180	Zr-89	Y	Y		925.7	8.939E+00	8.939E+00	8.939E+00		3.062E+11	3.062E+11	3.062E+11	
181	Zr-93	Y	Y		1.64	5.944E-03	5.944E-03	5.944E-03		4.047E+05	4.047E+05	4.047E+05	
182	Zr-95	Y	Y	Y	773	3.785E+04	3.785E+04	3.785E+04	3.785E+04	1.083E+15	1.083E+15	1.083E+15	1.083E+15
183	Zr-97	Y	Y	Y	869	1.418E+04	1.418E+04	1.418E+04	1.418E+04	4.558E+14	4.558E+14	4.558E+14	4.558E+14
					TOTAL	4.203E+08	4.202E+08	4.198E+08	4.075E+08	6.474E+18	6.468E+18	6.469E+18	6.365E+18
					Average Energy Mev/dls					4.163E-01	4.160E-01	4.165E-01	4.221E-01

Table 8. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Source Energy (Mev/dis)
For RG 1.183 DBA-LOCA Source; Time = 4 Day

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
1	Am-241	Y	Y	Y	5480	5.149E+00	5.149E+00	5.149E+00	5.149E+00	1.044E+12	1.044E+12	1.044E+12	1.044E+12
2	Am-242	Y	Y		18	3.621E+01	3.621E+01	3.621E+01		2.412E+10	2.412E+10	2.412E+10	
3	Am-242m	Y	Y		23.2	3.316E-01	3.316E-01	3.316E-01		2.846E+08	2.846E+08	2.846E+08	
4	Am-243	Y	Y		5265	6.265E-01	6.265E-01	6.265E-01		1.220E+11	1.220E+11	1.220E+11	
5	Am-244	Y	Y		806	3.805E+00	3.805E+00	3.805E+00		1.135E+11	1.135E+11	1.135E+11	
6	Ba-135m	Y	Y		60	2.059E+02	2.059E+02	2.059E+02		4.571E+11	4.571E+11	4.571E+11	
7	Ba-136m				1923	3.331E+04				2.370E+15			
8	Ba-137m	Y	Y		599	8.213E+05	8.213E+05	8.213E+05		1.820E+16	1.820E+16	1.820E+16	
9	Ba-139	Y	Y	Y	43.5	3.576E-14	3.576E-14	3.576E-14	3.576E-14	5.755E-05	5.755E-05	5.755E-05	5.755E-05
10	Ba-140	Y	Y	Y	182.6	7.869E+06	7.869E+06	7.869E+06	7.869E+06	5.317E+16	5.317E+16	5.317E+16	5.317E+16
11	Ba-141	Y	Y		845	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
12	Ba-142	Y	Y		1038	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
13	Br-82	Y	Y		2642	1.742E+04	1.742E+04	1.742E+04		1.703E+15	1.703E+15	1.703E+15	
14	Br-83	Y	Y		7.44	3.851E-06	3.851E-06	3.851E-06		1.060E+03	1.060E+03	1.060E+03	
15	Br-84	Y	Y		1720	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
16	Ce-141	Y	Y	Y	77	8.289E+04	8.289E+04	8.289E+04	8.289E+04	2.382E+14	2.382E+14	2.382E+14	2.382E+14
17	Ce-143	Y	Y	Y	274	1.119E+04	1.119E+04	1.119E+04	1.119E+04	1.135E+14	1.135E+14	1.135E+14	1.135E+14
18	Ce-144	Y	Y	Y	19.2	7.487E+04	7.487E+04	7.487E+04	7.487E+04	5.319E+13	5.319E+13	5.319E+13	5.319E+13
19	Ce-146				289	0.000E+00				0.000E+00			
20	Cm-242	Y	Y	Y	6043	1.319E+03	1.319E+03	1.319E+03	1.319E+03	2.948E+14	2.948E+14	2.948E+14	2.948E+14
21	Cm-243	Y	Y		5838	5.745E-01	5.745E-01	5.745E-01		1.241E+11	1.241E+11	1.241E+11	
22	Cm-244	Y	Y	Y	5796	7.808E+01	7.808E+01	7.808E+01	7.808E+01	1.674E+13	1.674E+13	1.674E+13	1.674E+13
23	Co-58	Y	Y	Y	824	1.421E+03	1.421E+03	1.421E+03	1.421E+03	4.332E+13	4.332E+13	4.332E+13	4.332E+13
24	Co-60	Y	Y	Y	2504.4	7.965E+02	7.965E+02	7.965E+02	7.965E+02	7.380E+13	7.380E+13	7.380E+13	7.380E+13
25	Co-60m	Y	Y		6.8	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
26	Co-61	Y	Y		98.4	5.424E-17	5.424E-17	5.424E-17		1.975E-07	1.975E-07	1.975E-07	
27	Cs-132	Y	Y		712.1	7.086E+02	7.086E+02	7.086E+02		1.867E+13	1.867E+13	1.867E+13	
28	Cs-134	Y	Y	Y	1655	5.730E+08	5.730E+08	5.730E+08	5.730E+08	3.297E+17	3.297E+17	3.297E+17	3.297E+17
29	Cs-134m	Y	Y		26.8	1.423E-04	1.423E-04	1.423E-04		1.411E+05	1.411E+05	1.411E+05	
30	Cs-135m		Y		1590	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
31	Cs-136	Y	Y	Y	2171	1.486E+06	1.486E+06	1.486E+06	1.486E+06	1.194E+17	1.194E+17	1.194E+17	1.194E+17
32	Cs-137	Y	Y	Y	568	4.336E+06	4.336E+06	4.336E+06	4.336E+06	9.080E+16	9.080E+16	9.080E+16	9.080E+16
33	Cs-138	Y	Y		2361	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
34	Cs-139	Y	Y		329	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
35	Eu-152m	Y	Y		306	3.927E-03	3.927E-03	3.927E-03		4.446E+07	4.446E+07	4.446E+07	
36	Eu-154	Y	Y		1283	2.110E+02	2.110E+02	2.110E+02		9.784E+12	9.784E+12	9.784E+12	
37	Eu-155	Y	Y		83	8.681E+01	8.681E+01	8.681E+01		2.023E+11	2.023E+11	2.023E+11	
38	Eu-156	Y	Y		1324	4.574E+03	4.574E+03	4.574E+03		2.241E+14	2.241E+14	2.241E+14	
39	Eu-157		Y		0	6.816E+00		6.816E+00		0.000E+00		0.000E+00	
40	Eu-158		Y		1081	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
41	Eu-159				0	0.000E+00				0.000E+00			
42	I-128	Y	Y		90	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
43	I-130	Y	Y		2139	3.687E+03	3.687E+03	3.687E+03		2.902E+14	2.902E+14	2.902E+14	
44	I-130m				121	0.000E+00				0.000E+00			
45	I-131	Y	Y	Y	382	2.361E+07	2.361E+07	2.361E+07	2.361E+07	3.337E+17	3.337E+17	3.337E+17	3.337E+17
46	I-132	Y	Y	Y	2280	2.035E+07	2.035E+07	2.035E+07	2.035E+07	1.725E+18	1.725E+18	1.725E+18	1.725E+18
47	I-133	Y	Y	Y	607	2.773E+06	2.773E+06	2.773E+06	2.773E+06	6.229E+16	6.229E+16	6.229E+16	6.229E+16
48	I-133m				1573	0.000E+00				0.000E+00			

Table 8. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Source Energy (Mev/dis)
For RG 1.183 DBA-LOCA Source; Time = 4 Day

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
49	I-134	Y	Y	Y	2611	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
50	I-135	Y	Y	Y	1647	2.521E+03	2.521E+03	2.521E+03	2.521E+03	1.536E+14	1.536E+14	1.536E+14	1.536E+14
51	Kr-83m	Y			2.57	5.394E-05	5.394E-05			5.129E+03	5.129E+03		
52	Kr-85	Y	Y	Y	2.2	1.482E+06	1.482E+06	1.482E+06	1.482E+06	1.206E+14	1.206E+14	1.206E+14	1.206E+14
53	Kr-85m	Y	Y	Y	158	9.626E+00	9.626E+00	9.626E+00	9.626E+00	6.556E+10	5.556E+10	5.556E+10	5.556E+10
54	Kr-87	Y	Y	Y	792	1.031E-15	1.031E-15	1.031E-15	1.031E-15	3.022E-05	3.022E-05	3.022E-05	3.022E-05
55	Kr-88	Y	Y	Y	1955	4.928E-03	4.928E-03	4.928E-03	4.928E-03	3.565E+08	3.565E+08	3.565E+08	3.565E+08
56	La-140	Y	Y	Y	2315	3.560E+04	3.560E+04	3.560E+04	3.560E+04	3.050E+15	3.050E+15	3.050E+15	3.050E+15
57	La-141	Y	Y	Y	0	1.635E-03	1.635E-03	1.635E-03	1.635E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00
58	La-142	Y	Y	Y	2485	3.637E-15	3.637E-15	3.637E-15	3.637E-15	3.344E-04	3.344E-04	3.344E-04	3.344E-04
59	La-143				93	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
60	Mo-99	Y	Y	Y	272	1.841E+05	1.841E+05	1.841E+05	1.841E+05	1.853E+15	1.853E+15	1.853E+15	1.853E+15
61	Mo-101	Y	Y		1514	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
62	Mo-102				18.5	0.000E+00				0.000E+00			
63	Nb-95	Y	Y	Y	764.31	3.846E+04		3.846E+04	3.846E+04	1.088E+15		1.088E+15	1.088E+15
64	Nb-95m	Y	Y		71.2	4.202E+02	4.202E+02	4.202E+02		1.107E+12	1.107E+12	1.107E+12	
65	Nb-96	Y	Y		2462	3.600E+00	3.600E+00	3.600E+00		3.279E+11	3.279E+11	3.279E+11	
66	Nb-97	Y	Y		666.8	7.438E+02	7.438E+02	7.438E+02		1.835E+13	1.835E+13	1.835E+13	
67	Nb-97m	Y	Y		728.3	7.023E+02	7.023E+02	7.023E+02		1.892E+13	1.892E+13	1.892E+13	
68	Nb-98m				2711	0.000E+00				0.000E+00			
69	Nd-147	Y	Y	Y	141	1.125E+04	1.125E+04	1.125E+04	1.125E+04	5.867E+13	5.867E+13	5.867E+13	5.867E+13
70	Nd-149	Y	Y		384	1.499E-13	1.499E-13	1.499E-13		2.130E-03	2.130E-03	2.130E-03	
71	Nd-151		Y		916	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
72	Nd-152				0	0.000E+00				0.000E+00			
73	Np-236m	Y	Y		49.7	1.257E-02	1.257E-02	1.257E-02		2.311E+07		2.311E+07	
74	Np-238	Y	Y		647	6.341E+03	6.341E+03	6.341E+03		1.518E+14	1.518E+14	1.518E+14	
75	Np-239	Y	Y	Y	174	3.293E+05	3.293E+05	3.293E+05	3.293E+05	2.120E+15	2.120E+15	2.120E+15	2.120E+15
76	Np-240	Y	Y		1193	3.098E-19	3.098E-19	3.098E-19		1.367E-08	1.367E-08	1.367E-08	
77	Pd-109	Y	Y		11.7	8.060E+02	8.060E+02	8.060E+02		3.489E+11	3.489E+11	3.489E+11	
78	Pd-111				45	3.094E-03				5.152E+06			
79	Pd-111m				359	3.935E-03				6.228E+07			
80	Pd-112				0	3.190E+02				0.000E+00			
81	Pm-147	Y	Y		0.00439	5.042E+03	5.042E+03	5.042E+03		8.190E+08	8.190E+08	8.190E+08	
82	Pm-148	Y	Y		574	2.430E+03	2.430E+03	2.430E+03		5.160E+13	5.160E+13	5.160E+13	
83	Pm-148m	Y	Y		1986	7.258E+02	7.258E+02	7.258E+02		5.333E+13	5.333E+13	5.333E+13	
84	Pm-149	Y	Y		10.7	3.774E+03	3.774E+03	3.774E+03		1.494E+12	1.494E+12	1.494E+12	
85	Pm-150		Y		1491	1.818E-09		1.818E-09		1.003E+02		1.003E+02	
86	Pm-151	Y	Y		321	4.202E+02	4.202E+02	4.202E+02		4.991E+12	4.991E+12	4.991E+12	
87	Pm-152				151	0.000E+00				0.000E+00			
88	Pm-152m				1508	0.000E+00				0.000E+00			
89	Pm-153				0	0.000E+00				0.000E+00			
90	Pr-142	Y	Y		58.4	4.523E+01	4.523E+01	4.523E+01		9.773E+10		9.773E+10	
91	Pr-143	Y	Y	Y	0	2.888E+04	2.888E+04	2.888E+04	2.888E+04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
92	Pr-144	Y	Y		28.9	2.995E+04	2.995E+04	2.995E+04		3.202E+13	3.202E+13	3.202E+13	
93	Pr-144m	Y	Y		12.1	4.187E+02	4.187E+02			1.874E+11	1.874E+11	1.874E+11	
94	Pr-145		Y		14.76	3.392E-01		3.392E-01		1.853E+08		1.853E+08	
95	Pr-146				1018	0.000E+00				0.000E+00			
96	Pr-147		Y		863	0.000E+00		0.000E+00		0.000E+00		0.000E+00	

Table 8. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Source Energy (Mev/ds)
For RG 1.183 DBA-LOCA Source; Time = 4 Day

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
97	Pu-237	Y	Y		53.6	3.152E-01	3.152E-01	3.152E-01		6.250E+08	6.250E+08	6.250E+08	
98	Pu-238	Y	Y	Y	1.78	2.292E+02	2.292E+02	2.292E+02	2.292E+02	1.493E+10	1.493E+10	1.493E+10	1.493E+10
99	Pu-239	Y	Y	Y	5101	2.433E+01	2.433E+01	2.433E+01	2.433E+01	4.593E+12	4.593E+12	4.593E+12	4.593E+12
100	Pu-240	Y	Y	Y	0.0286	3.896E+01	3.896E+01	3.896E+01	3.896E+01	4.123E+07	4.123E+07	4.123E+07	4.123E+07
101	Pu-241	Y	Y	Y	0.001354	9.588E+03	9.588E+03	9.588E+03	9.588E+03	4.803E+06	4.803E+06	4.803E+06	4.803E+06
102	Pu-243	Y	Y		26	3.083E-02	3.083E-02	3.083E-02		2.966E+07	2.966E+07	2.966E+07	
103	Rb-86	Y	Y	Y	94.5	4.660E+04	4.660E+04	4.660E+04	4.660E+04	1.630E+14	1.630E+14	1.630E+14	1.630E+14
104	Rb-88	Y	Y		629	1.377E-03	1.377E-03	1.377E-03		3.205E+07	3.205E+07	3.205E+07	
105	Rh-103m	Y	Y		1.65	3.992E+05	3.992E+05	3.992E+05		2.437E+13	2.437E+13	2.437E+13	
106	Rh-105	Y	Y	Y	77	4.909E+04	4.909E+04	4.909E+04	4.909E+04	1.398E+14	1.398E+14	1.398E+14	1.398E+14
107	Rh-105m	Y	Y		34.5	2.693E-02	2.693E-02			3.438E+07	3.438E+07		
108	Rh-106	Y	Y		208	1.700E+05	1.700E+05	1.700E+05		1.296E+15	1.296E+15		
109	Rh-106m		Y		2882	2.750E-10		2.750E-10		2.933E+01		2.933E+01	
110	Rh-107		Y		313	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
111	Rh-108		Y		2264	0.000E+00				0.000E+00			
112	Ru-103	Y	Y	Y	485	3.992E+05	3.992E+05	3.992E+05	3.992E+05	7.163E+15	7.163E+15	7.163E+15	7.163E+15
113	Ru-105	Y	Y	Y	738	9.455E-02	9.455E-02	9.455E-02	9.455E-02	2.582E+09	2.582E+09	2.582E+09	2.582E+09
114	Ru-106	Y	Y	Y	0	1.700E+05	1.700E+05	1.700E+05	1.700E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
115	Ru-107				206	0.000E+00				0.000E+00			
116	Ru-108				0	0.000E+00				0.000E+00			
117	Sb-122	Y	Y		433	3.824E+03	3.824E+03	3.824E+03		6.126E+13	6.126E+13	6.126E+13	
118	Sb-124	Y	Y		1852	4.657E+03	4.657E+03	4.657E+03		3.191E+14	3.191E+14	3.191E+14	
119	Sb-125	Y	Y		443	6.853E+04	6.853E+04	6.853E+04		1.123E+15	1.123E+15	1.123E+15	
120	Sb-126	Y	Y		2749	1.855E+03	1.855E+03	1.855E+03		1.987E+14	1.987E+14	1.987E+14	
121	Sb-126m	Y	Y		1548	4.164E+00	4.164E+00	4.164E+00		2.385E+11	2.385E+11	2.385E+11	
122	Sb-127	Y	Y	Y	664	2.307E+05	2.307E+05	2.307E+05	2.307E+05	5.669E+15	5.669E+15	5.669E+15	5.669E+15
123	Sb-128		Y		3108	5.233E+01		5.233E+01		6.018E+12		6.018E+12	
124	Sb-128m		Y		1909	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
125	Sb-129	Y	Y	Y	1356	4.737E-01	4.737E-01	4.737E-01	4.737E-01	2.377E+10	2.377E+10	2.377E+10	2.377E+10
126	Sb-130		Y		3265	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
127	Sb-130m		Y		2653	0.000E+00				0.000E+00			
128	Sb-131		Y		1809	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
129	Sb-132		Y		2583	0.000E+00				0.000E+00			
130	Se-79m				13.7	0.000E+00				0.000E+00			
131	Se-81		Y		9.9	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
132	Se-81m		Y		15	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
133	Se-83		Y		955	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
134	Sm-151	Y	Y		0.0131	1.374E+01	1.374E+01	1.374E+01		6.658E+06	6.658E+06	6.658E+06	
135	Sm-153	Y	Y		62.8	2.521E+03	2.521E+03	2.521E+03		5.858E+12	5.858E+12	5.858E+12	
136	Sm-155		Y		103	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
137	Sm-156		Y		0	4.324E-01		4.324E-01		0.000E+00		0.000E+00	
138	Sm-157				0	0.000E+00				0.000E+00			
139	Sr-89	Y	Y	Y	0.086	4.890E+06	4.890E+06	4.890E+06	4.890E+06	1.556E+13	1.556E+13	1.556E+13	1.556E+13
140	Sr-90	Y	Y	Y	0	6.532E+05	6.532E+05	6.532E+05	6.532E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
141	Sr-91	Y	Y	Y	1047	6.036E+03	6.036E+03	6.036E+03	6.036E+03	2.338E+14	2.338E+14	2.338E+14	2.338E+14
142	Sr-92	Y	Y	Y	1339	1.505E-04	1.505E-04	1.505E-04	1.505E-04	7.457E+06	7.457E+06	7.457E+06	7.457E+06
143	Sr-93	Y	Y		2214	0.000E+00	0.000E+00			0.000E+00	0.000E+00		
144	Tc-99	Y			0	5.520E+00	5.520E+00			0.000E+00	0.000E+00		

Table 8. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Source Energy (Mev/dis)
For RG 1.183 DBA-LOCA Source; Time = 4 Day

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
145	Tc-99m	Y		Y	123.9	1.784E+05	1.784E+05		1.784E+05	8.178E+14	8.178E+14		8.178E+14
146	Tc-100				83	0.000E+00				0.000E+00			
147	Tc-101	Y	Y		337	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
148	Tc-102				81	0.000E+00				0.000E+00			
149	Tc-104				1999	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
150	Tc-105				535	0.000E+00				0.000E+00			
151	Te-123m	Y	Y		148.1	4.737E+01	4.737E+01	4.737E+01		2.596E+11	2.596E+11	2.596E+11	
152	Te-125m	Y	Y		36	1.518E+04	1.518E+04	1.518E+04		2.022E+13	2.022E+13	2.022E+13	
153	Te-127	Y	Y	Y	4.8	2.888E+05	2.888E+05	2.888E+05	2.888E+05	5.129E+13	5.129E+13	5.129E+13	5.129E+13
154	Te-127m	Y	Y	Y	11.1	7.869E+04	7.869E+04	7.869E+04	7.869E+04	3.232E+13	3.232E+13	3.232E+13	3.232E+13
155	Te-129	Y	Y	Y	62.4	1.975E+05	1.975E+05	1.975E+05	1.975E+05	4.560E+14	4.560E+14	4.560E+14	4.560E+14
156	Te-129m	Y	Y	Y	37	3.083E+05	3.083E+05	3.083E+05	3.083E+05	4.220E+14	4.220E+14	4.220E+14	4.220E+14
157	Te-131	Y	Y		421	2.640E+04	2.640E+04	2.640E+04		4.112E+14	4.112E+14	4.112E+14	
158	Te-131m	Y	Y	Y	1423	1.173E+05	1.173E+05	1.173E+05	1.173E+05	6.175E+15	6.175E+15	6.175E+15	6.175E+15
159	Te-132	Y	Y	Y	234	3.293E+06	3.293E+06	3.293E+06	3.293E+06	2.851E+16	2.851E+16	2.851E+16	2.851E+16
160	Te-133	Y	Y		952	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
161	Te-133m	Y	Y		1696	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
162	Te-134	Y	Y		858	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
163	Xe-129m	Y	Y		51.3	3.774E+03	3.774E+03	3.774E+03		7.164E+12	7.164E+12	7.164E+12	
164	Xe-131m	Y	Y		20	1.375E+08	1.375E+08	1.375E+08		1.018E+15	1.018E+15	1.018E+15	
165	Xe-133	Y	Y	Y	45.9	1.513E+08	1.513E+08	1.513E+08	1.513E+08	2.569E+17	2.569E+17	2.569E+17	2.569E+17
166	Xe-133m	Y	Y		41.4	3.003E+08	3.003E+08	3.003E+08		4.599E+15	4.599E+15	4.599E+15	
167	Xe-134m				1896	0.000E+00				0.000E+00			
168	Xe-135	Y	Y	Y	249	4.003E+05	4.003E+05	4.003E+05	4.003E+05	3.688E+15	3.688E+15	3.688E+15	3.688E+15
169	Xe-135m	Y	Y		432	1.375E+03	1.375E+03	1.375E+03		2.198E+13	2.198E+13	2.198E+13	
170	Xe-137	Y	Y		190.8	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
171	Xe-138	Y	Y		1128	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
172	Y 89m				901.4	6.494E+00				2.166E+11			
173	Y 90	Y	Y	Y	0.00031	2.641E+03	2.641E+03	2.641E+03	2.641E+03	3.029E+07	3.029E+07	3.029E+07	3.029E+07
174	Y 91	Y	Y	Y	3.8	2.583E+04	2.583E+04	2.583E+04	2.583E+04	3.440E+12	3.440E+12	3.440E+12	3.440E+12
175	Y 91m	Y	Y		527.7	1.528E+01	1.528E+01	1.528E+01		2.983E+11	2.983E+11	2.983E+11	
176	Y 92	Y	Y	Y	253	8.083E-04	8.083E-04	8.083E-04	8.083E-04	7.567E+06	7.567E+06	7.567E+06	7.567E+06
177	Y 93	Y	Y	Y	88.9	2.964E+01	2.964E+01	2.964E+01	2.964E+01	9.751E+10	9.751E+10	9.751E+10	9.751E+10
178	Y 94				772	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
179	Y 95				1287	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
180	Zr- 89	Y	Y		925.7	4.737E+00	4.737E+00	4.737E+00		1.622E+11	1.622E+11	1.622E+11	
181	Zr- 93	Y	Y		1.84	5.944E-03	5.944E-03	5.944E-03		4.047E+05	4.047E+05	4.047E+05	
182	Zr- 95	Y	Y	Y	773	3.672E+04	3.672E+04	3.672E+04	3.672E+04	1.050E+15	1.050E+15	1.050E+15	1.050E+15
183	Zr- 97	Y	Y	Y	869	7.405E+02	7.405E+02	7.405E+02	7.405E+02	2.381E+13	2.381E+13	2.381E+13	2.381E+13
					TOTAL	2.371E+08	2.370E+08	2.369E+08	2.311E+08	3.067E+18	3.063E+18	3.063E+18	3.034E+18
					Average Energy Mev/dis					3.495E-01	3.493E-01	3.495E-01	3.549E-01

Table 9. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Source Energy (Mev/dis)
For RG 1.183 DBA-LOCA Source; Time = 30 Days

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
1	Am-241	Y	Y	Y	5480	5.577E+00	5.577E+00	5.577E+00	5.577E+00	1.131E+12	1.131E+12	1.131E+12	1.131E+12
2	Am-242	Y	Y		18	3.300E-01	3.300E-01	3.300E-01		2.198E+08	2.198E+08	2.198E+08	
3	Am-242m	Y	Y		23.2	3.316E-01	3.316E-01	3.316E-01		2.846E+08	2.846E+08	2.846E+08	
4	Am-243	Y	Y		5265	6.265E-01	6.265E-01	6.265E-01		1.220E+11	1.220E+11	1.220E+11	
5	Am-244	Y	Y		806	9.581E-19	9.581E-19	9.581E-19		2.857E-08	2.857E-08	2.857E-08	
6	Ba-135m	Y	Y		60	5.845E-05	5.845E-05	5.845E-05		1.298E+05	1.298E+05	1.298E+05	
7	Ba-136m				1923	8.460E+03				6.034E+14			
8	Ba-137m	Y	Y		599	8.175E+05	8.175E+05	8.175E+05		1.812E+16	1.812E+16	1.812E+16	
9	Ba-139	Y	Y	Y	43.5	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
10	Ba-140	Y	Y	Y	182.6	1.918E+08	1.918E+08	1.918E+08	1.918E+08	1.296E+18	1.296E+18	1.296E+18	1.296E+18
11	Ba-141	Y	Y		845	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
12	Ba-142	Y	Y		1038	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
13	Br-82	Y	Y		2642	8.320E-02	8.320E-02	8.320E-02		8.133E+09	8.133E+09	8.133E+09	
14	Br-83	Y	Y		7.44	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
15	Br-84	Y	Y		1720	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
16	Ce-141	Y	Y	Y	77	4.775E+04	4.775E+04	4.775E+04	4.775E+04	1.360E+14	1.360E+14	1.360E+14	1.360E+14
17	Ce-143	Y	Y	Y	274	2.273E-02	2.273E-02	2.273E-02	2.273E-02	2.304E+08	2.304E+08	2.304E+08	2.304E+08
18	Ce-144	Y	Y	Y	19.2	7.029E+04	7.029E+04	7.029E+04	7.029E+04	4.993E+13	4.993E+13	4.993E+13	4.993E+13
19	Ce-146				289	0.000E+00				0.000E+00			
20	Cm-242	Y	Y	Y	6043	1.181E+03	1.181E+03	1.181E+03	1.181E+03	2.641E+14	2.641E+14	2.641E+14	2.641E+14
21	Cm-243	Y	Y		5838	5.745E-01	5.745E-01	5.745E-01		1.241E+11	1.241E+11	1.241E+11	
22	Cm-244	Y	Y	Y	5798	7.778E+01	7.778E+01	7.778E+01	7.778E+01	1.668E+13	1.668E+13	1.668E+13	1.668E+13
23	Co-58	Y	Y	Y	824	1.102E+03	1.102E+03	1.102E+03	1.102E+03	3.360E+13	3.360E+13	3.360E+13	3.360E+13
24	Co-60	Y	Y	Y	2504.4	7.888E+02	7.888E+02	7.888E+02	7.888E+02	7.310E+13	7.310E+13	7.310E+13	7.310E+13
25	Co-60m	Y	Y		6.8	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
26	Co-61	Y	Y		98.4	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
27	Cs-132	Y	Y		712.1	4.393E+01	4.393E+01	4.393E+01		1.157E+12	1.157E+12	1.157E+12	
28	Cs-134	Y	Y	Y	1555	5.596E+06	5.596E+06	5.596E+06	5.596E+06	3.220E+17	3.220E+17	3.220E+17	3.220E+17
29	Cs-134m	Y	Y		28.8	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
30	Cs-135m		Y		1590	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
31	Cs-136	Y	Y	Y	2171	3.782E+05	3.782E+05	3.782E+05	3.782E+05	3.038E+16	3.038E+16	3.038E+16	3.038E+16
32	Cs-137	Y	Y	Y	566	4.336E+08	4.336E+08	4.336E+08	4.336E+08	9.080E+18	9.080E+18	9.080E+18	9.080E+18
33	Cs-138	Y	Y		2361	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
34	Cs-139	Y	Y		329	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
35	Eu-152m	Y	Y		306	2.735E-23	2.735E-23	2.735E-23		3.097E-13	3.097E-13	3.097E-13	
36	Eu-154	Y	Y		1253	2.110E+02	2.110E+02	2.110E+02		9.783E+12	9.783E+12	9.783E+12	
37	Eu-155	Y	Y		63	8.587E+01	8.587E+01	8.587E+01		2.002E+11	2.002E+11	2.002E+11	
38	Eu-156	Y	Y		1324	1.396E+03	1.396E+03	1.396E+03		6.836E+13	6.836E+13	6.836E+13	
39	Eu-157		Y		0	2.796E-12				0.000E+00		0.000E+00	
40	Eu-158		Y		1081	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
41	Eu-159				0	0.000E+00				0.000E+00			
42	I-128	Y	Y		90	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
43	I-130	Y	Y		2139	2.338E-12	2.338E-12	2.338E-12		1.850E-01	1.850E-01	1.850E-01	
44	I-130m				121	0.000E+00				0.000E+00			
45	I-131	Y	Y	Y	382	2.521E+08	2.521E+08	2.521E+08	2.521E+08	3.583E+16	3.583E+16	3.583E+16	3.583E+16
46	I-132	Y	Y	Y	2290	8.068E+04	8.068E+04	8.068E+04	8.068E+04	6.836E+15	6.836E+15	6.836E+15	6.836E+15
47	I-133	Y	Y	Y	607	2.590E-03	2.590E-03	2.590E-03	2.590E-03	5.817E+07	5.817E+07	5.817E+07	5.817E+07
48	I-133m				1573	0.000E+00				0.000E+00			

Table 9. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Source Energy (Mev/dis)
For RG 1.183 DBA-LOCA Source; Time = 30 Days

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
97	Pu-237	Y	Y		53.6	2.116E-01	2.116E-01	2.116E-01		4.197E+08	4.197E+08	4.197E+08	
98	Pu-238	Y	Y	Y	1.76	2.315E+02	2.315E+02	2.315E+02	2.315E+02	1.507E+10	1.507E+10	1.507E+10	1.507E+10
99	Pu-239	Y	Y	Y	5101	2.441E+01	2.441E+01	2.441E+01	2.441E+01	4.607E+12	4.607E+12	4.607E+12	4.607E+12
100	Pu-240	Y	Y	Y	0.0288	3.896E+01	3.896E+01	3.896E+01	3.896E+01	4.123E+07	4.123E+07	4.123E+07	4.123E+07
101	Pu-241	Y	Y	Y	0.001354	9.550E+03	9.550E+03	9.550E+03	9.550E+03	4.784E+08	4.784E+08	4.784E+08	4.784E+08
102	Pu-243	Y	Y		26	1.987E-08	1.987E-08	1.987E-08		1.893E+01	1.893E+01	1.893E+01	
103	Rb-86	Y	Y	Y	94.5	1.774E+04	1.774E+04	1.774E+04	1.774E+04	6.204E+13	6.204E+13	6.204E+13	6.204E+13
104	Rb-88	Y	Y		629	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
105	Rh-103m	Y	Y		1.65	2.521E+05	2.521E+05	2.521E+05		1.539E+13	1.539E+13	1.539E+13	
106	Rh-105	Y	Y	Y	77	2.388E-01	2.388E-01	2.388E-01	2.388E-01	6.802E+08	6.802E+08	6.802E+08	6.802E+08
107	Rh-105m	Y			34.5	0.000E+00	0.000E+00			0.000E+00	0.000E+00		
108	Rh-106	Y	Y		206	1.620E+05	1.620E+05	1.620E+05		1.235E+15	1.235E+15	1.235E+15	
109	Rh-106m		Y		2882	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
110	Rh-107		Y		313	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
111	Rh-108				2264	0.000E+00				0.000E+00			
112	Ru-103	Y	Y	Y	485	2.521E+05	2.521E+05	2.521E+05	2.521E+05	4.524E+15	4.524E+15	4.524E+15	4.524E+15
113	Ru-105	Y	Y	Y	738	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
114	Ru-106	Y	Y	Y	0	1.620E+05	1.620E+05	1.620E+05	1.620E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
115	Ru-107				206	0.000E+00				0.000E+00			
116	Ru-108				0	0.000E+00				0.000E+00			
117	Sb-122	Y	Y		433	4.828E+00	4.828E+00	4.828E+00		7.736E+10	7.736E+10	7.736E+10	
118	Sb-124	Y	Y		1852	3.443E+03	3.443E+03	3.443E+03		2.359E+14	2.359E+14	2.359E+14	
119	Sb-125	Y	Y		443	6.754E+04	6.754E+04	6.754E+04		1.107E+15	1.107E+15	1.107E+15	
120	Sb-126	Y	Y		2749	4.339E+02	4.339E+02	4.339E+02		4.413E+13	4.413E+13	4.413E+13	
121	Sb-126m	Y	Y		1548	4.164E+00	4.164E+00	4.164E+00		2.385E+11	2.385E+11	2.385E+11	
122	Sb-127	Y	Y	Y	684	2.139E+03	2.139E+03	2.139E+03	2.139E+03	5.256E+13	5.256E+13	5.256E+13	5.256E+13
123	Sb-128		Y		3108	7.487E-20	7.487E-20	7.487E-20		8.610E-09	8.610E-09	8.610E-09	
124	Sb-128m		Y		1909	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
125	Sb-129	Y	Y	Y	1356	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
126	Sb-130		Y		3265	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
127	Sb-130m				2653	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
128	Sb-131		Y		1609	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
129	Sb-132				2583	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
130	Se-79m				13.7	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
131	Se-81		Y		9.9	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
132	Se-81m		Y		15	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
133	Se-83		Y		955	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
134	Sm-151	Y	Y		0.0131	1.374E+01	1.374E+01	1.374E+01		6.658E+06	6.658E+06	6.658E+06	
135	Sm-153	Y	Y		62.8	2.200E-01	2.200E-01	2.200E-01		5.113E+08	5.113E+08	5.113E+08	
136	Sm-155		Y		103	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
137	Sm-156		Y		0	4.492E-21	4.492E-21	4.492E-21		0.000E+00	0.000E+00	0.000E+00	
138	Sm-157				0	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
139	Sr-89	Y	Y	Y	0.086	3.423E+06	3.423E+06	3.423E+06	3.423E+06	1.089E+13	1.089E+13	1.089E+13	1.089E+13
140	Sr-90	Y	Y	Y	0	6.494E+05	6.494E+05	6.494E+05	6.494E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00
141	Sr-91	1.115E-16	Y	Y	1047	1.115E-16	1.115E-16	1.115E-16	1.115E-16	4.321E-06	4.321E-06	4.321E-06	4.321E-06
142	Sr-92	Y	Y	Y	1339	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
143	Sr-93	Y			2214	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
144	Tc-99	Y			0	5.539E+00	5.539E+00	5.539E+00		0.000E+00	0.000E+00	0.000E+00	

Table 9. Evaluation Of Total Energy Release Rate (Mev/sec) And Average Source Energy (Mev/dls)
For RG 1.183 DBA-LOCA Source; Time = 30 Days

No.	Nuclide	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	Total Average Energy Release (kev / dis)	AST Activity Release (Curies)				Total Mev/sec for RG 1.183 LOCA Activity Release			
						Total AST Nuclides	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD	TOTAL AST SOURCE	GROVE Isotopic Library	ICRP38 Isotopic Library	RADTRAD
145	Tc-99m	Y		Y	123.9	2.521E+02	2.521E+02		2.521E+02	1.156E+12	1.156E+12		1.156E+12
146	Tc-100				83	0.000E+00				0.000E+00			
147	Tc-101	Y	Y		337	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
148	Tc-102				81	0.000E+00				0.000E+00			
149	Tc-104				1999	0.000E+00		0.000E+00		0.000E+00		0.000E+00	
150	Tc-105				535	0.000E+00				0.000E+00			
151	Te-123m	Y	Y		148.1	4.087E+01	4.087E+01	4.087E+01		2.240E+11	2.240E+11	2.240E+11	
152	Te-125m	Y	Y		38	1.531E+04	1.531E+04	1.531E+04		2.039E+13	2.039E+13	2.039E+13	
153	Te-127	Y	Y	Y	4.8	6.876E+04	6.876E+04	6.876E+04	6.876E+04	1.221E+13	1.221E+13	1.221E+13	1.221E+13
154	Te-127m	Y	Y	Y	11.1	6.800E+04	6.800E+04	6.800E+04	6.800E+04	2.793E+13	2.793E+13	2.793E+13	2.793E+13
155	Te-129	Y	Y	Y	82.4	1.157E+05	1.157E+05	1.157E+05	1.157E+05	2.672E+14	2.672E+14	2.672E+14	2.672E+14
156	Te-129m	Y	Y	Y	37	1.803E+05	1.803E+05	1.803E+05	1.803E+05	2.468E+14	2.468E+14	2.468E+14	2.468E+14
157	Te-131	Y	Y		421	1.448E-02	1.448E-02	1.448E-02		2.255E+08	2.255E+08	2.255E+08	
158	Te-131m	Y	Y	Y	1423	6.418E-02	6.418E-02	6.418E-02	6.418E-02	3.379E+09	3.379E+09	3.379E+09	3.379E+09
159	Te-132	Y	Y	Y	234	1.303E+04	1.303E+04	1.303E+04	1.303E+04	1.128E+14	1.128E+14	1.128E+14	1.128E+14
160	Te-133	Y	Y		952	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
161	Te-133m	Y	Y		1696	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
162	Te-134	Y	Y		858	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
163	Xe-129m	Y	Y		51.3	4.974E+02	4.974E+02	4.974E+02		9.440E+11	9.440E+11	9.440E+11	
164	Xe-131m	Y	Y		20	5.050E+05	5.050E+05	5.050E+05		3.737E+14	3.737E+14	3.737E+14	
165	Xe-133	Y	Y	Y	45.9	4.989E+06	4.989E+06	4.989E+06	4.989E+06	8.473E+15	8.473E+15	8.473E+15	8.473E+15
166	Xe-133m	Y	Y		41.4	8.480E-02	8.480E-02	8.480E-02		1.299E+12	1.299E+12	1.299E+12	
167	Xe-134m				1896	0.000E+00				0.000E+00			
168	Xe-135	Y	Y	Y	249	1.177E-15	1.177E-15	1.177E-15	1.177E-15	1.084E-05	1.084E-05	1.084E-05	1.084E-05
169	Xe-135m	Y	Y		432	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
170	Xe-137	Y			190.8	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
171	Xe-138	Y	Y		1126	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
172	Y 89m				901.4	1.291E+00				4.307E+10			
173	Y 90	Y	Y	Y	0.00031	2.598E+03	2.598E+03	2.598E+03	2.598E+03	2.979E+07	2.979E+07	2.979E+07	2.979E+07
174	Y 91	Y	Y	Y	3.6	1.895E+04	1.895E+04	1.895E+04	1.895E+04	2.524E+12	2.524E+12	2.524E+12	2.524E+12
175	Y 91m	Y	Y		527.7	2.827E-19	2.827E-19	2.827E-19		5.519E-09	5.519E-09	5.519E-09	
176	Y 92	Y	Y	Y	253	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
177	Y 93	Y	Y	Y	88.9	7.487E-18	7.487E-18	7.487E-18	7.487E-18	2.463E-08	2.463E-08	2.463E-08	2.463E-08
178	Y 94		Y		772	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
179	Y 95		Y		1287	0.000E+00	0.000E+00	0.000E+00		0.000E+00	0.000E+00	0.000E+00	
180	Zr- 89	Y	Y		925.7	1.910E-02	1.910E-02	1.910E-02		6.542E+08	6.542E+08	6.542E+08	
181	Zr- 93	Y	Y		1.84	5.944E-03	5.944E-03	5.944E-03		4.047E+05	4.047E+05	4.047E+05	
182	Zr- 95	Y	Y	Y	773	2.774E+04	2.774E+04	2.774E+04	2.774E+04	7.935E+14	7.935E+14	7.935E+14	7.935E+14
183	Zr- 97	Y	Y	Y	869	5.675E-09	5.675E-09	5.675E-09	5.675E-09	1.825E+02	1.825E+02	1.825E+02	1.825E+02
					TOTAL	2.835E+07	2.831E+07	2.834E+07	2.848E+07	5.376E+17	5.359E+17	5.370E+17	5.157E+17
					Average Energy Mev/dls					5.125E-01	5.117E-01	5.121E-01	5.263E-01

Table 10. Comparison Of Isotopic Mix Source Parameters

Time Post-Accident	AST 143 Dose Significant Isotopic Mix	MICROSHIELD Grove Library Isotopic Mix	MICROSHIELD ICRP 38 Isotopic Mix	RADTRAD 60 Dose Significant Isotopic Mix	RATIO AST 143 Isotopes / RADTRAD 60
SOURCE TOTAL ACTIVITY (Curies)					
0	1.459E+09	1.433E+09	1.218E+09	7.899E+08	1.847
1 hrs	8.482E+08	8.445E+08	8.335E+08	7.236E+08	1.172
8 hrs	5.681E+08	5.680E+08	5.640E+08	5.350E+08	1.062
1 day	4.203E+08	4.202E+08	4.198E+08	4.075E+08	1.031
4 day	2.371E+08	2.370E+08	2.369E+08	2.311E+08	1.026
30 days	2.835E+07	2.831E+07	2.834E+07	2.648E+07	1.071
SOURCE TOTAL ENERGY RELEASE RATE (Mev/ds)					
0	4.656E+19	4.482E+19	4.328E+19	2.855E+19	1.754
1 hrs	2.632E+19	2.608E+19	2.622E+19	2.222E+19	1.185
8 hrs	1.061E+19	1.060E+19	1.061E+19	1.021E+19	1.040
1 day	6.474E+18	6.468E+18	6.469E+18	6.365E+18	1.017
4 day	3.067E+18	3.063E+18	3.063E+18	3.034E+18	1.011
30 days	5.376E+17	5.359E+17	5.370E+17	5.157E+17	1.042
SOURCE AVERAGE ENERGY (Mev/ds)					
0	8.626E-01	8.456E-01	9.606E-01	9.085E-01	0.949
1 hrs	8.385E-01	8.346E-01	8.502E-01	8.288E-01	1.010
8 hrs	5.048E-01	5.045E-01	5.083E-01	5.155E-01	0.979
1 day	4.163E-01	4.160E-01	4.165E-01	4.221E-01	0.986
4 day	3.495E-01	3.493E-01	3.495E-01	3.549E-01	0.985
30 days	5.125E-01	5.117E-01	5.121E-01	5.263E-01	0.974

Table 11. Comparison Of DBA-LOCA AST Activity Release For 27 Isotopes Not Included In MICROSIELD Libraries

No.	Nuclide	Core Inventory (curies) x RG 1.183 LOCA Release Fraction											
		0.0 d	1 sec	30 ml-n	1 hr	8 hr	1.0 d	4.0 d	30.0 d	90.0 d	180.0 d	1 Yr	3 Yr
1	Ba-136m	4.202E+04	4.126E+04	4.087E+04	4.087E+04	4.049E+04	3.896E+04	3.331E+04	8.480E+03	3.581E+02	3.136E+00	1.815E-04	3.534E-21
2	Ce-146	4.508E+04	4.508E+04	9.741E+03	2.093E+03	9.321E-07	3.935E-28	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
3	Eu-159	9.811E+01	9.811E+01	3.438E+01	1.091E+01	1.128E-06	1.219E-22	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
4	I-130m	4.217E+05	4.217E+05	4.194E+04	4.149E+03	3.713E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
5	I-133m	5.088E+06	4.928E+06	2.095E+06	1.439E+06	7.518E+03	4.581E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
6	Mo-102	4.355E+05	4.355E+05	8.933E+04	1.100E+04	7.124E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
7	Nb-98m	2.934E+02	2.934E+02	1.956E+02	1.309E+02	4.477E-01	1.041E-06	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
8	Nd-152	2.888E+03	2.873E+03	4.660E+02	7.518E+01	8.112E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
9	Pd-111	1.666E+04	1.666E+04	7.201E+03	3.228E+03	2.025E+02	2.693E+01	3.094E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
10	Pd-111m	7.067E+02	7.067E+02	6.628E+02	6.227E+02	2.579E+02	3.438E+01	3.935E-03	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
11	Pd-112	7.545E+03	7.545E+03	7.430E+03	7.296E+03	5.806E+03	3.419E+03	3.190E+02	3.782E-07	9.550E-28	0.000E+00	0.000E+00	0.000E+00
12	Pm-152	2.995E+03	2.995E+03	7.197E+02	1.175E+02	9.535E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
13	Pm-152m	1.074E+02	1.073E+02	6.769E+00	4.263E-01	6.555E-18	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
14	Pm-153	1.986E+03	1.986E+03	5.180E+01	1.100E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
15	Pr-146	1.818E+04	1.818E+04	1.250E+04	6.311E+03	4.294E-02	4.630E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
16	Rh-108	1.140E+05	1.138E+05	1.251E+03	1.293E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
17	Ru-107	1.742E+05	1.740E+05	7.449E+02	2.903E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
18	Ru-108	1.123E+05	1.121E+05	1.175E+03	1.215E+01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
19	Sb-130m	2.410E+06	2.407E+06	1.750E+05	8.781E+03	5.806E-17	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
20	Sb-132	2.540E+06	2.533E+06	1.799E+04	1.272E+02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
21	Se-76m	6.685E+04	6.685E+04	1.184E+04	1.203E+03	1.119E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
22	Sm-157	3.239E+02	3.239E+02	2.643E+01	2.002E+00	4.309E-16	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
23	Tc-100	1.283E+05	1.207E+05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
24	Tc-102	4.355E+05	4.355E+05	6.991E+04	1.108E+04	7.182E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
25	Tc-105	2.922E+05	2.922E+05	2.044E+04	1.320E+03	3.056E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
26	Xe-134m	5.896E+06	9.932E+05	1.788E+03	8.356E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
27	Y 89m	3.351E+01	3.259E+01	1.285E+01	1.280E+01	1.215E+01	1.077E+01	6.484E+00	1.291E+00	5.593E-01	1.835E-01	1.285E-02	5.745E-07
TOTAL 27 Isotopes		1.825E+07	1.317E+07	2.586E+06	1.536E+06	5.429E+04	4.246E+04	3.384E+04	8.482E+03	3.596E+02	3.300E+00	1.303E-02	5.745E-07
TOTAL 183 Isotopes		1.459E+09	1.454E+09	9.575E+08	8.482E+08	5.681E+08	4.203E+08	2.371E+08	2.835E+07	1.506E+07	1.303E+07	1.153E+07	8.846E+06
RATIO 27 Isotopes / 183 Isotopes		1.251E-02	9.059E-03	2.701E-03	1.811E-03	9.556E-05	1.010E-04	1.419E-04	2.982E-04	2.388E-05	2.532E-07	1.130E-09	6.495E-14

Table 12. Comparison Of DBA-LOCA AST Source Parameters For 27 Isotopes Not Included In MICROSHIELD Libraries

No.	Nuclide	Total Average Energy Release Rate kev/dis)	Core Inventory at 1 Hour (Curies)	Total Mev/sec for RG 1.183 LOCA Activity Release D
1	Ba-138m	1923	4.087E+04	2.908E+15
2	Ce-146	289	2.093E+03	2.238E+13
3	Eu-159	0	1.091E+01	0.000E+00
4	I-130m	121	4.149E+03	1.857E+13
5	I-133m	1573	1.439E+08	8.377E+16
6	Mo-102	18.5	1.100E+04	7.531E+12
7	Nb-98m	2711	1.303E+02	1.307E+13
8	Nd-152	0	7.518E+01	0.000E+00
9	Pd-111	45	3.228E+03	5.374E+12
10	Pd-111m	359	6.227E+02	8.271E+12
11	Pd-112	0	7.296E+03	0.000E+00
12	Pm-152	151	1.175E+02	6.565E+11
13	Pm-152m	1508	4.263E-01	2.379E+10
14	Pm-153	0	1.100E+00	0.000E+00
15	Pt-146	1018	6.311E+03	2.377E+14
16	Rh-108	2264	1.293E+01	1.083E+12
17	Ru-107	206	2.903E+00	2.213E+10
18	Ru-108	0	1.215E+01	0.000E+00
19	Sb-130m	2653	6.781E+03	6.637E+14
20	Sb-132	2583	1.272E+02	1.216E+13
21	Se-79m	13.7	1.203E+03	6.100E+11
22	Sm-157	0	2.002E+00	0.000E+00
23	Tc-100	83	0.000E+00	0.000E+00
24	Tc-102	81	1.108E+04	3.320E+13
25	Tc-105	535	1.320E+03	2.613E+13
26	Xe-134m	1896	6.356E+00	4.459E+11
27	Y 89m	901.4	1.280E+01	4.271E+11
Total 27 Isotopes			1.536E+06	8.773E+16
Total 183 Isotopes			8.482E+08	2.632E+19
Ratio 27 Isotopes / 183 Isotopes			1.811E-03	3.334E-03
Average Energy Mev/dis - 27 Isotopes				1.544E+00
Average Energy Mev/dis - 183 Isotopes				8.365E-01

Table 13. DBA-LOCA Liquid Activity Release Distribution; Release Assumed At Time = 0 Post-Accident With Decay Only;
Regulatory Guide 1.183, Table 1 Activity Release Fractions

No.	Nucl-de	MS5 Grove	MS5 ICRP38	RADTRAD	Total kev / dis	Suppression Pool (uCi/cc) = (Core Inventory (curies) x RG 1.183 LOCA Release Fraction x 1000000 uCi/cc) / (132,000 ft ³ x 28316.85 cc/ft ³)											
						0.0 d	1 sec	30 ml-n	1 hr	8 hr	1.0 d	4.0 d	30.0 d	90.0 d	180.0 d	1 Yr	3 Yr
169	Xe-135m	Y	Y		432	1.239E+04	1.239E+04	9.566E+03	8.503E+03	3.965E+03	7.338E+02	3.670E-01	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
170	Xe-137	Y			180.8	5.396E+04	5.396E+04	2.473E+02	1.063E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
171	Xe-138	Y	Y		1128	5.049E+04	5.049E+04	1.155E+04	2.837E+03	2.758E-06	8.258E-27	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
172	Y-89m				901.4	8.965E-03	8.720E-03	3.438E-03	3.428E-03	3.250E-03	2.882E-03	1.737E-03	3.455E-04	1.496E-04	4.374E-05	3.438E-06	1.537E-10
173	Y-90	Y	Y	Y	0.00031	7.292E-01	7.292E-01	7.292E-01	7.291E-01	7.243E-01	7.188E-01	7.066E-01	6.950E-01	6.949E-01	6.909E-01	6.786E-01	6.456E-01
174	Y-91	Y	Y	Y	3.6	7.196E+00	7.196E+00	7.196E+00	7.196E+00	7.155E+00	7.155E+00	6.910E+00	6.070E+00	2.490E+00	8.586E-01	9.526E-02	1.664E-05
175	Y-91m	Y	Y		527.7	4.051E+00	4.051E+00	4.027E+00	3.981E+00	2.481E+00	7.728E-01	4.088E-03	7.583E-23	0.000E+00	0.000E+00	0.000E+00	0.000E+00
176	Y-92	Y	Y	Y	253	7.481E+00	7.481E+00	7.440E+00	7.318E+00	3.495E+00	2.363E-01	2.163E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
177	Y-93	Y	Y	Y	88.9	5.723E+00	5.723E+00	5.580E+00	5.396E+00	3.336E+00	1.112E+00	7.931E-03	2.003E-21	0.000E+00	0.000E+00	0.000E+00	0.000E+00
178	Y-94		Y		772	9.076E+00	9.076E+00	3.185E+00	1.047E+00	1.815E-07	8.377E-23	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
179	Y-95		Y		1287	9.443E+00	9.443E+00	1.348E+00	1.860E-01	1.692E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
180	Zr-89	Y	Y		925.7	2.956E-03	2.956E-03	2.943E-03	2.931E-03	2.755E-03	2.391E-03	1.267E-03	5.110E-06	1.521E-11	7.808E-20	9.321E-37	0.000E+00
181	Zr-93	Y	Y		1.84	1.590E-06	1.590E-06	1.590E-06	1.590E-06	1.590E-06	1.590E-06	1.590E-06	1.590E-06	1.590E-06	1.590E-06	1.590E-06	1.590E-06
182	Zr-95	Y	Y	Y	773	1.025E+01	1.025E+01	1.025E+01	1.025E+01	1.021E+01	1.013E+01	9.823E+00	7.422E+00	3.870E+00	1.459E+00	1.955E-01	7.209E-05
183	Zr-97	Y	Y	Y	869	1.015E+01	1.015E+01	9.930E+00	9.750E+00	7.301E+00	3.793E+00	1.981E-01	1.518E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00
					TOTAL	3.903E+05	3.890E+05	2.562E+05	2.269E+05	1.520E+05	1.124E+05	6.343E+04	7.585E+03	4.029E+03	3.486E+03	3.085E+03	2.367E+03

Table 14. DBA-LOCA Airborne Activity Release Distribution; Activity Released At Time = 0 Post-Accident With Decay Only;
Regulatory guide 1.183, Table 1 Activity release Fractions

No.	Nucl-de	MSS Grove	MSS ICRP38	RADTRAD	Total kev / dis	Reactor Building (uCi/cc) = (Core Inventory (curies) x RG 1.183 LOCA Release Fraction x 1000000 uCi/Ci) / (2078000 R3 x 28316.85 cc/t3)													
						0.0 d	1 sec	30 m-n	1 hr	8 hr	1.0 d	4.0 d	30.0 d	90.0 d	180.0 d	1 Yr	3 Yr		
169	Xe-135m	Y	Y		432	7.868E+02	7.868E+02	8.076E+02	5.401E+02	2.519E+02	4.881E+01	2.337E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00		
170	Xe-137	Y			190.8	3.428E+03	3.428E+03	1.571E+01	6.752E-02	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00		
171	Xe-138	Y	Y		1126	3.207E+03	3.207E+03	7.336E+02	1.875E+02	1.753E-07	5.245E-28	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00		
172	Y 89m				901.4	5.895E-04	5.539E-04	2.184E-04	2.176E-04	2.064E-04	1.831E-04	1.104E-04	2.195E-05	9.504E-06	2.779E-06	2.184E-07	9.764E-12		
173	Y 90	Y	Y	Y	0.00031	4.832E-02	4.832E-02	4.832E-02	4.832E-02	4.801E-02	4.566E-02	4.488E-02	4.415E-02	4.415E-02	4.388E-02	4.311E-02	4.103E-02		
174	Y 91	Y	Y	Y	3.6	4.571E-01	4.571E-01	4.571E-01	4.571E-01	4.545E-01	4.545E-01	4.389E-01	3.220E-01	1.582E-01	5.454E-02	8.051E-03	1.057E-06		
175	Y 91m	Y	Y		527.7	2.573E-01	2.573E-01	2.558E-01	2.516E-01	1.576E-01	4.908E-02	2.587E-04	4.804E-24	0.000E+00	0.000E+00	0.000E+00	0.000E+00		
176	Y 92	Y	Y	Y	253	4.752E-01	4.752E-01	4.726E-01	4.848E-01	2.220E-01	1.501E-02	1.374E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00		
177	Y 93	Y	Y	Y	88.9	3.635E-01	3.635E-01	3.532E-01	3.428E-01	2.119E-01	7.063E-02	5.038E-04	1.272E-22	0.000E+00	0.000E+00	0.000E+00	0.000E+00		
178	Y 94		Y		772	5.765E-01	5.765E-01	2.023E-01	6.648E-02	1.153E-08	4.051E-24	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00		
179	Y 95		Y		1287	5.999E-01	5.999E-01	8.569E-02	1.182E-02	1.075E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00		
180	Zr- 89	Y	Y		925.7	1.877E-04	1.877E-04	1.870E-04	1.862E-04	1.750E-04	1.519E-04	8.050E-05	3.246E-07	9.660E-13	4.980E-21	5.821E-38	0.000E+00		
181	Zr- 93	Y	Y		1.84	1.010E-07	1.010E-07	1.010E-07	1.010E-07	1.010E-07	1.010E-07	1.010E-07	1.010E-07	1.010E-07	1.010E-07	1.010E-07	1.010E-07		
182	Zr- 95	Y	Y	Y	773	6.513E-01	6.513E-01	6.513E-01	6.513E-01	6.487E-01	6.432E-01	6.240E-01	4.715E-01	2.458E-01	9.268E-02	1.246E-02	4.579E-06		
183	Zr- 97	Y	Y	Y	869	6.448E-01	6.448E-01	6.308E-01	6.193E-01	4.638E-01	2.408E-01	1.258E-02	9.644E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00		
					TOTAL	2.480E+04	2.471E+04	1.627E+04	1.442E+04	9.655E+03	7.143E+03	4.029E+03	4.818E+02	2.559E+02	2.215E+02	1.959E+02	1.503E+02		

TABLE 15. COMPARISON OF CALCULATED DOSE RATES FOR 183 ISOTOPE AST SOURCE
AND 60 ISOTOPE RADTRAD SOURCE

UNSHIELDED						6" CONCRETE SHIELD					
Time (hrs)	Case	Dose Rate (mr/hr)	183 Isotopes (mr/hr)	RADTRAD (mr/hr)	RATIO OF DOSE RATES 183 Isotopes / RADTRAD	Time (hrs)	Case	Dose Rate (mr/hr)	183 Isotopes (mr/hr)	RADTRAD (mr/hr)	RATIO OF DOSE RATES 183 Isotopes / RADTRAD
ESSR SUPPRESSION POOL						SUPPRESSION POOL					
1	Grove	4.933E+06	4.979E+06	4.144E+06	1.201	1	Grove	3.166E+05	3.193E+05	2.498E+05	1.278
	ICRP 38	4.565E+04					ICRP 38	2.657E+03			
	RADTRAD	4.144E+06					RADTRAD	2.498E+05			
8	Grove	2.172E+06	2.173E+06	2.137E+06	1.017	8	Grove	1.219E+05	1.220E+05	1.192E+05	1.023
	ICRP 38	1.133E+03					ICRP 38	5.631E+01			
	RADTRAD	2.137E+06					RADTRAD	1.192E+05			
24	Grove	1.471E+06	1.471E+06	1.463E+06	1.006	24	Grove	7.454E+04	7.455E+04	7.412E+04	1.006
	ICRP 38	2.843E+02					ICRP 38	1.404E+01			
	RADTRAD	1.463E+06					RADTRAD	7.412E+04			
RR B REACTOR BLDG						REACTOR BLDG					
1	Grove	1.804E+08	1.816E+08	1.533E+08	1.185	1	Grove	4.486E+07	4.516E+07	3.741E+07	1.207
	ICRP 38	1.224E+06					ICRP 38	2.950E+05			
	RADTRAD	1.533E+08					RADTRAD	3.741E+07			
8	Grove	7.757E+07	7.760E+07	7.461E+07	1.040	8	Grove	1.600E+07	1.601E+07	1.544E+07	1.037
	ICRP 38	3.077E+04					ICRP 38	6.850E+03			
	RADTRAD	7.461E+07					RADTRAD	1.544E+07			
24	Grove	5.010E+07	5.011E+07	4.931E+07	1.016	24	Grove	9.257E+06	9.259E+06	9.146E+06	1.012
	ICRP 38	7.704E+03					ICRP 38	1.710E+03			
	RADTRAD	4.931E+07					RADTRAD	9.146E+06			

TABLE 15. COMPARISON OF CALCULATED DOSE RATES FOR 183 ISOTOPE AST SOURCE
AND 60 ISOTOPE RADTRAD SOURCE

10 s)	1 FT. CONCRETE SHIELD					1.5 FT CONCRETE SHIELD						
	Time (hrs)	Case	Dose Rate (mr/hr)	183 Isotopes (mr/hr)	RADTRAD (mr/hr)	DOSE RATIO OF DOSE RATES 183 Isotopes / RADTRAD	Time (hrs)	Case	Dose Rate (mr/hr)	183 Isotopes (mr/hr)	RADTRAD (mr/hr)	RATIO OF DOSE RATES 183 Isotopes / RADTRAD
ESSI	SUPPRESSION POOL						SUPPRESSION POOL					
	1	Grove	5.138E+04	5.176E+04	3.732E+04	1.387	1	Grove	9.040E+03	9.098E+03	5.943E+03	1.531
		ICRP 38	3.772E+02					ICRP 38	5.781E+01			
		RADTRAD	3.732E+04					RADTRAD	5.943E+03			
	8	Grove	1.749E+04	1.750E+04	1.693E+04	1.033	8	Grove	2.737E+03	2.738E+03	2.612E+03	1.048
		ICRP 38	6.420E+00					ICRP 38	7.046E-01			
		RADTRAD	1.693E+04					RADTRAD	2.612E+03			
	24	Grove	9.494E+03	9.496E+03	9.441E+03	1.006	24	Grove	1.317E+03	1.317E+03	1.309E+03	1.006
		ICRP 38	1.595E+00					ICRP 38	1.733E-01			
RADTRAD		9.441E+03			RADTRAD			1.309E+03				
JR B	REACTOR BLDG						REACTOR BLDG					
	1	Grove	8.241E+06	8.285E+06	6.696E+06	1.237	1	Grove	1.582E+06	1.589E+06	1.250E+06	1.271
		ICRP 38	4.415E+04					ICRP 38	6.520E+03			
		RADTRAD	6.696E+06					RADTRAD	1.250E+06			
	8	Grove	2.435E+06	2.436E+06	2.358E+06	1.033	8	Grove	3.939E+05	3.936E+05	3.805E+05	1.034
		ICRP 38	8.670E+02					ICRP 38	9.861E+01			
		RADTRAD	2.358E+06					RADTRAD	3.805E+05			
	24	Grove	1.205E+06	1.205E+06	1.193E+06	1.010	24	Grove	1.602E+05	1.602E+05	1.590E+05	1.008
		ICRP 38	2.159E+02					ICRP 38	2.442E+01			
RADTRAD		1.193E+06			RADTRAD			1.590E+05				

TABLE 15. COMPARISON OF CALCULATED DOSE RATES FOR 183 ISOTOPE AST SOURCE
AND 60 ISOTOPE RADTRAD SOURCE

2 FT. CONCRETE SHIELD						2.5 FT. CONCRETE SHIELD					
Time (hrs)	Case	Dose Rate (mr/hr)	183 Isotopes (mr/hr)	RADTRAD (mr/hr)	RATIO OF DOSE RATES 183 Isotopes / RADTRAD	Time (hrs)	Case	Dose Rate (mr/hr)	183 Isotopes (mr/hr)	RADTRAD (mr/hr)	RATIO OF DOSE RATES 183 Isotopes / RADTRAD
SUPPRESSION POOL						SUPPRESSION POOL					
1	Grove	1.727E+03	1.737E+03	1.012E+03	1.716	1	Grove	3.548E+02	3.567E+02	1.816E+02	1.964
	ICRP 38	9.797E+00					ICRP 38	1.855E+00			
	RADTRAD	1.012E+03					RADTRAD	1.816E+02			
8	Grove	4.655E+02	4.656E+02	4.357E+02	1.069	8	Grove	8.437E+01	8.438E+01	7.700E+01	1.096
	ICRP 38	7.642E-02					ICRP 38	8.478E-03			
	RADTRAD	4.357E+02					RADTRAD	7.700E+01			
24	Grove	2.021E+02	2.021E+02	2.008E+02	1.007	24	Grove	3.380E+01	3.380E+01	3.355E+01	1.008
	ICRP 38	1.840E-02					ICRP 38	1.965E-03			
	RADTRAD	2.008E+02					RADTRAD	3.355E+01			
REACTOR BLDG						REACTOR BLDG					
1	Grove	3.243E+05	3.253E+05	2.498E+05	1.302	1	Grove	7.018E+04	7.034E+04	5.280E+04	1.332
	ICRP 38	1.039E+03					ICRP 38	1.845E+02			
	RADTRAD	2.498E+05					RADTRAD	5.280E+04			
8	Grove	6.933E+04	6.934E+04	6.661E+04	1.041	8	Grove	1.307E+04	1.307E+04	1.243E+04	1.052
	ICRP 38	1.066E+01					ICRP 38	1.153E+00			
	RADTRAD	6.661E+04					RADTRAD	1.243E+04			
24	Grove	2.326E+04	2.326E+04	2.310E+04	1.007	24	Grove	3.713E+03	3.713E+03	3.687E+03	1.007
	ICRP 38	2.602E+00					ICRP 38	2.736E-01			
	RADTRAD	2.310E+04					RADTRAD	3.687E+03			

TABLE 15. COMPARISON OF CALCULATED DOSE RATES FOR 183 ISOTOPE AST SOURCE
AND 60 ISOTOPE RADTRAD SOURCE

10 s)	3 FT. CONCRETE SHIELD					8 FT. CONCRETE SHIELD										
	Time (hrs)	Case	Dose Rate (mr/hr)	183 Isotopes (mr/hr)	RADTRAD (mr/hr)	RATIO OF DOSE RATES 183 Isotopes / RADTRAD	Time (hrs)	Case	Dose Rate (mr/hr)	183 Isotopes (mr/hr)	RADTRAD (mr/hr)	RATIO OF DOSE RATES 183 Isotopes / RADTRAD				
ESSI	SUPPRESSION POOL					SUPPRESSION POOL										
	1	Grove	7.772E+01	7.810E+01	3.392E+01	2.303	1	Grove	2.008E-04	2.009E-04	4.156E-06	48.351				
		ICRP 38	3.823E-01					ICRP 38	3.484E-07							
		RADTRAD	3.392E+01					RADTRAD	4.156E-06							
	8	Grove	1.605E+01	1.605E+01	1.417E+01	1.133	8	Grove	1.378E-05	1.378E-05	1.452E-06	9.490				
		ICRP 38	9.892E-04					ICRP 38	2.338E-11							
		RADTRAD	1.417E+01					RADTRAD	1.452E-06							
	24	Grove	6.026E+00	6.026E+00	5.973E+00	1.009	24	Grove	8.543E-07	8.543E-07	6.066E-07	1.408				
		ICRP 38	2.152E-04					ICRP 38	1.072E-12							
RADTRAD		5.973E+00			RADTRAD			6.066E-07								
DR B	REACTOR BLDG					REACTOR BLDG										
	1	Grove	1.584E+04	1.588E+04	1.164E+04	1.364										
		ICRP 38	3.608E+01										ICRP 38			
		RADTRAD	1.164E+04										RADTRAD			
	8	Grove	2.582E+03	2.582E+03	2.424E+03	1.065										
		ICRP 38	1.285E-01										ICRP 38			
		RADTRAD	2.424E+03										RADTRAD			
	24	Grove	6.389E+02	6.389E+02	6.339E+02	1.008										
		ICRP 38	2.906E-02										ICRP 38			
RADTRAD		6.339E+02			RADTRAD											

Table 16. Summary Of Shine Dose Rates With The Addition Of Radionuclides To The RADTRAD 60 Isotope Source Term

UNSHIELDED CASE					3 FT CONCRETE SHIELDING				
Time (hrs)	Case	Dose Rate (mr/hr)	RATIO OF DOSE RATES 183 Isotopes (base value)	Inverse Ratio	Time (hrs)	Case	Dose Rate (mr/hr)	RATIO OF DOSE RATES 183 Isotopes (base value)	Inverse Ratio
SUPPRESSION POOL UNSHIELDED					SUPPRESSION POOL WITH 3 FT CONCRETE SHIELD				
1	Grove+ICRP38	4.879E+06	n/a		1	Grove+ICRP38	7.810E+01	n/a	
	RADTRAD 60	4.144E+06	0.832	1.201		RADTRAD 60	3.392E+01	0.434	2.303
	RADTRAD 60 + Br-84, Cs-138, Rb-88	4.797E+06	0.964	1.038		RADTRAD 60 + Br-84, Cs-138, Rb-88	7.700E+01	0.966	1.014
8	Grove+ICRP38	2.173E+06	n/a		8	Grove+ICRP38	1.605E+01	n/a	
	RADTRAD 60	2.137E+06	0.983	1.017		RADTRAD 60	1.417E+01	0.683	1.133
	RADTRAD 60 + Br-84, Cs-138, Rb-88	2.156E+06	0.992	1.008		RADTRAD 60 + Br-84, Cs-138, Rb-88	1.602E+01	0.998	1.002
24	Grove+ICRP38	1.471E+06	n/a		24	Grove+ICRP38	6.026E+00	n/a	
	RADTRAD 60	1.463E+06	0.994	1.006		RADTRAD 60	5.973E+00	0.991	1.009
	RADTRAD 60 + Br-84, Cs-138, Rb-88	1.463E+06	0.994	1.006		RADTRAD 60 + Br-84, Cs-138, Rb-88	6.010E+00	0.997	1.003
REACTOR BLDG UNSHIELDED					REACTOR BLDG WITH 3 FT-CONCRETE SHIELD				
1	Grove+ICRP38	1.816E+08	n/a		1	Grove+ICRP38	1.588E+04	n/a	
	RADTRAD 60	1.533E+08	0.844	1.185		RADTRAD 60	1.164E+04	0.733	1.364
	RADTRAD 60 + Cs-138, Xe-135m, Xe-138	1.730E+08	0.953	1.050		RADTRAD 60 + Cs-138, Xe-135m, Xe-138	1.443E+04	0.909	1.100
8	Grove+ICRP38	7.760E+07	n/a		8	Grove+ICRP38	2.582E+03	n/a	
	RADTRAD 60	7.461E+07	0.961	1.040		RADTRAD 60	2.424E+03	0.939	1.065
	RADTRAD 60 + Cs-138, Xe-135m, Xe-138	7.643E+07	0.985	1.015		RADTRAD 60 + Cs-138, Xe-135m, Xe-138	2.425E+03	0.939	1.065
24	Grove+ICRP38	5.011E+07	n/a		24	Grove+ICRP38	6.389E+02	n/a	
	RADTRAD 60	4.931E+07	0.984	1.016		RADTRAD 60	6.339E+02	0.992	1.008
	RADTRAD 60 + Cs-138, Xe-135m, Xe-138	4.965E+07	0.991	1.009		RADTRAD 60 + Cs-138, Xe-135m, Xe-138	6.339E+02	0.992	1.008

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.Date 08/19/2005Designed By T.F. MackayChecked By M.M.Waselus

PROJECT

Justification Of AST 60 Isotope

RADTRAD Source Term For Direct

Shine Dose Calculations

Calc. No. EC-RADN-1135

Sh. No. 81

**ATTACHMENT 1
MICROSHIELD COMPUTER CODE OUTPUTS
AST DBA-LOCA LIQUID SOURCE**

Page : 1
 DOS File: 1SP1GR.MS5
 Run Date: August 1, 2005
 Run Time: 4:37:39 PM
 Duration: 00:00:21

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 1 Hour, Grove
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X Y Z
 152.4 cm 457.2 cm 0 cm
 5 ft 0.0 in 15 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	1.1038e-003	4.0842e+007	1.3570e-003	5.0209e+001
Am-242	4.7554e-001	1.7595e+010	5.8460e-001	2.1630e+004
Am-242m	7.2160e-005	2.6699e+006	8.8710e-005	3.2823e+000
Am-243	1.3601e-004	5.0323e+006	1.6720e-004	6.1864e+000
Am-244	5.6201e-001	2.0794e+010	6.9090e-001	2.5563e+004
Ba-135m	4.4479e-001	1.6457e+010	5.4680e-001	2.0232e+004
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	1.4634e+003	5.4145e+013	1.7990e+003	6.6563e+007
Ba-140	2.1280e+003	7.8734e+013	2.6160e+003	9.6792e+007
Ba-141	2.0035e+002	7.4130e+012	2.4630e+002	9.1131e+006
Ba-142	3.6166e+001	1.3381e+012	4.4460e+001	1.6450e+006
Br-82	2.4493e+001	9.0623e+011	3.0110e+001	1.1141e+006
Br-83	6.7833e+002	2.5098e+013	8.3390e+002	3.0854e+007
Br-84	4.6984e+002	1.7384e+013	5.7760e+002	2.1371e+007
Ce-141	1.9539e+001	7.2294e+011	2.4020e+001	8.8874e+005
Ce-143	1.7871e+001	6.6124e+011	2.1970e+001	8.1289e+005
Ce-144	1.6464e+001	6.0917e+011	2.0240e+001	7.4888e+005
Cm-242	2.9032e-001	1.0742e+010	3.5690e-001	1.3205e+004
Cm-243	1.2503e-004	4.6259e+006	1.5370e-004	5.6869e+000
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2172e-001	1.1903e+010	3.9550e-001	1.4633e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Co-60m	5.4037e-003	1.9994e+008	6.6430e-003	2.4579e+002
Co-61	2.5396e-003	9.3964e+007	3.1220e-003	1.1551e+002
Co-58 [?]	3.2172e-001	1.1903e+010	3.9550e-001	1.4633e+004
Co-60 _L	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003

Page : 2
 DOS File: 1SP1GR.MS5
 Run Date: August 1, 2005
 Run Time: 4:37:39 PM
 Duration: 00:00:21

EC-RADN-1135
 Page 83

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-134m	2.0621e+002	7.6297e+012	2.5350e+002	9.3795e+006
Cs-136	3.9859e+002	1.4748e+013	4.9000e+002	1.8130e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
Cs-138	4.8636e+003	1.7995e+014	5.9790e+003	2.2122e+008
Cs-139	1.2307e+002	4.5537e+012	1.5130e+002	5.5981e+006
Eu-152m	1.0005e-003	3.7020e+007	1.2300e-003	4.5510e+001
Eu-154	4.5935e-002	1.6996e+009	5.6470e-002	2.0894e+003
Eu-155	1.8888e-002	6.9886e+008	2.3220e-002	8.5914e+002
Eu-156	1.1884e+000	4.3972e+010	1.4610e+000	5.4057e+004
I-128	1.4666e+001	5.4265e+011	1.8030e+001	6.6711e+005
I-130	1.6358e+002	6.0526e+012	2.0110e+002	7.4407e+006
I-131	6.9834e+003	2.5839e+014	8.5850e+003	3.1764e+008
I-132	1.0176e+004	3.7652e+014	1.2510e+004	4.6287e+008
I-133	1.4219e+004	5.2610e+014	1.7480e+004	6.4676e+008
I-134	1.1421e+004	4.2257e+014	1.4040e+004	5.1948e+008
I-135	1.2421e+004	4.5959e+014	1.5270e+004	5.6499e+008
La-140	9.1105e+000	3.3709e+011	1.1200e+001	4.1440e+005
La-141	6.9834e+000	2.5839e+011	8.5850e+000	3.1764e+005
La-142	5.3866e+000	1.9930e+011	6.6220e+000	2.4501e+005
Mo-99	1.0892e+002	4.0300e+012	1.3390e+002	4.9543e+006
Mo-101	5.8193e+000	2.1532e+011	7.1540e+000	2.6470e+005
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nb-95m	9.2813e-002	3.4341e+009	1.1410e-001	4.2217e+003
Nb-96	1.3161e-002	4.8697e+008	1.6180e-002	5.9866e+002
Nb-97	8.1832e+000	3.0278e+011	1.0060e+001	3.7222e+005
Nb-97m	7.5316e+000	2.7867e+011	9.2590e+000	3.4258e+005
Nd-147	3.1423e+000	1.1627e+011	3.8630e+000	1.4293e+005
Nd-149	1.2372e+000	4.5778e+010	1.5210e+000	5.6277e+004
Np-236m	5.1125e-005	1.8916e+006	6.2850e-005	2.3254e+000
Np-238	5.0458e+000	1.8669e+011	6.2030e+000	2.2951e+005
Np-239	2.2947e+002	8.4904e+012	2.8210e+002	1.0438e+007
Np-240	2.1865e-001	8.0901e+009	2.6880e-001	9.9456e+003
Pd-109	2.1450e+001	7.9366e+011	2.6370e+001	9.7569e+005
Pm-147	1.0908e+000	4.0360e+010	1.3410e+000	4.9617e+004
Pm-148	8.7445e-001	3.2355e+010	1.0750e+000	3.9775e+004
Pm-148m	1.6863e-001	6.2392e+009	2.0730e-001	7.6701e+003
Pm-149	2.7934e+000	1.0335e+011	3.4340e+000	1.2706e+005
Pm-151	9.2813e-001	3.4341e+010	1.1410e+000	4.2217e+004
Pr-142	3.0789e-001	1.1392e+010	3.7850e-001	1.4004e+004
Pr-143	7.0167e+000	2.5962e+011	8.6260e+000	3.1916e+005
Pr-144	6.5840e+000	2.4361e+011	8.0940e+000	2.9948e+005
Pr-144m	9.2081e-002	3.4070e+009	1.1320e-001	4.1884e+003
Pu-237	7.2909e-005	2.6976e+006	8.9630e-005	3.3163e+000
Pu-238	4.9628e-002	1.8362e+009	6.1010e-002	2.2574e+003
Pu-239	5.2540e-003	1.9440e+008	6.4590e-003	2.3898e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Pu-243	3.9574e+000	1.4642e+011	4.8650e+000	1.8001e+005
Rb-86	1.1762e+001	4.3521e+011	1.4460e+001	5.3502e+005
Rb-88	3.5124e+003	1.2996e+014	4.3180e+003	1.5977e+008
Rh-103m	9.3139e+001	3.4461e+012	1.1450e+002	4.2365e+006
Rh-105	6.0683e+001	2.2453e+012	7.4600e+001	2.7602e+006
Rh-105m	1.6253e+001	6.0134e+011	1.9880e+001	7.3025e+005
Rb-86	1.1762e+001	4.3521e+011	1.4460e+001	5.3502e+005
Rh 20...	2.6234e+002	3.3294e+014	4.3380e+002	1.5923e+009

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Rh-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Ru-103	9.3139e+001	3.4461e+012	1.1450e+002	4.2365e+006
Ru-105	5.6949e+001	2.1071e+012	7.0010e+001	2.5904e+006
Ru-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Sb-122	2.3028e+000	8.5205e+010	2.8310e+000	1.0475e+005
Sb-124	1.0575e+000	3.9126e+010	1.3000e+000	4.8100e+004
Sb-125	1.4918e+001	5.5198e+011	1.8340e+001	6.7858e+005
Sb-126	5.0441e-001	1.8663e+010	6.2010e-001	2.2944e+004
Sb-126m	6.7239e-002	2.4878e+009	8.2660e-002	3.0584e+003
Sb-127	1.0144e+002	3.7531e+012	1.2470e+002	4.6139e+006
Sb-129	3.2668e+002	1.2087e+013	4.0160e+002	1.4859e+007
Sm-151	2.9593e-003	1.0949e+008	3.6380e-003	1.3461e+002
Sm-153	2.2776e+000	8.4272e+010	2.8000e+000	1.0360e+005
Sr-89	1.1225e+003	4.1534e+013	1.3800e+003	5.1060e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	1.3218e+003	4.8908e+013	1.6250e+003	6.0125e+007
Sr-92	1.1722e+003	4.3370e+013	1.4410e+003	5.3317e+007
Sr-93	6.3513e+000	2.3500e+011	7.8080e+000	2.8890e+005
Tc-99	1.2015e-003	4.4454e+007	1.4770e-003	5.4649e+001
Tc-99m	9.7287e+001	3.5996e+012	1.1960e+002	4.4252e+006
Tc-101	2.1743e+001	8.0450e+011	2.6730e+001	9.8901e+005
Te-123m	1.0558e-002	3.9066e+008	1.2980e-002	4.8026e+002
Te-125m	3.2928e+000	1.2183e+011	4.0480e+000	1.4978e+005
Te-127	1.0144e+002	3.7531e+012	1.2470e+002	4.6139e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	3.4750e+002	1.2858e+013	4.2720e+002	1.5806e+007
Te-129m	7.2494e+001	2.6823e+012	8.9120e+001	3.2974e+006
Te-131	4.8131e+002	1.7809e+013	5.9170e+002	2.1893e+007
Te-131m	2.2947e+002	8.4904e+012	2.8210e+002	1.0438e+007
Te-132	1.6627e+003	6.1519e+013	2.0440e+003	7.5628e+007
Te-133	1.5878e+002	5.8750e+012	1.9520e+002	7.2224e+006
Te-133m	5.1043e+002	1.8886e+013	6.2750e+002	2.3218e+007
Te-134	7.8481e+002	2.9038e+013	9.6480e+002	3.5698e+007
Y-90	5.9308e-001	2.1944e+010	7.2910e-001	2.6977e+004
Y-91	5.8535e+000	2.1658e+011	7.1960e+000	2.6625e+005
Y-91m	3.2220e+000	1.1922e+011	3.9610e+000	1.4656e+005
Y-92	5.9528e+000	2.2025e+011	7.3180e+000	2.7077e+005
Y-93	4.3893e+000	1.6240e+011	5.3960e+000	1.9965e+005
Zr-89	2.3842e-003	8.8215e+007	2.9310e-003	1.0845e+002
Zr-93	1.2934e-006	4.7855e+004	1.5900e-006	5.8830e-002
Zr-95	8.3378e+000	3.0850e+011	1.0250e+001	3.7925e+005
Zr-97	7.9310e+000	2.9345e+011	9.7500e+000	3.6075e+005

Buildup

The material reference is : Source

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Results

Y Direction (axial)	25
---------------------	----

Page : 4
 DOS File: 1SP1GR.MS5
 Run Date: August 1, 2005
 Run Time: 4:37:39 PM
 Duration: 00:00:21

EC-RADN-1135
 Page 85

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.015	8.979e+09	4.243e-186	3.292e-24	3.639e-187	2.823e-25
0.02	9.797e+11	8.168e-82	1.088e-21	2.829e-83	3.769e-23
0.03	1.057e+14	1.619e-22	2.544e-18	1.604e-24	2.521e-20
0.04	2.595e+12	4.809e-09	7.044e-07	2.127e-11	3.116e-09
0.05	8.101e+12	7.333e-03	1.501e+00	1.954e-05	3.999e-03
0.06	2.078e+12	8.329e-01	1.483e+02	1.654e-03	2.945e-01
0.08	1.522e+13	1.178e+03	1.066e+05	1.864e+00	1.687e+02
0.1	1.149e+13	7.630e+03	3.729e+05	1.167e+01	5.704e+02
0.15	6.122e+13	3.129e+05	6.062e+06	5.152e+02	9.983e+03
0.2	1.080e+14	1.263e+06	1.576e+07	2.229e+03	2.782e+04
0.3	8.913e+13	2.495e+06	1.853e+07	4.733e+03	3.515e+04
0.4	3.274e+14	1.579e+07	8.844e+07	3.076e+04	1.723e+05
0.5	7.714e+14	5.573e+07	2.564e+08	1.094e+05	5.033e+05
0.6	7.515e+14	7.501e+07	2.986e+08	1.464e+05	5.827e+05
0.8	1.339e+15	2.209e+08	7.128e+08	4.201e+05	1.356e+06
1.0	6.105e+14	1.479e+08	4.144e+08	2.727e+05	7.638e+05
1.5	5.759e+14	2.757e+08	6.161e+08	4.639e+05	1.037e+06
2.0	1.614e+14	1.224e+08	2.409e+08	1.894e+05	3.725e+05
3.0	2.061e+13	2.877e+07	4.880e+07	3.904e+04	6.621e+04
4.0	1.256e+12	2.629e+06	4.092e+06	3.252e+03	5.063e+03
5.0	1.863e+11	5.255e+05	7.688e+05	6.024e+02	8.814e+02
TOTALS:	4.963e+15	9.495e+08	2.722e+09	1.683e+06	4.933e+06

MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1SP1I38.MS5
 Run Date: August 1, 2005
 Run Time: 4:38:00 PM
 Duration: 00:00:20

EC-RADN-1135
 Page 86

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 1 Hour, ICRP38
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 152.4 cm 457.2 cm Z 0 cm
 5 ft 0.0 in 15 ft 0.0 in

Shields			
Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : ICRP-38

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Cs-135m	1.1559e+002	4.2768e+012	1.4210e+002	5.2577e+006
Eu-157	1.1006e-001	4.0722e+009	1.3530e-001	5.0061e+003
Eu-158	1.8725e-002	6.9284e+008	2.3020e-002	8.5174e+002
La-143	3.8573e-001	1.4272e+010	4.7420e-001	1.7545e+004
Nd-151	3.3587e-002	1.2427e+009	4.1290e-002	1.5277e+003
Pm-150	1.8587e-002	6.8772e+008	2.2850e-002	8.4545e+002
Pr-145	4.4560e+000	1.6487e+011	5.4780e+000	2.0269e+005
Pr-147	1.5732e-001	5.8208e+009	1.9340e-001	7.1558e+003
Rh-106m	9.4766e-001	3.5063e+010	1.1650e+000	4.3105e+004
Rh-107	6.8581e+000	2.5375e+011	8.4310e+000	3.1195e+005
Sb-128a	1.6627e+001	6.1519e+011	2.0440e+001	7.5628e+005
Sb-128b	9.8914e+001	3.6598e+012	1.2160e+002	4.4992e+006
Sb-130	4.3812e+001	1.6210e+012	5.3860e+001	1.9928e+006
Sb-131	1.5211e+002	5.6282e+012	1.8700e+002	6.9190e+006
Se-81	8.7282e+000	3.2294e+011	1.0730e+001	3.9701e+005
Se-81m	2.0450e+000	7.5665e+010	2.5140e+000	9.3018e+004
Se-83	1.0306e+001	3.8133e+011	1.2670e+001	4.6879e+005
Sm-155	2.8633e-002	1.0594e+009	3.5200e-002	1.3024e+003
Sm-156	1.0371e-001	3.8374e+009	1.2750e-001	4.7175e+003
Y-94	8.5167e-001	3.1512e+010	1.0470e+000	3.8739e+004
Y-95	1.5130e-001	5.5981e+009	1.8600e-001	6.8820e+003

Buildup
 The material reference is : Source

Y-95	1.5130e-001	5.5981e+009	1.8600e-001	6.8820e+003
------	-------------	-------------	-------------	-------------

Page : 2
 DOS File: 1SP1I38.MS5
 Run Date: August 1, 2005
 Run Time: 4:38:00 PM
 Duration: 00:00:20

EC-RADN-1135
 Page 87

Integration Parameters

Radial 20
 Circumferential 20
 Y Direction (axial) 25

Results

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec <u>No Buildup</u>	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
			<u>With Buildup</u>		<u>No Buildup</u>	<u>With Buildup</u>
0.015	2.062e+07	9.742e-189	7.558e-27		8.356e-190	6.483e-28
0.02	4.509e+09	3.759e-84	5.007e-24		1.302e-85	1.734e-25
0.03	5.594e+11	8.565e-25	1.346e-20		8.488e-27	1.334e-22
0.04	1.400e+10	2.593e-11	3.799e-09		1.147e-13	1.680e-11
0.05	1.170e+09	1.059e-06	2.169e-04		2.822e-09	5.777e-07
0.06	1.056e+09	4.233e-04	7.536e-02		8.408e-07	1.497e-04
0.08	2.406e+09	1.862e-01	1.685e+01		2.946e-04	2.667e-02
0.1	4.909e+10	3.259e+01	1.593e+03		4.986e-02	2.436e+00
0.15	1.781e+11	9.100e+02	1.763e+04		1.499e+00	2.904e+01
0.2	1.388e+12	1.623e+04	2.026e+05		2.865e+01	3.575e+02
0.3	5.283e+12	1.479e+05	1.098e+06		2.806e+02	2.083e+03
0.4	7.197e+11	3.470e+04	1.944e+05		6.762e+01	3.788e+02
0.5	2.518e+12	1.819e+05	8.370e+05		3.571e+02	1.643e+03
0.6	5.857e+12	5.846e+05	2.327e+06		1.141e+03	4.541e+03
0.8	2.252e+13	3.715e+06	1.199e+07		7.066e+03	2.280e+04
1.0	6.278e+12	1.521e+06	4.262e+06		2.804e+03	7.855e+03
1.5	1.590e+12	7.613e+05	1.701e+06		1.281e+03	2.862e+03
2.0	1.230e+12	9.332e+05	1.836e+06		1.443e+03	2.839e+03
3.0	7.760e+10	1.084e+05	1.838e+05		1.470e+02	2.493e+02
4.0	3.370e+08	7.054e+02	1.098e+03		8.727e-01	1.359e+00
TOTALS:	4.827e+13	8.006e+06	2.465e+07		1.462e+04	4.565e+04

MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.

Page : 1
 DOS File: LSP1RAD.MS5
 Run Date: August 1, 2005
 Run Time: 4:38:21 PM
 Duration: 00:00:20

EC-RADN-1135
 Page 88

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
Description: 1 Hour, RADTRAD
Geometry: 7 - Cylinder Volume - Side Shields



	Source Dimensions		
Height	914.4 cm	30 ft	
Radius	16.828 cm	6.6 in	

	Dose Points		
	X	Y	Z
# 1	152.4 cm	457.2 cm	0 cm
	5 ft 0.0 in	15 ft	0.0 in

	Shields		
<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	8.13e+05 cm ³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded

Library : Grove

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Am-241	1.1038e-003	4.0842e+007	1.3570e-003	5.0209e+001
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	1.4634e+003	5.4145e+013	1.7990e+003	6.6563e+007
Ba-140	2.1280e+003	7.8734e+013	2.6160e+003	9.6792e+007
Ce-141	1.9539e+001	7.2294e+011	2.4020e+001	8.8874e+005
Ce-143	1.7871e+001	6.6124e+011	2.1970e+001	8.1289e+005
Ce-144	1.6464e+001	6.0917e+011	2.0240e+001	7.4888e+005
Cm-242	2.9032e-001	1.0742e+010	3.5690e-001	1.3205e+004
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2172e-001	1.1903e+010	3.9550e-001	1.4633e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-136	3.9859e+002	1.4748e+013	4.9000e+002	1.8130e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
I-131	6.9834e+003	2.5839e+014	8.5850e+003	3.1764e+008
I-132	1.0176e+004	3.7652e+014	1.2510e+004	4.6287e+008
I-133	1.4219e+004	5.2610e+014	1.7480e+004	6.4676e+008
I-134	1.1421e+004	4.2257e+014	1.4040e+004	5.1948e+008
I-135	1.2421e+004	4.5959e+014	1.5270e+004	5.6499e+008
La-140	9.1105e+000	3.3709e+011	1.1200e+001	4.1440e+005
La-141	6.9834e+000	2.5839e+011	8.5850e+000	3.1764e+005
La-142	5.3866e+000	1.9930e+011	6.6220e+000	2.4501e+005
Mo-99	1.0892e+002	4.0300e+012	1.3390e+002	4.9543e+006
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
La-141	6.9834e+000	2.5839e+011	8.5850e+000	3.1764e+005
La-141	6.9834e+000	2.5839e+011	8.5850e+000	3.1764e+005
La-147	5.2865e+000	1.9020e+011	6.6330e+000	2.4501e+005

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Np-239	2.2947e+002	8.4904e+012	2.8210e+002	1.0438e+007
Pr-143	7.0167e+000	2.5962e+011	8.6260e+000	3.1916e+005
Pr-144	6.5840e+000	2.4361e+011	8.0940e+000	2.9948e+005
Pu-238	4.9628e-002	1.8362e+009	6.1010e-002	2.2574e+003
Pu-239	5.2540e-003	1.9440e+008	6.4590e-003	2.3898e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1762e+001	4.3521e+011	1.4460e+001	5.3502e+005
Rh-103m	9.3139e+001	3.4461e+012	1.1450e+002	4.2365e+006
Rh-105	6.0683e+001	2.2453e+012	7.4600e+001	2.7602e+006
Rh-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Ru-103	9.3139e+001	3.4461e+012	1.1450e+002	4.2365e+006
Ru-105	5.6949e+001	2.1071e+012	7.0010e+001	2.5904e+006
Ru-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Sb-127	1.0144e+002	3.7531e+012	1.2470e+002	4.6139e+006
Sb-129	3.2668e+002	1.2087e+013	4.0160e+002	1.4859e+007
Sr-89	1.1225e+003	4.1534e+013	1.3800e+003	5.1060e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	1.3218e+003	4.8908e+013	1.6250e+003	6.0125e+007
Sr-92	1.1722e+003	4.3370e+013	1.4410e+003	5.3317e+007
Tc-99m	9.7287e+001	3.5996e+012	1.1960e+002	4.4252e+006
Te-127	1.0144e+002	3.7531e+012	1.2470e+002	4.6139e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	3.4750e+002	1.2858e+013	4.2720e+002	1.5806e+007
Te-129m	7.2494e+001	2.6823e+012	8.9120e+001	3.2974e+006
Te-131m	2.2947e+002	8.4904e+012	2.8210e+002	1.0438e+007
Te-132	1.6627e+003	6.1519e+013	2.0440e+003	7.5628e+007
Y-90	5.9308e-001	2.1944e+010	7.2910e-001	2.6977e+004
Y-91	5.8535e+000	2.1658e+011	7.1960e+000	2.6625e+005
Y-92	5.9528e+000	2.2025e+011	7.3180e+000	2.7077e+005
Y-93	4.3893e+000	1.6240e+011	5.3960e+000	1.9965e+005
Zr-95	8.3378e+000	3.0850e+011	1.0250e+001	3.7925e+005
Zr-97	7.9310e+000	2.9345e+011	9.7500e+000	3.6075e+005

Buildup

The material reference is : Source

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate		Exposure Rate	
			MeV/cm ² /sec With Buildup		mR/hr No Buildup	mR/hr With Buildup
0.015	4.042e+08	1.910e-187	1.482e-25		1.638e-188	1.271e-26
0.02	7.059e+11	5.885e-82	7.839e-22		2.039e-83	2.715e-23
0.03	8.601e+13	1.317e-22	2.069e-18		1.305e-24	2.050e-20
0.04	1.956e+12	3.625e-09	5.309e-07		1.603e-11	2.348e-09
0.05	8.088e+12	7.321e-03	1.499e+00		1.950e-05	3.992e-03
0.06	2.067e+12	8.282e-01	1.474e+02		1.645e-03	2.929e-01
0.04	1.956e+12	3.625e-09	5.309e-07		1.603e-11	2.348e-09
0.05	8.088e+12	7.321e-03	1.499e+00		1.950e-05	3.992e-03

Page : 3
 DOS File: 1SP1RAD.MS5
 Run Date: August 1, 2005
 Run Time: 4:38:21 PM
 Duration: 00:00:20

EC-RADN-1135
 Page 90

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		<u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>mR/hr</u> <u>No Buildup</u>	<u>mR/hr</u> <u>With Buildup</u>
0.08	8.077e+12	6.250e+02	5.659e+04	9.891e-01	8.955e+01
0.1	9.345e+12	6.204e+03	3.032e+05	9.491e+00	4.638e+02
0.15	4.235e+13	2.164e+05	4.193e+06	3.564e+02	6.905e+03
0.2	8.365e+13	9.781e+05	1.221e+07	1.726e+03	2.154e+04
0.3	6.692e+13	1.873e+06	1.391e+07	3.553e+03	2.639e+04
0.4	3.055e+14	1.473e+07	8.254e+07	2.871e+04	1.608e+05
0.5	6.776e+14	4.895e+07	2.252e+08	9.609e+04	4.421e+05
0.6	7.274e+14	7.260e+07	2.890e+08	1.417e+05	5.640e+05
0.8	1.270e+15	2.096e+08	6.763e+08	3.986e+05	1.286e+06
1.0	5.217e+14	1.264e+08	3.541e+08	2.330e+05	6.527e+05
1.5	4.210e+14	2.016e+08	4.504e+08	3.392e+05	7.578e+05
2.0	9.745e+13	7.391e+07	1.454e+08	1.143e+05	2.248e+05
3.0	6.662e+10	9.303e+04	1.578e+05	1.262e+02	2.141e+02
4.0	5.232e+09	1.095e+04	1.705e+04	1.355e+01	2.109e+01
TOTALS:	4.330e+15	7.509e+08	2.254e+09	1.357e+06	4.144e+06

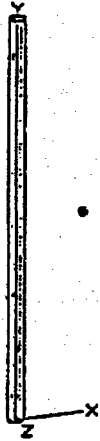
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1SP8GR.MS5
 Run Date: August 1, 2005
 Run Time: 4:39:43 PM
 Duration: 00:00:21

EC-RADN-1135
 Page 91

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 8 Hour, GROVE
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X Y Z
 152.4 cm 457.2 cm 0 cm
 5 ft 0.0 in 15 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	1.1071e-003	4.0962e+007	1.3610e-003	5.0357e+001
Am-242	3.5246e-001	1.3041e+010	4.3330e-001	1.6032e+004
Am-242m	7.2160e-005	2.6699e+006	8.8710e-005	3.2823e+000
Am-243	1.3601e-004	5.0323e+006	1.6720e-004	6.1864e+000
Am-244	3.4579e-001	1.2794e+010	4.2510e-001	1.5729e+004
Ba-135m	3.7573e-001	1.3902e+010	4.6190e-001	1.7090e+004
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	4.6968e+001	1.7378e+012	5.7740e+001	2.1364e+006
Ba-140	2.0946e+003	7.7500e+013	2.5750e+003	9.5275e+007
Ba-141	2.4029e-005	8.8907e+005	2.9540e-005	1.0930e+000
Ba-142	4.2811e-011	1.5840e+000	5.2630e-011	1.9473e-006
Br-82	2.1345e+001	7.8975e+011	2.6240e+001	9.7088e+005
Br-83	9.1268e+001	3.3769e+012	1.1220e+002	4.1514e+006
Br-84	4.9734e-002	1.8401e+009	6.1140e-002	2.2622e+003
Ce-141	1.9449e+001	7.1963e+011	2.3910e+001	8.8467e+005
Ce-143	1.5463e+001	5.7215e+011	1.9010e+001	7.0337e+005
Ce-144	1.6464e+001	6.0917e+011	2.0240e+001	7.4888e+005
Cm-242	2.9032e-001	1.0742e+010	3.5690e-001	1.3205e+004
Cm-243	1.2503e-004	4.6259e+006	1.5370e-004	5.6869e+000
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2090e-001	1.1873e+010	3.9450e-001	1.4597e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Co-60m				
Co-61	1.3430e-004	4.9691e+006	1.6510e-004	6.1087e+000
Cs-137	3.2858e-001	8.4573e+009	3.8190e-001	1.4397e+004
Co-58	3.2090e-001	1.1873e+010	3.9450e-001	1.4597e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003

Page : 2
 DOS File: 1SP8GR.MS5
 Run Date: August 1, 2005
 Run Time: 4:39:43 PM
 Duration: 00:00:21

EC-RADN-1135
 Page 92

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-134m	3.8947e+001	1.4411e+012	4.7880e+001	1.7716e+006
Cs-136	3.9240e+002	1.4519e+013	4.8240e+002	1.7849e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
Cs-138	6.2350e-001	2.3070e+010	7.6650e-001	2.8361e+004
Cs-139	2.8308e-012	1.0474e-001	3.4800e-012	1.2876e-007
Eu-152m	5.9519e-004	2.2022e+007	7.3170e-004	2.7073e+001
Eu-154	4.5935e-002	1.6996e+009	5.6470e-002	2.0894e+003
Eu-155	1.8888e-002	6.9886e+008	2.3220e-002	8.5914e+002
Eu-156	1.1746e+000	4.3460e+010	1.4440e+000	5.3428e+004
I-128	1.2771e-004	4.7253e+006	1.5700e-004	5.8090e+000
I-130	1.1071e+002	4.0962e+012	1.3610e+002	5.0357e+006
I-131	6.8337e+003	2.5285e+014	8.4010e+003	3.1084e+008
I-132	9.6799e+003	3.5816e+014	1.1900e+004	4.4030e+008
I-133	1.1372e+004	4.2076e+014	1.3980e+004	5.1726e+008
I-134	9.9728e+001	3.6899e+012	1.2260e+002	4.5362e+006
I-135	5.9357e+003	2.1962e+014	7.2970e+003	2.6999e+008
La-140	9.0454e+000	3.3468e+011	1.1120e+001	4.1144e+005
La-141	2.0450e+000	7.5665e+010	2.5140e+000	9.3018e+004
La-142	2.2182e-001	8.2075e+009	2.7270e-001	1.0090e+004
Mo-99	1.0103e+002	3.7381e+012	1.2420e+002	4.5954e+006
Mo-101	1.2763e-008	4.7223e+002	1.5690e-008	5.8053e-004
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nb-95m	9.2813e-002	3.4341e+009	1.1410e-001	4.2217e+003
Nb-96	1.0680e-002	3.9518e+008	1.3130e-002	4.8581e+002
Nb-97	6.3749e+000	2.3587e+011	7.8370e+000	2.8997e+005
Nb-97m	5.6493e+000	2.0903e+011	6.9450e+000	2.5697e+005
Nd-147	3.0862e+000	1.1419e+011	3.7940e+000	1.4038e+005
Nd-149	7.4153e-002	2.7437e+009	9.1160e-002	3.3729e+003
Np-236m	4.1152e-005	1.5226e+006	5.0590e-005	1.8718e+000
Np-238	4.5886e+000	1.6978e+011	5.6410e+000	2.0872e+005
Np-239	2.1036e+002	7.7832e+012	2.5860e+002	9.5682e+006
Np-240	1.9783e-003	7.3197e+007	2.4320e-003	8.9984e+001
Pd-109	1.5049e+001	5.5680e+011	1.8500e+001	6.8450e+005
Pm-147	1.0908e+000	4.0360e+010	1.3410e+000	4.9617e+004
Pm-148	8.4435e-001	3.1241e+010	1.0380e+000	3.8406e+004
Pm-148m	1.6789e-001	6.2121e+009	2.0640e-001	7.6368e+003
Pm-149	2.5835e+000	9.5589e+010	3.1760e+000	1.1751e+005
Pm-151	7.8147e-001	2.8914e+010	9.6070e-001	3.5546e+004
Pr-142	2.3874e-001	8.8335e+009	2.9350e-001	1.0860e+004
Pr-143	7.0167e+000	2.5962e+011	8.6260e+000	3.1916e+005
Pr-144	6.5840e+000	2.4361e+011	8.0940e+000	2.9948e+005
Pr-144m	9.2081e-002	3.4070e+009	1.1320e-001	4.1884e+003
Pu-237	7.2575e-005	2.6853e+006	8.9220e-005	3.3011e+000
Pu-238	4.9628e-002	1.8362e+009	6.1010e-002	2.2574e+003
Pu-239	5.2540e-003	1.9440e+008	6.4590e-003	2.3898e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Pu-243	1.4878e+000	5.5048e+010	1.8290e+000	6.7673e+004
Rb-86	1.1640e+001	4.3069e+011	1.4310e+001	5.2947e+005
Rb-88	6.4424e+002	2.3837e+013	7.9200e+002	2.9304e+007
Rh-103m	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Rh-105	5.6949e+001	2.1071e+012	7.0010e+001	2.5904e+006
Rh-105m	5.4452e+000	2.0147e+011	6.6940e+000	2.4768e+005
Rb-86	1.1640e+001	4.3069e+011	1.4310e+001	5.2947e+005
Rh-88	6.4424e+002	2.3837e+013	7.9200e+002	2.9304e+007

Page : 3
 DOS File: 1SP8GR.MS5
 Run Date: August 1, 2005
 Run Time: 4:39:43 PM
 Duration: 00:00:21

EC-RADN-1135
 Page 93

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Rh-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Ru-103	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Ru-105	1.9124e+001	7.0759e+011	2.3510e+001	8.6987e+005
Ru-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Sb-122	2.1369e+000	7.9066e+010	2.6270e+000	9.7199e+004
Sb-124	1.0575e+000	3.9126e+010	1.3000e+000	4.8100e+004
Sb-125	1.4918e+001	5.5198e+011	1.8340e+001	6.7858e+005
Sb-126	4.9636e-001	1.8365e+010	6.1020e-001	2.2577e+004
Sb-126m	9.0617e-004	3.3528e+007	1.1140e-003	4.1218e+001
Sb-127	9.7287e+001	3.5996e+012	1.1960e+002	4.4252e+006
Sb-129	1.0811e+002	3.9999e+012	1.3290e+002	4.9173e+006
Sm-151	2.9658e-003	1.0973e+008	3.6460e-003	1.3490e+002
Sm-153	2.0515e+000	7.5905e+010	2.5220e+000	9.3314e+004
Sr-89	1.1225e+003	4.1534e+013	1.3800e+003	5.1060e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	7.9473e+002	2.9405e+013	9.7700e+002	3.6149e+007
Sr-92	1.9539e+002	7.2294e+012	2.4020e+002	8.8874e+006
Sr-93				
Tc-99	1.2015e-003	4.4454e+007	1.4770e-003	5.4649e+001
Tc-99m	9.4359e+001	3.4913e+012	1.1600e+002	4.2920e+006
Tc-101	2.2736e-007	8.4122e+003	2.7950e-007	1.0342e-002
Te-123m	1.0558e-002	3.9066e+008	1.2980e-002	4.8026e+002
Te-125m	3.2928e+000	1.2183e+011	4.0480e+000	1.4978e+005
Te-127	1.0062e+002	3.7230e+012	1.2370e+002	4.5769e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	1.6627e+002	6.1519e+012	2.0440e+002	7.5628e+006
Te-129m	7.2242e+001	2.6729e+012	8.8810e+001	3.2860e+006
Te-131	4.3893e+001	1.6240e+012	5.3960e+001	1.9965e+006
Te-131m	1.9539e+002	7.2294e+012	2.4020e+002	8.8874e+006
Te-132	1.5626e+003	5.7817e+013	1.9210e+003	7.1077e+007
Te-133	6.0186e-001	2.2269e+010	7.3990e-001	2.7376e+004
Te-133m	2.6599e+000	9.8418e+010	3.2700e+000	1.2099e+005
Te-134	7.4153e-001	2.7437e+010	9.1160e-001	3.3729e+004
Y-90	5.8917e-001	2.1799e+010	7.2430e-001	2.6799e+004
Y-91	5.8202e+000	2.1535e+011	7.1550e+000	2.6473e+005
Y-91m	2.0181e+000	7.4671e+010	2.4810e+000	9.1797e+004
Y-92	2.8430e+000	1.0519e+011	3.4950e+000	1.2932e+005
Y-93	2.7136e+000	1.0040e+011	3.3360e+000	1.2343e+005
Zr-89	2.2410e-003	8.2918e+007	2.7550e-003	1.0194e+002
Zr-93	1.2934e-006	4.7855e+004	1.5900e-006	5.8830e-002
Zr-95	8.3052e+000	3.0729e+011	1.0210e+001	3.7777e+005
Zr-97	5.9389e+000	2.1974e+011	7.3010e+000	2.7014e+005

Buildup

The material reference is : Source

Integration Parameters

Radial 20
 Circumferential 20
 Y Direction (axial) 25

Results

Y Direction (axial) 25

Page : 4
 DOS File: 1SP8GR.MS5
 Run Date: August 1, 2005
 Run Time: 4:39:43 PM
 Duration: 00:00:21

EC-RADN-1135
 Page 94

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.015	4.433e+09	2.095e-186	1.625e-24	1.797e-187	1.394e-25
0.02	7.628e+11	6.360e-82	8.472e-22	2.203e-83	2.935e-23
0.03	7.388e+13	1.131e-22	1.777e-18	1.121e-24	1.761e-03
0.04	1.637e+12	3.034e-09	4.444e-07	1.342e-11	1.966e-09
0.05	7.614e+12	6.892e-03	1.411e+00	1.836e-05	3.758e-03
0.06	2.023e+12	8.107e-01	1.443e+02	1.610e-03	2.867e-01
0.08	7.886e+12	6.102e+02	5.525e+04	9.657e-01	8.743e+01
0.1	8.606e+12	5.713e+03	2.792e+05	8.740e+00	4.271e+02
0.15	1.408e+13	7.198e+04	1.395e+06	1.185e+02	2.297e+03
0.2	6.169e+13	7.214e+05	9.002e+06	1.273e+03	1.589e+04
0.3	5.280e+13	1.478e+06	1.098e+07	2.803e+03	2.082e+04
0.4	2.346e+14	1.131e+07	6.337e+07	2.204e+04	1.235e+05
0.5	5.080e+14	3.670e+07	1.688e+08	7.203e+04	3.314e+05
0.6	5.601e+14	5.591e+07	2.225e+08	1.091e+05	4.343e+05
0.8	4.852e+14	8.005e+07	2.583e+08	1.523e+05	4.914e+05
1.0	2.400e+14	5.817e+07	1.629e+08	1.072e+05	3.003e+05
1.5	1.956e+14	9.367e+07	2.093e+08	1.576e+05	3.521e+05
2.0	4.191e+13	3.179e+07	6.253e+07	4.916e+04	9.669e+04
3.0	6.922e+11	9.665e+05	1.639e+06	1.311e+03	2.224e+03
4.0	3.471e+08	7.268e+02	1.131e+03	8.991e-01	1.400e+00
5.0	3.418e+10	9.638e+04	1.410e+05	1.105e+02	1.617e+02
TOTALS:	2.497e+15	3.709e+08	1.171e+09	6.751e+05	2.172e+06

MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1SP8I38.MS5
 Run Date: August 1, 2005
 Run Time: 4:40:05 PM
 Duration: 00:00:19

EC-RADN-1135
 Page 95

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 8 Hour, ICRP38
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 152.4 cm 457.2 cm Z 0 cm
 5 ft 0.0 in 15 ft 0.0 in

Shields			
Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : ICRP-38

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Cs-135m	4.7383e-001	1.7532e+010	5.8250e-001	2.1553e+004
Eu-157	7.9807e-002	2.9528e+009	9.8110e-002	3.6301e+003
Eu-158	3.2952e-005	1.2192e+006	4.0510e-005	1.4989e+000
La-143	4.4227e-010	1.6364e+001	5.4370e-010	2.0117e-005
Nd-151	2.3045e-012	8.5266e-002	2.8330e-012	1.0482e-007
Pm-150	3.0423e-003	1.1256e+008	3.7400e-003	1.3838e+002
Pr-145	1.9718e+000	7.2956e+010	2.4240e+000	8.9688e+004
Pr-147	7.9473e-011	2.9405e+000	9.7700e-011	3.6149e-006
Rh-106m	1.0062e-001	3.7230e+009	1.2370e-001	4.5769e+003
Rh-107	1.0225e-005	3.7832e+005	1.2570e-005	4.6509e-001
Sb-128a	9.9728e+000	3.6899e+011	1.2260e+001	4.5362e+005
Sb-128b	7.1908e-001	2.6606e+010	8.8400e-001	3.2708e+004
Sb-130	2.7600e-002	1.0212e+009	3.3930e-002	1.2554e+003
Sb-131	4.8383e-004	1.7902e+007	5.9480e-004	2.2008e+001
Se-81	1.8620e-002	6.8893e+008	2.2890e-002	8.4693e+002
Se-81m	1.2633e-002	4.6741e+008	1.5530e-002	5.7461e+002
Se-83	2.2109e-005	8.1804e+005	2.7180e-005	1.0057e+000
Sm-155	6.1187e-008	2.2639e+003	7.5220e-008	2.7831e-003
Sm-156	6.1854e-002	2.2886e+009	7.6040e-002	2.8135e+003
Y-94	1.4764e-007	5.4627e+003	1.8150e-007	6.7155e-003
Y-95				

Buildup
 The material reference is : Source

Page : 2
 DOS File: 1SP8I38.MS5
 Run Date: August 1, 2005
 Run Time: 4:40:05 PM
 Duration: 00:00:19

EC-RADN-1135
 Page 96

Integration Parameters

Radial 20
 Circumferential 20
 Y Direction (axial) 25

Energy MeV	Activity photons/sec	Results		Exposure Rate	
		Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.446e+00	1.628e-195	1.263e-33	1.397e-196	1.084e-34
0.02	2.167e+08	1.807e-85	2.407e-25	6.259e-87	8.337e-27
0.03	1.209e+10	1.850e-26	2.907e-22	1.834e-28	2.881e-24
0.04	2.387e+09	4.423e-12	6.479e-10	1.956e-14	2.865e-12
0.05	6.022e+08	5.451e-07	1.116e-04	1.452e-09	2.972e-07
0.06	7.290e+08	2.922e-04	5.201e-02	5.803e-07	1.033e-04
0.08	6.964e+08	5.389e-02	4.879e+00	8.528e-05	7.721e-03
0.1	3.257e+08	2.162e-01	1.057e+01	3.308e-04	1.617e-02
0.15	4.733e+08	2.419e+00	4.687e+01	3.983e-03	7.718e-02
0.2	6.685e+09	7.817e+01	9.754e+02	1.380e-01	1.722e+00
0.3	3.586e+11	1.004e+04	7.454e+04	1.904e+01	1.414e+02
0.4	3.519e+09	1.697e+02	9.505e+02	3.306e-01	1.852e+00
0.5	1.733e+10	1.252e+03	5.760e+03	2.457e+00	1.131e+01
0.6	3.964e+10	3.956e+03	1.575e+04	7.722e+00	3.073e+01
0.8	8.728e+11	1.440e+05	4.647e+05	2.739e+02	8.840e+02
1.0	3.712e+10	8.994e+03	2.519e+04	1.658e+01	4.644e+01
1.5	8.136e+09	3.895e+03	8.704e+03	6.554e+00	1.464e+01
2.0	3.529e+08	2.677e+02	5.265e+02	4.139e-01	8.142e-01
3.0	1.630e+06	2.276e+00	3.861e+00	3.088e-03	5.238e-03
TOTALS:	1.362e+12	1.727e+05	5.972e+05	3.271e+02	1.133e+03

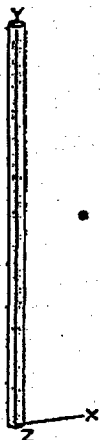
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1SP8RAD.MS5
 Run Date: August 1, 2005
 Run Time: 4:40:25 PM
 Duration: 00:00:20

EC-RADN-1135
 Page 97

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 1 Hour, RADTRAD
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X Y Z
 152.4 cm 457.2 cm 0 cm
 5 ft 0.0 in 15 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	1.1071e-003	4.0962e+007	1.3610e-003	5.0357e+001
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	4.6968e+001	1.7378e+012	5.7740e+001	2.1364e+006
Ba-140	2.0946e+003	7.7500e+013	2.5750e+003	9.5275e+007
Ce-141	1.9449e+001	7.1963e+011	2.3910e+001	8.8467e+005
Ce-143	1.5463e+001	5.7215e+011	1.9010e+001	7.0337e+005
Ce-144	1.6464e+001	6.0917e+011	2.0240e+001	7.4888e+005
Cm-242	2.9032e-001	1.0742e+010	3.5690e-001	1.3205e+004
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2090e-001	1.1873e+010	3.9450e-001	1.4597e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-136	3.9240e+002	1.4519e+013	4.8240e+002	1.7849e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
I-131	6.8337e+003	2.5285e+014	8.4010e+003	3.1084e+008
I-132	9.6799e+003	3.5816e+014	1.1900e+004	4.4030e+008
I-133	1.1372e+004	4.2076e+014	1.3980e+004	5.1726e+008
I-134	9.9728e+001	3.6899e+012	1.2260e+002	4.5362e+006
I-135	5.9357e+003	2.1962e+014	7.2970e+003	2.6999e+008
La-140	9.0454e+000	3.3468e+011	1.1120e+001	4.1144e+005
La-141	2.0450e+000	7.5665e+010	2.5140e+000	9.3018e+004
La-142	2.2182e-001	8.2075e+009	2.7270e-001	1.0090e+004
Mo-99	1.0103e+002	3.7381e+012	1.2420e+002	4.5954e+006
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nd-147	3.0862e+000	1.1419e+011	3.7940e+000	1.4038e+005
La-141	2.0450e+000	7.5665e+010	2.5140e+000	9.3018e+004
La-142	2.2182e-001	8.2075e+009	2.7270e-001	1.0090e+004

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Np-239	2.1036e+002	7.7832e+012	2.5860e+002	9.5682e+006
Pr-143	7.0167e+000	2.5962e+011	8.6260e+000	3.1916e+005
Pr-144	6.5840e+000	2.4361e+011	8.0940e+000	2.9948e+005
Pu-238	4.9628e-002	1.8362e+009	6.1010e-002	2.2574e+003
Pu-239	5.2540e-003	1.9440e+008	6.4590e-003	2.3898e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1640e+001	4.3069e+011	1.4310e+001	5.2947e+005
Rh-103m	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Rh-105	5.6949e+001	2.1071e+012	7.0010e+001	2.5904e+006
Rh-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Ru-103	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Ru-105	1.9124e+001	7.0759e+011	2.3510e+001	8.6987e+005
Ru-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Sb-127	9.7287e+001	3.5996e+012	1.1960e+002	4.4252e+006
Sb-129	1.0811e+002	3.9999e+012	1.3290e+002	4.9173e+006
Sr-89	1.1225e+003	4.1534e+013	1.3800e+003	5.1060e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	7.9473e+002	2.9405e+013	9.7700e+002	3.6149e+007
Sr-92	1.9539e+002	7.2294e+012	2.4020e+002	8.8874e+006
Tc-99m	9.4359e+001	3.4913e+012	1.1600e+002	4.2920e+006
Te-127	1.0062e+002	3.7230e+012	1.2370e+002	4.5769e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	1.6627e+002	6.1519e+012	2.0440e+002	7.5628e+006
Te-129m	7.2242e+001	2.6729e+012	8.8810e+001	3.2860e+006
Te-131m	1.9539e+002	7.2294e+012	2.4020e+002	8.8874e+006
Te-132	1.5626e+003	5.7817e+013	1.9210e+003	7.1077e+007
Y-90	5.8917e-001	2.1799e+010	7.2430e-001	2.6799e+004
Y-91	5.8202e+000	2.1535e+011	7.1550e+000	2.6473e+005
Y-92	2.8430e+000	1.0519e+011	3.4950e+000	1.2932e+005
Y-93	2.7136e+000	1.0040e+011	3.3360e+000	1.2343e+005
Zr-95	8.3052e+000	3.0729e+011	1.0210e+001	3.7777e+005
Zr-97	5.9389e+000	2.1974e+011	7.3010e+000	2.7014e+005

Buildup

The material reference is : Source

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Results

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>Results</u>		<u>Exposure Rate</u>	
			<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>No Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>With Buildup</u>	
0.015	3.466e+08	1.638e-187	1.271e-25	1.405e-188	1.090e-26	
0.02	6.789e+11	5.660e-82	7.539e-22	1.961e-83	2.612e-23	
0.03	7.273e+13	1.113e-22	1.749e-18	1.103e-24	1.734e-20	
0.04	1.553e+12	2.878e-09	4.216e-07	1.273e-11	1.665e-09	
0.05	7.602e+12	6.881e-03	1.409e+00	1.833e-05	3.752e-03	
0.06	2.018e+12	8.086e-01	1.439e+02	1.606e-03	2.859e-01	
0.04	1.553e+12	2.878e-09	4.216e-07	1.273e-11	1.665e-09	
0.05	7.602e+12	6.881e-03	1.409e+00	1.833e-05	3.752e-03	

Page : 3
 DOS File: 1SP8RAD.MS5
 Run Date: August 1, 2005
 Run Time: 4:40:25 PM
 Duration: 00:00:20

EC-RADN-1135
 Page 99

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u>		<u>Exposure Rate</u>	
		<u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>mR/hr</u> <u>No Buildup</u>	<u>mR/hr</u> <u>With Buildup</u>
0.08	7.859e+12	6.081e+02	5.506e+04	9.623e-01	8.713e+01
0.1	8.560e+12	5.682e+03	2.777e+05	8.693e+00	4.248e+02
0.15	1.271e+13	6.496e+04	1.259e+06	1.070e+02	2.073e+03
0.2	6.160e+13	7.203e+05	8.989e+06	1.271e+03	1.586e+04
0.3	5.271e+13	1.475e+06	1.096e+07	2.799e+03	2.079e+04
0.4	2.330e+14	1.123e+07	6.293e+07	2.189e+04	1.226e+05
0.5	5.033e+14	3.636e+07	1.673e+08	7.137e+04	3.284e+05
0.6	5.541e+14	5.530e+07	2.201e+08	1.079e+05	4.296e+05
0.8	4.772e+14	7.874e+07	2.541e+08	1.498e+05	4.833e+05
1.0	2.388e+14	5.787e+07	1.621e+08	1.067e+05	2.988e+05
1.5	1.949e+14	9.331e+07	2.085e+08	1.570e+05	3.508e+05
2.0	3.660e+13	2.776e+07	5.461e+07	4.293e+04	8.444e+04
3.0	1.417e+10	1.978e+04	3.355e+04	2.684e+01	4.552e+01
4.0	2.154e+08	4.510e+02	7.022e+02	5.580e-01	8.687e-01
TOTALS:	2.466e+15	3.629e+08	1.151e+09	6.618e+05	2.137e+06

MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1SP24GR.MS5
 Run Date: August 1, 2005
 Run Time: 4:38:42 PM
 Duration: 00:00:21

EC-RADN-1135
 Page 100

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 24 Hour, Grove
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 152.4 cm 457.2 cm Z 0 cm
 5 ft 0.0 in 15 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	1.1103e-003	4.1083e+007	1.3650e-003	5.0505e+001
Am-242	1.7595e-001	6.5100e+009	2.1630e-001	8.0031e+003
Am-242m	7.2160e-005	2.6699e+006	8.8710e-005	3.2823e+000
Am-243	1.3633e-004	5.0443e+006	1.6760e-004	6.2012e+000
Am-244	1.1575e-001	4.2828e+009	1.4230e-001	5.2651e+003
Ba-135m	2.5518e-001	9.4415e+009	3.1370e-001	1.1607e+004
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	1.8042e-002	6.6756e+008	2.2180e-002	8.2066e+002
Ba-140	2.0198e+003	7.4732e+013	2.4830e+003	9.1871e+007
Ba-141				
Ba-142				
Br-82	1.5561e+001	5.7576e+011	1.9130e+001	7.0781e+005
Br-83	8.9804e-001	3.3227e+010	1.1040e+000	4.0848e+004
Br-84	4.0599e-011	1.5022e+000	4.9910e-011	1.8467e-006
Ce-141	1.9205e+001	7.1060e+011	2.3610e+001	8.7357e+005
Ce-143	1.1055e+001	4.0902e+011	1.3590e+001	5.0283e+005
Ce-144	1.6375e+001	6.0586e+011	2.0130e+001	7.4481e+005
Cm-242	2.8999e-001	1.0730e+010	3.5650e-001	1.3191e+004
Cm-243	1.2503e-004	4.6259e+006	1.5370e-004	5.6869e+000
Cm-244	1.6993e-002	6.2873e+008	2.0890e-002	7.7293e+002
Co-58	3.1879e-001	1.1795e+010	3.9190e-001	1.4500e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Co-60m				
Co-61	1.6171e-007	5.9833e+003	1.9880e-007	7.3556e-003
Co-58	3.1879e-001	1.1795e+010	3.9190e-001	1.4500e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-134m	8.6469e-001	3.1993e+010	1.0630e+000	3.9331e+004
Cs-136	3.7866e+002	1.4010e+013	4.6550e+002	1.7223e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
Cs-138	6.6092e-010	2.4454e+001	8.1250e-010	3.0063e-005
Cs-139				
Eu-152m	1.8058e-004	6.6816e+006	2.2200e-004	8.2140e+000
Eu-154	4.5927e-002	1.6993e+009	5.6460e-002	2.0890e+003
Eu-155	1.8888e-002	6.9886e+008	2.3220e-002	8.5914e+002
Eu-156	1.1413e+000	4.2226e+010	1.4030e+000	5.1911e+004
I-128				
I-130	4.5089e+001	1.6683e+012	5.5430e+001	2.0509e+006
I-131	6.5344e+003	2.4177e+014	8.0330e+003	2.9722e+008
I-132	8.3784e+003	3.1000e+014	1.0300e+004	3.8110e+008
I-133	6.6840e+003	2.4731e+014	8.2170e+003	3.0403e+008
I-134	3.7312e-004	1.3806e+007	4.5870e-004	1.6972e+001
I-135	1.0973e+003	4.0601e+013	1.3490e+003	4.9913e+007
La-140	8.8421e+000	3.2716e+011	1.0870e+001	4.0219e+005
La-141	1.2071e-001	4.4664e+009	1.4840e-001	5.4908e+003
La-142	1.4894e-004	5.5108e+006	1.8310e-004	6.7747e+000
Mo-99	8.5248e+001	3.1542e+012	1.0480e+002	3.8776e+006
Mo-101				
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nb-95m	9.2488e-002	3.4221e+009	1.1370e-001	4.2069e+003
Nb-96	6.6645e-003	2.4659e+008	8.1930e-003	3.0314e+002
Nb-97	3.1033e+000	1.1482e+011	3.8150e+000	1.4115e+005
Nb-97m	2.9292e+000	1.0838e+011	3.6010e+000	1.3324e+005
Nd-147	2.9593e+000	1.0949e+011	3.6380e+000	1.3461e+005
Nd-149	1.1974e-004	4.4303e+006	1.4720e-004	5.4464e+000
Np-236m	2.5192e-005	9.3211e+005	3.0970e-005	1.1459e+000
Np-238	3.6914e+000	1.3658e+011	4.5380e+000	1.6791e+005
Np-239	1.7294e+002	6.3987e+012	2.1260e+002	7.8662e+006
Np-240	4.2478e-008	1.5717e+003	5.2220e-008	1.9321e-003
Pd-109	6.6922e+000	2.4761e+011	8.2270e+000	3.0440e+005
Pm-147	1.0941e+000	4.0481e+010	1.3450e+000	4.9765e+004
Pm-148	7.7480e-001	2.8668e+010	9.5250e-001	3.5243e+004
Pm-148m	1.6594e-001	6.1398e+009	2.0400e-001	7.5480e+003
Pm-149	2.0979e+000	7.7621e+010	2.5790e+000	9.5423e+004
Pm-151	5.2874e-001	1.9563e+010	6.5000e-001	2.4050e+004
Pr-142	1.3365e-001	4.9450e+009	1.6430e-001	6.0791e+003
Pr-143	6.9500e+000	2.5715e+011	8.5440e+000	3.1613e+005
Pr-144	6.5506e+000	2.4237e+011	8.0530e+000	2.9796e+005
Pr-144m	9.1756e-002	3.3950e+009	1.1280e-001	4.1736e+003
Pu-237	7.1827e-005	2.6576e+006	8.8300e-005	3.2671e+000
Pu-238	4.9709e-002	1.8392e+009	6.1110e-002	2.2611e+003
Pu-239	5.2621e-003	1.9470e+008	6.4690e-003	2.3935e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Pu-243	1.5878e-001	5.8750e+009	1.9520e-001	7.2224e+003
Rb-86	1.1347e+001	4.1986e+011	1.3950e+001	5.1615e+005
Rb-88	1.2926e+001	4.7825e+011	1.5890e+001	5.8793e+005
Rh-103m	9.1431e+001	3.3829e+012	1.1240e+002	4.1588e+006
Rh-105	4.3641e+001	1.6147e+012	5.3650e+001	1.9851e+006
Rh-105m	4.4894e-001	1.6611e+010	5.5190e-001	2.0420e+004
Rb-86	1.1347e+001	4.1986e+011	1.3950e+001	5.1615e+005
Rh-88	1.2926e+001	4.7825e+011	1.5890e+001	5.8793e+005

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Rh-106	3.7199e+001	1.3763e+012	4.5730e+001	1.6920e+006
Ru-103	9.1837e+001	3.3980e+012	1.1290e+002	4.1773e+006
Ru-105	1.5716e+000	5.8148e+010	1.9320e+000	7.1484e+004
Ru-106	3.7199e+001	1.3763e+012	4.5730e+001	1.6920e+006
Sb-122	1.7944e+000	6.6395e+010	2.2060e+000	8.1622e+004
Sb-124	1.0485e+000	3.8795e+010	1.2890e+000	4.7693e+004
Sb-125	1.4918e+001	5.5198e+011	1.8340e+001	6.7858e+005
Sb-126	4.7749e-001	1.7667e+010	5.8700e-001	2.1719e+004
Sb-126m	9.0617e-004	3.3528e+007	1.1140e-003	4.1218e+001
Sb-127	8.6469e+001	3.1993e+012	1.0630e+002	3.9331e+006
Sb-129	8.7282e+000	3.2294e+011	1.0730e+001	3.9701e+005
Sm-151	2.9731e-003	1.1001e+008	3.6550e-003	1.3524e+002
Sm-153	1.6131e+000	5.9683e+010	1.9830e+000	7.3371e+004
Sr-89	1.1055e+003	4.0902e+013	1.3590e+003	5.0283e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	2.4777e+002	9.1676e+012	3.0460e+002	1.1270e+007
Sr-92	3.2586e+000	1.2057e+011	4.0060e+000	1.4822e+005
Sr-93				
Tc-99	1.2015e-003	4.4454e+007	1.4770e-003	5.4649e+001
Tc-99m	8.2320e+001	3.0458e+012	1.0120e+002	3.7444e+006
Tc-101				
Te-123m	1.0477e-002	3.8765e+008	1.2880e-002	4.7656e+002
Te-125m	3.3018e+000	1.2216e+011	4.0590e+000	1.5018e+005
Te-127	9.3952e+001	3.4762e+012	1.1550e+002	4.2735e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	5.5452e+001	2.0517e+012	6.8170e+001	2.5223e+006
Te-129m	7.1412e+001	2.6422e+012	8.7790e+001	3.2482e+006
Te-131	3.0341e+001	1.1226e+012	3.7300e+001	1.3801e+006
Te-131m	1.3471e+002	4.9841e+012	1.6560e+002	6.1272e+006
Te-132	1.3552e+003	5.0142e+013	1.6660e+003	6.1642e+007
Te-133	3.6580e-006	1.3535e+005	4.4970e-006	1.6639e-001
Te-133m	1.6212e-005	5.9984e+005	1.9930e-005	7.3741e-001
Te-134	9.0617e-008	3.3528e+003	1.1140e-007	4.1218e-003
Y-90	5.8470e-001	2.1634e+010	7.1880e-001	2.6596e+004
Y-91	5.8202e+000	2.1535e+011	7.1550e+000	2.6473e+005
Y-91m	6.2846e-001	2.3253e+010	7.7260e-001	2.8586e+004
Y-92	1.9222e-001	7.1120e+009	2.3630e-001	8.7431e+003
Y-93	9.0454e-001	3.3468e+010	1.1120e+000	4.1144e+004
Zr-89	1.9449e-003	7.1963e+007	2.3910e-003	8.8467e+001
Zr-93	1.2934e-006	4.7855e+004	1.5900e-006	5.8830e-002
Zr-95	8.2401e+000	3.0489e+011	1.0130e+001	3.7481e+005
Zr-97	3.0854e+000	1.1416e+011	3.7930e+000	1.4034e+005

Buildup

The material reference is : Source

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Results

Y Direction (axial)	25
---------------------	----

Page : 4
 DOS File: 1SP24GR.MS5
 Run Date: August 1, 2005
 Run Time: 4:38:42 PM
 Duration: 00:00:21

EC-RADN-1135
 Page 103

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.015	2.894e+09	1.368e-186	1.061e-24	1.173e-187	9.099e-26
0.02	6.257e+11	5.217e-82	6.949e-22	1.807e-83	2.407e-23
0.03	6.438e+13	9.857e-23	1.549e-18	9.769e-25	1.535e-20
0.04	1.477e+12	2.736e-09	4.009e-07	1.210e-11	1.773e-09
0.05	6.604e+12	5.978e-03	1.224e+00	1.592e-05	3.260e-03
0.06	1.918e+12	7.686e-01	1.368e+02	1.527e-03	2.718e-01
0.08	7.443e+12	5.759e+02	5.214e+04	9.114e-01	8.252e+01
0.1	7.097e+12	4.711e+03	2.302e+05	7.207e+00	3.522e+02
0.15	1.207e+13	6.167e+04	1.195e+06	1.016e+02	1.968e+03
0.2	5.010e+13	5.858e+05	7.310e+06	1.034e+03	1.290e+04
0.3	4.153e+13	1.162e+06	8.633e+06	2.205e+03	1.638e+04
0.4	2.123e+14	1.024e+07	5.734e+07	1.995e+04	1.117e+05
0.5	3.238e+14	2.339e+07	1.076e+08	4.592e+04	2.113e+05
0.6	4.864e+14	4.855e+07	1.932e+08	9.475e+04	3.771e+05
0.8	3.895e+14	6.427e+07	2.074e+08	1.222e+05	3.945e+05
1.0	1.347e+14	3.265e+07	9.145e+07	6.018e+04	1.686e+05
1.5	7.849e+13	3.758e+07	8.398e+07	6.323e+04	1.413e+05
2.0	1.499e+13	1.137e+07	2.237e+07	1.758e+04	3.459e+04
3.0	2.521e+10	3.520e+04	5.971e+04	4.776e+01	8.101e+01
4.0	1.447e+05	3.028e-01	4.715e-01	3.747e-04	5.833e-04
5.0	6.857e+08	1.934e+03	2.829e+03	2.217e+00	3.243e+00
TOTALS:	1.833e+15	2.299e+08	7.809e+08	4.273e+05	1.471e+06

MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1SP24I38.MS5
 Run Date: August 1, 2005
 Run Time: 4:39:04 PM
 Duration: 00:00:18

EC-RADN-1135
 Page 104

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 24 Hour, ICRP38
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X Y Z
 152.4 cm 457.2 cm 0 cm
 5 ft 0.0 in 15 ft 0.0 in

Shields			
Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : ICRP-38

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm ³
Cs-135m	1.6749e-006	6.1970e+004	2.0590e-006	7.6183e-002
Eu-157	3.8573e-002	1.4272e+009	4.7420e-002	1.7545e+003
Eu-158	1.6659e-011	6.1639e-001	2.0480e-011	7.5776e-007
La-143				
Nd-151				
Pm-150	4.8546e-005	1.7962e+006	5.9680e-005	2.2082e+000
Pr-145	3.0927e-001	1.1443e+010	3.8020e-001	1.4067e+004
Pr-147				
Rh-106m	6.0268e-004	2.2299e+007	7.4090e-004	2.7413e+001
Rh-107				
Sb-128a	2.9015e+000	1.0736e+011	3.5670e+000	1.3198e+005
Sb-128b	9.2244e-006	3.4130e+005	1.1340e-005	4.1958e-001
Sb-130	1.3300e-009	4.9209e+001	1.6350e-009	6.0495e-005
Sb-131				
Se-81	1.6708e-007	6.1820e+003	2.0540e-007	7.5998e-003
Se-81m	1.1307e-007	4.1835e+003	1.3900e-007	5.1430e-003
Se-83				
Sm-155				
Sm-156	1.9051e-001	7.0488e+009	2.3420e-001	8.6654e+003
Y-94				
Y-95				

Buildup
 The material reference is : Source

Page : 2
 DOS File: 1SP24I38.MS5
 Run Date: August 1, 2005
 Run Time: 4:39:04 PM
 Duration: 00:00:18

EC-RADN-1135
 Page 105

Integration Parameters

Radial 20
 Circumferential 20
 Y Direction (axial) 25

Results

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u>		<u>Exposure Rate</u>	
		<u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>mR/hr</u> <u>No Buildup</u>	<u>mR/hr</u> <u>With Buildup</u>
0.02	5.468e+08	4.559e-85	6.073e-25	1.579e-86	2.104e-26
0.03	3.045e+09	4.662e-27	7.325e-23	4.620e-29	7.260e-25
0.04	1.739e+09	3.222e-12	4.719e-10	1.425e-14	2.087e-12
0.05	4.414e+08	3.995e-07	8.178e-05	1.064e-09	2.179e-07
0.06	4.338e+08	1.739e-04	3.095e-02	3.453e-07	6.148e-05
0.08	1.709e+09	1.323e-01	1.198e+01	2.093e-04	1.895e-02
0.1	3.947e+03	2.620e-06	1.280e-04	4.009e-09	1.959e-07
0.15	1.037e+09	5.301e+00	1.027e+02	8.729e-03	1.691e-01
0.2	2.844e+09	3.326e+01	4.151e+02	5.870e-02	7.325e-01
0.3	9.911e+10	2.774e+03	2.060e+04	5.263e+00	3.908e+01
0.4	4.685e+08	2.259e+01	1.266e+02	4.402e-02	2.466e-01
0.5	8.020e+07	5.794e+00	2.666e+01	1.137e-02	5.232e-02
0.6	3.791e+09	3.784e+02	1.506e+03	7.387e-01	2.940e+00
0.8	2.246e+11	3.706e+04	1.196e+05	7.049e+01	2.275e+02
1.0	8.672e+09	2.102e+03	5.887e+03	3.874e+00	1.085e+01
1.5	1.511e+09	7.234e+02	1.616e+03	1.217e+00	2.720e+00
2.0	1.088e+06	8.252e-01	1.623e+00	1.276e-03	2.510e-03
3.0	2.211e+04	3.087e-02	5.236e-02	4.189e-05	7.104e-05
TOTALS:	3.500e+11	4.311e+04	1.499e+05	8.171e+01	2.843e+02

MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1SP24RAD.MS5
 Run Date: August 1, 2005
 Run Time: 4:39:22 PM
 Duration: 00:00:20

EC-RADN-1135
 Page 106

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 24 Hour, RADTRAD
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 152.4 cm 457.2 cm Z 0 cm
 5 ft 0.0 in 15 ft 0.0 in

Shields			
Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	1.1103e-003	4.1083e+007	1.3650e-003	5.0505e+001
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	1.8042e-002	6.6756e+008	2.2180e-002	8.2066e+002
Ba-140	2.0198e+003	7.4732e+013	2.4830e+003	9.1871e+007
Ce-141	1.9205e+001	7.1060e+011	2.3610e+001	8.7357e+005
Ce-143	1.1055e+001	4.0902e+011	1.3590e+001	5.0283e+005
Ce-144	1.6375e+001	6.0586e+011	2.0130e+001	7.4481e+005
Cm-242	2.8999e-001	1.0730e+010	3.5650e-001	1.3191e+004
Cm-244	1.6993e-002	6.2873e+008	2.0890e-002	7.7293e+002
Co-58	3.1879e-001	1.1795e+010	3.9190e-001	1.4500e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-136	3.7866e+002	1.4010e+013	4.6550e+002	1.7223e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
I-131	6.5344e+003	2.4177e+014	8.0330e+003	2.9722e+008
I-132	8.3784e+003	3.1000e+014	1.0300e+004	3.8110e+008
I-133	6.6840e+003	2.4731e+014	8.2170e+003	3.0403e+008
I-134	3.7312e-004	1.3806e+007	4.5870e-004	1.6972e+001
I-135	1.0973e+003	4.0601e+013	1.3490e+003	4.9913e+007
La-140	8.8421e+000	3.2716e+011	1.0870e+001	4.0219e+005
La-141	1.2071e-001	4.4664e+009	1.4840e-001	5.4908e+003
La-142	1.4894e-004	5.5108e+006	1.8310e-004	6.7747e+000
Mo-99	8.5248e+001	3.1542e+012	1.0480e+002	3.8776e+006
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nd-147	2.9593e+000	1.0949e+011	3.6380e+000	1.3461e+005
La-141	1.2071e-001	4.4664e+009	1.4840e-001	5.4908e+003
La-142	1.4894e-004	5.5108e+006	1.8310e-004	6.7747e+000

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Np-239	1.7294e+002	6.3987e+012	2.1260e+002	7.8662e+006
Pr-143	6.9500e+000	2.5715e+011	8.5440e+000	3.1613e+005
Pr-144	6.5506e+000	2.4237e+011	8.0530e+000	2.9796e+005
Pu-238	4.9709e-002	1.8392e+009	6.1110e-002	2.2611e+003
Pu-239	5.2621e-003	1.9470e+008	6.4690e-003	2.3935e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1347e+001	4.1986e+011	1.3950e+001	5.1615e+005
Rh-103m	9.1431e+001	3.3829e+012	1.1240e+002	4.1588e+006
Rh-105	4.3641e+001	1.6147e+012	5.3650e+001	1.9851e+006
Rh-106	3.7199e+001	1.3763e+012	4.5730e+001	1.6920e+006
Ru-103	9.1837e+001	3.3980e+012	1.1290e+002	4.1773e+006
Ru-105	1.5716e+000	5.8148e+010	1.9320e+000	7.1484e+004
Ru-106	3.7199e+001	1.3763e+012	4.5730e+001	1.6920e+006
Sb-127	8.6469e+001	3.1993e+012	1.0630e+002	3.9331e+006
Sb-129	8.7282e+000	3.2294e+011	1.0730e+001	3.9701e+005
Sr-89	1.1055e+003	4.0902e+013	1.3590e+003	5.0283e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	2.4777e+002	9.1676e+012	3.0460e+002	1.1270e+007
Sr-92	3.2586e+000	1.2057e+011	4.0060e+000	1.4822e+005
Tc-99m	8.2320e+001	3.0458e+012	1.0120e+002	3.7444e+006
Te-127	9.3952e+001	3.4762e+012	1.1550e+002	4.2735e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	5.5452e+001	2.0517e+012	6.8170e+001	2.5223e+006
Te-129m	7.1412e+001	2.6422e+012	8.7790e+001	3.2482e+006
Te-131m	1.3471e+002	4.9841e+012	1.6560e+002	6.1272e+006
Te-132	1.3552e+003	5.0142e+013	1.6660e+003	6.1642e+007
Y-90	5.8470e-001	2.1634e+010	7.1880e-001	2.6596e+004
Y-91	5.8202e+000	2.1535e+011	7.1550e+000	2.6473e+005
Y-92	1.9222e-001	7.1120e+009	2.3630e-001	8.7431e+003
Y-93	9.0454e-001	3.3468e+010	1.1120e+000	4.1144e+004
Zr-95	8.2401e+000	3.0489e+011	1.0130e+001	3.7481e+005
Zr-97	3.0854e+000	1.1416e+011	3.7930e+000	1.4034e+005

Buildup

The material reference is : Source

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Results

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u>		<u>Exposure Rate</u>	
		<u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>mR/hr</u> <u>No Buildup</u>	<u>mR/hr</u> <u>With Buildup</u>
0.015	2.845e+08	1.344e-187	1.043e-25	1.153e-188	8.944e-27
0.02	6.183e+11	5.156e-82	6.867e-22	1.786e-83	2.379e-23
0.03	6.381e+13	9.769e-23	1.535e-18	9.681e-25	1.521e-20
0.04	1.405e+12	2.603e-09	3.813e-07	1.151e-11	1.686e-09
0.05	6.594e+12	5.969e-03	1.222e+00	1.590e-05	3.255e-03
0.06	1.914e+12	7.671e-01	1.366e+02	1.524e-03	2.712e-01
0.04	1.405e+12	2.603e-09	3.813e-07	1.151e-11	1.686e-09
0.05	6.594e+12	5.969e-03	1.222e+00	1.590e-05	3.255e-03

Page : 3
 DOS File: 1SP24RAD.MS5
 Run Date: August 1, 2005
 Run Time: 4:39:22 PM
 Duration: 00:00:20

EC-RADN-1135
 Page 108

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.08	7.437e+12	5.755e+02	5.210e+04	9.107e-01	8.245e+01
0.1	7.069e+12	4.692e+03	2.293e+05	7.179e+00	3.508e+02
0.15	1.128e+13	5.764e+04	1.117e+06	9.492e+01	1.839e+03
0.2	5.004e+13	5.852e+05	7.302e+06	1.033e+03	1.289e+04
0.3	4.150e+13	1.162e+06	8.627e+06	2.204e+03	1.636e+04
0.4	2.115e+14	1.020e+07	5.713e+07	1.987e+04	1.113e+05
0.5	3.218e+14	2.325e+07	1.070e+08	4.564e+04	2.100e+05
0.6	4.833e+14	4.824e+07	1.920e+08	9.416e+04	3.747e+05
0.8	3.873e+14	6.390e+07	2.062e+08	1.215e+05	3.923e+05
1.0	1.341e+14	3.249e+07	9.102e+07	5.990e+04	1.678e+05
1.5	7.817e+13	3.743e+07	8.364e+07	6.298e+04	1.407e+05
2.0	1.487e+13	1.128e+07	2.219e+07	1.744e+04	3.431e+04
3.0	1.165e+10	1.627e+04	2.759e+04	2.207e+01	3.744e+01
4.0	1.447e+05	3.028e-01	4.715e-01	3.747e-04	5.833e-04
TOTALS:	1.823e+15	2.286e+08	7.765e+08	4.249e+05	1.463e+06

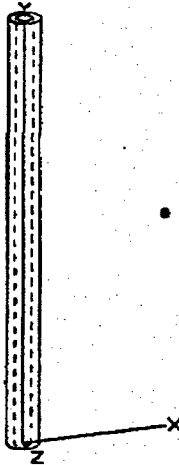
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2SP1GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:30:37 PM
 Duration: 00:02:11

EC-RADN-1135
 Page 109

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool Case
 Description: 1 Hour, Grove
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X Y Z
 304.8 cm 457.2 cm 0 cm
 10 ft 0.0 in 15 ft 0.0 in

Shields			
Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	15.24 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded

Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	1.1038e-003	4.0842e+007	1.3570e-003	5.0209e+001
Am-242	4.7554e-001	1.7595e+010	5.8460e-001	2.1630e+004
Am-242m	7.2160e-005	2.6699e+006	8.8710e-005	3.2823e+000
Am-243	1.3601e-004	5.0323e+006	1.6720e-004	6.1864e+000
Am-244	5.6201e-001	2.0794e+010	6.9090e-001	2.5563e+004
Ba-135m	4.4479e-001	1.6457e+010	5.4680e-001	2.0232e+004
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	1.4634e+003	5.4145e+013	1.7990e+003	6.6563e+007
Ba-140	2.1280e+003	7.8734e+013	2.6160e+003	9.6792e+007
Ba-141	2.0035e+002	7.4130e+012	2.4630e+002	9.1131e+006
Ba-142	3.6166e+001	1.3381e+012	4.4460e+001	1.6450e+006
Br-82	2.4493e+001	9.0623e+011	3.0110e+001	1.1141e+006
Br-83	6.7833e+002	2.5098e+013	8.3390e+002	3.0854e+007
Br-84	4.6984e+002	1.7384e+013	5.7760e+002	2.1371e+007
Ce-141	1.9539e+001	7.2294e+011	2.4020e+001	8.8874e+005
Ce-143	1.7871e+001	6.6124e+011	2.1970e+001	8.1289e+005
Ce-144	1.6464e+001	6.0917e+011	2.0240e+001	7.4888e+005
Cm-242	2.9032e-001	1.0742e+010	3.5690e-001	1.3205e+004
Cm-243	1.2503e-004	4.6259e+006	1.5370e-004	5.6869e+000
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2172e-001	1.1903e+010	3.9550e-001	1.4633e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.6847e+003
Co-60m	5.4037e-003	1.9994e+008	6.6430e-003	2.4579e+002
Co-61	2.5396e-003	9.3964e+007	3.1220e-003	1.1551e+002
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-62	3.2172e-001	1.1903e+010	3.9550e-001	1.4633e+004

Page : 2
 DOS File: 2SP1GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:30:37 PM
 Duration: 00:02:11

EC-RADN-1135
 Page 110

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Cs-132	2.3565e-001	8.7192e+009	2.8970e-001	1.0719e+004
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-134m	2.0621e+002	7.6297e+012	2.5350e+002	9.3795e+006
Cs-136	3.9859e+002	1.4748e+013	4.9000e+002	1.8130e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
Cs-138	4.8636e+003	1.7995e+014	5.9790e+003	2.2122e+008
Cs-139	1.2307e+002	4.5537e+012	1.5130e+002	5.5981e+006
Eu-152m	1.0005e-003	3.7020e+007	1.2300e-003	4.5510e+001
Eu-154	4.5935e-002	1.6996e+009	5.6470e-002	2.0894e+003
Eu-155	1.8888e-002	6.9886e+008	2.3220e-002	8.5914e+002
Eu-156	1.1884e+000	4.3972e+010	1.4610e+000	5.4057e+004
I-128	1.4666e+001	5.4265e+011	1.8030e+001	6.6711e+005
I-130	1.6358e+002	6.0526e+012	2.0110e+002	7.4407e+006
I-131	6.9834e+003	2.5839e+014	8.5850e+003	3.1764e+008
I-132	1.0176e+004	3.7652e+014	1.2510e+004	4.6287e+008
I-133	1.4219e+004	5.2610e+014	1.7480e+004	6.4676e+008
I-134	1.1421e+004	4.2257e+014	1.4040e+004	5.1948e+008
I-135	1.2421e+004	4.5959e+014	1.5270e+004	5.6499e+008
La-140	9.1105e+000	3.3709e+011	1.1200e+001	4.1440e+005
La-141	6.9834e+000	2.5839e+011	8.5850e+000	3.1764e+005
La-142	5.3866e+000	1.9930e+011	6.6220e+000	2.4501e+005
Mo-99	1.0892e+002	4.0300e+012	1.3390e+002	4.9543e+006
Mo-101	5.8193e+000	2.1532e+011	7.1540e+000	2.6470e+005
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nb-95m	9.2813e-002	3.4341e+009	1.1410e-001	4.2217e+003
Nb-96	1.3161e-002	4.8697e+008	1.6180e-002	5.9866e+002
Nb-97	8.1832e+000	3.0278e+011	1.0060e+001	3.7222e+005
Nb-97m	7.5316e+000	2.7867e+011	9.2590e+000	3.4258e+005
Nd-147	3.1423e+000	1.1627e+011	3.8630e+000	1.4293e+005
Nd-149	1.2372e+000	4.5778e+010	1.5210e+000	5.6277e+004
Np-236m	5.1125e-005	1.8916e+006	6.2850e-005	2.3254e+000
Np-238	5.0458e+000	1.8669e+011	6.2030e+000	2.2951e+005
Np-239	2.2947e+002	8.4904e+012	2.8210e+002	1.0438e+007
Np-240	2.1865e-001	8.0901e+009	2.6880e-001	9.9456e+003
Pd-109	2.1450e+001	7.9366e+011	2.6370e+001	9.7569e+005
Pm-147	1.0908e+000	4.0360e+010	1.3410e+000	4.9617e+004
Pm-148	8.7445e-001	3.2355e+010	1.0750e+000	3.9775e+004
Pm-148m	1.6863e-001	6.2392e+009	2.0730e-001	7.6701e+003
Pm-149	2.7934e+000	1.0335e+011	3.4340e+000	1.2706e+005
Pm-151	9.2813e-001	3.4341e+010	1.1410e+000	4.2217e+004
Pr-142	3.0789e-001	1.1392e+010	3.7850e-001	1.4004e+004
Pr-143	7.0167e+000	2.5962e+011	8.6260e+000	3.1916e+005
Pr-144	6.5840e+000	2.4361e+011	8.0940e+000	2.9948e+005
Pr-144m	9.2081e-002	3.4070e+009	1.1320e-001	4.1884e+003
Pu-237	7.2909e-005	2.6976e+006	8.9630e-005	3.3163e+000
Pu-238	4.9628e-002	1.8362e+009	6.1010e-002	2.2574e+003
Pu-239	5.2540e-003	1.9440e+008	6.4590e-003	2.3898e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Pu-243	3.9574e+000	1.4642e+011	4.8650e+000	1.8001e+005
Rb-86	1.1762e+001	4.3521e+011	1.4460e+001	5.3502e+005
Rb-88	3.5124e+003	1.2996e+014	4.3180e+003	1.5977e+008
Rh-103m	9.3139e+001	3.4461e+012	1.1450e+002	4.2365e+006
Rh-105	6.0683e+001	2.2453e+012	2.4600e+001	2.7607e+005
Rh-105	3.9574e+000	1.4642e+011	4.8650e+000	1.8001e+005
Rh-86	1.1762e+001	4.3521e+011	1.4460e+001	5.3502e+005

Page : 3
 DOS File: 2SP1GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:30:37 PM
 Duration: 00:02:11

EC-RADN-1135
 Page 111

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Rh-105m	1.6253e+001	6.0134e+011	1.9980e+001	7.3926e+005
Rh-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Ru-103	9.3139e+001	3.4461e+012	1.1450e+002	4.2365e+006
Ru-105	5.6949e+001	2.1071e+012	7.0010e+001	2.5904e+006
Ru-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Sb-122	2.3028e+000	8.5205e+010	2.8310e+000	1.0475e+005
Sb-124	1.0575e+000	3.9126e+010	1.3000e+000	4.8100e+004
Sb-125	1.4918e+001	5.5198e+011	1.8340e+001	6.7858e+005
Sb-126	5.0441e-001	1.8663e+010	6.2010e-001	2.2944e+004
Sb-126m	6.7239e-002	2.4878e+009	8.2660e-002	3.0584e+003
Sb-127	1.0144e+002	3.7531e+012	1.2470e+002	4.6139e+006
Sb-129	3.2668e+002	1.2087e+013	4.0160e+002	1.4859e+007
Sm-151	2.9593e-003	1.0949e+008	3.6380e-003	1.3461e+002
Sm-153	2.2776e+000	8.4272e+010	2.8000e+000	1.0360e+005
Sr-89	1.1225e+003	4.1534e+013	1.3800e+003	5.1060e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	1.3218e+003	4.8908e+013	1.6250e+003	6.0125e+007
Sr-92	1.1722e+003	4.3370e+013	1.4410e+003	5.3317e+007
Sr-93	6.3513e+000	2.3500e+011	7.8080e+000	2.8890e+005
Tc-99	1.2015e-003	4.4454e+007	1.4770e-003	5.4649e+001
Tc-99m	9.7287e+001	3.5996e+012	1.1960e+002	4.4252e+006
Tc-101	2.1743e+001	8.0450e+011	2.6730e+001	9.8901e+005
Te-123m	1.0558e-002	3.9066e+008	1.2980e-002	4.8026e+002
Te-125m	3.2928e+000	1.2183e+011	4.0480e+000	1.4978e+005
Te-127	1.0144e+002	3.7531e+012	1.2470e+002	4.6139e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	3.4750e+002	1.2858e+013	4.2720e+002	1.5806e+007
Te-129m	7.2494e+001	2.6823e+012	8.9120e+001	3.2974e+006
Te-131	4.8131e+002	1.7809e+013	5.9170e+002	2.1893e+007
Te-131m	2.2947e+002	8.4904e+012	2.8210e+002	1.0438e+007
Te-132	1.6627e+003	6.1519e+013	2.0440e+003	7.5628e+007
Te-133	1.5878e+002	5.8750e+012	1.9520e+002	7.2224e+006
Te-133m	5.1043e+002	1.8886e+013	6.2750e+002	2.3218e+007
Te-134	7.8481e+002	2.9038e+013	9.6480e+002	3.5698e+007
Y-90	5.9308e-001	2.1944e+010	7.2910e-001	2.6977e+004
Y-91	5.8535e+000	2.1658e+011	7.1960e+000	2.6625e+005
Y-91m	3.2220e+000	1.1922e+011	3.9610e+000	1.4656e+005
Y-92	5.9528e+000	2.2025e+011	7.3180e+000	2.7077e+005
Y-93	4.3893e+000	1.6240e+011	5.3960e+000	1.9965e+005
Zr-89	2.3842e-003	8.8215e+007	2.9310e-003	1.0845e+002
Zr-93	1.2934e-006	4.7855e+004	1.5900e-006	5.8830e-002
Zr-95	8.3378e+000	3.0850e+011	1.0250e+001	3.7925e+005
Zr-97	7.9310e+000	2.9345e+011	9.7500e+000	3.6075e+005

Buildup

The material reference is : Shield 1

Integration Parameters

Radial 20
 Circumferential 20
 Y Direction (axial) 25

Results

Circumferential 20
 Y Direction (axial) 25

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	8.979e+09	2.647e-312	7.352e-25	2.270e-313	6.306e-26
0.02	9.797e+11	6.359e-137	1.262e-22	2.203e-138	4.372e-24
0.03	1.057e+14	8.877e-41	3.012e-20	8.798e-43	2.986e-22
0.04	2.595e+12	2.197e-18	8.962e-18	9.715e-21	3.963e-20
0.05	8.101e+12	4.719e-09	3.780e-08	1.257e-11	1.007e-10
0.06	2.078e+12	1.302e-05	1.669e-04	2.587e-08	3.315e-07
0.08	1.522e+13	2.436e-01	5.133e+00	3.856e-04	8.122e-03
0.1	1.149e+13	4.329e+00	1.184e+02	6.622e-03	1.811e-01
0.15	6.122e+13	4.970e+02	1.526e+04	8.184e-01	2.514e+01
0.2	1.080e+14	3.397e+03	9.648e+04	5.995e+00	1.703e+02
0.3	8.913e+13	1.301e+04	2.809e+05	2.468e+01	5.328e+02
0.4	3.274e+14	1.281e+05	2.119e+06	2.497e+02	4.129e+03
0.5	7.714e+14	6.289e+05	8.300e+06	1.234e+03	1.629e+04
0.6	7.515e+14	1.097e+06	1.197e+07	2.141e+03	2.336e+04
0.8	1.339e+15	4.774e+06	3.869e+07	9.081e+03	7.359e+04
1.0	6.105e+14	4.259e+06	2.758e+07	7.850e+03	5.083e+04
1.5	5.759e+14	1.278e+07	5.689e+07	2.150e+04	9.572e+04
2.0	1.614e+14	7.594e+06	2.705e+07	1.174e+04	4.183e+04
3.0	2.061e+13	2.506e+06	6.806e+06	3.400e+03	9.233e+03
4.0	1.256e+12	2.776e+05	6.373e+05	3.434e+02	7.884e+02
5.0	1.863e+11	6.272e+04	1.284e+05	7.190e+01	1.472e+02

TOTALS: 4.963e+15 3.412e+07 1.806e+08 5.765e+04 3.166e+05

Energy	Activity	Sensitivity Variable		(1 of 5)	
		Variable	Variable	(1 of 5)	(30.48 cm)
0.015	8.979e+09	0.000e+00	7.352e-25	0.000e+00	6.306e-26
0.02	9.797e+11	1.318e-191	1.262e-22	4.566e-193	4.372e-24
0.03	1.057e+14	1.250e-58	3.012e-20	1.239e-60	2.986e-22
0.04	2.595e+12	2.566e-27	1.961e-21	1.135e-29	8.672e-24
0.05	8.101e+12	7.927e-15	7.628e-14	2.112e-17	2.032e-16
0.06	2.078e+12	5.477e-10	1.001e-08	1.088e-12	1.989e-11
0.08	1.522e+13	1.443e-04	4.985e-03	2.283e-07	7.888e-06
0.1	1.149e+13	7.374e-03	3.858e-01	1.128e-05	5.902e-04
0.15	6.122e+13	2.495e+00	1.735e+02	4.109e-03	2.857e-01
0.2	1.080e+14	2.900e+01	1.962e+03	5.119e-02	3.462e+00
0.3	8.913e+13	2.110e+02	1.058e+04	4.002e-01	2.007e+01
0.4	3.274e+14	3.160e+03	1.151e+05	6.158e+00	2.242e+02
0.5	7.714e+14	2.114e+04	5.824e+05	4.149e+01	1.143e+03
0.6	7.515e+14	4.697e+04	1.023e+06	9.169e+01	1.997e+03
0.8	1.339e+15	2.942e+05	4.420e+06	5.597e+02	8.406e+03
1.0	6.105e+14	3.426e+05	3.872e+06	6.315e+02	7.137e+03
1.5	5.759e+14	1.600e+06	1.129e+07	2.692e+03	1.900e+04
2.0	1.614e+14	1.246e+06	6.619e+06	1.927e+03	1.024e+04
3.0	2.061e+13	5.644e+05	2.116e+06	7.657e+02	2.870e+03
4.0	1.256e+12	7.483e+04	2.267e+05	9.257e+01	2.805e+02
5.0	1.863e+11	1.897e+04	4.942e+04	2.175e+01	5.665e+01

TOTALS: 4.963e+15 4.213e+06 3.033e+07 6.830e+03 5.138e+04

Energy	Activity	Sensitivity Variable		(2 of 5)	
		Variable	Variable	(2 of 5)	(45.72 cm)
TOTALS:	4.963e+15	4.213e+06	3.033e+07	6.830e+03	5.138e+04

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	8.979e+09	0.000e+00	7.352e-25	0.000e+00	6.306e-26
0.02	9.797e+11	2.903e-246	1.262e-22	1.005e-247	4.372e-24
0.03	1.057e+14	1.878e-76	3.012e-20	1.861e-78	2.986e-22
0.04	2.595e+12	3.209e-36	1.961e-21	1.419e-38	8.672e-24
0.05	8.101e+12	1.435e-20	1.617e-19	3.823e-23	4.307e-22
0.06	2.078e+12	2.498e-14	6.616e-13	4.963e-17	1.314e-15
0.08	1.522e+13	9.381e-08	4.681e-06	1.484e-10	7.407e-09
0.1	1.149e+13	1.390e-05	1.174e-03	2.127e-08	1.796e-06
0.15	6.122e+13	1.395e-02	1.780e+00	2.297e-05	2.931e-03
0.2	1.080e+14	2.756e-01	3.564e+01	4.864e-04	6.291e-02
0.3	8.913e+13	3.791e+00	3.562e+02	7.192e-03	6.758e-01
0.4	3.274e+14	8.598e+01	5.621e+03	1.675e-01	1.095e+01
0.5	7.714e+14	7.806e+02	3.713e+04	1.532e+00	7.288e+01
0.6	7.515e+14	2.202e+03	7.990e+04	4.298e+00	1.560e+02
0.8	1.339e+15	1.972e+04	4.668e+05	3.751e+01	8.879e+02
1.0	6.105e+14	2.981e+04	5.094e+05	5.495e+01	9.390e+02
1.5	5.759e+14	2.143e+05	2.129e+06	3.606e+02	3.582e+03
2.0	1.614e+14	2.171e+05	1.554e+06	3.358e+02	2.403e+03
3.0	2.061e+13	1.335e+05	6.403e+05	1.812e+02	8.687e+02
4.0	1.256e+12	2.105e+04	7.899e+04	2.605e+01	9.772e+01
5.0	1.863e+11	5.963e+03	1.879e+04	6.835e+00	2.154e+01

TOTALS: 4.963e+15 6.446e+05 5.520e+06 1.009e+03 9.040e+03

Energy	Sensitivity	Variable	(3 of 5)	
			MeV/cm ² /sec	mR/hr
0.015	8.979e+09	0.000e+00	7.352e-25	0.000e+00
0.02	9.797e+11	6.611e-301	1.262e-22	2.290e-302
0.03	1.057e+14	2.921e-94	3.012e-20	2.895e-96
0.04	2.595e+12	4.158e-45	1.961e-21	1.839e-47
0.05	8.101e+12	2.698e-26	2.001e-20	7.188e-29
0.06	2.078e+12	1.187e-18	4.651e-17	2.358e-21
0.08	1.522e+13	6.381e-11	4.221e-09	1.010e-13
0.1	1.149e+13	2.749e-08	3.382e-06	4.205e-11
0.15	6.122e+13	8.200e-05	1.698e-02	1.350e-07
0.2	1.080e+14	2.752e-03	6.011e-01	4.858e-06
0.3	8.913e+13	7.151e-02	1.116e+01	1.356e-04
0.4	3.274e+14	2.451e+00	2.561e+02	4.776e-03
0.5	7.714e+14	3.016e+01	2.218e+03	5.921e-02
0.6	7.515e+14	1.079e+02	5.876e+03	2.105e-01
0.8	1.339e+15	1.379e+03	4.676e+04	2.622e+00
1.0	6.105e+14	2.700e+03	6.412e+04	4.978e+00
1.5	5.759e+14	2.978e+04	3.884e+05	5.010e+01
2.0	1.614e+14	3.912e+04	3.559e+05	6.049e+01
3.0	2.061e+13	3.252e+04	1.904e+05	4.412e+01
4.0	1.256e+12	6.080e+03	2.720e+04	7.521e+00
5.0	1.863e+11	1.919e+03	7.092e+03	2.200e+00

TOTALS: 4.963e+15 1.136e+05 1.088e+06 1.723e+02 1.727e+03

Sensitivity Variable (4 of 5) (76.2 cm)

TOTALS: 4.963e+15 1.136e+05 1.088e+06 1.723e+02 1.727e+03

Page : 6
 DOS File: 2SP1GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:30:37 PM
 Duration: 00:02:11

EC-RADN-1135
 Page 114

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec <u>No Buildup</u>	MeV/cm ² /sec <u>With Buildup</u>	mR/hr <u>No Buildup</u>	mR/hr <u>With Buildup</u>
0.015	8.979e+09	0.000e+00	7.352e-25	0.000e+00	6.306e-26
0.02	9.797e+11	0.000e+00	1.262e-22	0.000e+00	4.372e-24
0.03	1.057e+14	4.640e-112	3.012e-20	4.599e-114	2.986e-22
0.04	2.595e+12	5.506e-54	1.961e-21	2.435e-56	8.672e-24
0.05	8.101e+12	5.192e-32	2.001e-20	1.383e-34	5.330e-23
0.06	2.078e+12	5.780e-23	3.818e-20	1.148e-25	7.584e-23
0.08	1.522e+13	4.458e-14	3.662e-12	7.055e-17	5.795e-15
0.1	1.149e+13	5.589e-11	9.481e-09	8.550e-14	1.450e-11
0.15	6.122e+13	4.960e-07	1.541e-04	8.168e-10	2.537e-07
0.2	1.080e+14	2.829e-05	9.580e-03	4.993e-08	1.691e-05
0.3	8.913e+13	1.387e-03	3.314e-01	2.631e-06	6.286e-04
0.4	3.274e+14	7.181e-02	1.110e+01	1.399e-04	2.163e-02
0.5	7.714e+14	1.197e+00	1.267e+02	2.350e-03	2.487e-01
0.6	7.515e+14	5.423e+00	4.150e+02	1.059e-02	8.101e-01
0.8	1.339e+15	9.882e+01	4.539e+03	1.880e-01	8.634e+00
1.0	6.105e+14	2.506e+02	7.821e+03	4.619e-01	1.442e+01
1.5	5.759e+14	4.231e+03	6.918e+04	7.119e+00	1.164e+02
2.0	1.614e+14	7.198e+03	8.005e+04	1.113e+01	1.238e+02
3.0	2.061e+13	8.071e+03	5.601e+04	1.095e+01	7.598e+01
4.0	1.256e+12	1.787e+03	9.293e+03	2.210e+00	1.150e+01
5.0	1.863e+11	6.278e+02	2.660e+03	7.197e-01	3.049e+00
TOTALS:	4.963e+15	2.227e+04	2.301e+05	3.279e+01	3.548e+02

Energy	Activity	Sensitivity		Variable	
		MeV/cm ² /sec	mR/hr	(5 of 5)	(91.44 cm)
0.015	8.979e+09	0.000e+00	7.352e-25	0.000e+00	6.306e-26
0.02	9.797e+11	0.000e+00	1.262e-22	0.000e+00	4.372e-24
0.03	1.057e+14	7.476e-130	3.012e-20	7.409e-132	2.986e-22
0.04	2.595e+12	7.401e-63	1.961e-21	3.273e-65	8.672e-24
0.05	8.101e+12	1.015e-37	2.001e-20	2.703e-40	5.330e-23
0.06	2.078e+12	2.861e-27	3.684e-20	5.682e-30	7.317e-23
0.08	1.522e+13	3.170e-17	3.035e-15	5.016e-20	4.803e-18
0.1	1.149e+13	1.157e-13	2.589e-11	1.770e-16	3.961e-14
0.15	6.122e+13	3.058e-09	1.352e-06	5.035e-12	2.226e-09
0.2	1.080e+14	2.963e-07	1.469e-04	5.229e-10	2.593e-07
0.3	8.913e+13	2.740e-05	9.443e-03	5.198e-08	1.791e-05
0.4	3.274e+14	2.142e-03	4.639e-01	4.174e-06	9.039e-04
0.5	7.714e+14	4.834e-02	6.992e+00	9.488e-05	1.372e-02
0.6	7.515e+14	2.774e-01	2.841e+01	5.415e-04	5.546e-02
0.8	1.339e+15	7.202e+00	4.283e+02	1.370e-02	8.147e-01
1.0	6.105e+14	2.364e+01	9.311e+02	4.357e-02	1.716e+00
1.5	5.759e+14	6.105e+02	1.214e+04	1.027e+00	2.042e+01
2.0	1.614e+14	1.344e+03	1.779e+04	2.078e+00	2.750e+01
3.0	2.061e+13	2.030e+03	1.633e+04	2.755e+00	2.216e+01
4.0	1.256e+12	5.316e+02	3.153e+03	6.577e-01	3.900e+00
5.0	1.863e+11	2.079e+02	9.940e+02	2.383e-01	1.140e+00
TOTALS:	4.963e+15	4.755e+03	5.180e+04	6.814e+00	7.772e+01

TOTALS: 4.963e+15 4.755e+03 5.180e+04 6.814e+00 7.772e+01

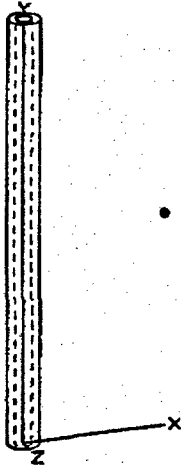
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2SP1I38.MS5
 Run Date: August 19, 2005
 Run Time: 2:32:48 PM
 Duration: 00:02:05

EC-RADN-1135
 Page 115

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 1 Hour, ICRP38
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X Y Z
 304.8 cm 457.2 cm 0 cm
 10 ft 0.0 in 15 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	15.24 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : ICRP-38

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Cs-135m	1.1559e+002	4.2768e+012	1.4210e+002	5.2577e+006
Eu-157	1.1006e-001	4.0722e+009	1.3530e-001	5.0061e+003
Eu-158	1.8725e-002	6.9284e+008	2.3020e-002	8.5174e+002
La-143	3.8573e-001	1.4272e+010	4.7420e-001	1.7545e+004
Nd-151	3.3587e-002	1.2427e+009	4.1290e-002	1.5277e+003
Pm-150	1.8587e-002	6.8772e+008	2.2850e-002	8.4545e+002
Pr-145	4.4560e+000	1.6487e+011	5.4780e+000	2.0269e+005
Pr-147	1.5732e-001	5.8208e+009	1.9340e-001	7.1558e+003
Rh-106m	9.4766e-001	3.5063e+010	1.1650e+000	4.3105e+004
Rh-107	6.8581e+000	2.5375e+011	8.4310e+000	3.1195e+005
Sb-128a	1.6627e+001	6.1519e+011	2.0440e+001	7.5628e+005
Sb-128b	9.8914e+001	3.6598e+012	1.2160e+002	4.4992e+006
Sb-130	4.3812e+001	1.6210e+012	5.3860e+001	1.9928e+006
Sb-131	1.5211e+002	5.6282e+012	1.8700e+002	6.9190e+006
Se-81	8.7282e+000	3.2294e+011	1.0730e+001	3.9701e+005
Se-81m	2.0450e+000	7.5665e+010	2.5140e+000	9.3018e+004
Se-83	1.0306e+001	3.8133e+011	1.2670e+001	4.6879e+005
Sm-155	2.8633e-002	1.0594e+009	3.5200e-002	1.3024e+003
Sm-156	1.0371e-001	3.8374e+009	1.2750e-001	4.7175e+003
Y-94	8.5167e-001	3.1512e+010	1.0470e+000	3.8739e+004
Y-95	1.5130e-001	5.5981e+009	1.8600e-001	6.8820e+003

Buildup

The material reference is: Shield 1
 Y-94 8.5167e-001 3.1512e+010 1.0470e+000 3.8739e+004
 Y-95 1.5130e-001 5.5981e+009 1.8600e-001 6.8820e+003

Integration Parameters

Radial 20
 Circumferential 20
 Y Direction (axial) 25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec		Exposure Rate mR/hr	
			With Buildup	No Buildup	With Buildup	
0.015	2.062e+07	6.077e-315	1.688e-27	5.213e-316	1.448e-28	
0.02	4.509e+09	2.927e-139	5.809e-25	1.014e-140	2.012e-26	
0.03	5.594e+11	4.696e-43	1.594e-22	4.654e-45	1.580e-24	
0.04	1.400e+10	1.185e-20	4.833e-20	5.239e-23	2.137e-22	
0.05	1.170e+09	6.817e-13	5.461e-12	1.816e-15	1.455e-14	
0.06	1.056e+09	6.620e-09	8.483e-08	1.315e-11	1.685e-10	
0.08	2.406e+09	3.851e-05	8.113e-04	6.094e-08	1.284e-06	
0.1	4.909e+10	1.849e-02	5.055e-01	2.828e-05	7.734e-04	
0.15	1.781e+11	1.446e+00	4.440e+01	2.380e-03	7.311e-02	
0.2	1.388e+12	4.366e+01	1.240e+03	7.706e-02	2.189e+00	
0.3	5.283e+12	7.712e+02	1.665e+04	1.463e+00	3.159e+01	
0.4	7.197e+11	2.817e+02	4.658e+03	5.488e-01	9.075e+00	
0.5	2.518e+12	2.053e+03	2.709e+04	4.030e+00	5.318e+01	
0.6	5.857e+12	8.548e+03	9.325e+04	1.668e+01	1.820e+02	
0.8	2.252e+13	8.030e+04	6.507e+05	1.527e+02	1.238e+03	
1.0	6.278e+12	4.380e+04	2.836e+05	8.073e+01	5.228e+02	
1.5	1.590e+12	3.528e+04	1.571e+05	5.936e+01	2.643e+02	
2.0	1.230e+12	5.788e+04	2.061e+05	8.950e+01	3.188e+02	
3.0	7.760e+10	9.438e+03	2.563e+04	1.280e+01	3.477e+01	
4.0	3.370e+08	7.448e+01	1.710e+02	9.214e-02	2.116e-01	
TOTALS:	4.827e+13	2.385e+05	1.466e+06	4.180e+02	2.657e+03	

Energy MeV	Sensitivity	Variable	(1 of 5)		(30.48 cm)
			Fluence Rate MeV/cm ² /sec	Exposure Rate mR/hr	
0.015	2.062e+07	0.000e+00	1.688e-27	0.000e+00	1.448e-28
0.02	4.509e+09	6.066e-194	5.809e-25	2.101e-195	2.012e-26
0.03	5.594e+11	6.612e-61	1.594e-22	6.553e-63	1.580e-24
0.04	1.400e+10	1.384e-29	1.057e-23	6.119e-32	4.677e-26
0.05	1.170e+09	1.145e-18	1.102e-17	3.051e-21	2.936e-20
0.06	1.056e+09	2.783e-13	5.090e-12	5.529e-16	1.011e-14
0.08	2.406e+09	2.280e-08	7.879e-07	3.609e-11	1.247e-09
0.1	4.909e+10	3.150e-05	1.648e-03	4.819e-08	2.521e-06
0.15	1.781e+11	7.259e-03	5.047e-01	1.195e-05	8.311e-04
0.2	1.388e+12	3.728e-01	2.521e+01	6.579e-04	4.450e-02
0.3	5.283e+12	1.251e+01	6.273e+02	2.372e-02	1.190e+00
0.4	7.197e+11	6.947e+00	2.530e+02	1.354e-02	4.929e-01
0.5	2.518e+12	6.901e+01	1.901e+03	1.354e-01	3.732e+00
0.6	5.857e+12	3.661e+02	7.974e+03	7.145e-01	1.557e+01
0.8	2.252e+13	4.949e+03	7.433e+04	9.413e+00	1.414e+02
1.0	6.278e+12	3.523e+03	3.982e+04	6.495e+00	7.340e+01
1.5	1.590e+12	4.417e+03	3.118e+04	7.431e+00	5.246e+01
2.0	1.230e+12	9.498e+03	5.044e+04	1.469e+01	7.801e+01
3.0	7.760e+10	2.125e+03	7.967e+03	2.883e+00	1.081e+01
4.0	3.370e+08	2.008e+01	6.084e+01	2.484e-02	7.527e-02
2.0	1.230e+12	9.498e+03	5.044e+04	1.469e+01	7.801e+01
3.0	7.760e+10	2.125e+03	7.967e+03	2.883e+00	1.081e+01

Page : 3
 DOS File: 2SP1I38.MS5
 Run Date: August 19, 2005
 Run Time: 2:32:48 PM
 Duration: 00:02:05

EC-RADN-1135
 Page 117

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
TOTALS:	4.827e+13	2.499e+04	2.146e+05	4.182e+01	3.772e+02
	Sensitivity	Variable		(2 of 5)	(45.72 cm)
0.015	2.062e+07	0.000e+00	1.688e-27	0.000e+00	1.448e-28
0.02	4.509e+09	1.336e-248	5.809e-25	4.627e-250	2.012e-26
0.03	5.594e+11	9.935e-79	1.594e-22	9.846e-81	1.580e-24
0.04	1.400e+10	1.731e-38	1.057e-23	7.654e-41	4.677e-26
0.05	1.170e+09	2.073e-24	2.336e-23	5.523e-27	6.222e-26
0.06	1.056e+09	1.270e-17	3.362e-16	2.522e-20	6.679e-19
0.08	2.406e+09	1.483e-11	7.399e-10	2.346e-14	1.171e-12
0.1	4.909e+10	5.937e-08	5.013e-06	9.083e-11	7.670e-09
0.15	1.781e+11	4.058e-05	5.177e-03	6.683e-08	8.526e-06
0.2	1.388e+12	3.542e-03	4.581e-01	6.252e-06	8.086e-04
0.3	5.283e+12	2.248e-01	2.112e+01	4.263e-04	4.006e-02
0.4	7.197e+11	1.890e-01	1.236e+01	3.683e-04	2.408e-02
0.5	2.518e+12	2.548e+00	1.212e+02	5.002e-03	2.379e-01
0.6	5.857e+12	1.716e+01	6.227e+02	3.349e-02	1.215e+00
0.8	2.252e+13	3.317e+02	7.851e+03	6.309e-01	1.493e+01
1.0	6.278e+12	3.066e+02	5.239e+03	5.651e-01	9.657e+00
1.5	1.590e+12	5.917e+02	5.878e+03	9.956e-01	9.889e+00
2.0	1.230e+12	1.655e+03	1.184e+04	2.559e+00	1.831e+01
3.0	7.760e+10	5.028e+02	2.411e+03	6.822e-01	3.271e+00
4.0	3.370e+08	5.650e+00	2.120e+01	6.990e-03	2.622e-02
TOTALS:	4.827e+13	3.413e+03	3.402e+04	5.479e+00	5.761e+01
	Sensitivity	Variable		(3 of 5)	(60.96 cm)
0.015	2.062e+07	0.000e+00	1.688e-27	0.000e+00	1.448e-28
0.02	4.509e+09	3.043e-303	5.809e-25	1.054e-304	2.012e-26
0.03	5.594e+11	1.545e-96	1.594e-22	1.531e-98	1.580e-24
0.04	1.400e+10	2.242e-47	1.057e-23	9.917e-50	4.677e-26
0.05	1.170e+09	3.898e-30	2.891e-24	1.038e-32	7.700e-27
0.06	1.056e+09	6.034e-22	2.364e-20	1.198e-24	4.696e-23
0.08	2.406e+09	1.009e-14	6.672e-13	1.596e-17	1.056e-15
0.1	4.909e+10	1.174e-10	1.444e-08	1.796e-13	2.210e-11
0.15	1.781e+11	2.385e-07	4.939e-05	3.928e-10	8.133e-08
0.2	1.388e+12	3.538e-05	7.725e-03	6.244e-08	1.363e-05
0.3	5.283e+12	4.239e-03	6.613e-01	8.041e-06	1.255e-03
0.4	7.197e+11	5.388e-03	5.630e-01	1.050e-05	1.097e-03
0.5	2.518e+12	9.846e-02	7.241e+00	1.933e-04	1.421e-02
0.6	5.857e+12	8.405e-01	4.579e+01	1.641e-03	8.938e-02
0.8	2.252e+13	2.319e+01	7.865e+02	4.410e-02	1.496e+00
1.0	6.278e+12	2.777e+01	6.594e+02	5.119e-02	1.216e+00
1.5	1.590e+12	8.221e+01	1.072e+03	1.383e-01	1.804e+00
2.0	1.230e+12	2.981e+02	2.712e+03	4.610e-01	4.194e+00
3.0	7.760e+10	1.225e+02	7.170e+02	1.661e-01	9.728e-01
4.0	3.370e+08	1.631e+00	7.299e+00	2.018e-03	9.030e-03
TOTALS:	4.827e+13	5.563e+02	6.009e+03	8.646e-01	9.797e+00
4.0	3.370e+08	1.631e+00	7.299e+00	2.018e-03	9.030e-03

Page : 4
 DOS File: 2SP1I38.MS5
 Run Date: August 19, 2005
 Run Time: 2:32:48 PM
 Duration: 00:02:05

EC-RADN-1135
 Page 118

Energy MeV	Activity photons/sec	Fluence Rate	Fluence Rate	Exposure Rate	Exposure Rate
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
	Sensitivity	Variable		(4 of 5)	(76.2 cm)
0.015	2.062e+07	0.000e+00	1.688e-27	0.000e+00	1.448e-28
0.02	4.509e+09	0.000e+00	5.809e-25	0.000e+00	2.012e-26
0.03	5.594e+11	2.455e-114	1.594e-22	2.433e-116	1.580e-24
0.04	1.400e+10	2.969e-56	1.057e-23	1.313e-58	4.677e-26
0.05	1.170e+09	7.501e-36	2.891e-24	1.998e-38	7.700e-27
0.06	1.056e+09	2.938e-26	1.941e-23	5.835e-29	3.855e-26
0.08	2.406e+09	7.047e-18	5.788e-16	1.115e-20	9.160e-19
0.1	4.909e+10	2.387e-13	4.049e-11	3.652e-16	6.195e-14
0.15	1.781e+11	1.443e-09	4.482e-07	2.376e-12	7.381e-10
0.2	1.388e+12	3.636e-07	1.231e-04	6.418e-10	2.173e-07
0.3	5.283e+12	8.222e-05	1.964e-02	1.560e-07	3.726e-05
0.4	7.197e+11	1.579e-04	2.440e-02	3.076e-07	4.754e-05
0.5	2.518e+12	3.907e-03	4.135e-01	7.669e-06	8.117e-04
0.6	5.857e+12	4.226e-02	3.234e+00	8.249e-05	6.313e-03
0.8	2.252e+13	1.662e+00	7.635e+01	3.161e-03	1.452e-01
1.0	6.278e+12	2.577e+00	8.043e+01	4.751e-03	1.483e-01
1.5	1.590e+12	1.168e+01	1.910e+02	1.965e-02	3.213e-01
2.0	1.230e+12	5.485e+01	6.101e+02	8.482e-02	9.434e-01
3.0	7.760e+10	3.039e+01	2.109e+02	4.124e-02	2.861e-01
4.0	3.370e+08	4.794e-01	2.494e+00	5.931e-04	3.085e-03
TOTALS:	4.827e+13	1.017e+02	1.175e+03	1.543e-01	1.855e+00
	Sensitivity	Variable		(5 of 5)	(91.44 cm)
0.015	2.062e+07	0.000e+00	1.688e-27	0.000e+00	1.448e-28
0.02	4.509e+09	0.000e+00	5.809e-25	0.000e+00	2.012e-26
0.03	5.594e+11	3.955e-132	1.594e-22	3.920e-134	1.580e-24
0.04	1.400e+10	3.991e-65	1.057e-23	1.765e-67	4.677e-26
0.05	1.170e+09	1.466e-41	2.891e-24	3.905e-44	7.700e-27
0.06	1.056e+09	1.454e-30	1.872e-23	2.888e-33	3.719e-26
0.08	2.406e+09	5.010e-21	4.798e-19	7.929e-24	7.592e-22
0.1	4.909e+10	4.943e-16	1.106e-13	7.562e-19	1.692e-16
0.15	1.781e+11	8.894e-12	3.932e-09	1.465e-14	6.475e-12
0.2	1.388e+12	3.808e-09	1.889e-06	6.721e-12	3.333e-09
0.3	5.283e+12	1.624e-06	5.598e-04	3.081e-09	1.062e-06
0.4	7.197e+11	4.708e-06	1.020e-03	9.174e-09	1.987e-06
0.5	2.518e+12	1.578e-04	2.282e-02	3.097e-07	4.480e-05
0.6	5.857e+12	2.162e-03	2.214e-01	4.220e-06	4.322e-04
0.8	2.252e+13	1.211e-01	7.204e+00	2.304e-04	1.370e-02
1.0	6.278e+12	2.431e-01	9.576e+00	4.481e-04	1.765e-02
1.5	1.590e+12	1.685e+00	3.350e+01	2.836e-03	5.637e-02
2.0	1.230e+12	1.024e+01	1.356e+02	1.584e-02	2.096e-01
3.0	7.760e+10	7.646e+00	6.151e+01	1.037e-02	8.344e-02
4.0	3.370e+08	1.427e-01	8.461e-01	1.765e-04	1.047e-03
TOTALS:	4.827e+13	2.008e+01	2.484e+02	2.990e-02	3.823e-01
TOTALS:	4.827e+13	2.008e+01	2.484e+02	2.990e-02	3.823e-01

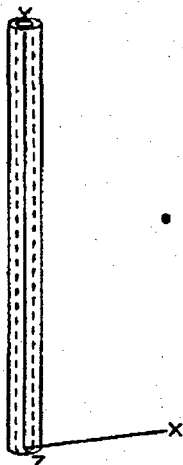
MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2SP1RAD.MS5
 Run Date: August 19, 2005
 Run Time: 2:34:54 PM
 Duration: 00:02:06

EC-RADN-1135
 Page 119

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
Description: 1 Hour, RADTRAD
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	914.4 cm	30 ft
Radius	16.828 cm	6.6 in

Dose Points

	<u>X</u>	<u>Y</u>	<u>Z</u>
# 1	304.8 cm	457.2 cm	0 cm
	10 ft 0.0 in	15 ft	0.0 in

Shields

<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	8.13e+05 cm ³	Water	1
Shield 1	15.24 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Am-241	1.1038e-003	4.0842e+007	1.3570e-003	5.0209e+001
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	1.4634e+003	5.4145e+013	1.7990e+003	6.6563e+007
Ba-140	2.1280e+003	7.8734e+013	2.6160e+003	9.6792e+007
Ce-141	1.9539e+001	7.2294e+011	2.4020e+001	8.8874e+005
Ce-143	1.7871e+001	6.6124e+011	2.1970e+001	8.1289e+005
Ce-144	1.6464e+001	6.0917e+011	2.0240e+001	7.4888e+005
Cm-242	2.9032e-001	1.0742e+010	3.5690e-001	1.3205e+004
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2172e-001	1.1903e+010	3.9550e-001	1.4633e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-136	3.9859e+002	1.4748e+013	4.9000e+002	1.8130e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
I-131	6.9834e+003	2.5839e+014	8.5850e+003	3.1764e+008
I-132	1.0176e+004	3.7652e+014	1.2510e+004	4.6287e+008
I-133	1.4219e+004	5.2610e+014	1.7480e+004	6.4676e+008
I-134	1.1421e+004	4.2257e+014	1.4040e+004	5.1948e+008
I-135	1.2421e+004	4.5959e+014	1.5270e+004	5.6499e+008
La-140	9.1105e+000	3.3709e+011	1.1200e+001	4.1440e+005
La-141	6.9834e+000	2.5839e+011	8.5850e+000	3.1764e+005
La-142	5.3866e+000	1.9930e+011	6.6220e+000	2.4501e+005
Mo-99	1.0892e+002	4.0300e+012	1.3390e+002	4.9543e+006
Nb-95	8.7703e+000	3.9709e+011	1.9280e+001	4.1440e+005
La-141	6.9834e+000	2.5839e+011	8.5850e+000	3.1764e+005

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm ³
Nd-147	3.1423e+000	1.1627e+011	3.8630e+000	1.4293e+005
Np-239	2.2947e+002	8.4904e+012	2.8210e+002	1.0438e+007
Pr-143	7.0167e+000	2.5962e+011	8.6260e+000	3.1916e+005
Pr-144	6.5840e+000	2.4361e+011	8.0940e+000	2.9948e+005
Pu-238	4.9628e-002	1.8362e+009	6.1010e-002	2.2574e+003
Pu-239	5.2540e-003	1.9440e+008	6.4590e-003	2.3898e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1762e+001	4.3521e+011	1.4460e+001	5.3502e+005
Rh-103m	9.3139e+001	3.4461e+012	1.1450e+002	4.2365e+006
Rh-105	6.0683e+001	2.2453e+012	7.4600e+001	2.7602e+006
Rh-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Ru-103	9.3139e+001	3.4461e+012	1.1450e+002	4.2365e+006
Ru-105	5.6949e+001	2.1071e+012	7.0010e+001	2.5904e+006
Ru-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Sb-127	1.0144e+002	3.7531e+012	1.2470e+002	4.6139e+006
Sb-129	3.2668e+002	1.2087e+013	4.0160e+002	1.4859e+007
Sr-89	1.1225e+003	4.1534e+013	1.3800e+003	5.1060e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	1.3218e+003	4.8908e+013	1.6250e+003	6.0125e+007
Sr-92	1.1722e+003	4.3370e+013	1.4410e+003	5.3317e+007
Tc-99m	9.7287e+001	3.5996e+012	1.1960e+002	4.4252e+006
Te-127	1.0144e+002	3.7531e+012	1.2470e+002	4.6139e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	3.4750e+002	1.2858e+013	4.2720e+002	1.5806e+007
Te-129m	7.2494e+001	2.6823e+012	8.9120e+001	3.2974e+006
Te-131m	2.2947e+002	8.4904e+012	2.8210e+002	1.0438e+007
Te-132	1.6627e+003	6.1519e+013	2.0440e+003	7.5628e+007
Y-90	5.9308e-001	2.1944e+010	7.2910e-001	2.6977e+004
Y-91	5.8535e+000	2.1658e+011	7.1960e+000	2.6625e+005
Y-92	5.9528e+000	2.2025e+011	7.3180e+000	2.7077e+005
Y-93	4.3893e+000	1.6240e+011	5.3960e+000	1.9965e+005
Zr-95	8.3378e+000	3.0850e+011	1.0250e+001	3.7925e+005
Zr-97	7.9310e+000	2.9345e+011	9.7500e+000	3.6075e+005

Buildup
 The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		No Buildup MeV/cm ² /sec	With Buildup MeV/cm ² /sec	No Buildup mR/hr	With Buildup mR/hr
0.015	4.042e+08	1.191e-313	3.309e-26	1.022e-314	2.838e-27
0.02	7.059e+11	4.582e-137	9.094e-23	1.587e-138	3.150e-24
0.03	8.601e+13	7.220e-41	2.450e-20	7.156e-43	2.428e-22
0.04	1.956e+12	1.656e-18	6.754e-18	7.323e-21	2.987e-20
0.05	8.088e+12	4.711e-09	3.774e-08	1.255e-11	1.005e-10
0.03	8.601e+13	7.220e-41	2.450e-20	7.156e-43	2.428e-22
0.04	1.956e+12	1.656e-18	6.754e-18	7.323e-21	2.987e-20

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.06	2.067e+12	1.295e-05	1.660e-04	2.573e-08	3.297e-07
0.08	8.077e+12	1.293e-01	2.724e+00	2.046e-04	4.310e-03
0.1	9.345e+12	3.519e+00	9.623e+01	5.384e-03	1.472e-01
0.15	4.235e+13	3.437e+02	1.056e+04	5.660e-01	1.739e+01
0.2	8.365e+13	2.631e+03	7.472e+04	4.643e+00	1.319e+02
0.3	6.692e+13	9.767e+03	2.109e+05	1.853e+01	4.001e+02
0.4	3.055e+14	1.196e+05	1.978e+06	2.330e+02	3.853e+03
0.5	6.776e+14	5.524e+05	7.291e+06	1.084e+03	1.431e+04
0.6	7.274e+14	1.062e+06	1.158e+07	2.072e+03	2.260e+04
0.8	1.270e+15	4.530e+06	3.671e+07	8.616e+03	6.982e+04
1.0	5.217e+14	3.639e+06	2.357e+07	6.708e+03	4.344e+04
1.5	4.210e+14	9.342e+06	4.159e+07	1.572e+04	6.998e+04
2.0	9.745e+13	4.584e+06	1.633e+07	7.088e+03	2.525e+04
3.0	6.662e+10	8.103e+03	2.200e+04	1.099e+01	2.985e+01
4.0	5.232e+09	1.156e+03	2.655e+03	1.431e+00	3.285e+00
TOTALS:	4.330e+15	2.385e+07	1.394e+08	4.156e+04	2.498e+05

Energy	Sensitivity	Variable		(1 of 5)	
		Variable	Variable	(1 of 5)	(30.48 cm)
0.015	4.042e+08	0.000e+00	3.309e-26	0.000e+00	2.838e-27
0.02	7.059e+11	9.497e-192	9.094e-23	3.290e-193	3.150e-24
0.03	8.601e+13	1.017e-58	2.450e-20	1.007e-60	2.428e-22
0.04	1.956e+12	1.934e-27	1.478e-21	8.552e-30	6.536e-24
0.05	8.088e+12	7.914e-15	7.615e-14	2.108e-17	2.029e-16
0.06	2.067e+12	5.446e-10	9.958e-09	1.082e-12	1.978e-11
0.08	8.077e+12	7.656e-05	2.645e-03	1.212e-07	4.186e-06
0.1	9.345e+12	5.996e-03	3.137e-01	9.173e-06	4.799e-04
0.15	4.235e+13	1.726e+00	1.200e+02	2.842e-03	1.976e-01
0.2	8.365e+13	2.246e+01	1.519e+03	3.964e-02	2.681e+00
0.3	6.692e+13	1.584e+02	7.946e+03	3.005e-01	1.507e+01
0.4	3.055e+14	2.949e+03	1.074e+05	5.747e+00	2.093e+02
0.5	6.776e+14	1.857e+04	5.116e+05	3.645e+01	1.004e+03
0.6	7.274e+14	4.546e+04	9.904e+05	8.874e+01	1.933e+03
0.8	1.270e+15	2.792e+05	4.193e+06	5.310e+02	7.976e+03
1.0	5.217e+14	2.928e+05	3.309e+06	5.397e+02	6.099e+03
1.5	4.210e+14	1.170e+06	8.257e+06	1.968e+03	1.389e+04
2.0	9.745e+13	7.522e+05	3.995e+06	1.163e+03	6.178e+03
3.0	6.662e+10	1.825e+03	6.839e+03	2.475e+00	9.279e+00
4.0	5.232e+09	3.118e+02	9.447e+02	3.857e-01	1.169e+00
TOTALS:	4.330e+15	2.563e+06	2.138e+07	4.336e+03	3.732e+04

Energy	Sensitivity	Variable		(2 of 5)	
		Variable	Variable	(2 of 5)	(45.72 cm)
0.015	4.042e+08	0.000e+00	3.309e-26	0.000e+00	2.838e-27
0.02	7.059e+11	2.091e-246	9.094e-23	7.245e-248	3.150e-24
0.03	8.601e+13	1.527e-76	2.450e-20	1.514e-78	2.428e-22
0.04	1.956e+12	2.419e-36	1.478e-21	1.070e-38	6.536e-24
0.05	8.088e+12	1.433e-20	1.614e-19	3.816e-23	4.300e-22
0.06	2.067e+12	2.485e-14	6.579e-13	4.935e-17	1.307e-15
0.08	8.077e+12	4.978e-08	2.484e-06	7.878e-11	3.931e-09
0.05	8.088e+12	1.433e-20	1.614e-19	3.816e-23	4.300e-22
0.06	2.067e+12	2.485e-14	6.579e-13	4.935e-17	1.307e-15

Page : 4
 DOS File: 2SP1RAD.MS5
 Run Date: August 19, 2005
 Run Time: 2:34:54 PM
 Duration: 00:02:06

EC-RADN-1135
 Page 122

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.1	9.345e+12	1.130e-05	9.543e-04	1.729e-08	1.460e-06
0.15	4.235e+13	9.650e-03	1.231e+00	1.589e-05	2.027e-03
0.2	8.365e+13	2.134e-01	2.760e+01	3.767e-04	4.872e-02
0.3	6.692e+13	2.847e+00	2.675e+02	5.400e-03	5.074e-01
0.4	3.055e+14	8.024e+01	5.246e+03	1.563e-01	1.022e+01
0.5	6.776e+14	6.857e+02	3.261e+04	1.346e+00	6.402e+01
0.6	7.274e+14	2.131e+03	7.733e+04	4.159e+00	1.509e+02
0.8	1.270e+15	1.871e+04	4.429e+05	3.559e+01	8.424e+02
1.0	5.217e+14	2.548e+04	4.353e+05	4.696e+01	8.024e+02
1.5	4.210e+14	1.567e+05	1.556e+06	2.636e+02	2.619e+03
2.0	9.745e+13	1.311e+05	9.378e+05	2.027e+02	1.450e+03
3.0	6.662e+10	4.317e+02	2.070e+03	5.857e-01	2.808e+00
4.0	5.232e+09	8.773e+01	3.291e+02	1.085e-01	4.072e-01
TOTALS:	4.330e+15	3.354e+05	3.490e+06	5.552e+02	5.943e+03

Energy	Sensitivity	Variable	(3 of 5)	
			MeV/cm ² /sec	mR/hr
0.015	4.042e+08	0.000e+00	3.309e-26	0.000e+00
0.02	7.059e+11	4.764e-301	9.094e-23	1.650e-302
0.03	8.601e+13	2.376e-94	2.450e-20	2.355e-96
0.04	1.956e+12	3.134e-45	1.478e-21	1.386e-47
0.05	8.088e+12	2.694e-26	1.998e-20	7.176e-29
0.06	2.067e+12	1.181e-18	4.626e-17	2.345e-21
0.08	8.077e+12	3.387e-11	2.240e-09	5.359e-14
0.1	9.345e+12	2.235e-08	2.749e-06	3.419e-11
0.15	4.235e+13	5.672e-05	1.174e-02	9.340e-08
0.2	8.365e+13	2.132e-03	4.655e-01	3.762e-06
0.3	6.692e+13	5.369e-02	8.377e+00	1.018e-04
0.4	3.055e+14	2.288e+00	2.390e+02	4.457e-03
0.5	6.776e+14	2.650e+01	1.948e+03	5.201e-02
0.6	7.274e+14	1.044e+02	5.687e+03	2.038e-01
0.8	1.270e+15	1.308e+03	4.437e+04	2.488e+00
1.0	5.217e+14	2.308e+03	5.479e+04	4.254e+00
1.5	4.210e+14	2.177e+04	2.840e+05	3.663e+01
2.0	9.745e+13	2.361e+04	2.148e+05	3.651e+01
3.0	6.662e+10	1.051e+02	6.156e+02	1.426e-01
4.0	5.232e+09	2.533e+01	1.133e+02	3.134e-02
TOTALS:	4.330e+15	4.926e+04	6.065e+05	8.031e+01

Energy	Sensitivity	Variable	(4 of 5)	
			MeV/cm ² /sec	mR/hr
0.015	4.042e+08	0.000e+00	3.309e-26	0.000e+00
0.02	7.059e+11	0.000e+00	9.094e-23	0.000e+00
0.03	8.601e+13	3.774e-112	2.450e-20	3.741e-114
0.04	1.956e+12	4.150e-54	1.478e-21	1.835e-56
0.05	8.088e+12	5.183e-32	1.998e-20	1.381e-34
0.06	2.067e+12	5.748e-23	3.797e-20	1.142e-25
0.08	8.077e+12	2.366e-14	1.943e-12	3.744e-17
0.1	9.345e+12	4.544e-11	7.708e-09	6.951e-14
0.15	4.235e+13	3.431e-07	1.066e-04	5.650e-10
0.08	8.077e+12	2.366e-14	1.943e-12	3.744e-17
0.1	9.345e+12	4.544e-11	7.708e-09	6.951e-14

Page : 5
 DOS File: 2SP1RAD.MS5
 Run Date: August 19, 2005
 Run Time: 2:34:54 PM
 Duration: 00:02:06

EC-RADN-1135
 Page 123

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.2	8.365e+13	2.191e-05	7.419e-03	3.867e-08	1.309e-05
0.3	6.692e+13	1.041e-03	2.488e-01	1.975e-06	4.719e-04
0.4	3.055e+14	6.702e-02	1.036e+01	1.306e-04	2.018e-02
0.5	6.776e+14	1.051e+00	1.113e+02	2.064e-03	2.184e-01
0.6	7.274e+14	5.249e+00	4.017e+02	1.025e-02	7.840e-01
0.8	1.270e+15	9.376e+01	4.307e+03	1.783e-01	8.192e+00
1.0	5.217e+14	2.142e+02	6.684e+03	3.948e-01	1.232e+01
1.5	4.210e+14	3.093e+03	5.058e+04	5.204e+00	8.509e+01
2.0	9.745e+13	4.344e+03	4.832e+04	6.718e+00	7.472e+01
3.0	6.662e+10	2.609e+01	1.811e+02	3.540e-02	2.456e-01
4.0	5.232e+09	7.444e+00	3.872e+01	9.209e-03	4.790e-02
TOTALS:	4.330e+15	7.786e+03	1.106e+05	1.255e+01	1.816e+02
	<u>Sensitivity</u>	<u>Variable</u>		(5 of 5)	(91.44 cm)
0.015	4.042e+08	0.000e+00	3.309e-26	0.000e+00	2.838e-27
0.02	7.059e+11	0.000e+00	9.094e-23	0.000e+00	3.150e-24
0.03	8.601e+13	6.081e-130	2.450e-20	6.026e-132	2.428e-22
0.04	1.956e+12	5.578e-63	1.478e-21	2.467e-65	6.536e-24
0.05	8.088e+12	1.013e-37	1.998e-20	2.699e-40	5.321e-23
0.06	2.067e+12	2.845e-27	3.663e-20	5.651e-30	7.277e-23
0.08	8.077e+12	1.682e-17	1.611e-15	2.662e-20	2.549e-18
0.1	9.345e+12	9.409e-14	2.105e-11	1.439e-16	3.220e-14
0.15	4.235e+13	2.115e-09	9.350e-07	3.483e-12	1.540e-09
0.2	8.365e+13	2.294e-07	1.138e-04	4.050e-10	2.008e-07
0.3	6.692e+13	2.057e-05	7.090e-03	3.903e-08	1.345e-05
0.4	3.055e+14	1.999e-03	4.330e-01	3.895e-06	8.436e-04
0.5	6.776e+14	4.246e-02	6.142e+00	8.335e-05	1.206e-02
0.6	7.274e+14	2.685e-01	2.750e+01	5.241e-04	5.368e-02
0.8	1.270e+15	6.833e+00	4.064e+02	1.300e-02	7.730e-01
1.0	5.217e+14	2.020e+01	7.957e+02	3.723e-02	1.467e+00
1.5	4.210e+14	4.463e+02	8.872e+03	7.509e-01	1.493e+01
2.0	9.745e+13	8.111e+02	1.074e+04	1.254e+00	1.660e+01
3.0	6.662e+10	6.564e+00	5.280e+01	8.906e-03	7.164e-02
4.0	5.232e+09	2.215e+00	1.314e+01	2.740e-03	1.625e-02
TOTALS:	4.330e+15	1.293e+03	2.091e+04	2.068e+00	3.392e+01

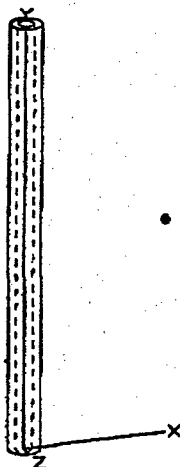
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2SP8GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:43:22 PM
 Duration: 00:02:11

EC-RADN-1135
 Page 124

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 8 Hour, GROVE
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 304.8 cm 457.2 cm Z 0 cm
 10 ft 0.0 in 15 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	15.24 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded

Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	1.1071e-003	4.0962e+007	1.3610e-003	5.0357e+001
Am-242	3.5246e-001	1.3041e+010	4.3330e-001	1.6032e+004
Am-242m	7.2160e-005	2.6699e+006	8.8710e-005	3.2823e+000
Am-243	1.3601e-004	5.0323e+006	1.6720e-004	6.1864e+000
Am-244	3.4579e-001	1.2794e+010	4.2510e-001	1.5729e+004
Ba-135m	3.7573e-001	1.3902e+010	4.6190e-001	1.7090e+004
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	4.6968e+001	1.7378e+012	5.7740e+001	2.1364e+006
Ba-140	2.0946e+003	7.7500e+013	2.5750e+003	9.5275e+007
Ba-141	2.4029e-005	8.8907e+005	2.9540e-005	1.0930e+000
Ba-142	4.2811e-011	1.5840e+000	5.2630e-011	1.9473e-006
Br-82	2.1345e+001	7.8975e+011	2.6240e+001	9.7088e+005
Br-83	9.1268e+001	3.3769e+012	1.1220e+002	4.1514e+006
Br-84	4.9734e-002	1.8401e+009	6.1140e-002	2.2622e+003
Ce-141	1.9449e+001	7.1963e+011	2.3910e+001	8.8467e+005
Ce-143	1.5463e+001	5.7215e+011	1.9010e+001	7.0337e+005
Ce-144	1.6464e+001	6.0917e+011	2.0240e+001	7.4888e+005
Cm-242	2.9032e-001	1.0742e+010	3.5690e-001	1.3205e+004
Cm-243	1.2503e-004	4.6259e+006	1.5370e-004	5.6869e+000
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2090e-001	1.1873e+010	3.9450e-001	1.4597e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Co-60m				
Co-61	1.3430e-004	4.9691e+006	1.6510e-004	6.1097e+000
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2090e-001	1.1873e+010	3.9450e-001	1.4597e+004

Page : 2
 DOS File: 2SP8GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:43:22 PM
 Duration: 00:02:11

EC-RADN-1135
 Page 125

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Cs-132	2.2858e-001	8.4573e+009	2.8100e-001	1.0397e+004
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-134m	3.8947e+001	1.4411e+012	4.7880e+001	1.7716e+006
Cs-136	3.9240e+002	1.4519e+013	4.8240e+002	1.7849e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
Cs-138	6.2350e-001	2.3070e+010	7.6650e-001	2.8361e+004
Cs-139	2.8308e-012	1.0474e-001	3.4800e-012	1.2876e-007
Eu-152m	5.9519e-004	2.2022e+007	7.3170e-004	2.7073e+001
Eu-154	4.5935e-002	1.6996e+009	5.6470e-002	2.0894e+003
Eu-155	1.8888e-002	6.9886e+008	2.3220e-002	8.5914e+002
Eu-156	1.1746e+000	4.3460e+010	1.4440e+000	5.3428e+004
I-128	1.2771e-004	4.7253e+006	1.5700e-004	5.8090e+000
I-130	1.1071e+002	4.0962e+012	1.3610e+002	5.0357e+006
I-131	6.8337e+003	2.5285e+014	8.4010e+003	3.1084e+008
I-132	9.6799e+003	3.5816e+014	1.1900e+004	4.4030e+008
I-133	1.1372e+004	4.2076e+014	1.3980e+004	5.1726e+008
I-134	9.9728e+001	3.6899e+012	1.2260e+002	4.5362e+006
I-135	5.9357e+003	2.1962e+014	7.2970e+003	2.6999e+008
La-140	9.0454e+000	3.3468e+011	1.1120e+001	4.1144e+005
La-141	2.0450e+000	7.5665e+010	2.5140e+000	9.3018e+004
La-142	2.2182e-001	8.2075e+009	2.7270e-001	1.0090e+004
Mo-99	1.0103e+002	3.7381e+012	1.2420e+002	4.5954e+006
Mo-101	1.2763e-008	4.7223e+002	1.5690e-008	5.8053e-004
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nb-95m	9.2813e-002	3.4341e+009	1.1410e-001	4.2217e+003
Nb-96	1.0680e-002	3.9518e+008	1.3130e-002	4.8581e+002
Nb-97	6.3749e+000	2.3587e+011	7.8370e+000	2.8997e+005
Nb-97m	5.6493e+000	2.0903e+011	6.9450e+000	2.5697e+005
Nd-147	3.0862e+000	1.1419e+011	3.7940e+000	1.4038e+005
Nd-149	7.4153e-002	2.7437e+009	9.1160e-002	3.3729e+003
Np-236m	4.1152e-005	1.5226e+006	5.0590e-005	1.8718e+000
Np-238	4.5886e+000	1.6978e+011	5.6410e+000	2.0872e+005
Np-239	2.1036e+002	7.7832e+012	2.5860e+002	9.5682e+006
Np-240	1.9783e-003	7.3197e+007	2.4320e-003	8.9984e+001
Pd-109	1.5049e+001	5.5680e+011	1.8500e+001	6.8450e+005
Pm-147	1.0908e+000	4.0360e+010	1.3410e+000	4.9617e+004
Pm-148	8.4435e-001	3.1241e+010	1.0380e+000	3.8406e+004
Pm-148m	1.6789e-001	6.2121e+009	2.0640e-001	7.6368e+003
Pm-149	2.5835e+000	9.5589e+010	3.1760e+000	1.1751e+005
Pm-151	7.8147e-001	2.8914e+010	9.6070e-001	3.5546e+004
Pr-142	2.3874e-001	8.8335e+009	2.9350e-001	1.0860e+004
Pr-143	7.0167e+000	2.5962e+011	8.6260e+000	3.1916e+005
Pr-144	6.5840e+000	2.4361e+011	8.0940e+000	2.9948e+005
Pr-144m	9.2081e-002	3.4070e+009	1.1320e-001	4.1884e+003
Pu-237	7.2575e-005	2.6853e+006	8.9220e-005	3.3011e+000
Pu-238	4.9628e-002	1.8362e+009	6.1010e-002	2.2574e+003
Pu-239	5.2540e-003	1.9440e+008	6.4590e-003	2.3898e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Pu-243	1.4878e+000	5.5048e+010	1.8290e+000	6.7673e+004
Rb-86	1.1640e+001	4.3069e+011	1.4310e+001	5.2947e+005
Rb-88	6.4424e+002	2.3837e+013	7.9200e+002	2.9304e+007
Rh-103m	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Rh-105	5.6949e+001	2.1071e+012	7.0010e+001	2.5904e+006
Pu-243	1.4878e+000	5.5048e+010	1.8290e+000	6.7673e+004
Rh-86	1.1640e+001	4.3069e+011	1.4310e+001	5.2947e+005

Page : 3
 DOS File: 2SP8GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:43:22 PM
 Duration: 00:02:11

EC-RADN-1135
 Page 126

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Rh-105m	5.4452e+000	2.0147e+011	6.6940e+000	2.4768e+005
Rh-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Ru-103	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Ru-105	1.9124e+001	7.0759e+011	2.3510e+001	8.6987e+005
Ru-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Sb-122	2.1369e+000	7.9066e+010	2.6270e+000	9.7199e+004
Sb-124	1.0575e+000	3.9126e+010	1.3000e+000	4.8100e+004
Sb-125	1.4918e+001	5.5198e+011	1.8340e+001	6.7858e+005
Sb-126	4.9636e-001	1.8365e+010	6.1020e-001	2.2577e+004
Sb-126m	9.0617e-004	3.3528e+007	1.1140e-003	4.1218e+001
Sb-127	9.7287e+001	3.5996e+012	1.1960e+002	4.4252e+006
Sb-129	1.0811e+002	3.9999e+012	1.3290e+002	4.9173e+006
Sm-151	2.9658e-003	1.0973e+008	3.6460e-003	1.3490e+002
Sm-153	2.0515e+000	7.5905e+010	2.5220e+000	9.3314e+004
Sr-89	1.1225e+003	4.1534e+013	1.3800e+003	5.1060e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	7.9473e+002	2.9405e+013	9.7700e+002	3.6149e+007
Sr-92	1.9539e+002	7.2294e+012	2.4020e+002	8.8874e+006
Sr-93				
Tc-99	1.2015e-003	4.4454e+007	1.4770e-003	5.4649e+001
Tc-99m	9.4359e+001	3.4913e+012	1.1600e+002	4.2920e+006
Tc-101	2.2736e-007	8.4122e+003	2.7950e-007	1.0342e-002
Te-123m	1.0558e-002	3.9066e+008	1.2980e-002	4.8026e+002
Te-125m	3.2928e+000	1.2183e+011	4.0480e+000	1.4978e+005
Te-127	1.0062e+002	3.7230e+012	1.2370e+002	4.5769e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	1.6627e+002	6.1519e+012	2.0440e+002	7.5628e+006
Te-129m	7.2242e+001	2.6729e+012	8.8810e+001	3.2860e+006
Te-131	4.3893e+001	1.6240e+012	5.3960e+001	1.9965e+006
Te-131m	1.9539e+002	7.2294e+012	2.4020e+002	8.8874e+006
Te-132	1.5626e+003	5.7817e+013	1.9210e+003	7.1077e+007
Te-133	6.0186e-001	2.2269e+010	7.3990e-001	2.7376e+004
Te-133m	2.6599e+000	9.8418e+010	3.2700e+000	1.2099e+005
Te-134	7.4153e-001	2.7437e+010	9.1160e-001	3.3729e+004
Y-90	5.8917e-001	2.1799e+010	7.2430e-001	2.6799e+004
Y-91	5.8202e+000	2.1535e+011	7.1550e+000	2.6473e+005
Y-91m	2.0181e+000	7.4671e+010	2.4810e+000	9.1797e+004
Y-92	2.8430e+000	1.0519e+011	3.4950e+000	1.2932e+005
Y-93	2.7136e+000	1.0040e+011	3.3360e+000	1.2343e+005
Zr-89	2.2410e-003	8.2918e+007	2.7550e-003	1.0194e+002
Zr-93	1.2934e-006	4.7855e+004	1.5900e-006	5.8830e-002
Zr-95	8.3052e+000	3.0729e+011	1.0210e+001	3.7777e+005
Zr-97	5.9389e+000	2.1974e+011	7.3010e+000	2.7014e+005

Buildup

The material reference is : Shield 1

Integration Parameters

Radial 20
 Circumferential 20
 Y Direction (axial) 25

Results

Circumferential 20
 Y Direction (axial) 25

Page : 4
 DOS File: 2SP8GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:43:22 PM
 Duration: 00:02:11

EC-RADN-1135
 Page 127

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	4.433e+09	1.307e-312	3.630e-25	1.121e-313	3.113e-26
0.02	7.628e+11	4.951e-137	9.828e-23	1.715e-138	3.404e-24
0.03	7.388e+13	6.202e-41	2.105e-20	6.147e-43	2.086e-22
0.04	1.637e+12	1.386e-18	5.654e-18	6.129e-21	2.501e-20
0.05	7.614e+12	4.435e-09	3.553e-08	1.181e-11	9.464e-11
0.06	2.023e+12	1.268e-05	1.625e-04	2.518e-08	3.227e-07
0.08	7.886e+12	1.262e-01	2.659e+00	1.998e-04	4.208e-03
0.1	8.606e+12	3.241e+00	8.862e+01	4.958e-03	1.356e-01
0.15	1.408e+13	1.143e+02	3.512e+03	1.883e-01	5.783e+00
0.2	6.169e+13	1.940e+03	5.511e+04	3.424e+00	9.726e+01
0.3	5.280e+13	7.706e+03	1.664e+05	1.462e+01	3.156e+02
0.4	2.346e+14	9.182e+04	1.518e+06	1.789e+02	2.958e+03
0.5	5.080e+14	4.141e+05	5.466e+06	8.129e+02	1.073e+04
0.6	5.601e+14	8.175e+05	8.918e+06	1.596e+03	1.741e+04
0.8	4.852e+14	1.730e+06	1.402e+07	3.291e+03	2.667e+04
1.0	2.400e+14	1.675e+06	1.084e+07	3.087e+03	1.999e+04
1.5	1.956e+14	4.341e+06	1.933e+07	7.304e+03	3.252e+04
2.0	4.191e+13	1.971e+06	7.022e+06	3.049e+03	1.086e+04
3.0	6.922e+11	8.419e+04	2.286e+05	1.142e+02	3.101e+02
4.0	3.471e+08	7.673e+01	1.762e+02	9.493e-02	2.180e-01
5.0	3.418e+10	1.150e+04	2.355e+04	1.319e+01	2.700e+01
TOTALS:	2.497e+15	1.115e+07	6.759e+07	1.946e+04	1.219e+05

Energy	Activity	Sensitivity Variable		(1 of 5)	
		Variable			(30.48 cm)
0.015	4.433e+09	0.000e+00	3.630e-25	0.000e+00	3.113e-26
0.02	7.628e+11	1.026e-191	9.828e-23	3.555e-193	3.404e-24
0.03	7.388e+13	8.732e-59	2.105e-20	8.654e-61	2.086e-22
0.04	1.637e+12	1.619e-27	1.237e-21	7.159e-30	5.471e-24
0.05	7.614e+12	7.450e-15	7.169e-14	1.985e-17	1.910e-16
0.06	2.023e+12	5.331e-10	9.747e-09	1.059e-12	1.936e-11
0.08	7.886e+12	7.475e-05	2.583e-03	1.183e-07	4.087e-06
0.1	8.606e+12	5.521e-03	2.889e-01	8.447e-06	4.419e-04
0.15	1.408e+13	5.741e-01	3.992e+01	9.454e-04	6.574e-02
0.2	6.169e+13	1.656e+01	1.120e+03	2.924e-02	1.977e+00
0.3	5.280e+13	1.250e+02	6.269e+03	2.371e-01	1.189e+01
0.4	2.346e+14	2.265e+03	8.247e+04	4.412e+00	1.607e+02
0.5	5.080e+14	1.392e+04	3.835e+05	2.732e+01	7.528e+02
0.6	5.601e+14	3.501e+04	7.627e+05	6.834e+01	1.489e+03
0.8	4.852e+14	1.066e+05	1.602e+06	2.028e+02	3.046e+03
1.0	2.400e+14	1.347e+05	1.522e+06	2.483e+02	2.806e+03
1.5	1.956e+14	5.435e+05	3.837e+06	9.144e+02	6.456e+03
2.0	4.191e+13	3.235e+05	1.718e+06	5.003e+02	2.657e+03
3.0	6.922e+11	1.896e+04	7.106e+04	2.572e+01	9.641e+01
4.0	3.471e+08	2.069e+01	6.268e+01	2.559e-02	7.754e-02
5.0	3.418e+10	3.479e+03	9.064e+03	3.989e+00	1.039e+01
TOTALS:	2.497e+15	1.182e+06	9.996e+06	1.996e+03	1.749e+04

Energy	Activity	Sensitivity Variable		(2 of 5)	
		Variable			(45.72 cm)
TOTALS:	2.497e+15	1.182e+06	9.996e+06	1.996e+03	1.749e+04

Page : 5
 DOS File: 2SP8GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:43:22 PM
 Duration: 00:02:11

EC-RADN-1135
 Page 128

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec		Exposure Rate mR/hr	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	4.433e+09	0.000e+00	3.630e-25	0.000e+00	3.113e-26
0.02	7.628e+11	2.260e-246	9.828e-23	7.829e-248	3.404e-24
0.03	7.388e+13	1.312e-76	2.105e-20	1.300e-78	2.086e-22
0.04	1.637e+12	2.024e-36	1.237e-21	8.954e-39	5.471e-24
0.05	7.614e+12	1.349e-20	1.519e-19	3.593e-23	4.048e-22
0.06	2.023e+12	2.432e-14	6.439e-13	4.830e-17	1.279e-15
0.08	7.886e+12	4.860e-08	2.425e-06	7.691e-11	3.838e-09
0.1	8.606e+12	1.041e-05	8.788e-04	1.592e-08	1.345e-06
0.15	1.408e+13	3.210e-03	4.095e-01	5.285e-06	6.743e-04
0.2	6.169e+13	1.574e-01	2.036e+01	2.778e-04	3.593e-02
0.3	5.280e+13	2.246e+00	2.110e+02	4.260e-03	4.003e-01
0.4	2.346e+14	6.161e+01	4.028e+03	1.200e-01	7.848e+00
0.5	5.080e+14	5.140e+02	2.445e+04	1.009e+00	4.799e+01
0.6	5.601e+14	1.641e+03	5.955e+04	3.203e+00	1.162e+02
0.8	4.852e+14	7.147e+03	1.692e+05	1.359e+01	3.218e+02
1.0	2.400e+14	1.172e+04	2.003e+05	2.161e+01	3.692e+02
1.5	1.956e+14	7.281e+04	7.233e+05	1.225e+02	1.217e+03
2.0	4.191e+13	5.637e+04	4.033e+05	8.717e+01	6.237e+02
3.0	6.922e+11	4.485e+03	2.151e+04	6.085e+00	2.918e+01
4.0	3.471e+08	5.821e+00	2.184e+01	7.201e-03	2.702e-02
5.0	3.418e+10	1.094e+03	3.446e+03	1.254e+00	3.951e+00
TOTALS:	2.497e+15	1.559e+05	1.609e+06	2.566e+02	2.737e+03

Energy	Sensitivity	Variable		(3 of 5)	
		Variable	Variable	(3 of 5)	(60.96 cm)
0.015	4.433e+09	0.000e+00	3.630e-25	0.000e+00	3.113e-26
0.02	7.628e+11	5.148e-301	9.828e-23	1.783e-302	3.404e-24
0.03	7.388e+13	2.041e-94	2.105e-20	2.022e-96	2.086e-22
0.04	1.637e+12	2.623e-45	1.237e-21	1.160e-47	5.471e-24
0.05	7.614e+12	2.536e-26	1.881e-20	6.756e-29	5.010e-23
0.06	2.023e+12	1.155e-18	4.527e-17	2.295e-21	8.993e-20
0.08	7.886e+12	3.306e-11	2.187e-09	5.232e-14	3.461e-12
0.1	8.606e+12	2.058e-08	2.532e-06	3.148e-11	3.874e-09
0.15	1.408e+13	1.886e-05	3.906e-03	3.106e-08	6.433e-06
0.2	6.169e+13	1.572e-03	3.433e-01	2.774e-06	6.059e-04
0.3	5.280e+13	4.236e-02	6.609e+00	8.035e-05	1.254e-02
0.4	2.346e+14	1.756e+00	1.835e+02	3.422e-03	3.576e-01
0.5	5.080e+14	1.986e+01	1.461e+03	3.899e-02	2.867e+00
0.6	5.601e+14	8.039e+01	4.380e+03	1.569e-01	8.548e+00
0.8	4.852e+14	4.996e+02	1.695e+04	9.503e-01	3.223e+01
1.0	2.400e+14	1.062e+03	2.521e+04	1.957e+00	4.647e+01
1.5	1.956e+14	1.012e+04	1.320e+05	1.702e+01	2.220e+02
2.0	4.191e+13	1.015e+04	9.238e+04	1.570e+01	1.429e+02
3.0	6.922e+11	1.092e+03	6.396e+03	1.482e+00	8.677e+00
4.0	3.471e+08	1.681e+00	7.520e+00	2.079e-03	9.303e-03
5.0	3.418e+10	3.520e+02	1.301e+03	4.035e-01	1.491e+00
TOTALS:	2.497e+15	2.338e+04	2.802e+05	3.772e+01	4.655e+02

Energy	Sensitivity	Variable		(4 of 5)	
		Variable	Variable	(4 of 5)	(76.2 cm)
TOTALS:	2.497e+15	2.338e+04	2.802e+05	3.772e+01	4.655e+02

Page : 6
 DOS File: 2SP8GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:43:22 PM
 Duration: 00:02:11

EC-RADN-1135
 Page 129

Energy MeV	Activity photons/sec	Fluence Rate	Fluence Rate	Exposure Rate	Exposure Rate
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	4.433e+09	0.000e+00	3.630e-25	0.000e+00	3.113e-26
0.02	7.628e+11	0.000e+00	9.828e-23	0.000e+00	3.404e-24
0.03	7.388e+13	3.242e-112	2.105e-20	3.213e-114	2.086e-22
0.04	1.637e+12	3.474e-54	1.237e-21	1.536e-56	5.471e-24
0.05	7.614e+12	4.880e-32	1.881e-20	1.300e-34	5.010e-23
0.06	2.023e+12	5.626e-23	3.717e-20	1.118e-25	7.382e-23
0.08	7.886e+12	2.310e-14	1.897e-12	3.655e-17	3.002e-15
0.1	8.606e+12	4.184e-11	7.099e-09	6.402e-14	1.086e-11
0.15	1.408e+13	1.141e-07	3.545e-05	1.879e-10	5.838e-08
0.2	6.169e+13	1.616e-05	5.472e-03	2.852e-08	9.657e-06
0.3	5.280e+13	8.216e-04	1.963e-01	1.559e-06	3.723e-04
0.4	2.346e+14	5.146e-02	7.953e+00	1.003e-04	1.550e-02
0.5	5.080e+14	7.882e-01	8.342e+01	1.547e-03	1.637e-01
0.6	5.601e+14	4.042e+00	3.093e+02	7.890e-03	6.038e-01
0.8	4.852e+14	3.581e+01	1.645e+03	6.812e-02	3.129e+00
1.0	2.400e+14	9.854e+01	3.075e+03	1.816e-01	5.669e+00
1.5	1.956e+14	1.437e+03	2.350e+04	2.418e+00	3.954e+01
2.0	4.191e+13	1.868e+03	2.078e+04	2.889e+00	3.214e+01
3.0	6.922e+11	2.711e+02	1.881e+03	3.678e-01	2.552e+00
4.0	3.471e+08	4.939e-01	2.569e+00	6.110e-04	3.178e-03
5.0	3.418e+10	1.152e+02	4.879e+02	1.320e-01	5.593e-01
TOTALS:	2.497e+15	3.832e+03	5.178e+04	6.067e+00	8.437e+01
	Sensitivity	Variable		(5 of 5)	(91.44 cm)
0.015	4.433e+09	0.000e+00	3.630e-25	0.000e+00	3.113e-26
0.02	7.628e+11	0.000e+00	9.828e-23	0.000e+00	3.404e-24
0.03	7.388e+13	5.223e-130	2.105e-20	5.176e-132	2.086e-22
0.04	1.637e+12	4.669e-63	1.237e-21	2.065e-65	5.471e-24
0.05	7.614e+12	9.537e-38	1.881e-20	2.540e-40	5.010e-23
0.06	2.023e+12	2.785e-27	3.586e-20	5.531e-30	7.122e-23
0.08	7.886e+12	1.642e-17	1.573e-15	2.599e-20	2.489e-18
0.1	8.606e+12	8.665e-14	1.938e-11	1.326e-16	2.966e-14
0.15	1.408e+13	7.034e-10	3.110e-07	1.158e-12	5.121e-10
0.2	6.169e+13	1.692e-07	8.392e-05	2.987e-10	1.481e-07
0.3	5.280e+13	1.623e-05	5.594e-03	3.079e-08	1.061e-05
0.4	2.346e+14	1.535e-03	3.324e-01	2.991e-06	6.477e-04
0.5	5.080e+14	3.183e-02	4.604e+00	6.248e-05	9.037e-03
0.6	5.601e+14	2.068e-01	2.118e+01	4.036e-04	4.134e-02
0.8	4.852e+14	2.610e+00	1.552e+02	4.964e-03	2.953e-01
1.0	2.400e+14	9.294e+00	3.661e+02	1.713e-02	6.749e-01
1.5	1.956e+14	2.074e+02	4.122e+03	3.489e-01	6.936e+00
2.0	4.191e+13	3.488e+02	4.617e+03	5.394e-01	7.140e+00
3.0	6.922e+11	6.820e+01	5.486e+02	9.253e-02	7.443e-01
4.0	3.471e+08	1.470e-01	8.717e-01	1.818e-04	1.078e-03
5.0	3.418e+10	3.812e+01	1.823e+02	4.370e-02	2.090e-01
TOTALS:	2.497e+15	6.748e+02	1.002e+04	1.047e+00	1.605e+01
TOTALS:	2.497e+15	6.748e+02	1.002e+04	1.047e+00	1.605e+01

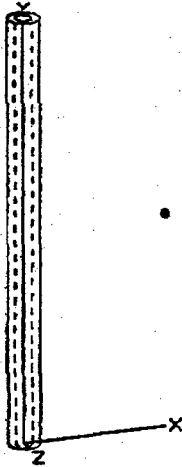
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2SP8I38.MS5
 Run Date: August 19, 2005
 Run Time: 2:45:34 PM
 Duration: 00:02:01

EC-RADN-1135
 Page 130

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 8 Hour, ICRP38
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions		
Height	914.4 cm	30 ft
Radius	16.828 cm	6.6 in

Dose Points			
#	X	Y	Z
# 1	304.8 cm	457.2 cm	0 cm
	10 ft 0.0 in	15 ft 0.0 in	

Shields			
Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	15.24 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : ICRP-38

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Cs-135m	4.7383e-001	1.7532e+010	5.8250e-001	2.1553e+004
Eu-157	7.9807e-002	2.9528e+009	9.8110e-002	3.6301e+003
Eu-158	3.2952e-005	1.2192e+006	4.0510e-005	1.4989e+000
La-143	4.4227e-010	1.6364e+001	5.4370e-010	2.0117e-005
Nd-151	2.3045e-012	8.5266e-002	2.8330e-012	1.0482e-007
Pm-150	3.0423e-003	1.1256e+008	3.7400e-003	1.3838e+002
Pr-145	1.9718e+000	7.2956e+010	2.4240e+000	8.9688e+004
Pr-147	7.9473e-011	2.9405e+000	9.7700e-011	3.6149e-006
Rh-106m	1.0062e-001	3.7230e+009	1.2370e-001	4.5769e+003
Rh-107	1.0225e-005	3.7832e+005	1.2570e-005	4.6509e-001
Sb-128a	9.9728e+000	3.6899e+011	1.2260e+001	4.5362e+005
Sb-128b	7.1908e-001	2.6606e+010	8.8400e-001	3.2708e+004
Sb-130	2.7600e-002	1.0212e+009	3.3930e-002	1.2554e+003
Sb-131	4.8383e-004	1.7902e+007	5.9480e-004	2.2008e+001
Se-81	1.8620e-002	6.8893e+008	2.2890e-002	8.4693e+002
Se-81m	1.2633e-002	4.6741e+008	1.5530e-002	5.7461e+002
Se-83	2.2109e-005	8.1804e+005	2.7180e-005	1.0057e+000
Sm-155	6.1187e-008	2.2639e+003	7.5220e-008	2.7831e-003
Sm-156	6.1854e-002	2.2886e+009	7.6040e-002	2.8135e+003
Y-94	1.4764e-007	5.4627e+003	1.8150e-007	6.7155e-003
Y-95				

Buildup				
Y-94	1.4764e-007	5.4627e+003	1.8150e-007	6.7155e-003
Y-95				

Page : 2
 DOS File: 2SP8I38.MS5
 Run Date: August 19, 2005
 Run Time: 2:45:34 PM
 Duration: 00:02:01

EC-RADN-1135
 Page 131

Integration Parameters

Radial 20
 Circumferential 20
 Y Direction (axial) 25

Results

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	3.446e+00	1.018e-321	2.821e-34	8.399e-323	2.420e-35
0.02	2.167e+08	1.407e-140	2.792e-26	4.873e-142	9.672e-28
0.03	1.209e+10	1.015e-44	3.443e-24	1.005e-46	3.412e-26
0.04	2.387e+09	2.020e-21	8.242e-21	8.935e-24	3.645e-23
0.05	6.022e+08	3.507e-13	2.810e-12	9.343e-16	7.485e-15
0.06	7.290e+08	4.569e-09	5.855e-08	9.075e-12	1.163e-10
0.08	6.964e+08	1.115e-05	2.349e-04	1.764e-08	3.717e-07
0.1	3.257e+08	1.227e-04	3.354e-03	1.877e-07	5.131e-06
0.15	4.733e+08	3.842e-03	1.180e-01	6.326e-06	1.943e-04
0.2	6.685e+09	2.102e-01	5.971e+00	3.711e-04	1.054e-02
0.3	3.586e+11	5.233e+01	1.130e+03	9.927e-02	2.144e+00
0.4	3.519e+09	1.377e+00	2.277e+01	2.683e-03	4.437e-02
0.5	1.733e+10	1.413e+01	1.865e+02	2.773e-02	3.660e-01
0.6	3.964e+10	5.785e+01	6.311e+02	1.129e-01	1.232e+00
0.8	8.728e+11	3.113e+03	2.522e+04	5.920e+00	4.798e+01
1.0	3.712e+10	2.589e+02	1.677e+03	4.773e-01	3.091e+00
1.5	8.136e+09	1.805e+02	8.038e+02	3.037e-01	1.352e+00
2.0	3.529e+08	1.660e+01	5.913e+01	2.567e-02	9.144e-02
3.0	1.630e+06	1.983e-01	5.384e-01	2.690e-04	7.305e-04

TOTALS: 1.362e+12 3.695e+03 2.974e+04 6.970e+00 5.631e+01

Energy MeV	Activity photons/sec	Sensitivity		Variable	
		Variable	Variable	(1 of 5)	(30.48 cm)
0.015	3.446e+00	0.000e+00	2.821e-34	0.000e+00	2.420e-35
0.02	2.167e+08	2.916e-195	2.792e-26	1.010e-196	9.672e-28
0.03	1.209e+10	1.428e-62	3.443e-24	1.416e-64	3.412e-26
0.04	2.387e+09	2.360e-30	1.803e-24	1.044e-32	7.975e-27
0.05	6.022e+08	5.892e-19	5.670e-18	1.570e-21	1.510e-20
0.06	7.290e+08	1.921e-13	3.513e-12	3.816e-16	6.978e-15
0.08	6.964e+08	6.601e-09	2.281e-07	1.045e-11	3.609e-10
0.1	3.257e+08	2.090e-07	1.093e-05	3.197e-10	1.673e-08
0.15	4.733e+08	1.929e-05	1.341e-03	3.177e-08	2.209e-06
0.2	6.685e+09	1.795e-03	1.214e-01	3.168e-06	2.143e-04
0.3	3.586e+11	8.487e-01	4.257e+01	1.610e-03	8.076e-02
0.4	3.519e+09	3.396e-02	1.237e+00	6.618e-05	2.410e-03
0.5	1.733e+10	4.749e-01	1.308e+01	9.321e-04	2.568e-02
0.6	3.964e+10	2.477e+00	5.397e+01	4.836e-03	1.053e-01
0.8	8.728e+11	1.918e+02	2.881e+03	3.649e-01	5.480e+00
1.0	3.712e+10	2.083e+01	2.354e+02	3.839e-02	4.339e-01
1.5	8.136e+09	2.260e+01	1.596e+02	3.803e-02	2.685e-01
2.0	3.529e+08	2.724e+00	1.447e+01	4.213e-03	2.238e-02
3.0	1.630e+06	4.465e-02	1.674e-01	6.058e-05	2.271e-04

TOTALS: 1.362e+12 2.419e+02 3.402e+03 4.530e-01 6.420e+00

3.0 1.630e+06 4.465e-02 1.674e-01 6.058e-05 2.271e-04

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
	Sensitivity	Variable		(2 of 5)	(45.72 cm)
0.015	3.446e+00	0.000e+00	2.821e-34	0.000e+00	2.420e-35
0.02	2.167e+08	6.422e-250	2.792e-26	2.224e-251	9.672e-28
0.03	1.209e+10	2.146e-80	3.443e-24	2.127e-82	3.412e-26
0.04	2.387e+09	2.951e-39	1.803e-24	1.305e-41	7.975e-27
0.05	6.022e+08	1.067e-24	1.202e-23	2.841e-27	3.201e-26
0.06	7.290e+08	8.764e-18	2.321e-16	1.741e-20	4.610e-19
0.08	6.964e+08	4.292e-12	2.142e-10	6.793e-15	3.389e-13
0.1	3.257e+08	3.939e-10	3.326e-08	6.026e-13	5.089e-11
0.15	4.733e+08	1.079e-07	1.376e-05	1.776e-10	2.266e-08
0.2	6.685e+09	1.706e-05	2.205e-03	3.010e-08	3.893e-06
0.3	3.586e+11	1.525e-02	1.433e+00	2.893e-05	2.719e-03
0.4	3.519e+09	9.240e-04	6.041e-02	1.800e-06	1.177e-04
0.5	1.733e+10	1.754e-02	8.340e-01	3.442e-05	1.637e-03
0.6	3.964e+10	1.161e-01	4.214e+00	2.267e-04	8.225e-03
0.8	8.728e+11	1.286e+01	3.043e+02	2.446e-02	5.789e-01
1.0	3.712e+10	1.812e+00	3.097e+01	3.341e-03	5.709e-02
1.5	8.136e+09	3.028e+00	3.008e+01	5.094e-03	5.061e-02
2.0	3.529e+08	4.747e-01	3.396e+00	7.340e-04	5.252e-03
3.0	1.630e+06	1.056e-02	5.056e-02	1.433e-05	6.872e-05
TOTALS:	1.362e+12	1.833e+01	3.754e+02	3.393e-02	7.046e-01

	Sensitivity	Variable		(3 of 5)	(60.96 cm)
0.015	3.446e+00	0.000e+00	2.821e-34	0.000e+00	2.420e-35
0.02	2.167e+08	1.463e-304	2.792e-26	5.066e-306	9.672e-28
0.03	1.209e+10	3.338e-98	3.443e-24	3.308e-100	3.412e-26
0.04	2.387e+09	3.824e-48	1.803e-24	1.691e-50	7.975e-27
0.05	6.022e+08	2.006e-30	1.487e-24	5.343e-33	3.962e-27
0.06	7.290e+08	4.164e-22	1.632e-20	8.272e-25	3.241e-23
0.08	6.964e+08	2.920e-15	1.931e-13	4.621e-18	3.056e-16
0.1	3.257e+08	7.789e-13	9.583e-11	1.192e-15	1.466e-13
0.15	4.733e+08	6.339e-10	1.313e-07	1.044e-12	2.161e-10
0.2	6.685e+09	1.703e-07	3.720e-05	3.006e-10	6.566e-08
0.3	3.586e+11	2.877e-04	4.488e-02	5.457e-07	8.514e-05
0.4	3.519e+09	2.634e-05	2.753e-03	5.133e-08	5.364e-06
0.5	1.733e+10	6.776e-04	4.983e-02	1.330e-06	9.781e-05
0.6	3.964e+10	5.689e-03	3.099e-01	1.110e-05	6.049e-04
0.8	8.728e+11	8.988e-01	3.049e+01	1.710e-03	5.799e-02
1.0	3.712e+10	1.642e-01	3.898e+00	3.026e-04	7.186e-03
1.5	8.136e+09	4.207e-01	5.488e+00	7.078e-04	9.233e-03
2.0	3.529e+08	8.551e-02	7.779e-01	1.322e-04	1.203e-03
3.0	1.630e+06	2.573e-03	1.506e-02	3.490e-06	2.044e-05
TOTALS:	1.362e+12	1.578e+00	4.107e+01	2.869e-03	7.642e-02

	Sensitivity	Variable		(4 of 5)	(76.2 cm)
0.015	3.446e+00	0.000e+00	2.821e-34	0.000e+00	2.420e-35
0.02	2.167e+08	0.000e+00	2.792e-26	0.000e+00	9.672e-28

	Sensitivity	Variable		(4 of 5)	(76.2 cm)
0.015	3.446e+00	0.000e+00	2.821e-34	0.000e+00	2.420e-35

Page : 4
 DOS File: 2SP8I38.MS5
 Run Date: August 19, 2005
 Run Time: 2:45:34 PM
 Duration: 00:02:01

EC-RADN-1135
 Page 133

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec		Exposure Rate mR/hr	
		No Buildup	With Buildup	No Buildup	With Buildup
0.03	1.209e+10	5.304e-116	3.443e-24	5.256e-118	3.412e-26
0.04	2.387e+09	5.064e-57	1.803e-24	2.240e-59	7.975e-27
0.05	6.022e+08	3.859e-36	1.487e-24	1.028e-38	3.962e-27
0.06	7.290e+08	2.028e-26	1.339e-23	4.027e-29	2.660e-26
0.08	6.964e+08	2.040e-18	1.676e-16	3.228e-21	2.652e-19
0.1	3.257e+08	1.584e-15	2.687e-13	2.423e-18	4.110e-16
0.15	4.733e+08	3.835e-12	1.191e-09	6.315e-15	1.962e-12
0.2	6.685e+09	1.751e-09	5.929e-07	3.090e-12	1.046e-09
0.3	3.586e+11	5.580e-06	1.333e-03	1.058e-08	2.529e-06
0.4	3.519e+09	7.718e-07	1.193e-04	1.504e-09	2.324e-07
0.5	1.733e+10	2.689e-05	2.846e-03	5.278e-08	5.586e-06
0.6	3.964e+10	2.860e-04	2.189e-02	5.583e-07	4.272e-05
0.8	8.728e+11	6.443e-02	2.959e+00	1.225e-04	5.629e-03
1.0	3.712e+10	1.524e-02	4.755e-01	2.808e-05	8.765e-04
1.5	8.136e+09	5.978e-02	9.774e-01	1.006e-04	1.644e-03
2.0	3.529e+08	1.573e-02	1.750e-01	2.433e-05	2.706e-04
3.0	1.630e+06	6.385e-04	4.431e-03	8.663e-07	6.011e-06
TOTALS:	1.362e+12	1.561e-01	4.618e+00	2.770e-04	8.478e-03
Sensitivity		Variable		(5 of 5)	(91.44 cm)
0.015	3.446e+00	0.000e+00	2.821e-34	0.000e+00	2.420e-35
0.02	2.167e+08	0.000e+00	2.792e-26	0.000e+00	9.672e-28
0.03	1.209e+10	8.544e-134	3.443e-24	8.468e-136	3.412e-26
0.04	2.387e+09	6.806e-66	1.803e-24	3.010e-68	7.975e-27
0.05	6.022e+08	7.542e-42	1.487e-24	2.009e-44	3.962e-27
0.06	7.290e+08	1.004e-30	1.292e-23	1.993e-33	2.567e-26
0.08	6.964e+08	1.450e-21	1.389e-19	2.295e-24	2.198e-22
0.1	3.257e+08	3.279e-18	7.337e-16	5.017e-21	1.122e-18
0.15	4.733e+08	2.364e-14	1.045e-11	3.892e-17	1.721e-14
0.2	6.685e+09	1.834e-11	9.094e-09	3.236e-14	1.605e-11
0.3	3.586e+11	1.102e-07	3.799e-05	2.091e-10	7.206e-08
0.4	3.519e+09	2.302e-08	4.986e-06	4.485e-11	9.715e-09
0.5	1.733e+10	1.086e-06	1.571e-04	2.131e-09	3.083e-07
0.6	3.964e+10	1.463e-05	1.499e-03	2.856e-08	2.925e-06
0.8	8.728e+11	4.695e-03	2.793e-01	8.931e-06	5.312e-04
1.0	3.712e+10	1.437e-03	5.661e-02	2.649e-06	1.044e-04
1.5	8.136e+09	8.624e-03	1.714e-01	1.451e-05	2.884e-04
2.0	3.529e+08	2.937e-03	3.888e-02	4.542e-06	6.013e-05
3.0	1.630e+06	1.606e-04	1.292e-03	2.179e-07	1.753e-06
TOTALS:	1.362e+12	1.787e-02	5.492e-01	3.088e-05	9.892e-04

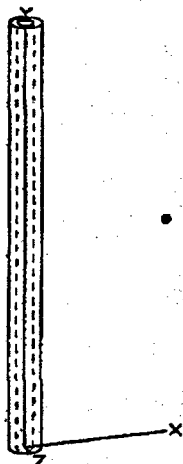
**MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.**

Page : 1
 DOS File: 2SP8RAD.MS5
 Run Date: August 19, 2005
 Run Time: 2:47:36 PM
 Duration: 00:02:07

EC-RADN-1135
 Page 134

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

**Case Title: Suppression Pool
 Description: 1 Hour, RADTRAD
 Geometry: 7 - Cylinder Volume - Side Shields**



	Source Dimensions		
Height	914.4 cm	30 ft	
Radius	16.828 cm	6.6 in	

	Dose Points		
	<u>X</u>	<u>Y</u>	<u>Z</u>
# 1	304.8 cm	457.2 cm	0 cm
	10 ft 0.0 in	15 ft 0.0 in	

	Shields		
<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	8.13e+05 cm ³	Water	1
Shield 1	15.24 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Am-241	1.1071e-003	4.0962e+007	1.3610e-003	5.0357e+001
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	4.6968e+001	1.7378e+012	5.7740e+001	2.1364e+006
Ba-140	2.0946e+003	7.7500e+013	2.5750e+003	9.5275e+007
Ce-141	1.9449e+001	7.1963e+011	2.3910e+001	8.8467e+005
Ce-143	1.5463e+001	5.7215e+011	1.9010e+001	7.0337e+005
Ce-144	1.6464e+001	6.0917e+011	2.0240e+001	7.4888e+005
Cm-242	2.9032e-001	1.0742e+010	3.5690e-001	1.3205e+004
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2090e-001	1.1873e+010	3.9450e-001	1.4597e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-136	3.9240e+002	1.4519e+013	4.8240e+002	1.7849e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
I-131	6.8337e+003	2.5285e+014	8.4010e+003	3.1084e+008
I-132	9.6799e+003	3.5816e+014	1.1900e+004	4.4030e+008
I-133	1.1372e+004	4.2076e+014	1.3980e+004	5.1726e+008
I-134	9.9728e+001	3.6899e+012	1.2260e+002	4.5362e+006
I-135	5.9357e+003	2.1962e+014	7.2970e+003	2.6999e+008
La-140	9.0454e+000	3.3468e+011	1.1120e+001	4.1144e+005
La-141	2.0450e+000	7.5665e+010	2.5140e+000	9.3018e+004
La-142	2.2182e-001	8.2075e+009	2.7270e-001	1.0090e+004
Mo-99	1.0103e+002	3.7381e+012	1.2420e+002	4.5954e+006
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
La-140	9.0454e+000	3.3468e+011	1.1120e+001	4.1144e+005
La-141	2.0450e+000	7.5665e+010	2.5140e+000	9.3018e+004

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Nd-147	3.0862e+000	1.1419e+011	3.7940e+000	1.4038e+005
Np-239	2.1036e+002	7.7832e+012	2.5860e+002	9.5682e+006
Pr-143	7.0167e+000	2.5962e+011	8.6260e+000	3.1916e+005
Pr-144	6.5840e+000	2.4361e+011	8.0940e+000	2.9948e+005
Pu-238	4.9628e-002	1.8362e+009	6.1010e-002	2.2574e+003
Pu-239	5.2540e-003	1.9440e+008	6.4590e-003	2.3898e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1640e+001	4.3069e+011	1.4310e+001	5.2947e+005
Rh-103m	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Rh-105	5.6949e+001	2.1071e+012	7.0010e+001	2.5904e+006
Rh-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Ru-103	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Ru-105	1.9124e+001	7.0759e+011	2.3510e+001	8.6987e+005
Ru-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Sb-127	9.7287e+001	3.5996e+012	1.1960e+002	4.4252e+006
Sb-129	1.0811e+002	3.9999e+012	1.3290e+002	4.9173e+006
Sr-89	1.1225e+003	4.1534e+013	1.3800e+003	5.1060e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	7.9473e+002	2.9405e+013	9.7700e+002	3.6149e+007
Sr-92	1.9539e+002	7.2294e+012	2.4020e+002	8.8874e+006
Tc-99m	9.4359e+001	3.4913e+012	1.1600e+002	4.2920e+006
Te-127	1.0062e+002	3.7230e+012	1.2370e+002	4.5769e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	1.6627e+002	6.1519e+012	2.0440e+002	7.5628e+006
Te-129m	7.2242e+001	2.6729e+012	8.8810e+001	3.2860e+006
Te-131m	1.9539e+002	7.2294e+012	2.4020e+002	8.8874e+006
Te-132	1.5626e+003	5.7817e+013	1.9210e+003	7.1077e+007
Y-90	5.8917e-001	2.1799e+010	7.2430e-001	2.6799e+004
Y-91	5.8202e+000	2.1535e+011	7.1550e+000	2.6473e+005
Y-92	2.8430e+000	1.0519e+011	3.4950e+000	1.2932e+005
Y-93	2.7136e+000	1.0040e+011	3.3360e+000	1.2343e+005
Zr-95	8.3052e+000	3.0729e+011	1.0210e+001	3.7777e+005
Zr-97	5.9389e+000	2.1974e+011	7.3010e+000	2.7014e+005

Buildup

The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Results

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u>		<u>Exposure Rate</u>	
		<u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>mR/hr</u> <u>No Buildup</u>	<u>mR/hr</u> <u>With Buildup</u>
0.015	3.466e+08	1.022e-313	2.838e-26	8.764e-315	2.434e-27
0.02	6.789e+11	4.406e-137	8.746e-23	1.526e-138	3.030e-24
0.03	7.273e+13	6.105e-41	2.072e-20	6.051e-43	2.053e-22
0.04	1.553e+12	1.315e-18	5.363e-18	5.814e-21	2.372e-20
0.05	7.602e+12	4.428e-09	3.547e-08	1.179e-11	9.449e-11
0.03	7.273e+13	6.105e-41	2.072e-20	6.051e-43	2.053e-22
0.04	1.553e+12	1.315e-18	5.363e-18	5.814e-21	2.372e-20

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.06	2.018e+12	1.264e-05	1.620e-04	2.512e-08	3.218e-07
0.08	7.859e+12	1.258e-01	2.650e+00	1.991e-04	4.194e-03
0.1	8.560e+12	3.223e+00	8.814e+01	4.932e-03	1.348e-01
0.15	1.271e+13	1.032e+02	3.170e+03	1.699e-01	5.219e+00
0.2	6.160e+13	1.937e+03	5.503e+04	3.419e+00	9.712e+01
0.3	5.271e+13	7.693e+03	1.661e+05	1.459e+01	3.151e+02
0.4	2.330e+14	9.118e+04	1.508e+06	1.777e+02	2.938e+03
0.5	5.033e+14	4.103e+05	5.415e+06	8.054e+02	1.063e+04
0.6	5.541e+14	8.087e+05	8.822e+06	1.578e+03	1.722e+04
0.8	4.772e+14	1.702e+06	1.379e+07	3.237e+03	2.623e+04
1.0	2.388e+14	1.666e+06	1.079e+07	3.071e+03	1.988e+04
1.5	1.949e+14	4.324e+06	1.925e+07	7.275e+03	3.239e+04
2.0	3.660e+13	1.722e+06	6.133e+06	2.663e+03	9.483e+03
3.0	1.417e+10	1.723e+03	4.678e+03	2.338e+00	6.347e+00
4.0	2.154e+08	4.762e+01	1.093e+02	5.891e-02	1.353e-01
TOTALS:	2.466e+15	1.074e+07	6.594e+07	1.883e+04	1.192e+05

Energy	Sensitivity	Variable	(1 of 5)		
			Variable	Variable	Variable
0.015	3.466e+08	0.000e+00	2.838e-26	0.000e+00	2.434e-27
0.02	6.789e+11	9.134e-192	8.746e-23	3.164e-193	3.030e-24
0.03	7.273e+13	8.596e-59	2.072e-20	8.519e-61	2.053e-22
0.04	1.553e+12	1.536e-27	1.173e-21	6.791e-30	5.190e-24
0.05	7.602e+12	7.438e-15	7.157e-14	1.982e-17	1.907e-16
0.06	2.018e+12	5.317e-10	9.722e-09	1.056e-12	1.931e-11
0.08	7.859e+12	7.449e-05	2.574e-03	1.179e-07	4.073e-06
0.1	8.560e+12	5.492e-03	2.873e-01	8.402e-06	4.395e-04
0.15	1.271e+13	5.182e-01	3.603e+01	8.533e-04	5.933e-02
0.2	6.160e+13	1.654e+01	1.119e+03	2.919e-02	1.975e+00
0.3	5.271e+13	1.248e+02	6.258e+03	2.367e-01	1.187e+01
0.4	2.330e+14	2.249e+03	8.190e+04	4.382e+00	1.596e+02
0.5	5.033e+14	1.379e+04	3.800e+05	2.707e+01	7.458e+02
0.6	5.541e+14	3.463e+04	7.544e+05	6.759e+01	1.473e+03
0.8	4.772e+14	1.049e+05	1.575e+06	1.995e+02	2.997e+03
1.0	2.388e+14	1.340e+05	1.515e+06	2.470e+02	2.792e+03
1.5	1.949e+14	5.414e+05	3.822e+06	9.108e+02	6.431e+03
2.0	3.660e+13	2.826e+05	1.501e+06	4.369e+02	2.321e+03
3.0	1.417e+10	3.880e+02	1.454e+03	5.264e-01	1.973e+00
4.0	2.154e+08	1.284e+01	3.890e+01	1.588e-02	4.813e-02
TOTALS:	2.466e+15	1.114e+06	9.638e+06	1.894e+03	1.693e+04

Energy	Sensitivity	Variable	(2 of 5)		
			Variable	Variable	Variable
0.015	3.466e+08	0.000e+00	2.838e-26	0.000e+00	2.434e-27
0.02	6.789e+11	2.011e-246	8.746e-23	6.968e-248	3.030e-24
0.03	7.273e+13	1.292e-76	2.072e-20	1.280e-78	2.053e-22
0.04	1.553e+12	1.920e-36	1.173e-21	8.494e-39	5.190e-24
0.05	7.602e+12	1.347e-20	1.517e-19	3.587e-23	4.041e-22
0.06	2.018e+12	2.426e-14	6.423e-13	4.818e-17	1.276e-15
0.08	7.859e+12	4.844e-08	2.417e-06	7.665e-11	3.824e-09
0.05	7.602e+12	1.347e-20	1.517e-19	3.587e-23	4.041e-22
0.06	2.018e+12	2.426e-14	6.423e-13	4.818e-17	1.276e-15

Page : 4
 DOS File: 2SP8RAD.MS5
 Run Date: August 19, 2005
 Run Time: 2:47:36 PM
 Duration: 00:02:07

EC-RADN-1135
 Page 137

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		No Buildup MeV/cm ² /sec	With Buildup MeV/cm ² /sec	No Buildup mR/hr	With Buildup mR/hr
0.1	8.560e+12	1.035e-05	8.741e-04	1.584e-08	1.337e-06
0.15	1.271e+13	2.897e-03	3.696e-01	4.771e-06	6.086e-04
0.2	6.160e+13	1.572e-01	2.033e+01	2.774e-04	3.588e-02
0.3	5.271e+13	2.242e+00	2.107e+02	4.253e-03	3.996e-01
0.4	2.330e+14	6.118e+01	4.000e+03	1.192e-01	7.794e+00
0.5	5.033e+14	5.093e+02	2.422e+04	9.997e-01	4.755e+01
0.6	5.541e+14	1.623e+03	5.891e+04	3.168e+00	1.150e+02
0.8	4.772e+14	7.030e+03	1.664e+05	1.337e+01	3.165e+02
1.0	2.388e+14	1.166e+04	1.993e+05	2.150e+01	3.673e+02
1.5	1.949e+14	7.253e+04	7.205e+05	1.220e+02	1.212e+03
2.0	3.660e+13	4.923e+04	3.523e+05	7.613e+01	5.447e+02
3.0	1.417e+10	9.179e+01	4.402e+02	1.245e-01	5.972e-01
4.0	2.154e+08	3.613e+00	1.355e+01	4.469e-03	1.677e-02
TOTALS:	2.466e+15	1.427e+05	1.526e+06	2.374e+02	2.612e+03

Energy	Sensitivity	Variable	(3 of 5)	
			(3 of 5)	(60.96 cm)
0.015	3.466e+08	0.000e+00	2.838e-26	0.000e+00
0.02	6.789e+11	4.581e-301	8.746e-23	1.587e-302
0.03	7.273e+13	2.009e-94	2.072e-20	1.991e-96
0.04	1.553e+12	2.488e-45	1.173e-21	1.101e-47
0.05	7.602e+12	2.532e-26	1.877e-20	6.745e-29
0.06	2.018e+12	1.153e-18	4.516e-17	2.289e-21
0.08	7.859e+12	3.295e-11	2.179e-09	5.214e-14
0.1	8.560e+12	2.047e-08	2.518e-06	3.131e-11
0.15	1.271e+13	1.703e-05	3.526e-03	2.804e-08
0.2	6.160e+13	1.570e-03	3.428e-01	2.770e-06
0.3	5.271e+13	4.229e-02	6.598e+00	8.022e-05
0.4	2.330e+14	1.744e+00	1.823e+02	3.399e-03
0.5	5.033e+14	1.968e+01	1.447e+03	3.863e-02
0.6	5.541e+14	7.952e+01	4.332e+03	1.552e-01
0.8	4.772e+14	4.914e+02	1.667e+04	9.348e-01
1.0	2.388e+14	1.056e+03	2.508e+04	1.947e+00
1.5	1.949e+14	1.008e+04	1.314e+05	1.695e+01
2.0	3.660e+13	8.869e+03	8.068e+04	1.371e+01
3.0	1.417e+10	2.235e+01	1.309e+02	3.033e-02
4.0	2.154e+08	1.043e+00	4.667e+00	1.290e-03
TOTALS:	2.466e+15	2.062e+04	2.600e+05	3.378e+01

Energy	Sensitivity	Variable	(4 of 5)	
			(4 of 5)	(76.2 cm)
0.015	3.466e+08	0.000e+00	2.838e-26	0.000e+00
0.02	6.789e+11	0.000e+00	8.746e-23	0.000e+00
0.03	7.273e+13	3.192e-112	2.072e-20	3.163e-114
0.04	1.553e+12	3.295e-54	1.173e-21	1.457e-56
0.05	7.602e+12	4.872e-32	1.877e-20	1.298e-34
0.06	2.018e+12	5.612e-23	3.707e-20	1.115e-25
0.08	7.859e+12	2.302e-14	1.891e-12	3.643e-17
0.1	8.560e+12	4.162e-11	7.060e-09	6.367e-14
0.15	1.271e+13	1.030e-07	3.200e-05	1.696e-10
0.08	7.859e+12	2.302e-14	1.891e-12	3.643e-17
0.1	8.560e+12	4.162e-11	7.060e-09	6.367e-14

Page : 5
 DOS File: 2SP8RAD.MS5
 Run Date: August 19, 2005
 Run Time: 2:47:36 PM
 Duration: 00:02:07

EC-RADN-1135
 Page 138

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.2	6.160e+13	1.613e-05	5.464e-03	2.848e-08	9.643e-06
0.3	5.271e+13	8.203e-04	1.960e-01	1.556e-06	3.717e-04
0.4	2.330e+14	5.110e-02	7.898e+00	9.957e-05	1.539e-02
0.5	5.033e+14	7.810e-01	8.265e+01	1.533e-03	1.622e-01
0.6	5.541e+14	3.998e+00	3.060e+02	7.804e-03	5.972e-01
0.8	4.772e+14	3.523e+01	1.618e+03	6.700e-02	3.078e+00
1.0	2.388e+14	9.803e+01	3.059e+03	1.807e-01	5.639e+00
1.5	1.949e+14	1.432e+03	2.341e+04	2.409e+00	3.939e+01
2.0	3.660e+13	1.632e+03	1.815e+04	2.523e+00	2.807e+01
3.0	1.417e+10	5.549e+00	3.850e+01	7.528e-03	5.223e-02
4.0	2.154e+08	3.065e-01	1.594e+00	3.792e-04	1.973e-03
TOTALS:	2.466e+15	3.208e+03	4.667e+04	5.198e+00	7.700e+01

Energy MeV	Sensitivity	Variable		(5 of 5)	
		Variable	Variable	(5 of 5)	(91.44 cm)
0.015	3.466e+08	0.000e+00	2.838e-26	0.000e+00	2.434e-27
0.02	6.789e+11	0.000e+00	8.746e-23	0.000e+00	3.030e-24
0.03	7.273e+13	5.142e-130	2.072e-20	5.096e-132	2.053e-22
0.04	1.553e+12	4.429e-63	1.173e-21	1.959e-65	5.190e-24
0.05	7.602e+12	9.521e-38	1.877e-20	2.536e-40	5.001e-23
0.06	2.018e+12	2.777e-27	3.577e-20	5.517e-30	7.104e-23
0.08	7.859e+12	1.637e-17	1.567e-15	2.590e-20	2.480e-18
0.1	8.560e+12	8.618e-14	1.928e-11	1.318e-16	2.950e-14
0.15	1.271e+13	6.349e-10	2.807e-07	1.046e-12	4.622e-10
0.2	6.160e+13	1.690e-07	8.380e-05	2.982e-10	1.479e-07
0.3	5.271e+13	1.620e-05	5.584e-03	3.074e-08	1.059e-05
0.4	2.330e+14	1.524e-03	3.301e-01	2.970e-06	6.432e-04
0.5	5.033e+14	3.154e-02	4.562e+00	6.191e-05	8.954e-03
0.6	5.541e+14	2.045e-01	2.095e+01	3.992e-04	4.089e-02
0.8	4.772e+14	2.567e+00	1.527e+02	4.883e-03	2.904e-01
1.0	2.388e+14	9.246e+00	3.642e+02	1.704e-02	6.714e-01
1.5	1.949e+14	2.066e+02	4.106e+03	3.476e-01	6.909e+00
2.0	3.660e+13	3.047e+02	4.033e+03	4.711e-01	6.236e+00
3.0	1.417e+10	1.396e+00	1.123e+01	1.894e-03	1.523e-02
4.0	2.154e+08	9.122e-02	5.410e-01	1.128e-04	6.692e-04
TOTALS:	2.466e+15	5.248e+02	8.694e+03	8.431e-01	1.417e+01

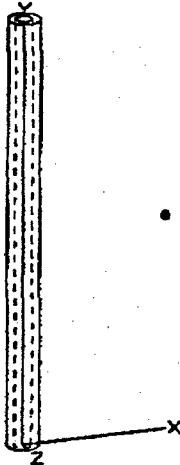
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2SP24GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:37:01 PM
 Duration: 00:02:11

EC-RADN-1135
 Page 139

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 24 Hour, Grove
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 304.8 cm 457.2 cm Z 0 cm
 10 ft 0.0 in 15 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	15.24 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded

Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	1.1103e-003	4.1083e+007	1.3650e-003	5.0505e+001
Am-242	1.7595e-001	6.5100e+009	2.1630e-001	8.0031e+003
Am-242m	7.2160e-005	2.6699e+006	8.8710e-005	3.2823e+000
Am-243	1.3633e-004	5.0443e+006	1.6760e-004	6.2012e+000
Am-244	1.1575e-001	4.2828e+009	1.4230e-001	5.2651e+003
Ba-135m	2.5518e-001	9.4415e+009	3.1370e-001	1.1607e+004
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	1.8042e-002	6.6756e+008	2.2180e-002	8.2066e+002
Ba-140	2.0198e+003	7.4732e+013	2.4830e+003	9.1871e+007
Ba-141				
Ba-142				
Br-82	1.5561e+001	5.7576e+011	1.9130e+001	7.0781e+005
Br-83	8.9804e-001	3.3227e+010	1.1040e+000	4.0848e+004
Br-84	4.0599e-011	1.5022e+000	4.9910e-011	1.8467e-006
Ce-141	1.9205e+001	7.1060e+011	2.3610e+001	8.7357e+005
Ce-143	1.1055e+001	4.0902e+011	1.3590e+001	5.0283e+005
Ce-144	1.6375e+001	6.0586e+011	2.0130e+001	7.4481e+005
Cm-242	2.8999e-001	1.0730e+010	3.5650e-001	1.3191e+004
Cm-243	1.2503e-004	4.6259e+006	1.5370e-004	5.6869e+000
Cm-244	1.6993e-002	6.2873e+008	2.0890e-002	7.7293e+002
Co-58	3.1879e-001	1.1795e+010	3.9190e-001	1.4500e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Co-60m				
Co-61	1.6171e-002	5.9833e+003	1.8880e-002	7.3556e-003
Cm-244	1.6993e-002	6.2873e+008	2.0890e-002	7.7293e+002
Co-58	3.1879e-001	1.1795e+010	3.9190e-001	1.4500e+004

Page : 2
 DOS File: 2SP24GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:37:01 PM
 Duration: 00:02:11

EC-RADN-1135
 Page 140

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Cs-132	2.1280e-001	7.8734e+009	2.6160e-001	9.6792e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-134m	8.6469e-001	3.1993e+010	1.0630e+000	3.9331e+004
Cs-136	3.7866e+002	1.4010e+013	4.6550e+002	1.7223e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
Cs-138	6.6092e-010	2.4454e+001	8.1250e-010	3.0063e-005
Cs-139				
Eu-152m	1.8058e-004	6.6816e+006	2.2200e-004	8.2140e+000
Eu-154	4.5927e-002	1.6993e+009	5.6460e-002	2.0890e+003
Eu-155	1.8888e-002	6.9886e+008	2.3220e-002	8.5914e+002
Eu-156	1.1413e+000	4.2226e+010	1.4030e+000	5.1911e+004
I-128				
I-130	4.5089e+001	1.6683e+012	5.5430e+001	2.0509e+006
I-131	6.5344e+003	2.4177e+014	8.0330e+003	2.9722e+008
I-132	8.3784e+003	3.1000e+014	1.0300e+004	3.8110e+008
I-133	6.6840e+003	2.4731e+014	8.2170e+003	3.0403e+008
I-134	3.7312e-004	1.3806e+007	4.5870e-004	1.6972e+001
I-135	1.0973e+003	4.0601e+013	1.3490e+003	4.9913e+007
La-140	8.8421e+000	3.2716e+011	1.0870e+001	4.0219e+005
La-141	1.2071e-001	4.4664e+009	1.4840e-001	5.4908e+003
La-142	1.4894e-004	5.5108e+006	1.8310e-004	6.7747e+000
Mo-99	8.5248e+001	3.1542e+012	1.0480e+002	3.8776e+006
Mo-101				
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nb-95m	9.2488e-002	3.4221e+009	1.1370e-001	4.2069e+003
Nb-96	6.6645e-003	2.4659e+008	8.1930e-003	3.0314e+002
Nb-97	3.1033e+000	1.1482e+011	3.8150e+000	1.4115e+005
Nb-97m	2.9292e+000	1.0838e+011	3.6010e+000	1.3324e+005
Nd-147	2.9593e+000	1.0949e+011	3.6380e+000	1.3461e+005
Nd-149	1.1974e-004	4.4303e+006	1.4720e-004	5.4464e+000
Np-236m	2.5192e-005	9.3211e+005	3.0970e-005	1.1459e+000
Np-238	3.6914e+000	1.3658e+011	4.5380e+000	1.6791e+005
Np-239	1.7294e+002	6.3987e+012	2.1260e+002	7.8662e+006
Np-240	4.2478e-008	1.5717e+003	5.2220e-008	1.9321e-003
Pd-109	6.6922e+000	2.4761e+011	8.2270e+000	3.0440e+005
Pm-147	1.0941e+000	4.0481e+010	1.3450e+000	4.9765e+004
Pm-148	7.7480e-001	2.8668e+010	9.5250e-001	3.5243e+004
Pm-148m	1.6594e-001	6.1398e+009	2.0400e-001	7.5480e+003
Pm-149	2.0979e+000	7.7621e+010	2.5790e+000	9.5423e+004
Pm-151	5.2874e-001	1.9563e+010	6.5000e-001	2.4050e+004
Pr-142	1.3365e-001	4.9450e+009	1.6430e-001	6.0791e+003
Pr-143	6.9500e+000	2.5715e+011	8.5440e+000	3.1613e+005
Pr-144	6.5506e+000	2.4237e+011	8.0530e+000	2.9796e+005
Pr-144m	9.1756e-002	3.3950e+009	1.1280e-001	4.1736e+003
Pu-237	7.1827e-005	2.6576e+006	8.8300e-005	3.2671e+000
Pu-238	4.9709e-002	1.8392e+009	6.1110e-002	2.2611e+003
Pu-239	5.2621e-003	1.9470e+008	6.4690e-003	2.3935e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Pu-243	1.5878e-001	5.8750e+009	1.9520e-001	7.2224e+003
Rb-86	1.1347e+001	4.1986e+011	1.3950e+001	5.1615e+005
Rb-88	1.2926e+001	4.7825e+011	1.5890e+001	5.8793e+005
Rh-103m	9.1431e+001	3.3829e+012	1.1240e+002	4.1588e+006
Rh-105	4.3641e+001	5.6147e+012	5.3650e+001	1.9851e+005
Rh-243	4.3641e+001	5.6147e+012	5.3650e+001	1.9851e+005
Rh-86	1.1347e+001	4.1986e+011	1.3950e+001	5.1615e+005

Page : 3
 DOS File: 2SP24GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:37:01 PM
 Duration: 00:02:11

EC-RADN-1135
 Page 141

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Rh-105m	4.4894e-001	1.6611e+010	5.5190e-001	2.0420e+004
Rh-106	3.7199e+001	1.3763e+012	4.5730e+001	1.6920e+006
Ru-103	9.1837e+001	3.3980e+012	1.1290e+002	4.1773e+006
Ru-105	1.5716e+000	5.8148e+010	1.9320e+000	7.1484e+004
Ru-106	3.7199e+001	1.3763e+012	4.5730e+001	1.6920e+006
Sb-122	1.7944e+000	6.6395e+010	2.2060e+000	8.1622e+004
Sb-124	1.0485e+000	3.8795e+010	1.2890e+000	4.7693e+004
Sb-125	1.4918e+001	5.5198e+011	1.8340e+001	6.7858e+005
Sb-126	4.7749e-001	1.7667e+010	5.8700e-001	2.1719e+004
Sb-126m	9.0617e-004	3.3528e+007	1.1140e-003	4.1218e+001
Sb-127	8.6469e+001	3.1993e+012	1.0630e+002	3.9331e+006
Sb-129	8.7282e+000	3.2294e+011	1.0730e+001	3.9701e+005
Sm-151	2.9731e-003	1.1001e+008	3.6550e-003	1.3524e+002
Sm-153	1.6131e+000	5.9683e+010	1.9830e+000	7.3371e+004
Sr-89	1.1055e+003	4.0902e+013	1.3590e+003	5.0283e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	2.4777e+002	9.1676e+012	3.0460e+002	1.1270e+007
Sr-92	3.2586e+000	1.2057e+011	4.0060e+000	1.4822e+005
Sr-93				
Tc-99	1.2015e-003	4.4454e+007	1.4770e-003	5.4649e+001
Tc-99m	8.2320e+001	3.0458e+012	1.0120e+002	3.7444e+006
Tc-101				
Te-123m	1.0477e-002	3.8765e+008	1.2880e-002	4.7656e+002
Te-125m	3.3018e+000	1.2216e+011	4.0590e+000	1.5018e+005
Te-127	9.3952e+001	3.4762e+012	1.1550e+002	4.2735e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	5.5452e+001	2.0517e+012	6.8170e+001	2.5223e+006
Te-129m	7.1412e+001	2.6422e+012	8.7790e+001	3.2482e+006
Te-131	3.0341e+001	1.1226e+012	3.7300e+001	1.3801e+006
Te-131m	1.3471e+002	4.9841e+012	1.6560e+002	6.1272e+006
Te-132	1.3552e+003	5.0142e+013	1.6660e+003	6.1642e+007
Te-133	3.6580e-006	1.3535e+005	4.4970e-006	1.6639e-001
Te-133m	1.6212e-005	5.9984e+005	1.9930e-005	7.3741e-001
Te-134	9.0617e-008	3.3528e+003	1.1140e-007	4.1218e-003
Y-90	5.8470e-001	2.1634e+010	7.1880e-001	2.6596e+004
Y-91	5.8202e+000	2.1535e+011	7.1550e+000	2.6473e+005
Y-91m	6.2846e-001	2.3253e+010	7.7260e-001	2.8586e+004
Y-92	1.9222e-001	7.1120e+009	2.3630e-001	8.7431e+003
Y-93	9.0454e-001	3.3468e+010	1.1120e+000	4.1144e+004
Zr-89	1.9449e-003	7.1963e+007	2.3910e-003	8.8467e+001
Zr-93	1.2934e-006	4.7855e+004	1.5900e-006	5.8830e-002
Zr-95	8.2401e+000	3.0489e+011	1.0130e+001	3.7481e+005
Zr-97	3.0854e+000	1.1416e+011	3.7930e+000	1.4034e+005

Buildup

The material reference is : Shield 1

Integration Parameters

Radial 20
 Circumferential 20
 Y Direction (axial) 25

Results

Circumferential 20
 Y Direction (axial) 25

Page : 4
 DOS File: 2SP24GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:37:01 PM
 Duration: 00:02:11

EC-RADN-1135
 Page 142

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	2.894e+09	8.531e-313	2.369e-25	7.317e-314	2.032e-26
0.02	6.257e+11	4.061e-137	8.061e-23	1.407e-138	2.792e-24
0.03	6.438e+13	5.405e-41	1.834e-20	5.357e-43	1.818e-22
0.04	1.477e+12	1.250e-18	5.099e-18	5.528e-21	2.255e-20
0.05	6.604e+12	3.846e-09	3.081e-08	1.025e-11	8.208e-11
0.06	1.918e+12	1.202e-05	1.540e-04	2.387e-08	3.059e-07
0.08	7.443e+12	1.191e-01	2.510e+00	1.885e-04	3.972e-03
0.1	7.097e+12	2.672e+00	7.308e+01	4.089e-03	1.118e-01
0.15	1.207e+13	9.796e+01	3.009e+03	1.613e-01	4.955e+00
0.2	5.010e+13	1.576e+03	4.475e+04	2.781e+00	7.899e+01
0.3	4.153e+13	6.061e+03	1.309e+05	1.150e+01	2.483e+02
0.4	2.123e+14	8.308e+04	1.374e+06	1.619e+02	2.677e+03
0.5	3.238e+14	2.640e+05	3.484e+06	5.182e+02	6.840e+03
0.6	4.864e+14	7.099e+05	7.744e+06	1.386e+03	1.511e+04
0.8	3.895e+14	1.389e+06	1.126e+07	2.642e+03	2.141e+04
1.0	1.347e+14	9.399e+05	6.086e+06	1.732e+03	1.122e+04
1.5	7.849e+13	1.742e+06	7.755e+06	2.931e+03	1.305e+04
2.0	1.499e+13	7.052e+05	2.512e+06	1.091e+03	3.884e+03
3.0	2.521e+10	3.066e+03	8.326e+03	4.160e+00	1.130e+01
4.0	1.447e+05	3.198e-02	7.342e-02	3.956e-05	9.083e-05
5.0	6.857e+08	2.308e+02	4.725e+02	2.646e-01	5.417e-01
TOTALS:	1.833e+15	5.844e+06	4.040e+07	1.048e+04	7.454e+04
	Sensitivity	Variable		(1 of 5)	(30.48 cm)
0.015	2.894e+09	0.000e+00	2.369e-25	0.000e+00	2.032e-26
0.02	6.257e+11	8.419e-192	8.061e-23	2.916e-193	2.792e-24
0.03	6.438e+13	7.610e-59	1.834e-20	7.542e-61	1.818e-22
0.04	1.477e+12	1.460e-27	1.116e-21	6.457e-30	4.935e-24
0.05	6.604e+12	6.462e-15	6.218e-14	1.721e-17	1.656e-16
0.06	1.918e+12	5.054e-10	9.241e-09	1.004e-12	1.836e-11
0.08	7.443e+12	7.055e-05	2.438e-03	1.116e-07	3.857e-06
0.1	7.097e+12	4.553e-03	2.382e-01	6.966e-06	3.644e-04
0.15	1.207e+13	4.919e-01	3.420e+01	8.100e-04	5.632e-02
0.2	5.010e+13	1.345e+01	9.099e+02	2.374e-02	1.606e+00
0.3	4.153e+13	9.829e+01	4.931e+03	1.865e-01	9.353e+00
0.4	2.123e+14	2.049e+03	7.462e+04	3.992e+00	1.454e+02
0.5	3.238e+14	8.874e+03	2.445e+05	1.742e+01	4.799e+02
0.6	4.864e+14	3.040e+04	6.622e+05	5.934e+01	1.293e+03
0.8	3.895e+14	8.562e+04	1.286e+06	1.628e+02	2.446e+03
1.0	1.347e+14	7.561e+04	8.545e+05	1.394e+02	1.575e+03
1.5	7.849e+13	2.181e+05	1.540e+06	3.669e+02	2.590e+03
2.0	1.499e+13	1.157e+05	6.147e+05	1.790e+02	9.505e+02
3.0	2.521e+10	6.905e+02	2.588e+03	9.368e-01	3.511e+00
4.0	1.447e+05	8.620e-03	2.612e-02	1.066e-05	3.231e-05
5.0	6.857e+08	6.981e+01	1.819e+02	8.003e-02	2.085e-01
TOTALS:	1.833e+15	5.372e+05	5.285e+06	9.300e+02	9.494e+03
	Sensitivity	Variable		(2 of 5)	(45.72 cm)
TOTALS:	1.833e+15	5.372e+05	5.285e+06	9.300e+02	9.494e+03

Page : 5
 DOS File: 2SP24GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:37:01 PM
 Duration: 00:02:11

EC-RADN-1135
 Page 143

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	2.894e+09	0.000e+00	2.369e-25	0.000e+00	2.032e-26
0.02	6.257e+11	1.854e-246	8.061e-23	6.422e-248	2.792e-24
0.03	6.438e+13	1.143e-76	1.834e-20	1.133e-78	1.818e-22
0.04	1.477e+12	1.826e-36	1.116e-21	8.076e-39	4.935e-24
0.05	6.604e+12	1.170e-20	1.318e-19	3.116e-23	3.511e-22
0.06	1.918e+12	2.306e-14	6.105e-13	4.580e-17	1.213e-15
0.08	7.443e+12	4.587e-08	2.289e-06	7.259e-11	3.622e-09
0.1	7.097e+12	8.582e-06	7.247e-04	1.313e-08	1.109e-06
0.15	1.207e+13	2.750e-03	3.509e-01	4.529e-06	5.778e-04
0.2	5.010e+13	1.278e-01	1.653e+01	2.256e-04	2.918e-02
0.3	4.153e+13	1.766e+00	1.660e+02	3.351e-03	3.148e-01
0.4	2.123e+14	5.575e+01	3.645e+03	1.086e-01	7.101e+00
0.5	3.238e+14	3.277e+02	1.559e+04	6.432e-01	3.059e+01
0.6	4.864e+14	1.425e+03	5.171e+04	2.781e+00	1.009e+02
0.8	3.895e+14	5.739e+03	1.358e+05	1.092e+01	2.584e+02
1.0	1.347e+14	6.579e+03	1.124e+05	1.213e+01	2.072e+02
1.5	7.849e+13	2.921e+04	2.902e+05	4.915e+01	4.883e+02
2.0	1.499e+13	2.016e+04	1.443e+05	3.118e+01	2.231e+02
3.0	2.521e+10	1.634e+02	7.834e+02	2.216e-01	1.063e+00
4.0	1.447e+05	2.426e-03	9.100e-03	3.001e-06	1.126e-05
5.0	6.857e+08	2.194e+01	6.915e+01	2.515e-02	7.927e-02
TOTALS:	1.833e+15	6.369e+04	7.547e+05	1.072e+02	1.317e+03

Energy	Activity	Sensitivity Variable		(3 of 5)	
		Variable	Variable	(3 of 5)	(60.96 cm)
0.015	2.894e+09	0.000e+00	2.369e-25	0.000e+00	2.032e-26
0.02	6.257e+11	4.222e-301	8.061e-23	1.463e-302	2.792e-24
0.03	6.438e+13	1.778e-94	1.834e-20	1.763e-96	1.818e-22
0.04	1.477e+12	2.366e-45	1.116e-21	1.046e-47	4.935e-24
0.05	6.604e+12	2.199e-26	1.631e-20	5.859e-29	4.345e-23
0.06	1.918e+12	1.096e-18	4.292e-17	2.176e-21	8.526e-20
0.08	7.443e+12	3.121e-11	2.064e-09	4.938e-14	3.266e-12
0.1	7.097e+12	1.697e-08	2.088e-06	2.596e-11	3.194e-09
0.15	1.207e+13	1.616e-05	3.347e-03	2.662e-08	5.512e-06
0.2	5.010e+13	1.277e-03	2.788e-01	2.253e-06	4.921e-04
0.3	4.153e+13	3.332e-02	5.198e+00	6.320e-05	9.860e-03
0.4	2.123e+14	1.589e+00	1.661e+02	3.097e-03	3.236e-01
0.5	3.238e+14	1.266e+01	9.312e+02	2.485e-02	1.828e+00
0.6	4.864e+14	6.980e+01	3.803e+03	1.362e-01	7.423e+00
0.8	3.895e+14	4.012e+02	1.361e+04	7.630e-01	2.588e+01
1.0	1.347e+14	5.960e+02	1.415e+04	1.099e+00	2.608e+01
1.5	7.849e+13	4.059e+03	5.295e+04	6.829e+00	8.908e+01
2.0	1.499e+13	3.632e+03	3.304e+04	5.617e+00	5.110e+01
3.0	2.521e+10	3.978e+01	2.329e+02	5.397e-02	3.160e-01
4.0	1.447e+05	7.004e-04	3.134e-03	8.665e-07	3.877e-06
5.0	6.857e+08	7.062e+00	2.610e+01	8.096e-03	2.992e-02
TOTALS:	1.833e+15	8.819e+03	1.189e+05	1.453e+01	2.021e+02

Energy	Activity	Sensitivity Variable		(4 of 5)	
		Variable	Variable	(4 of 5)	(76.2 cm)
TOTALS:	1.833e+15	8.819e+03	1.189e+05	1.453e+01	2.021e+02

Page : 6
 DOS File: 2SP24GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:37:01 PM
 Duration: 00:02:11

EC-RADN-1135
 Page 144

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	2.894e+09	0.000e+00	2.369e-25	0.000e+00	2.032e-26
0.02	6.257e+11	0.000e+00	8.061e-23	0.000e+00	2.792e-24
0.03	6.438e+13	2.826e-112	1.834e-20	2.800e-114	1.818e-22
0.04	1.477e+12	3.133e-54	1.116e-21	1.386e-56	4.935e-24
0.05	6.604e+12	4.232e-32	1.631e-20	1.127e-34	4.345e-23
0.06	1.918e+12	5.334e-23	3.524e-20	1.060e-25	6.999e-23
0.08	7.443e+12	2.180e-14	1.791e-12	3.450e-17	2.834e-15
0.1	7.097e+12	3.450e-11	5.853e-09	5.279e-14	8.955e-12
0.15	1.207e+13	9.778e-08	3.037e-05	1.610e-10	5.002e-08
0.2	5.010e+13	1.312e-05	4.444e-03	2.316e-08	7.843e-06
0.3	4.153e+13	6.462e-04	1.544e-01	1.226e-06	2.929e-04
0.4	2.123e+14	4.656e-02	7.196e+00	9.073e-05	1.402e-02
0.5	3.238e+14	5.025e-01	5.318e+01	9.863e-04	1.044e-01
0.6	4.864e+14	3.510e+00	2.686e+02	6.851e-03	5.242e-01
0.8	3.895e+14	2.875e+01	1.321e+03	5.469e-02	2.512e+00
1.0	1.347e+14	5.531e+01	1.726e+03	1.019e-01	3.182e+00
1.5	7.849e+13	5.767e+02	9.430e+03	9.703e-01	1.587e+01
2.0	1.499e+13	6.684e+02	7.434e+03	1.034e+00	1.150e+01
3.0	2.521e+10	9.874e+00	6.852e+01	1.340e-02	9.296e-02
4.0	1.447e+05	2.058e-04	1.071e-03	2.546e-07	1.324e-06
5.0	6.857e+08	2.310e+00	9.789e+00	2.649e-03	1.122e-02

TOTALS: 1.833e+15 1.345e+03 2.032e+04 2.185e+00 3.380e+01

Energy MeV	Activity photons/sec	Sensitivity Variable		(5 of 5) (91.44 cm)	
		Variable	Variable	(5 of 5)	(91.44 cm)
0.015	2.894e+09	0.000e+00	2.369e-25	0.000e+00	2.032e-26
0.02	6.257e+11	0.000e+00	8.061e-23	0.000e+00	2.792e-24
0.03	6.438e+13	4.552e-130	1.834e-20	4.511e-132	1.818e-22
0.04	1.477e+12	4.211e-63	1.116e-21	1.863e-65	4.935e-24
0.05	6.604e+12	8.271e-38	1.631e-20	2.203e-40	4.345e-23
0.06	1.918e+12	2.640e-27	3.400e-20	5.244e-30	6.753e-23
0.08	7.443e+12	1.550e-17	1.484e-15	2.453e-20	2.349e-18
0.1	7.097e+12	7.145e-14	1.598e-11	1.093e-16	2.445e-14
0.15	1.207e+13	6.027e-10	2.665e-07	9.925e-13	4.388e-10
0.2	5.010e+13	1.374e-07	6.816e-05	2.426e-10	1.203e-07
0.3	4.153e+13	1.277e-05	4.400e-03	2.422e-08	8.345e-06
0.4	2.123e+14	1.389e-03	3.008e-01	2.706e-06	5.861e-04
0.5	3.238e+14	2.029e-02	2.935e+00	3.983e-05	5.761e-03
0.6	4.864e+14	1.795e-01	1.839e+01	3.504e-04	3.589e-02
0.8	3.895e+14	2.096e+00	1.246e+02	3.986e-03	2.371e-01
1.0	1.347e+14	5.216e+00	2.055e+02	9.615e-03	3.788e-01
1.5	7.849e+13	8.321e+01	1.654e+03	1.400e-01	2.783e+00
2.0	1.499e+13	1.248e+02	1.652e+03	1.930e-01	2.554e+00
3.0	2.521e+10	2.484e+00	1.998e+01	3.370e-03	2.711e-02
4.0	1.447e+05	6.125e-05	3.632e-04	7.577e-08	4.493e-07
5.0	6.857e+08	7.649e-01	3.658e+00	8.768e-04	4.194e-03

TOTALS: 1.833e+15 2.188e+02 3.681e+03 3.512e-01 6.026e+00

TOTALS: 1.833e+15 2.188e+02 3.681e+03 3.512e-01 6.026e+00

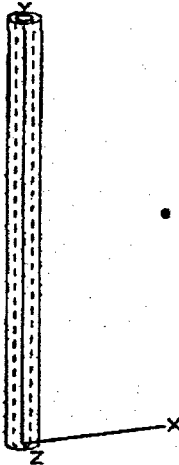
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2SP24I38.MS5
 Run Date: August 19, 2005
 Run Time: 2:39:13 PM
 Duration: 00:01:58

EC-RADN-1135
 Page 145

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 24 Hour, ICRP38
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X Y Z
 304.8 cm 457.2 cm 0 cm
 10 ft 0.0 in 15 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	15.24 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : ICRP-38

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Cs-135m	1.6749e-006	6.1970e+004	2.0590e-006	7.6183e-002
Eu-157	3.8573e-002	1.4272e+009	4.7420e-002	1.7545e+003
Eu-158	1.6659e-011	6.1639e-001	2.0480e-011	7.5776e-007
La-143				
Nd-151				
Pm-150	4.8546e-005	1.7962e+006	5.9680e-005	2.2082e+000
Pr-145	3.0927e-001	1.1443e+010	3.8020e-001	1.4067e+004
Pr-147				
Rh-106m	6.0268e-004	2.2299e+007	7.4090e-004	2.7413e+001
Rh-107				
Sb-128a	2.9015e+000	1.0736e+011	3.5670e+000	1.3198e+005
Sb-128b	9.2244e-006	3.4130e+005	1.1340e-005	4.1958e-001
Sb-130	1.3300e-009	4.9209e+001	1.6350e-009	6.0495e-005
Sb-131				
Se-81	1.6708e-007	6.1820e+003	2.0540e-007	7.5998e-003
Se-81m	1.1307e-007	4.1835e+003	1.3900e-007	5.1430e-003
Se-83				
Sm-155				
Sm-156	1.9051e-001	7.0488e+009	2.3420e-001	8.6654e+003
Y-94				
Y-95				

Buildup
 The material reference is : Shield 1
 Y-94
 v-05

Integration Parameters

Radial 20
 Circumferential 20
 Y Direction (axial) 25

Energy MeV	Activity photons/sec	Results			
		Fluence Rate	Fluence Rate	Exposure Rate	Exposure Rate
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.02	5.468e+08	3.549e-140	7.045e-26	1.229e-141	2.440e-27
0.03	3.045e+09	2.556e-45	8.675e-25	2.534e-47	8.598e-27
0.04	1.739e+09	1.472e-21	6.003e-21	6.508e-24	2.655e-23
0.05	4.414e+08	2.571e-13	2.059e-12	6.848e-16	5.486e-15
0.06	4.338e+08	2.719e-09	3.484e-08	5.401e-12	6.921e-11
0.08	1.709e+09	2.736e-05	5.765e-04	4.330e-08	9.123e-07
0.1	3.947e+03	1.486e-09	4.064e-08	2.274e-12	6.218e-11
0.15	1.037e+09	8.420e-03	2.586e-01	1.387e-05	4.259e-04
0.2	2.844e+09	8.946e-02	2.541e+00	1.579e-04	4.485e-03
0.3	9.911e+10	1.447e+01	3.124e+02	2.744e-02	5.925e-01
0.4	4.685e+08	1.834e-01	3.032e+00	3.573e-04	5.908e-03
0.5	8.020e+07	6.538e-02	8.629e-01	1.283e-04	1.694e-03
0.6	3.791e+09	5.534e+00	6.037e+01	1.080e-02	1.178e-01
0.8	2.246e+11	8.010e+02	6.492e+03	1.524e+00	1.235e+01
1.0	8.672e+09	6.050e+01	3.918e+02	1.115e-01	7.221e-01
1.5	1.511e+09	3.352e+01	1.493e+02	5.640e-02	2.511e-01
2.0	1.088e+06	5.118e-02	1.823e-01	7.914e-05	2.819e-04
3.0	2.211e+04	2.689e-03	7.302e-03	3.648e-06	9.907e-06
TOTALS:	3.500e+11	9.155e+02	7.412e+03	1.731e+00	1.404e+01

Energy	Sensitivity	Variable	(1 of 5)		
			Fluence Rate	Exposure Rate	Variable
0.02	5.468e+08	7.357e-195	7.045e-26	2.549e-196	(30.48 cm)
0.03	3.045e+09	3.599e-63	8.675e-25	3.567e-65	2.440e-27
0.04	1.739e+09	1.719e-30	1.314e-24	7.601e-33	8.598e-27
0.05	4.414e+08	4.319e-19	4.156e-18	1.150e-21	5.809e-27
0.06	4.338e+08	1.143e-13	2.091e-12	2.271e-16	1.107e-20
0.08	1.709e+09	1.620e-08	5.599e-07	2.564e-11	4.152e-15
0.1	3.947e+03	2.532e-12	1.325e-10	3.874e-15	8.860e-10
0.15	1.037e+09	4.228e-05	2.940e-03	6.962e-08	2.027e-13
0.2	2.844e+09	7.638e-04	5.166e-02	1.348e-06	4.841e-06
0.3	9.911e+10	2.346e-01	1.177e+01	4.450e-04	9.118e-05
0.4	4.685e+08	4.523e-03	1.647e-01	8.812e-06	2.232e-02
0.5	8.020e+07	2.198e-03	6.055e-02	4.314e-06	3.209e-04
0.6	3.791e+09	2.370e-01	5.162e+00	4.626e-04	1.188e-04
0.8	2.246e+11	4.937e+01	7.415e+02	9.390e-02	1.008e-02
1.0	8.672e+09	4.867e+00	5.500e+01	8.971e-03	1.410e+00
1.5	1.511e+09	4.197e+00	2.963e+01	7.061e-03	1.014e-01
2.0	1.088e+06	8.399e-03	4.461e-02	1.299e-05	4.985e-02
3.0	2.211e+04	6.056e-04	2.270e-03	8.216e-07	6.898e-05
TOTALS:	3.500e+11	5.892e+01	8.434e+02	1.109e-01	3.080e-06

Energy	Sensitivity	Variable	(2 of 5)		
			Fluence Rate	Exposure Rate	Variable
TOTALS:	3.500e+11	5.892e+01	8.434e+02	1.109e-01	(45.72 cm)
TOTALS:	3.500e+11	5.892e+01	8.434e+02	1.109e-01	1.595e+00

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec	MeV/cm ² /sec	mR/hr	mR/hr
		No Buildup	With Buildup	No Buildup	With Buildup
0.02	5.468e+08	1.620e-249	7.045e-26	5.612e-251	2.440e-27
0.03	3.045e+09	5.408e-81	8.675e-25	5.360e-83	8.598e-27
0.04	1.739e+09	2.150e-39	1.314e-24	9.507e-42	5.809e-27
0.05	4.414e+08	7.818e-25	8.808e-24	2.083e-27	2.346e-26
0.06	4.338e+08	5.216e-18	1.381e-16	1.036e-20	2.743e-19
0.08	1.709e+09	1.054e-11	5.257e-10	1.667e-14	8.319e-13
0.1	3.947e+03	4.773e-15	4.031e-13	7.303e-18	6.166e-16
0.15	1.037e+09	2.364e-07	3.016e-05	3.892e-10	4.966e-08
0.2	2.844e+09	7.257e-06	9.387e-04	1.281e-08	1.657e-06
0.3	9.911e+10	4.216e-03	3.961e-01	7.997e-06	7.514e-04
0.4	4.685e+08	1.230e-04	8.044e-03	2.397e-07	1.567e-05
0.5	8.020e+07	8.115e-05	3.860e-03	1.593e-07	7.577e-06
0.6	3.791e+09	1.111e-02	4.031e-01	2.168e-05	7.868e-04
0.8	2.246e+11	3.309e+00	7.832e+01	6.294e-03	1.490e-01
1.0	8.672e+09	4.235e-01	7.237e+00	7.806e-04	1.334e-02
1.5	1.511e+09	5.623e-01	5.585e+00	9.460e-04	9.397e-03
2.0	1.088e+06	1.463e-03	1.047e-02	2.263e-06	1.619e-05
3.0	2.211e+04	1.433e-04	6.870e-04	1.944e-07	9.321e-07
TOTALS:	3.500e+11	4.312e+00	9.197e+01	8.053e-03	1.733e-01

Sensitivity		Variable	(3 of 5)		(60.96 cm)
0.02	5.468e+08	3.690e-304	7.045e-26	1.278e-305	2.440e-27
0.03	3.045e+09	8.411e-99	8.675e-25	8.336e-101	8.598e-27
0.04	1.739e+09	2.785e-48	1.314e-24	1.232e-50	5.809e-27
0.05	4.414e+08	1.470e-30	1.090e-24	3.916e-33	2.904e-27
0.06	4.338e+08	2.478e-22	9.710e-21	4.922e-25	1.929e-23
0.08	1.709e+09	7.167e-15	4.741e-13	1.134e-17	7.502e-16
0.1	3.947e+03	9.438e-18	1.161e-15	1.444e-20	1.777e-18
0.15	1.037e+09	1.389e-09	2.877e-07	2.288e-12	4.737e-10
0.2	2.844e+09	7.248e-08	1.583e-05	1.279e-10	2.794e-08
0.3	9.911e+10	7.952e-05	1.241e-02	1.508e-07	2.353e-05
0.4	4.685e+08	3.508e-06	3.666e-04	6.835e-09	7.142e-07
0.5	8.020e+07	3.136e-06	2.306e-04	6.155e-09	4.526e-07
0.6	3.791e+09	5.441e-04	2.964e-02	1.062e-06	5.786e-05
0.8	2.246e+11	2.313e-01	7.846e+00	4.400e-04	1.492e-02
1.0	8.672e+09	3.836e-02	9.109e-01	7.071e-05	1.679e-03
1.5	1.511e+09	7.812e-02	1.019e+00	1.314e-04	1.715e-03
2.0	1.088e+06	2.636e-04	2.398e-03	4.077e-07	3.709e-06
3.0	2.211e+04	3.489e-05	2.043e-04	4.733e-08	2.772e-07
TOTALS:	3.500e+11	3.487e-01	9.821e+00	6.438e-04	1.840e-02

Sensitivity		Variable	(4 of 5)		(76.2 cm)
0.02	5.468e+08	0.000e+00	7.045e-26	0.000e+00	2.440e-27
0.03	3.045e+09	1.336e-116	8.675e-25	1.324e-118	8.598e-27
0.04	1.739e+09	3.688e-57	1.314e-24	1.631e-59	5.809e-27
0.05	4.414e+08	2.829e-36	1.090e-24	7.535e-39	2.904e-27
0.06	4.338e+08	1.207e-26	7.971e-24	2.397e-29	1.583e-26
0.08	1.709e+09	5.007e-18	4.113e-16	7.924e-21	6.509e-19
0.05	4.414e+08	2.829e-36	1.090e-24	7.535e-39	2.904e-27
0.06	4.338e+08	1.207e-26	7.971e-24	2.397e-29	1.583e-26

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.1	3.947e+03	1.919e-20	3.256e-18	2.936e-23	4.981e-21
0.15	1.037e+09	8.404e-12	2.611e-09	1.384e-14	4.299e-12
0.2	2.844e+09	7.450e-10	2.523e-07	1.315e-12	4.453e-10
0.3	9.911e+10	1.542e-06	3.685e-04	2.926e-09	6.990e-07
0.4	4.685e+08	1.028e-07	1.588e-05	2.002e-10	3.095e-08
0.5	8.020e+07	1.244e-07	1.317e-05	2.443e-10	2.585e-08
0.6	3.791e+09	2.736e-05	2.094e-03	5.340e-08	4.087e-06
0.8	2.246e+11	1.658e-02	7.616e-01	3.154e-05	1.449e-03
1.0	8.672e+09	3.560e-03	1.111e-01	6.562e-06	2.048e-04
1.5	1.511e+09	1.110e-02	1.815e-01	1.868e-05	3.054e-04
2.0	1.088e+06	4.851e-05	5.395e-04	7.501e-08	8.343e-07
3.0	2.211e+04	8.660e-06	6.009e-05	1.175e-08	8.153e-08
TOTALS:	3.500e+11	3.133e-02	1.057e+00	5.692e-05	1.965e-03

Energy MeV	Activity photons/sec	Sensitivity		Variable	
		Variable	Variable	(5 of 5)	(91.44 cm)
0.02	5.468e+08	0.000e+00	7.045e-26	0.000e+00	2.440e-27
0.03	3.045e+09	2.153e-134	8.675e-25	2.134e-136	8.598e-27
0.04	1.739e+09	4.958e-66	1.314e-24	2.193e-68	5.809e-27
0.05	4.414e+08	5.528e-42	1.090e-24	1.473e-44	2.904e-27
0.06	4.338e+08	5.972e-31	7.691e-24	1.186e-33	1.528e-26
0.08	1.709e+09	3.560e-21	3.409e-19	5.634e-24	5.395e-22
0.1	3.947e+03	3.974e-23	8.890e-21	6.080e-26	1.360e-23
0.15	1.037e+09	5.180e-14	2.290e-11	8.531e-17	3.772e-14
0.2	2.844e+09	7.802e-12	3.870e-09	1.377e-14	6.830e-12
0.3	9.911e+10	3.047e-08	1.050e-05	5.780e-11	1.992e-08
0.4	4.685e+08	3.065e-09	6.639e-07	5.973e-12	1.294e-09
0.5	8.020e+07	5.025e-09	7.269e-07	9.864e-12	1.427e-09
0.6	3.791e+09	1.400e-06	1.434e-04	2.732e-09	2.798e-07
0.8	2.246e+11	1.208e-03	7.187e-02	2.298e-06	1.367e-04
1.0	8.672e+09	3.358e-04	1.323e-02	6.189e-07	2.438e-05
1.5	1.511e+09	1.602e-03	3.184e-02	2.695e-06	5.356e-05
2.0	1.088e+06	9.056e-06	1.199e-04	1.400e-08	1.854e-07
3.0	2.211e+04	2.179e-06	1.752e-05	2.956e-09	2.378e-08
TOTALS:	3.500e+11	3.158e-03	1.172e-01	5.632e-06	2.152e-04

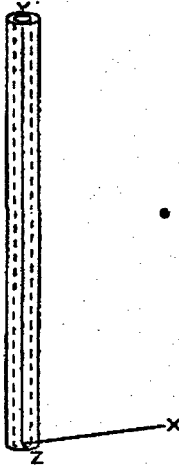
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2SP24RAD.MS5
 Run Date: August 19, 2005
 Run Time: 2:41:13 PM
 Duration: 00:02:08

EC-RADN-1135
 Page 149

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 24 Hour, RADTRAD
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 304.8 cm 457.2 cm Z 0 cm
 10 ft 0.0 in 15 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	15.24 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded

Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	1.1103e-003	4.1083e+007	1.3650e-003	5.0505e+001
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	1.8042e-002	6.6756e+008	2.2180e-002	8.2066e+002
Ba-140	2.0198e+003	7.4732e+013	2.4830e+003	9.1871e+007
Ce-141	1.9205e+001	7.1060e+011	2.3610e+001	8.7357e+005
Ce-143	1.1055e+001	4.0902e+011	1.3590e+001	5.0283e+005
Ce-144	1.6375e+001	6.0586e+011	2.0130e+001	7.4481e+005
Cm-242	2.8999e-001	1.0730e+010	3.5650e-001	1.3191e+004
Cm-244	1.6993e-002	6.2873e+008	2.0890e-002	7.7293e+002
Co-58	3.1879e-001	1.1795e+010	3.9190e-001	1.4500e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-136	3.7866e+002	1.4010e+013	4.6550e+002	1.7223e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
I-131	6.5344e+003	2.4177e+014	8.0330e+003	2.9722e+008
I-132	8.3784e+003	3.1000e+014	1.0300e+004	3.8110e+008
I-133	6.6840e+003	2.4731e+014	8.2170e+003	3.0403e+008
I-134	3.7312e-004	1.3806e+007	4.5870e-004	1.6972e+001
I-135	1.0973e+003	4.0601e+013	1.3490e+003	4.9913e+007
La-140	8.8421e+000	3.2716e+011	1.0870e+001	4.0219e+005
La-141	1.2071e-001	4.4664e+009	1.4840e-001	5.4908e+003
La-142	1.4894e-004	5.5108e+006	1.8310e-004	6.7747e+000
Mo-99	8.5248e+001	3.1542e+012	1.0480e+002	3.8776e+006
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
La-140	8.8421e+000	3.2716e+011	1.0870e+001	4.0219e+005
La-141	1.2071e-001	4.4664e+009	1.4840e-001	5.4908e+003

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Nd-147	2.9593e+000	1.0949e+011	3.6380e+000	1.3461e+005
Np-239	1.7294e+002	6.3987e+012	2.1260e+002	7.8662e+006
Pr-143	6.9500e+000	2.5715e+011	8.5440e+000	3.1613e+005
Pr-144	6.5506e+000	2.4237e+011	8.0530e+000	2.9796e+005
Pu-238	4.9709e-002	1.8392e+009	6.1110e-002	2.2611e+003
Pu-239	5.2621e-003	1.9470e+008	6.4690e-003	2.3935e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1347e+001	4.1986e+011	1.3950e+001	5.1615e+005
Rh-103m	9.1431e+001	3.3829e+012	1.1240e+002	4.1588e+006
Rh-105	4.3641e+001	1.6147e+012	5.3650e+001	1.9851e+006
Rh-106	3.7199e+001	1.3763e+012	4.5730e+001	1.6920e+006
Ru-103	9.1837e+001	3.3980e+012	1.1290e+002	4.1773e+006
Ru-105	1.5716e+000	5.8148e+010	1.9320e+000	7.1484e+004
Ru-106	3.7199e+001	1.3763e+012	4.5730e+001	1.6920e+006
Sb-127	8.6469e+001	3.1993e+012	1.0630e+002	3.9331e+006
Sb-129	8.7282e+000	3.2294e+011	1.0730e+001	3.9701e+005
Sr-89	1.1055e+003	4.0902e+013	1.3590e+003	5.0283e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	2.4777e+002	9.1676e+012	3.0460e+002	1.1270e+007
Sr-92	3.2586e+000	1.2057e+011	4.0060e+000	1.4822e+005
Tc-99m	8.2320e+001	3.0458e+012	1.0120e+002	3.7444e+006
Te-127	9.3952e+001	3.4762e+012	1.1550e+002	4.2735e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	5.5452e+001	2.0517e+012	6.8170e+001	2.5223e+006
Te-129m	7.1412e+001	2.6422e+012	8.7790e+001	3.2482e+006
Te-131m	1.3471e+002	4.9841e+012	1.6560e+002	6.1272e+006
Te-132	1.3552e+003	5.0142e+013	1.6660e+003	6.1642e+007
Y-90	5.8470e-001	2.1634e+010	7.1880e-001	2.6596e+004
Y-91	5.8202e+000	2.1535e+011	7.1550e+000	2.6473e+005
Y-92	1.9222e-001	7.1120e+009	2.3630e-001	8.7431e+003
Y-93	9.0454e-001	3.3468e+010	1.1120e+000	4.1144e+004
Zr-95	8.2401e+000	3.0489e+011	1.0130e+001	3.7481e+005
Zr-97	3.0854e+000	1.1416e+011	3.7930e+000	1.4034e+005

Buildup

The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	2.845e+08	8.385e-314	2.329e-26	7.192e-315	1.998e-27
0.02	6.183e+11	4.014e-137	7.967e-23	1.390e-138	2.760e-24
0.03	6.381e+13	5.357e-41	1.818e-20	5.309e-43	1.802e-22
0.04	1.405e+12	1.189e-18	4.850e-18	5.258e-21	2.145e-20
0.05	6.594e+12	3.841e-09	3.077e-08	1.023e-11	8.196e-11
0.03	6.381e+13	5.357e-41	1.818e-20	5.309e-43	1.802e-22
0.04	1.405e+12	1.189e-18	4.850e-18	5.258e-21	2.145e-20

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.06	1.914e+12	1.200e-05	1.537e-04	2.383e-08	3.053e-07
0.08	7.437e+12	1.190e-01	2.508e+00	1.884e-04	3.969e-03
0.1	7.069e+12	2.662e+00	7.279e+01	4.073e-03	1.114e-01
0.15	1.128e+13	9.156e+01	2.812e+03	1.508e-01	4.631e+00
0.2	5.004e+13	1.574e+03	4.470e+04	2.778e+00	7.889e+01
0.3	4.150e+13	6.057e+03	1.308e+05	1.149e+01	2.481e+02
0.4	2.115e+14	8.278e+04	1.369e+06	1.613e+02	2.667e+03
0.5	3.218e+14	2.624e+05	3.463e+06	5.150e+02	6.797e+03
0.6	4.833e+14	7.054e+05	7.695e+06	1.377e+03	1.502e+04
0.8	3.873e+14	1.381e+06	1.119e+07	2.627e+03	2.129e+04
1.0	1.341e+14	9.354e+05	6.057e+06	1.724e+03	1.117e+04
1.5	7.817e+13	1.735e+06	7.723e+06	2.919e+03	1.299e+04
2.0	1.487e+13	6.996e+05	2.492e+06	1.082e+03	3.853e+03
3.0	1.165e+10	1.417e+03	3.848e+03	1.923e+00	5.220e+00
4.0	1.447e+05	3.198e-02	7.342e-02	3.956e-05	9.083e-05

TOTALS: 1.823e+15 5.811e+06 4.017e+07 1.042e+04 7.412e+04

Sensitivity	Variable	(1 of 5) (30.48 cm)			
0.015	2.845e+08	0.000e+00	2.329e-26	0.000e+00	1.998e-27
0.02	6.183e+11	8.320e-192	7.967e-23	2.882e-193	2.760e-24
0.03	6.381e+13	7.541e-59	1.818e-20	7.474e-61	1.802e-22
0.04	1.405e+12	1.389e-27	1.061e-21	6.142e-30	4.694e-24
0.05	6.594e+12	6.452e-15	6.208e-14	1.719e-17	1.654e-16
0.06	1.914e+12	5.044e-10	9.223e-09	1.002e-12	1.832e-11
0.08	7.437e+12	7.049e-05	2.436e-03	1.116e-07	3.854e-06
0.1	7.069e+12	4.535e-03	2.373e-01	6.938e-06	3.630e-04
0.15	1.128e+13	4.597e-01	3.197e+01	7.571e-04	5.264e-02
0.2	5.004e+13	1.344e+01	9.088e+02	2.372e-02	1.604e+00
0.3	4.150e+13	9.823e+01	4.927e+03	1.863e-01	9.347e+00
0.4	2.115e+14	2.042e+03	7.435e+04	3.978e+00	1.449e+02
0.5	3.218e+14	8.819e+03	2.430e+05	1.731e+01	4.769e+02
0.6	4.833e+14	3.021e+04	6.581e+05	5.896e+01	1.284e+03
0.8	3.873e+14	8.512e+04	1.279e+06	1.619e+02	2.432e+03
1.0	1.341e+14	7.525e+04	8.504e+05	1.387e+02	1.568e+03
1.5	7.817e+13	2.172e+05	1.533e+06	3.654e+02	2.580e+03
2.0	1.487e+13	1.148e+05	6.098e+05	1.775e+02	9.429e+02
3.0	1.165e+10	3.191e+02	1.196e+03	4.329e-01	1.623e+00
4.0	1.447e+05	8.620e-03	2.612e-02	1.066e-05	3.231e-05

TOTALS: 1.823e+15 5.338e+05 5.254e+06 9.244e+02 9.441e+03

Sensitivity	Variable	(2 of 5) (45.72 cm)			
0.015	2.845e+08	0.000e+00	2.329e-26	0.000e+00	1.998e-27
0.02	6.183e+11	1.832e-246	7.967e-23	6.346e-248	2.760e-24
0.03	6.381e+13	1.133e-76	1.818e-20	1.123e-78	1.802e-22
0.04	1.405e+12	1.737e-36	1.061e-21	7.681e-39	4.694e-24
0.05	6.594e+12	1.168e-20	1.316e-19	3.111e-23	3.505e-22
0.06	1.914e+12	2.301e-14	6.093e-13	4.570e-17	1.210e-15
0.08	7.437e+12	4.584e-08	2.287e-06	7.254e-11	3.619e-09

U.05 6.594e+12 1.168e-20 1.316e-19 3.111e-23 3.505e-22
 0.06 1.914e+12 2.301e-14 6.093e-13 4.570e-17 1.210e-15

Page : 4
 DOS File: 2SP24RAD.MS5
 Run Date: August 19, 2005
 Run Time: 2:41:13 PM
 Duration: 00:02:08

EC-RADN-1135
 Page 152

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.1	7.069e+12	8.548e-06	7.218e-04	1.308e-08	1.104e-06
0.15	1.128e+13	2.570e-03	3.279e-01	4.233e-06	5.400e-04
0.2	5.004e+13	1.277e-01	1.651e+01	2.253e-04	2.915e-02
0.3	4.150e+13	1.765e+00	1.659e+02	3.349e-03	3.146e-01
0.4	2.115e+14	5.554e+01	3.631e+03	1.082e-01	7.076e+00
0.5	3.218e+14	3.257e+02	1.549e+04	6.392e-01	3.040e+01
0.6	4.833e+14	1.416e+03	5.138e+04	2.764e+00	1.003e+02
0.8	3.873e+14	5.706e+03	1.350e+05	1.085e+01	2.569e+02
1.0	1.341e+14	6.548e+03	1.119e+05	1.207e+01	2.062e+02
1.5	7.817e+13	2.909e+04	2.890e+05	4.895e+01	4.863e+02
2.0	1.487e+13	2.000e+04	1.431e+05	3.093e+01	2.213e+02
3.0	1.165e+10	7.549e+01	3.620e+02	1.024e-01	4.911e-01
4.0	1.447e+05	2.426e-03	9.100e-03	3.001e-06	1.126e-05
TOTALS:	1.823e+15	6.323e+04	7.501e+05	1.064e+02	1.309e+03

Energy	Sensitivity	Variable	(3 of 5)		(60.96 cm)
			MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	
0.015	2.845e+08	0.000e+00	2.329e-26	0.000e+00	1.998e-27
0.02	6.183e+11	4.173e-301	7.967e-23	1.445e-302	2.760e-24
0.03	6.381e+13	1.762e-94	1.818e-20	1.747e-96	1.802e-22
0.04	1.405e+12	2.250e-45	1.061e-21	9.953e-48	4.694e-24
0.05	6.594e+12	2.196e-26	1.629e-20	5.850e-29	4.338e-23
0.06	1.914e+12	1.093e-18	4.284e-17	2.172e-21	8.509e-20
0.08	7.437e+12	3.118e-11	2.062e-09	4.934e-14	3.264e-12
0.1	7.069e+12	1.690e-08	2.080e-06	2.586e-11	3.182e-09
0.15	1.128e+13	1.511e-05	3.128e-03	2.488e-08	5.151e-06
0.2	5.004e+13	1.275e-03	2.785e-01	2.251e-06	4.915e-04
0.3	4.150e+13	3.329e-02	5.195e+00	6.316e-05	9.854e-03
0.4	2.115e+14	1.584e+00	1.655e+02	3.085e-03	3.224e-01
0.5	3.218e+14	1.258e+01	9.254e+02	2.470e-02	1.816e+00
0.6	4.833e+14	6.936e+01	3.779e+03	1.354e-01	7.376e+00
0.8	3.873e+14	3.988e+02	1.353e+04	7.586e-01	2.573e+01
1.0	1.341e+14	5.931e+02	1.408e+04	1.093e+00	2.596e+01
1.5	7.817e+13	4.042e+03	5.273e+04	6.801e+00	8.871e+01
2.0	1.487e+13	3.604e+03	3.278e+04	5.572e+00	5.069e+01
3.0	1.165e+10	1.838e+01	1.077e+02	2.494e-02	1.461e-01
4.0	1.447e+05	7.004e-04	3.134e-03	8.665e-07	3.877e-06
TOTALS:	1.823e+15	8.740e+03	1.181e+05	1.441e+01	2.008e+02

Energy	Sensitivity	Variable	(4 of 5)		(76.2 cm)
			MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	
0.015	2.845e+08	0.000e+00	2.329e-26	0.000e+00	1.998e-27
0.02	6.183e+11	0.000e+00	7.967e-23	0.000e+00	2.760e-24
0.03	6.381e+13	2.800e-112	1.818e-20	2.775e-114	1.802e-22
0.04	1.405e+12	2.980e-54	1.061e-21	1.318e-56	4.694e-24
0.05	6.594e+12	4.226e-32	1.629e-20	1.126e-34	4.338e-23
0.06	1.914e+12	5.323e-23	3.517e-20	1.057e-25	6.985e-23
0.08	7.437e+12	2.178e-14	1.789e-12	3.447e-17	2.832e-15
0.1	7.069e+12	3.437e-11	5.830e-09	5.258e-14	8.920e-12
0.15	1.128e+13	9.139e-08	2.839e-05	1.505e-10	4.675e-08
0.2	5.004e+13	1.275e-03	2.785e-01	2.251e-06	4.915e-04
0.3	4.150e+13	3.329e-02	5.195e+00	6.316e-05	9.854e-03
0.4	2.115e+14	1.584e+00	1.655e+02	3.085e-03	3.224e-01
0.5	3.218e+14	1.258e+01	9.254e+02	2.470e-02	1.816e+00
0.6	4.833e+14	6.936e+01	3.779e+03	1.354e-01	7.376e+00
0.8	3.873e+14	3.988e+02	1.353e+04	7.586e-01	2.573e+01
1.0	1.341e+14	5.931e+02	1.408e+04	1.093e+00	2.596e+01
1.5	7.817e+13	4.042e+03	5.273e+04	6.801e+00	8.871e+01
2.0	1.487e+13	3.604e+03	3.278e+04	5.572e+00	5.069e+01
3.0	1.165e+10	1.838e+01	1.077e+02	2.494e-02	1.461e-01
4.0	1.447e+05	7.004e-04	3.134e-03	8.665e-07	3.877e-06
TOTALS:	1.823e+15	8.740e+03	1.181e+05	1.441e+01	2.008e+02

Page : 5
 DOS File: 2SP24RAD.MS5
 Run Date: August 19, 2005
 Run Time: 2:41:13 PM
 Duration: 00:02:08

EC-RADN-1135
 Page 153

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec		Exposure Rate mR/hr	
		No Buildup	With Buildup	No Buildup	With Buildup
0.2	5.004e+13	1.311e-05	4.439e-03	2.313e-08	7.834e-06
0.3	4.150e+13	6.458e-04	1.543e-01	1.225e-06	2.927e-04
0.4	2.115e+14	4.639e-02	7.170e+00	9.040e-05	1.397e-02
0.5	3.218e+14	4.994e-01	5.285e+01	9.802e-04	1.037e-01
0.6	4.833e+14	3.487e+00	2.669e+02	6.807e-03	5.209e-01
0.8	3.873e+14	2.859e+01	1.313e+03	5.438e-02	2.498e+00
1.0	1.341e+14	5.505e+01	1.718e+03	1.015e-01	3.167e+00
1.5	7.817e+13	5.744e+02	9.391e+03	9.664e-01	1.580e+01
2.0	1.487e+13	6.630e+02	7.374e+03	1.025e+00	1.140e+01
3.0	1.165e+10	4.563e+00	3.166e+01	6.191e-03	4.296e-02
4.0	1.447e+05	2.058e-04	1.071e-03	2.546e-07	1.324e-06
TOTALS:	1.823e+15	1.330e+03	2.016e+04	2.162e+00	3.355e+01

Energy MeV	Sensitivity	Variable		(5 of 5)	
		Variable	Variable	(5 of 5)	(91.44 cm)
0.015	2.845e+08	0.000e+00	2.329e-26	0.000e+00	1.998e-27
0.02	6.183e+11	0.000e+00	7.967e-23	0.000e+00	2.760e-24
0.03	6.381e+13	4.511e-130	1.818e-20	4.471e-132	1.802e-22
0.04	1.405e+12	4.006e-63	1.061e-21	1.772e-65	4.694e-24
0.05	6.594e+12	8.259e-38	1.629e-20	2.200e-40	4.338e-23
0.06	1.914e+12	2.635e-27	3.393e-20	5.233e-30	6.739e-23
0.08	7.437e+12	1.549e-17	1.483e-15	2.451e-20	2.347e-18
0.1	7.069e+12	7.117e-14	1.592e-11	1.089e-16	2.436e-14
0.15	1.128e+13	5.633e-10	2.491e-07	9.276e-13	4.101e-10
0.2	5.004e+13	1.373e-07	6.808e-05	2.423e-10	1.202e-07
0.3	4.150e+13	1.276e-05	4.397e-03	2.420e-08	8.340e-06
0.4	2.115e+14	1.384e-03	2.997e-01	2.696e-06	5.840e-04
0.5	3.218e+14	2.017e-02	2.917e+00	3.958e-05	5.725e-03
0.6	4.833e+14	1.784e-01	1.827e+01	3.482e-04	3.567e-02
0.8	3.873e+14	2.083e+00	1.239e+02	3.963e-03	2.357e-01
1.0	1.341e+14	5.192e+00	2.045e+02	9.570e-03	3.770e-01
1.5	7.817e+13	8.287e+01	1.647e+03	1.394e-01	2.772e+00
2.0	1.487e+13	1.238e+02	1.638e+03	1.914e-01	2.534e+00
3.0	1.165e+10	1.148e+00	9.234e+00	1.557e-03	1.253e-02
4.0	1.447e+05	6.125e-05	3.632e-04	7.577e-08	4.493e-07
TOTALS:	1.823e+15	2.153e+02	3.645e+03	3.463e-01	5.973e+00

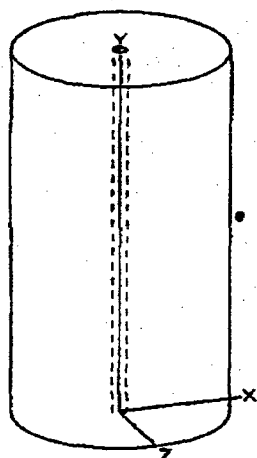
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 10SP1GR.MS5
 Run Date: August 19, 2005
 Run Time: 11:08:04 AM
 Duration: 00:00:25

EC-RADN-1135
 Page 154

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool Case
 Description: 1 Hour, Grove
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 304.8 cm 10 ft 0.0 in Y 457.2 cm 15 ft Z 0 cm 0.0 in

Shields			
Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	243.84 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	µCi/cm ³	Bq/cm ³
Am-241	1.1038e-003	4.0842e+007	1.3570e-003	5.0209e+001
Am-242	4.7554e-001	1.7595e+010	5.8460e-001	2.1630e+004
Am-242m	7.2160e-005	2.6699e+006	8.8710e-005	3.2823e+000
Am-243	1.3601e-004	5.0323e+006	1.6720e-004	6.1864e+000
Am-244	5.6201e-001	2.0794e+010	6.9090e-001	2.5563e+004
Ba-135m	4.4479e-001	1.6457e+010	5.4680e-001	2.0232e+004
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	1.4634e+003	5.4145e+013	1.7990e+003	6.6563e+007
Ba-140	2.1280e+003	7.8734e+013	2.6160e+003	9.6792e+007
Ba-141	2.0035e+002	7.4130e+012	2.4630e+002	9.1131e+006
Ba-142	3.6166e+001	1.3381e+012	4.4460e+001	1.6450e+006
Br-82	2.4493e+001	9.0623e+011	3.0110e+001	1.1141e+006
Br-83	6.7833e+002	2.5098e+013	8.3390e+002	3.0854e+007
Br-84	4.6984e+002	1.7384e+013	5.7760e+002	2.1371e+007
Ce-141	1.9539e+001	7.2294e+011	2.4020e+001	8.8874e+005
Ce-143	1.7871e+001	6.6124e+011	2.1970e+001	8.1289e+005
Ce-144	1.6464e+001	6.0917e+011	2.0240e+001	7.4888e+005
Cm-242	2.9032e-001	1.0742e+010	3.5690e-001	1.3205e+004
Cm-243	1.2503e-004	4.6259e+006	1.5370e-004	5.6869e+000
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2172e-001	1.1903e+010	3.9550e-001	1.4633e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Co-60m	5.4037e-003	1.9994e+008	6.6430e-003	2.4579e+002
Co-58	3.2172e-001	1.1903e+010	3.9550e-001	1.4633e+004

Page : 2
 DOS File: 10SP1GR.MS5
 Run Date: August 19, 2005
 Run Time: 11:08:04 AM
 Duration: 00:00:25

EC-RADN-1135
 Page 155

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Cs-132	2.3565e-001	8.7192e+009	2.8970e-001	1.0719e+004
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-134m	2.0621e+002	7.6297e+012	2.5350e+002	9.3795e+006
Cs-136	3.9859e+002	1.4748e+013	4.9000e+002	1.8130e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
Cs-138	4.8636e+003	1.7995e+014	5.9790e+003	2.2122e+008
Cs-139	1.2307e+002	4.5537e+012	1.5130e+002	5.5981e+006
Eu-152m	1.0005e-003	3.7020e+007	1.2300e-003	4.5510e+001
Eu-154	4.5935e-002	1.6996e+009	5.6470e-002	2.0894e+003
Eu-155	1.8888e-002	6.9886e+008	2.3220e-002	8.5914e+002
Eu-156	1.1884e+000	4.3972e+010	1.4610e+000	5.4057e+004
I-128	1.4666e+001	5.4265e+011	1.8030e+001	6.6711e+005
I-130	1.6358e+002	6.0526e+012	2.0110e+002	7.4407e+006
I-131	6.9834e+003	2.5839e+014	8.5850e+003	3.1764e+008
I-132	1.0176e+004	3.7652e+014	1.2510e+004	4.6287e+008
I-133	1.4219e+004	5.2610e+014	1.7480e+004	6.4676e+008
I-134	1.1421e+004	4.2257e+014	1.4040e+004	5.1948e+008
I-135	1.2421e+004	4.5959e+014	1.5270e+004	5.6499e+008
La-140	9.1105e+000	3.3709e+011	1.1200e+001	4.1440e+005
La-141	6.9834e+000	2.5839e+011	8.5850e+000	3.1764e+005
La-142	5.3866e+000	1.9930e+011	6.6220e+000	2.4501e+005
Mo-99	1.0892e+002	4.0300e+012	1.3390e+002	4.9543e+006
Mo-101	5.8193e+000	2.1532e+011	7.1540e+000	2.6470e+005
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nb-95m	9.2813e-002	3.4341e+009	1.1410e-001	4.2217e+003
Nb-96	1.3161e-002	4.8697e+008	1.6180e-002	5.9866e+002
Nb-97	8.1832e+000	3.0278e+011	1.0060e+001	3.7222e+005
Nb-97m	7.5316e+000	2.7867e+011	9.2590e+000	3.4258e+005
Nd-147	3.1423e+000	1.1627e+011	3.8630e+000	1.4293e+005
Nd-149	1.2372e+000	4.5778e+010	1.5210e+000	5.6277e+004
Np-236m	5.1125e-005	1.8916e+006	6.2850e-005	2.3254e+000
Np-238	5.0458e+000	1.8669e+011	6.2030e+000	2.2951e+005
Np-239	2.2947e+002	8.4904e+012	2.8210e+002	1.0438e+007
Np-240	2.1865e-001	8.0901e+009	2.6880e-001	9.9456e+003
Pd-109	2.1450e+001	7.9366e+011	2.6370e+001	9.7569e+005
Pm-147	1.0908e+000	4.0360e+010	1.3410e+000	4.9617e+004
Pm-148	8.7445e-001	3.2355e+010	1.0750e+000	3.9775e+004
Pm-148m	1.6863e-001	6.2392e+009	2.0730e-001	7.6701e+003
Pm-149	2.7934e+000	1.0335e+011	3.4340e+000	1.2706e+005
Pm-151	9.2813e-001	3.4341e+010	1.1410e+000	4.2217e+004
Pr-142	3.0789e-001	1.1392e+010	3.7850e-001	1.4004e+004
Pr-143	7.0167e+000	2.5962e+011	8.6260e+000	3.1916e+005
Pr-144	6.5840e+000	2.4361e+011	8.0940e+000	2.9948e+005
Pr-144m	9.2081e-002	3.4070e+009	1.1320e-001	4.1884e+003
Pu-237	7.2909e-005	2.6976e+006	8.9630e-005	3.3163e+000
Pu-238	4.9628e-002	1.8362e+009	6.1010e-002	2.2574e+003
Pu-239	5.2540e-003	1.9440e+008	6.4590e-003	2.3898e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Pu-243	3.9574e+000	1.4642e+011	4.8650e+000	1.8001e+005
Rb-86	1.1762e+001	4.3521e+011	1.4460e+001	5.3502e+005
Rb-88	3.5124e+003	1.2996e+014	4.3180e+003	1.5977e+008
Rh-103m	9.3139e+001	3.4461e+012	1.1450e+002	4.2365e+006
Rh-105	6.0683e+001	2.2453e+012	7.4600e+001	2.7602e+006
Rh-105	6.0683e+001	2.2453e+012	7.4600e+001	2.7602e+006
Rh-86	1.1762e+001	4.3521e+011	1.4460e+001	5.3502e+005

Page : 3
 DOS File: 10SP1GR.MS5
 Run Date: August 19, 2005
 Run Time: 11:08:04 AM
 Duration: 00:00:25

EC-RADN-1135
 Page 156

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Rh-105m	1.6253e+001	6.0134e+011	1.9980e+001	7.3926e+005
Rh-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Ru-103	9.3139e+001	3.4461e+012	1.1450e+002	4.2365e+006
Ru-105	5.6949e+001	2.1071e+012	7.0010e+001	2.5904e+006
Ru-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Sb-122	2.3028e+000	8.5205e+010	2.8310e+000	1.0475e+005
Sb-124	1.0575e+000	3.9126e+010	1.3000e+000	4.8100e+004
Sb-125	1.4918e+001	5.5198e+011	1.8340e+001	6.7858e+005
Sb-126	5.0441e-001	1.8663e+010	6.2010e-001	2.2944e+004
Sb-126m	6.7239e-002	2.4878e+009	8.2660e-002	3.0584e+003
Sb-127	1.0144e+002	3.7531e+012	1.2470e+002	4.6139e+006
Sb-129	3.2668e+002	1.2087e+013	4.0160e+002	1.4859e+007
Sm-151	2.9593e-003	1.0949e+008	3.6380e-003	1.3461e+002
Sm-153	2.2776e+000	8.4272e+010	2.8000e+000	1.0360e+005
Sr-89	1.1225e+003	4.1534e+013	1.3800e+003	5.1060e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	1.3218e+003	4.8908e+013	1.6250e+003	6.0125e+007
Sr-92	1.1722e+003	4.3370e+013	1.4410e+003	5.3317e+007
Sr-93	6.3513e+000	2.3500e+011	7.8080e+000	2.8890e+005
Tc-99	1.2015e-003	4.4454e+007	1.4770e-003	5.4649e+001
Tc-99m	9.7287e+001	3.5996e+012	1.1960e+002	4.4252e+006
Tc-101	2.1743e+001	8.0450e+011	2.6730e+001	9.8901e+005
Te-123m	1.0558e-002	3.9066e+008	1.2980e-002	4.8026e+002
Te-125m	3.2928e+000	1.2183e+011	4.0480e+000	1.4978e+005
Te-127	1.0144e+002	3.7531e+012	1.2470e+002	4.6139e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	3.4750e+002	1.2858e+013	4.2720e+002	1.5806e+007
Te-129m	7.2494e+001	2.6823e+012	8.9120e+001	3.2974e+006
Te-131	4.8131e+002	1.7809e+013	5.9170e+002	2.1893e+007
Te-131m	2.2947e+002	8.4904e+012	2.8210e+002	1.0438e+007
Te-132	1.6627e+003	6.1519e+013	2.0440e+003	7.5628e+007
Te-133	1.5878e+002	5.8750e+012	1.9520e+002	7.2224e+006
Te-133m	5.1043e+002	1.8886e+013	6.2750e+002	2.3218e+007
Te-134	7.8481e+002	2.9038e+013	9.6480e+002	3.5698e+007
Y-90	5.9308e-001	2.1944e+010	7.2910e-001	2.6977e+004
Y-91	5.8535e+000	2.1658e+011	7.1960e+000	2.6625e+005
Y-91m	3.2220e+000	1.1922e+011	3.9610e+000	1.4656e+005
Y-92	5.9528e+000	2.2025e+011	7.3180e+000	2.7077e+005
Y-93	4.3893e+000	1.6240e+011	5.3960e+000	1.9965e+005
Zr-89	2.3842e-003	8.8215e+007	2.9310e-003	1.0845e+002
Zr-93	1.2934e-006	4.7855e+004	1.5900e-006	5.8830e-002
Zr-95	8.3378e+000	3.0850e+011	1.0250e+001	3.7925e+005
Zr-97	7.9310e+000	2.9345e+011	9.7500e+000	3.6075e+005

Buildup

The material reference is : Shield 1

Integration Parameters

Radial 20
 Circumferential 20
 Y Direction (axial) 25

Results

Circumferential 20
 Y Direction (axial) 25

Page : 4
 DOS File: 10SP1GR.MS5
 Run Date: August 19, 2005
 Run Time: 11:08:04 AM
 Duration: 00:00:25

EC-RADN-1135
 Page 157

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.015	8.979e+09	0.000e+00	7.352e-25	0.000e+00	6.306e-26
0.02	9.797e+11	0.000e+00	1.262e-22	0.000e+00	4.372e-24
0.03	1.057e+14	1.179e-307	3.012e-20	1.169e-309	2.986e-22
0.04	2.595e+12	2.007e-151	1.961e-21	8.878e-154	8.672e-24
0.05	8.101e+12	1.172e-94	2.001e-20	3.122e-97	5.330e-23
0.06	2.078e+12	3.624e-70	3.684e-20	7.199e-73	7.317e-23
0.08	1.522e+13	1.533e-48	6.419e-19	2.426e-51	1.016e-21
0.1	1.149e+13	2.485e-40	2.241e-18	3.801e-43	3.428e-21
0.15	6.122e+13	3.615e-31	6.540e-17	5.953e-34	1.077e-19
0.2	1.080e+14	7.011e-27	2.683e-16	1.237e-29	4.735e-19
0.3	8.913e+13	3.674e-22	2.925e-16	6.969e-25	5.548e-19
0.4	3.274e+14	1.756e-18	3.170e-15	3.421e-21	6.176e-18
0.5	7.714e+14	8.155e-16	6.958e-13	1.601e-18	1.366e-15
0.6	7.515e+14	4.948e-14	2.714e-11	9.658e-17	5.297e-14
0.8	1.339e+15	4.388e-11	1.181e-08	8.346e-14	2.246e-11
1.0	6.105e+14	1.883e-09	2.903e-07	3.471e-12	5.351e-10
1.5	5.759e+14	3.362e-06	2.132e-04	5.657e-09	3.587e-07
2.0	1.614e+14	9.629e-05	3.613e-03	1.489e-07	5.587e-06
3.0	2.061e+13	2.825e-03	5.620e-02	3.833e-06	7.625e-05
4.0	1.256e+12	3.919e-03	5.326e-02	4.849e-06	6.589e-05
5.0	1.863e+11	4.411e-03	4.580e-02	5.057e-06	5.250e-05
TOTALS:	4.963e+15	1.126e-02	1.591e-01	1.389e-05	2.006e-04

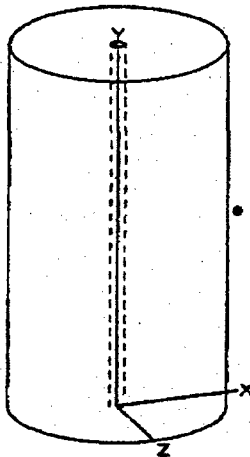
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 10SP1I38.MS5
 Run Date: August 19, 2005
 Run Time: 11:08:31 AM
 Duration: 00:00:24

EC-RADN-1135
 Page 158

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 1 Hour, ICRP38
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 304.8 cm 457.2 cm Z 0 cm
 10 ft 0.0 in 15 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	243.84 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : ICRP-38

Nuclide	curies	becquerels	μCi/cm ²	Bq/cm ²
Cs-135m	1.1559e+002	4.2768e+012	1.4210e+002	5.2577e+006
Eu-157	1.1006e-001	4.0722e+009	1.3530e-001	5.0061e+003
Eu-158	1.8725e-002	6.9284e+008	2.3020e-002	8.5174e+002
La-143	3.8573e-001	1.4272e+010	4.7420e-001	1.7545e+004
Nd-151	3.3587e-002	1.2427e+009	4.1290e-002	1.5277e+003
Pm-150	1.8587e-002	6.8772e+008	2.2850e-002	8.4545e+002
Pr-145	4.4560e+000	1.6487e+011	5.4780e+000	2.0269e+005
Pr-147	1.5732e-001	5.8208e+009	1.9340e-001	7.1558e+003
Rh-106m	9.4766e-001	3.5063e+010	1.1650e+000	4.3105e+004
Rh-107	6.8581e+000	2.5375e+011	8.4310e+000	3.1195e+005
Sb-128a	1.6627e+001	6.1519e+011	2.0440e+001	7.5628e+005
Sb-128b	9.8914e+001	3.6598e+012	1.2160e+002	4.4992e+006
Sb-130	4.3812e+001	1.6210e+012	5.3860e+001	1.9928e+006
Sb-131	1.5211e+002	5.6282e+012	1.8700e+002	6.9190e+006
Se-81	8.7282e+000	3.2294e+011	1.0730e+001	3.9701e+005
Se-81m	2.0450e+000	7.5665e+010	2.5140e+000	9.3018e+004
Se-83	1.0306e+001	3.8133e+011	1.2670e+001	4.6879e+005
Sm-155	2.8633e-002	1.0594e+009	3.5200e-002	1.3024e+003
Sm-156	1.0371e-001	3.8374e+009	1.2750e-001	4.7175e+003
Y-94	8.5167e-001	3.1512e+010	1.0470e+000	3.8739e+004
Y-95	1.5130e-001	5.5981e+009	1.8600e-001	6.8820e+003

Buildup

The material reference is: Shield 1

Y-94	8.5167e-001	3.1512e+010	1.0470e+000	3.8739e+004
Y-95	1.5130e-001	5.5981e+009	1.8600e-001	6.8820e+003

Page : 2
 DOS File: 10SP1I38.MS5
 Run Date: August 19, 2005
 Run Time: 11:08:31 AM
 Duration: 00:00:24

EC-RADN-1135
 Page 159

Integration Parameters

Radial 20
 Circumferential 20
 Y Direction (axial) 25

Energy MeV	Activity photons/sec	Results			
		Fluence Rate	Fluence Rate	Exposure Rate	Exposure Rate
		MeV/cm ² /sec <u>No Buildup</u>	MeV/cm ² /sec <u>With Buildup</u>	mR/hr <u>No Buildup</u>	mR/hr <u>With Buildup</u>
0.015	2.062e+07	0.000e+00	1.688e-27	0.000e+00	1.448e-28
0.02	4.509e+09	0.000e+00	5.809e-25	0.000e+00	2.012e-26
0.03	5.594e+11	6.239e-310	1.594e-22	6.183e-312	1.580e-24
0.04	1.400e+10	1.083e-153	1.057e-23	4.788e-156	4.677e-26
0.05	1.170e+09	1.693e-98	2.891e-24	4.511e-101	7.700e-27
0.06	1.056e+09	1.842e-73	1.872e-23	3.659e-76	3.719e-26
0.08	2.406e+09	2.423e-52	1.015e-22	3.834e-55	1.606e-25
0.1	4.909e+10	1.061e-42	9.570e-21	1.624e-45	1.464e-23
0.15	1.781e+11	1.051e-33	1.902e-19	1.732e-36	3.133e-22
0.2	1.388e+12	9.011e-29	3.449e-18	1.590e-31	6.086e-21
0.3	5.283e+12	2.178e-23	1.734e-17	4.131e-26	3.289e-20
0.4	7.197e+11	3.859e-21	6.967e-18	7.520e-24	1.358e-20
0.5	2.518e+12	2.662e-18	2.271e-15	5.225e-21	4.458e-18
0.6	5.857e+12	3.856e-16	2.115e-13	7.527e-19	4.128e-16
0.8	2.252e+13	7.380e-13	1.986e-10	1.404e-15	3.778e-13
1.0	6.278e+12	1.937e-11	2.985e-09	3.570e-14	5.503e-12
1.5	1.590e+12	9.282e-09	5.886e-07	1.562e-11	9.902e-10
2.0	1.230e+12	7.339e-07	2.753e-05	1.135e-09	4.258e-08
3.0	7.760e+10	1.064e-05	2.116e-04	1.443e-08	2.871e-07
4.0	3.370e+08	1.052e-06	1.429e-05	1.301e-09	1.768e-08
TOTALS:	4.827e+13	1.243e-05	2.541e-04	1.688e-08	3.484e-07

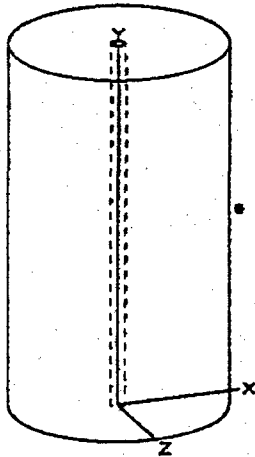
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 10SP1RAD.MS5
 Run Date: August 19, 2005
 Run Time: 11:08:55 AM
 Duration: 00:00:24

EC-RADN-1135
 Page 160

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 1 Hour, RADTRAD
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 304.8 cm 457.2 cm Z 0 cm
 10 ft 0.0 in 15 ft 0.0 in

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	243.84 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	1.1038e-003	4.0842e+007	1.3570e-003	5.0209e+001
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	1.4634e+003	5.4145e+013	1.7990e+003	6.6563e+007
Ba-140	2.1280e+003	7.8734e+013	2.6160e+003	9.6792e+007
Ce-141	1.9539e+001	7.2294e+011	2.4020e+001	8.8874e+005
Ce-143	1.7871e+001	6.6124e+011	2.1970e+001	8.1289e+005
Ce-144	1.6464e+001	6.0917e+011	2.0240e+001	7.4888e+005
Cm-242	2.9032e-001	1.0742e+010	3.5690e-001	1.3205e+004
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2172e-001	1.1903e+010	3.9550e-001	1.4633e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-136	3.9859e+002	1.4748e+013	4.9000e+002	1.8130e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
I-131	6.9834e+003	2.5839e+014	8.5850e+003	3.1764e+008
I-132	1.0176e+004	3.7652e+014	1.2510e+004	4.6287e+008
I-133	1.4219e+004	5.2610e+014	1.7480e+004	6.4676e+008
I-134	1.1421e+004	4.2257e+014	1.4040e+004	5.1948e+008
I-135	1.2421e+004	4.5959e+014	1.5270e+004	5.6499e+008
La-140	9.1105e+000	3.3709e+011	1.1200e+001	4.1440e+005
La-141	6.9834e+000	2.5839e+011	8.5850e+000	3.1764e+005
La-142	5.3866e+000	1.9930e+011	6.6220e+000	2.4501e+005
Mo-99	1.0892e+002	4.0300e+012	1.3390e+002	4.9543e+006
Nb-95	8.3703e+000	3.0779e+011	1.1280e+001	4.1440e+005
La-141	6.9834e+000	2.5839e+011	8.5850e+000	3.1764e+005

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Nd-147	3.1423e+000	1.1627e+011	3.8630e+000	1.4293e+005
Np-239	2.2947e+002	8.4904e+012	2.8210e+002	1.0438e+007
Pr-143	7.0167e+000	2.5962e+011	8.6260e+000	3.1916e+005
Pr-144	6.5840e+000	2.4361e+011	8.0940e+000	2.9948e+005
Pu-238	4.9628e-002	1.8362e+009	6.1010e-002	2.2574e+003
Pu-239	5.2540e-003	1.9440e+008	6.4590e-003	2.3898e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1762e+001	4.3521e+011	1.4460e+001	5.3502e+005
Rh-103m	9.3139e+001	3.4461e+012	1.1450e+002	4.2365e+006
Rh-105	6.0683e+001	2.2453e+012	7.4600e+001	2.7602e+006
Rh-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Ru-103	9.3139e+001	3.4461e+012	1.1450e+002	4.2365e+006
Ru-105	5.6949e+001	2.1071e+012	7.0010e+001	2.5904e+006
Ru-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Sb-127	1.0144e+002	3.7531e+012	1.2470e+002	4.6139e+006
Sb-129	3.2668e+002	1.2087e+013	4.0160e+002	1.4859e+007
Sr-89	1.1225e+003	4.1534e+013	1.3800e+003	5.1060e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	1.3218e+003	4.8908e+013	1.6250e+003	6.0125e+007
Sr-92	1.1722e+003	4.3370e+013	1.4410e+003	5.3317e+007
Tc-99m	9.7287e+001	3.5996e+012	1.1960e+002	4.4252e+006
Te-127	1.0144e+002	3.7531e+012	1.2470e+002	4.6139e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	3.4750e+002	1.2858e+013	4.2720e+002	1.5806e+007
Te-129m	7.2494e+001	2.6823e+012	8.9120e+001	3.2974e+006
Te-131m	2.2947e+002	8.4904e+012	2.8210e+002	1.0438e+007
Te-132	1.6627e+003	6.1519e+013	2.0440e+003	7.5628e+007
Y-90	5.9308e-001	2.1944e+010	7.2910e-001	2.6977e+004
Y-91	5.8535e+000	2.1658e+011	7.1960e+000	2.6625e+005
Y-92	5.9528e+000	2.2025e+011	7.3180e+000	2.7077e+005
Y-93	4.3893e+000	1.6240e+011	5.3960e+000	1.9965e+005
Zr-95	8.3378e+000	3.0850e+011	1.0250e+001	3.7925e+005
Zr-97	7.9310e+000	2.9345e+011	9.7500e+000	3.6075e+005

Buildup

The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Results

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u>		<u>Exposure Rate</u>	
		<u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>mR/hr</u> <u>No Buildup</u>	<u>mR/hr</u> <u>With Buildup</u>
0.015	4.042e+08	0.000e+00	3.309e-26	0.000e+00	2.838e-27
0.02	7.059e+11	0.000e+00	9.094e-23	0.000e+00	3.150e-24
0.03	8.601e+13	9.592e-308	2.450e-20	9.506e-310	2.428e-22
0.04	1.956e+12	1.513e-151	1.478e-21	6.691e-154	6.536e-24
0.05	8.088e+12	1.170e-94	1.998e-20	3.117e-97	5.321e-23
0.03	8.601e+13	9.592e-308	2.450e-20	9.506e-310	2.428e-22
0.04	1.956e+12	1.513e-151	1.478e-21	6.691e-154	6.536e-24

Page : 3
 DOS File: 10SP1RAD.MS5
 Run Date: August 19, 2005
 Run Time: 11:08:55 AM
 Duration: 00:00:24

EC-RADN-1129
 Page 162

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.06	2.067e+12	3.604e-70	3.663e-20	7.159e-73	7.277e-23
0.08	8.077e+12	8.134e-49	3.407e-19	1.287e-51	5.391e-22
0.1	9.345e+12	2.020e-40	1.822e-18	3.090e-43	2.787e-21
0.15	4.235e+13	2.500e-31	4.524e-17	4.117e-34	7.449e-20
0.2	8.365e+13	5.429e-27	2.078e-16	9.582e-30	3.667e-19
0.3	6.692e+13	2.758e-22	2.196e-16	5.232e-25	4.165e-19
0.4	3.055e+14	1.639e-18	2.958e-15	3.193e-21	5.764e-18
0.5	6.776e+14	7.164e-16	6.112e-13	1.406e-18	1.200e-15
0.6	7.274e+14	4.789e-14	2.627e-11	9.348e-17	5.127e-14
0.8	1.270e+15	4.163e-11	1.121e-08	7.918e-14	2.131e-11
1.0	5.217e+14	1.609e-09	2.481e-07	2.966e-12	4.572e-10
1.5	4.210e+14	2.458e-06	1.559e-04	4.136e-09	2.622e-07
2.0	9.745e+13	5.812e-05	2.181e-03	6.988e-08	3.372e-06
3.0	6.662e+10	9.133e-06	1.817e-04	1.239e-08	2.465e-07
4.0	5.232e+09	1.633e-05	2.219e-04	2.020e-08	2.745e-07
TOTALS:	4.330e+15	8.605e-05	2.740e-03	1.266e-07	4.156e-06

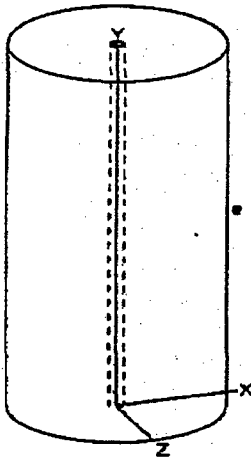
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 10SP8GR.MS5
 Run Date: August 19, 2005
 Run Time: 11:10:33 AM
 Duration: 00:00:25

EC-RADN-1135
 Page 163

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 8 Hour, GROVE
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X Y Z
 304.8 cm 457.2 cm 0 cm
 10 ft 0.0 in 15 ft 0.0 in

Shields			
Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	243.84 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded

Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	1.1071e-003	4.0962e+007	1.3610e-003	5.0357e+001
Am-242	3.5246e-001	1.3041e+010	4.3330e-001	1.6032e+004
Am-242m	7.2160e-005	2.6699e+006	8.8710e-005	3.2823e+000
Am-243	1.3601e-004	5.0323e+006	1.6720e-004	6.1864e+000
Am-244	3.4579e-001	1.2794e+010	4.2510e-001	1.5729e+004
Ba-135m	3.7573e-001	1.3902e+010	4.6190e-001	1.7090e+004
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	4.6968e+001	1.7378e+012	5.7740e+001	2.1364e+006
Ba-140	2.0946e+003	7.7500e+013	2.5750e+003	9.5275e+007
Ba-141	2.4029e-005	8.8907e+005	2.9540e-005	1.0930e+000
Ba-142	4.2811e-011	1.5840e+000	5.2630e-011	1.9473e-006
Br-82	2.1345e+001	7.8975e+011	2.6240e+001	9.7088e+005
Br-83	9.1268e+001	3.3769e+012	1.1220e+002	4.1514e+006
Br-84	4.9734e-002	1.8401e+009	6.1140e-002	2.2622e+003
Ce-141	1.9449e+001	7.1963e+011	2.3910e+001	8.8467e+005
Ce-143	1.5463e+001	5.7215e+011	1.9010e+001	7.0337e+005
Ce-144	1.6464e+001	6.0917e+011	2.0240e+001	7.4888e+005
Cm-242	2.9032e-001	1.0742e+010	3.5690e-001	1.3205e+004
Cm-243	1.2503e-004	4.6259e+006	1.5370e-004	5.6869e+000
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2090e-001	1.1873e+010	3.9450e-001	1.4597e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Co-60m				
Co-61	1.3430e-004	4.9691e+006	1.6510e-004	6.1087e+000
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2090e-001	1.1873e+010	3.9450e-001	1.4597e+004

Page : 2
 DOS File: 10SP8GR.MS5
 Run Date: August 19, 2005
 Run Time: 11:10:33 AM
 Duration: 00:00:25

EC-RADN-1135
 Page 164

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Cs-132	2.2858e-001	8.4573e+009	2.8100e-001	1.0397e+004
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-134m	3.8947e+001	1.4411e+012	4.7880e+001	1.7716e+006
Cs-136	3.9240e+002	1.4519e+013	4.8240e+002	1.7849e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
Cs-138	6.2350e-001	2.3070e+010	7.6650e-001	2.8361e+004
Cs-139	2.8308e-012	1.0474e-001	3.4800e-012	1.2876e-007
Eu-152m	5.9519e-004	2.2022e+007	7.3170e-004	2.7073e+001
Eu-154	4.5935e-002	1.6996e+009	5.6470e-002	2.0894e+003
Eu-155	1.8888e-002	6.9886e+008	2.3220e-002	8.5914e+002
Eu-156	1.1746e+000	4.3460e+010	1.4440e+000	5.3428e+004
I-128	1.2771e-004	4.7253e+006	1.5700e-004	5.8090e+000
I-130	1.1071e+002	4.0962e+012	1.3610e+002	5.0357e+006
I-131	6.8337e+003	2.5285e+014	8.4010e+003	3.1084e+008
I-132	9.6799e+003	3.5816e+014	1.1900e+004	4.4030e+008
I-133	1.1372e+004	4.2076e+014	1.3980e+004	5.1726e+008
I-134	9.9728e+001	3.6899e+012	1.2260e+002	4.5362e+006
I-135	5.9357e+003	2.1962e+014	7.2970e+003	2.6999e+008
La-140	9.0454e+000	3.3468e+011	1.1120e+001	4.1144e+005
La-141	2.0450e+000	7.5665e+010	2.5140e+000	9.3018e+004
La-142	2.2182e-001	8.2075e+009	2.7270e-001	1.0090e+004
Mo-99	1.0103e+002	3.7381e+012	1.2420e+002	4.5954e+006
Mo-101	1.2763e-008	4.7223e+002	1.5690e-008	5.8053e-004
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nb-95m	9.2813e-002	3.4341e+009	1.1410e-001	4.2217e+003
Nb-96	1.0680e-002	3.9518e+008	1.3130e-002	4.8581e+002
Nb-97	6.3749e+000	2.3587e+011	7.8370e+000	2.8997e+005
Nb-97m	5.6493e+000	2.0903e+011	6.9450e+000	2.5697e+005
Nd-147	3.0862e+000	1.1419e+011	3.7940e+000	1.4038e+005
Nd-149	7.4153e-002	2.7437e+009	9.1160e-002	3.3729e+003
Np-236m	4.1152e-005	1.5226e+006	5.0590e-005	1.8718e+000
Np-238	4.5886e+000	1.6978e+011	5.6410e+000	2.0872e+005
Np-239	2.1036e+002	7.7832e+012	2.5860e+002	9.5682e+006
Np-240	1.9783e-003	7.3197e+007	2.4320e-003	8.9984e+001
Pd-109	1.5049e+001	5.5680e+011	1.8500e+001	6.8450e+005
Pm-147	1.0908e+000	4.0360e+010	1.3410e+000	4.9617e+004
Pm-148	8.4435e-001	3.1241e+010	1.0380e+000	3.8406e+004
Pm-148m	1.6789e-001	6.2121e+009	2.0640e-001	7.6368e+003
Pm-149	2.5835e+000	9.5589e+010	3.1760e+000	1.1751e+005
Pm-151	7.8147e-001	2.8914e+010	9.6070e-001	3.5546e+004
Pr-142	2.3874e-001	8.8335e+009	2.9350e-001	1.0860e+004
Pr-143	7.0167e+000	2.5962e+011	8.6260e+000	3.1916e+005
Pr-144	6.5840e+000	2.4361e+011	8.0940e+000	2.9948e+005
Pr-144m	9.2081e-002	3.4070e+009	1.1320e-001	4.1884e+003
Pu-237	7.2575e-005	2.6853e+006	8.9220e-005	3.3011e+000
Pu-238	4.9628e-002	1.8362e+009	6.1010e-002	2.2574e+003
Pu-239	5.2540e-003	1.9440e+008	6.4590e-003	2.3898e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Pu-243	1.4878e+000	5.5048e+010	1.8290e+000	6.7673e+004
Rb-86	1.1640e+001	4.3069e+011	1.4310e+001	5.2947e+005
Rb-88	6.4424e+002	2.3837e+013	7.9200e+002	2.9304e+007
Rh-103m	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Rh-105	5.6849e+000	3.5048e+010	1.8290e+000	6.7673e+004
Rh-105	1.1640e+001	4.3069e+011	1.4310e+001	5.2947e+005

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Rh-105m	5.4452e+000	2.0147e+011	6.6940e+000	2.4768e+005
Rh-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Ru-103	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Ru-105	1.9124e+001	7.0759e+011	2.3510e+001	8.6987e+005
Ru-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Sb-122	2.1369e+000	7.9066e+010	2.6270e+000	9.7199e+004
Sb-124	1.0575e+000	3.9126e+010	1.3000e+000	4.8100e+004
Sb-125	1.4918e+001	5.5198e+011	1.8340e+001	6.7858e+005
Sb-126	4.9636e-001	1.8365e+010	6.1020e-001	2.2577e+004
Sb-126m	9.0617e-004	3.3528e+007	1.1140e-003	4.1218e+001
Sb-127	9.7287e+001	3.5996e+012	1.1960e+002	4.4252e+006
Sb-129	1.0811e+002	3.9999e+012	1.3290e+002	4.9173e+006
Sm-151	2.9658e-003	1.0973e+008	3.6460e-003	1.3490e+002
Sm-153	2.0515e+000	7.5905e+010	2.5220e+000	9.3314e+004
Sr-89	1.1225e+003	4.1534e+013	1.3800e+003	5.1060e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	7.9473e+002	2.9405e+013	9.7700e+002	3.6149e+007
Sr-92	1.9539e+002	7.2294e+012	2.4020e+002	8.8874e+006
Sr-93				
Tc-99	1.2015e-003	4.4454e+007	1.4770e-003	5.4649e+001
Tc-99m	9.4359e+001	3.4913e+012	1.1600e+002	4.2920e+006
Tc-101	2.2736e-007	8.4122e+003	2.7950e-007	1.0342e-002
Te-123m	1.0558e-002	3.9066e+008	1.2980e-002	4.8026e+002
Te-125m	3.2928e+000	1.2183e+011	4.0480e+000	1.4978e+005
Te-127	1.0062e+002	3.7230e+012	1.2370e+002	4.5769e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	1.6627e+002	6.1519e+012	2.0440e+002	7.5628e+006
Te-129m	7.2242e+001	2.6729e+012	8.8810e+001	3.2860e+006
Te-131	4.3893e+001	1.6240e+012	5.3960e+001	1.9965e+006
Te-131m	1.9539e+002	7.2294e+012	2.4020e+002	8.8874e+006
Te-132	1.5626e+003	5.7817e+013	1.9210e+003	7.1077e+007
Te-133	6.0186e-001	2.2269e+010	7.3990e-001	2.7376e+004
Te-133m	2.6599e+000	9.8418e+010	3.2700e+000	1.2099e+005
Te-134	7.4153e-001	2.7437e+010	9.1160e-001	3.3729e+004
Y-90	5.8917e-001	2.1799e+010	7.2430e-001	2.6799e+004
Y-91	5.8202e+000	2.1535e+011	7.1550e+000	2.6473e+005
Y-91m	2.0181e+000	7.4671e+010	2.4810e+000	9.1797e+004
Y-92	2.8430e+000	1.0519e+011	3.4950e+000	1.2932e+005
Y-93	2.7136e+000	1.0040e+011	3.3360e+000	1.2343e+005
Zr-89	2.2410e-003	8.2918e+007	2.7550e-003	1.0194e+002
Zr-93	1.2934e-006	4.7855e+004	1.5900e-006	5.8830e-002
Zr-95	8.3052e+000	3.0729e+011	1.0210e+001	3.7777e+005
Zr-97	5.9389e+000	2.1974e+011	7.3010e+000	2.7014e+005

Buildup

The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Results

Circumferential	20
Y Direction (axial)	25

Page : 4
 DOS File: 10SP8GR.MS5
 Run Date: August 19, 2005
 Run Time: 11:10:33 AM
 Duration: 00:00:25

EC-RADN-1135
 Page 166

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.015	4.433e+09	0.000e+00	3.630e-25	0.000e+00	3.113e-26
0.02	7.628e+11	0.000e+00	9.828e-23	0.000e+00	3.404e-24
0.03	7.388e+13	8.239e-308	2.105e-20	8.165e-310	2.086e-22
0.04	1.637e+12	1.266e-151	1.237e-21	5.601e-154	5.471e-24
0.05	7.614e+12	1.102e-94	1.881e-20	2.934e-97	5.010e-23
0.06	2.023e+12	3.528e-70	3.586e-20	7.007e-73	7.122e-23
0.08	7.886e+12	7.942e-49	3.326e-19	1.257e-51	5.263e-22
0.1	8.606e+12	1.860e-40	1.678e-18	2.846e-43	2.567e-21
0.15	1.408e+13	8.316e-32	1.505e-17	1.369e-34	2.478e-20
0.2	6.169e+13	4.004e-27	1.532e-16	7.067e-30	2.705e-19
0.3	5.280e+13	2.176e-22	1.732e-16	4.128e-25	3.286e-19
0.4	2.346e+14	1.258e-18	2.271e-15	2.451e-21	4.425e-18
0.5	5.080e+14	5.370e-16	4.582e-13	1.054e-18	8.994e-16
0.6	5.601e+14	3.688e-14	2.023e-11	7.198e-17	3.948e-14
0.8	4.852e+14	1.590e-11	4.280e-09	3.025e-14	8.141e-12
1.0	2.400e+14	7.404e-10	1.141e-07	1.365e-12	2.104e-10
1.5	1.956e+14	1.142e-06	7.242e-05	1.922e-09	1.218e-07
2.0	4.191e+13	2.500e-05	9.379e-04	3.866e-08	1.450e-06
3.0	6.922e+11	9.489e-05	1.888e-03	1.287e-07	2.561e-06
4.0	3.471e+08	1.084e-06	1.473e-05	1.341e-09	1.822e-08
5.0	3.418e+10	8.091e-04	8.400e-03	9.276e-07	9.630e-06
TOTALS:	2.497e+15	9.312e-04	1.131e-02	1.098e-06	1.378e-05

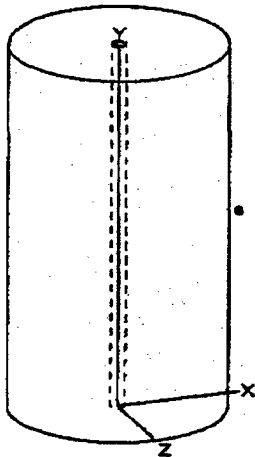
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 10SP8I38.MS5
 Run Date: August 19, 2005
 Run Time: 11:10:58 AM
 Duration: 00:00:23

EC-RADN-1135
 Page 167

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 8 Hour, ICRP38
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 304.8 cm 457.2 cm Z 0 cm
 10 ft 0.0 in 15 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	243.84 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : ICRP-38

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Cs-135m	4.7383e-001	1.7532e+010	5.8250e-001	2.1553e+004
Eu-157	7.9807e-002	2.9528e+009	9.8110e-002	3.6301e+003
Eu-158	3.2952e-005	1.2192e+006	4.0510e-005	1.4989e+000
La-143	4.4227e-010	1.6364e+001	5.4370e-010	2.0117e-005
Nd-151	2.3045e-012	8.5266e-002	2.8330e-012	1.0482e-007
Pm-150	3.0423e-003	1.1256e+008	3.7400e-003	1.3838e+002
Pr-145	1.9718e+000	7.2956e+010	2.4240e+000	8.9688e+004
Pr-147	7.9473e-011	2.9405e+000	9.7700e-011	3.6149e-006
Rh-106m	1.0062e-001	3.7230e+009	1.2370e-001	4.5769e+003
Rh-107	1.0225e-005	3.7832e+005	1.2570e-005	4.6509e-001
Sb-128a	9.9728e+000	3.6899e+011	1.2260e+001	4.5362e+005
Sb-128b	7.1908e-001	2.6606e+010	8.8400e-001	3.2708e+004
Sb-130	2.7600e-002	1.0212e+009	3.3930e-002	1.2554e+003
Sb-131	4.8383e-004	1.7902e+007	5.9480e-004	2.2008e+001
Se-81	1.8620e-002	6.8893e+008	2.2890e-002	8.4693e+002
Se-81m	1.2633e-002	4.6741e+008	1.5530e-002	5.7461e+002
Se-83	2.2109e-005	8.1804e+005	2.7180e-005	1.0057e+000
Sm-155	6.1187e-008	2.2639e+003	7.5220e-008	2.7831e-003
Sm-156	6.1854e-002	2.2886e+009	7.6040e-002	2.8135e+003
Y-94	1.4764e-007	5.4627e+003	1.8150e-007	6.7155e-003
Y-95				

Buildup

The material reference is : Shield 1
 Y-94 1.4764e-007 5.4627e+003 1.8150e-007 6.7155e-003
 Y-95

Page : 2
 DOS File: 10SP8I38.MS5
 Run Date: August 19, 2005
 Run Time: 11:10:58 AM
 Duration: 00:00:23

EC-RADN-1135
 Page 168

Integration Parameters

Radial 20
 Circumferential 20
 Y Direction (axial) 25

Energy MeV	Activity photons/sec	Results			
		Fluence Rate	Fluence Rate	Exposure Rate	Exposure Rate
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	3.446e+00	0.000e+00	2.821e-34	0.000e+00	2.420e-35
0.02	2.167e+08	0.000e+00	2.792e-26	0.000e+00	9.672e-28
0.03	1.209e+10	1.348e-311	3.443e-24	1.336e-313	3.412e-26
0.04	2.387e+09	1.846e-154	1.803e-24	8.165e-157	7.975e-27
0.05	6.022e+08	8.712e-99	1.487e-24	2.321e-101	3.962e-27
0.06	7.290e+08	1.271e-73	1.292e-23	2.525e-76	2.567e-26
0.08	6.964e+08	7.014e-53	2.937e-23	1.110e-55	4.648e-26
0.1	3.257e+08	7.041e-45	6.350e-23	1.077e-47	9.714e-26
0.15	4.733e+08	2.794e-36	5.056e-22	4.602e-39	8.325e-25
0.2	6.685e+09	4.339e-31	1.661e-20	7.658e-34	2.931e-23
0.3	3.586e+11	1.478e-24	1.177e-18	2.804e-27	2.232e-21
0.4	3.519e+09	1.887e-23	3.407e-20	3.677e-26	6.638e-23
0.5	1.733e+10	1.832e-20	1.563e-17	3.596e-23	3.068e-20
0.6	3.964e+10	2.610e-18	1.431e-15	5.094e-21	2.794e-18
0.8	8.728e+11	2.861e-14	7.700e-12	5.441e-17	1.465e-14
1.0	3.712e+10	1.145e-13	1.765e-11	2.110e-16	3.253e-14
1.5	8.136e+09	4.750e-11	3.012e-09	7.992e-14	5.067e-12
2.0	3.529e+08	2.105e-10	7.898e-09	3.255e-13	1.221e-11
3.0	1.630e+06	2.235e-10	4.446e-09	3.032e-13	6.032e-12
TOTALS:	1.362e+12	4.816e-10	1.538e-08	7.089e-13	2.336e-11

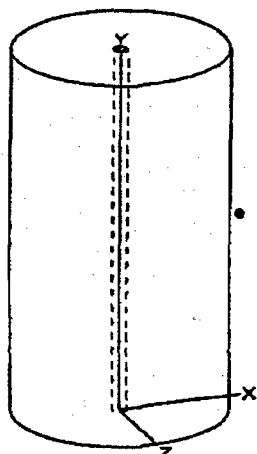
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 10SP8RAD.MS5
 Run Date: August 19, 2005
 Run Time: 11:11:22 AM
 Duration: 00:00:24

EC-RADN-1135
 Page 169

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 1 Hour, RADTRAD
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 304.8 cm 457.2 cm Z 0 cm
 10 ft 0.0 in 15 ft 0.0 in

Shields			
Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	243.84 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	1.1071e-003	4.0962e+007	1.3610e-003	5.0357e+001
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	4.6968e+001	1.7378e+012	5.7740e+001	2.1364e+006
Ba-140	2.0946e+003	7.7500e+013	2.5750e+003	9.5275e+007
Ce-141	1.9449e+001	7.1963e+011	2.3910e+001	8.8467e+005
Ce-143	1.5463e+001	5.7215e+011	1.9010e+001	7.0337e+005
Ce-144	1.6464e+001	6.0917e+011	2.0240e+001	7.4888e+005
Cm-242	2.9032e-001	1.0742e+010	3.5690e-001	1.3205e+004
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2090e-001	1.1873e+010	3.9450e-001	1.4597e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-136	3.9240e+002	1.4519e+013	4.8240e+002	1.7849e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
I-131	6.8337e+003	2.5285e+014	8.4010e+003	3.1084e+008
I-132	9.6799e+003	3.5816e+014	1.1900e+004	4.4030e+008
I-133	1.1372e+004	4.2076e+014	1.3980e+004	5.1726e+008
I-134	9.9728e+001	3.6899e+012	1.2260e+002	4.5362e+006
I-135	5.9357e+003	2.1962e+014	7.2970e+003	2.6999e+008
La-140	9.0454e+000	3.3468e+011	1.1120e+001	4.1144e+005
La-141	2.0450e+000	7.5665e+010	2.5140e+000	9.3018e+004
La-142	2.2182e-001	8.2075e+009	2.7270e-001	1.0090e+004
Mo-99	1.0103e+002	3.7381e+012	1.2420e+002	4.5954e+006
Nb-95	9.3793e+000	3.3468e+011	1.1120e+001	4.1144e+005
La-140	9.0454e+000	3.3468e+011	1.1120e+001	4.1144e+005
La-141	2.0450e+000	7.5665e+010	2.5140e+000	9.3018e+004

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm ³
Nd-147	3.0862e+000	1.1419e+011	3.7940e+000	1.4038e+005
Np-239	2.1036e+002	7.7832e+012	2.5860e+002	9.5682e+006
Pr-143	7.0167e+000	2.5962e+011	8.6260e+000	3.1916e+005
Pr-144	6.5840e+000	2.4361e+011	8.0940e+000	2.9948e+005
Pu-238	4.9628e-002	1.8362e+009	6.1010e-002	2.2574e+003
Pu-239	5.2540e-003	1.9440e+008	6.4590e-003	2.3898e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1640e+001	4.3069e+011	1.4310e+001	5.2947e+005
Rh-103m	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Rh-105	5.6949e+001	2.1071e+012	7.0010e+001	2.5904e+006
Rh-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Ru-103	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Ru-105	1.9124e+001	7.0759e+011	2.3510e+001	8.6987e+005
Ru-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Sb-127	9.7287e+001	3.5996e+012	1.1960e+002	4.4252e+006
Sb-129	1.0811e+002	3.9999e+012	1.3290e+002	4.9173e+006
Sr-89	1.1225e+003	4.1534e+013	1.3800e+003	5.1060e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	7.9473e+002	2.9405e+013	9.7700e+002	3.6149e+007
Sr-92	1.9539e+002	7.2294e+012	2.4020e+002	8.8874e+006
Tc-99m	9.4359e+001	3.4913e+012	1.1600e+002	4.2920e+006
Te-127	1.0062e+002	3.7230e+012	1.2370e+002	4.5769e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	1.6627e+002	6.1519e+012	2.0440e+002	7.5628e+006
Te-129m	7.2242e+001	2.6729e+012	8.8810e+001	3.2860e+006
Te-131m	1.9539e+002	7.2294e+012	2.4020e+002	8.8874e+006
Te-132	1.5626e+003	5.7817e+013	1.9210e+003	7.1077e+007
Y-90	5.8917e-001	2.1799e+010	7.2430e-001	2.6799e+004
Y-91	5.8202e+000	2.1535e+011	7.1550e+000	2.6473e+005
Y-92	2.8430e+000	1.0519e+011	3.4950e+000	1.2932e+005
Y-93	2.7136e+000	1.0040e+011	3.3360e+000	1.2343e+005
Zr-95	8.3052e+000	3.0729e+011	1.0210e+001	3.7777e+005
Zr-97	5.9389e+000	2.1974e+011	7.3010e+000	2.7014e+005

Buildup
 The material reference is : Shield 1

Integration Parameters	
Radial	20
Circumferential	20
Y Direction (axial)	25

Energy MeV	Activity photons/sec	Results			
		Fluence Rate MeV/cm ² /sec	Fluence Rate MeV/cm ² /sec	Exposure Rate mR/hr	Exposure Rate mR/hr
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	3.466e+08	0.000e+00	2.838e-26	0.000e+00	2.434e-27
0.02	6.789e+11	0.000e+00	8.746e-23	0.000e+00	3.030e-24
0.03	7.273e+13	8.111e-308	2.072e-20	8.038e-310	2.053e-22
0.04	1.553e+12	1.201e-151	1.173e-21	5.313e-154	5.190e-24
0.05	7.602e+12	1.100e-94	1.877e-20	2.930e-97	5.001e-23
0.03	7.273e+13	8.111e-308	2.072e-20	8.038e-310	2.053e-22
0.04	1.553e+12	1.201e-151	1.173e-21	5.313e-154	5.190e-24

Page : 3
 DOS File: 10SP8RAD.MS5
 Run Date: August 19, 2005
 Run Time: 11:11:22 AM
 Duration: 00:00:24

EC-RADN-1135
 Page 171

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.06	2.018e+12	3.519e-70	3.577e-20	6.989e-73	7.104e-23
0.08	7.859e+12	7.914e-49	3.314e-19	1.252e-51	5.245e-22
0.1	8.560e+12	1.850e-40	1.669e-18	2.831e-43	2.553e-21
0.15	1.271e+13	7.506e-32	1.358e-17	1.236e-34	2.236e-20
0.2	6.160e+13	3.998e-27	1.530e-16	7.057e-30	2.701e-19
0.3	5.271e+13	2.173e-22	1.730e-16	4.121e-25	3.281e-19
0.4	2.330e+14	1.249e-18	2.255e-15	2.434e-21	4.395e-18
0.5	5.033e+14	5.321e-16	4.540e-13	1.044e-18	8.911e-16
0.6	5.541e+14	3.648e-14	2.001e-11	7.120e-17	3.905e-14
0.8	4.772e+14	1.564e-11	4.210e-09	2.975e-14	8.008e-12
1.0	2.388e+14	7.366e-10	1.135e-07	1.358e-12	2.093e-10
1.5	1.949e+14	1.138e-06	7.214e-05	1.914e-09	1.214e-07
2.0	3.660e+13	2.183e-05	8.191e-04	3.376e-08	1.267e-06
3.0	1.417e+10	1.942e-06	3.864e-05	2.635e-09	5.242e-08
4.0	2.154e+08	6.725e-07	9.139e-06	8.320e-10	1.131e-08
TOTALS:	2.466e+15	2.559e-05	9.391e-04	3.914e-08	1.452e-06

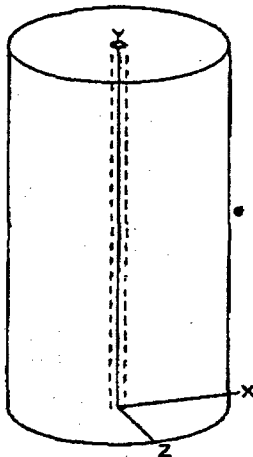
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 10SP24GR.MS5
 Run Date: August 19, 2005
 Run Time: 11:09:20 AM
 Duration: 00:00:25

EC-RADN-1135
 Page 172

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 24 Hour, Grove
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 304.8 cm 457.2 cm Z 0 cm
 10 ft 0.0 in 15 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	243.84 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded

Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	1.1103e-003	4.1083e+007	1.3650e-003	5.0505e+001
Am-242	1.7595e-001	6.5100e+009	2.1630e-001	8.0031e+003
Am-242m	7.2160e-005	2.6699e+006	8.8710e-005	3.2823e+000
Am-243	1.3633e-004	5.0443e+006	1.6760e-004	6.2012e+000
Am-244	1.1575e-001	4.2828e+009	1.4230e-001	5.2651e+003
Ba-135m	2.5518e-001	9.4415e+009	3.1370e-001	1.1607e+004
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	1.8042e-002	6.6756e+008	2.2180e-002	8.2066e+002
Ba-140	2.0198e+003	7.4732e+013	2.4830e+003	9.1871e+007
Ba-141				
Ba-142				
Br-82	1.5561e+001	5.7576e+011	1.9130e+001	7.0781e+005
Br-83	8.9804e-001	3.3227e+010	1.1040e+000	4.0848e+004
Br-84	4.0599e-011	1.5022e+000	4.9910e-011	1.8467e-006
Ce-141	1.9205e+001	7.1060e+011	2.3610e+001	8.7357e+005
Ce-143	1.1055e+001	4.0902e+011	1.3590e+001	5.0283e+005
Ce-144	1.6375e+001	6.0586e+011	2.0130e+001	7.4481e+005
Cm-242	2.8999e-001	1.0730e+010	3.5650e-001	1.3191e+004
Cm-243	1.2503e-004	4.6259e+006	1.5370e-004	5.6869e+000
Cm-244	1.6993e-002	6.2873e+008	2.0890e-002	7.7293e+002
Co-58	3.1879e-001	1.1795e+010	3.9190e-001	1.4500e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Co-60m				
Co-51	1.6171e-002	5.9833e+003	1.9880e-002	7.3556e-003
Cm-244	1.6993e-002	6.2873e+008	2.0890e-002	7.7293e+002
Co-58	3.1879e-001	1.1795e+010	3.9190e-001	1.4500e+004

Page : 2
 DOS File: 10SP24GR.MS5
 Run Date: August 19, 2005
 Run Time: 11:09:20 AM
 Duration: 00:00:25

EC-RADN-1135
 Page 173

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Cs-132	2.1280e-001	7.8734e+009	2.6160e-001	9.6792e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-134m	8.6469e-001	3.1993e+010	1.0630e+000	3.9331e+004
Cs-136	3.7866e+002	1.4010e+013	4.6550e+002	1.7223e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
Cs-138	6.6092e-010	2.4454e+001	8.1250e-010	3.0063e-005
Cs-139				
Eu-152m	1.8058e-004	6.6816e+006	2.2200e-004	8.2140e+000
Eu-154	4.5927e-002	1.6993e+009	5.6460e-002	2.0890e+003
Eu-155	1.8888e-002	6.9886e+008	2.3220e-002	8.5914e+002
Eu-156	1.1413e+000	4.2226e+010	1.4030e+000	5.1911e+004
I-128				
I-130	4.5089e+001	1.6683e+012	5.5430e+001	2.0509e+006
I-131	6.5344e+003	2.4177e+014	8.0330e+003	2.9722e+008
I-132	8.3784e+003	3.1000e+014	1.0300e+004	3.8110e+008
I-133	6.6840e+003	2.4731e+014	8.2170e+003	3.0403e+008
I-134	3.7312e-004	1.3806e+007	4.5870e-004	1.6972e+001
I-135	1.0973e+003	4.0601e+013	1.3490e+003	4.9913e+007
La-140	8.8421e+000	3.2716e+011	1.0870e+001	4.0219e+005
La-141	1.2071e-001	4.4664e+009	1.4840e-001	5.4908e+003
La-142	1.4894e-004	5.5108e+006	1.8310e-004	6.7747e+000
Mo-99	8.5248e+001	3.1542e+012	1.0480e+002	3.8776e+006
Mo-101				
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nb-95m	9.2488e-002	3.4221e+009	1.1370e-001	4.2069e+003
Nb-96	6.6645e-003	2.4659e+008	8.1930e-003	3.0314e+002
Nb-97	3.1033e+000	1.1482e+011	3.8150e+000	1.4115e+005
Nb-97m	2.9292e+000	1.0838e+011	3.6010e+000	1.3324e+005
Nd-147	2.9593e+000	1.0949e+011	3.6380e+000	1.3461e+005
Nd-149	1.1974e-004	4.4303e+006	1.4720e-004	5.4464e+000
Np-236m	2.5192e-005	9.3211e+005	3.0970e-005	1.1459e+000
Np-238	3.6914e+000	1.3658e+011	4.5380e+000	1.6791e+005
Np-239	1.7294e+002	6.3987e+012	2.1260e+002	7.8662e+006
Np-240	4.2478e-008	1.5717e+003	5.2220e-008	1.9321e-003
Pd-109	6.6922e+000	2.4761e+011	8.2270e+000	3.0440e+005
Pm-147	1.0941e+000	4.0481e+010	1.3450e+000	4.9765e+004
Pm-148	7.7480e-001	2.8668e+010	9.5250e-001	3.5243e+004
Pm-148m	1.6594e-001	6.1398e+009	2.0400e-001	7.5480e+003
Pm-149	2.0979e+000	7.7621e+010	2.5790e+000	9.5423e+004
Pm-151	5.2874e-001	1.9563e+010	6.5000e-001	2.4050e+004
Pr-142	1.3365e-001	4.9450e+009	1.6430e-001	6.0791e+003
Pr-143	6.9500e+000	2.5715e+011	8.5440e+000	3.1613e+005
Pr-144	6.5506e+000	2.4237e+011	8.0530e+000	2.9796e+005
Pr-144m	9.1756e-002	3.3950e+009	1.1280e-001	4.1736e+003
Pu-237	7.1827e-005	2.6576e+006	8.8300e-005	3.2671e+000
Pu-238	4.9709e-002	1.8392e+009	6.1110e-002	2.2611e+003
Pu-239	5.2621e-003	1.9470e+008	6.4690e-003	2.3935e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Pu-243	1.5878e-001	5.8750e+009	1.9520e-001	7.2224e+003
Rb-86	1.1347e+001	4.1986e+011	1.3950e+001	5.1615e+005
Rb-88	1.2926e+001	4.7825e+011	1.5890e+001	5.8793e+005
Rh-103m	9.1431e+001	3.3829e+012	1.1240e+002	4.1588e+006
Rh-105	1.5878e-001	5.8750e+009	1.9520e-001	7.2224e+003
Pu-243	1.5878e-001	5.8750e+009	1.9520e-001	7.2224e+003
Rh-86	1.1347e+001	4.1986e+011	1.3950e+001	5.1615e+005

Page : 3
 DOS File: 10SP24GR.MS5
 Run Date: August 19, 2005
 Run Time: 11:09:20 AM
 Duration: 00:00:25

EC-RADN-1135
 Page 174

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Rh-105m	4.4894e-001	1.6611e+010	5.5190e-001	2.0420e+004
Rh-106	3.7199e+001	1.3763e+012	4.5730e+001	1.6920e+006
Ru-103	9.1837e+001	3.3980e+012	1.1290e+002	4.1773e+006
Ru-105	1.5716e+000	5.8148e+010	1.9320e+000	7.1484e+004
Ru-106	3.7199e+001	1.3763e+012	4.5730e+001	1.6920e+006
Sb-122	1.7944e+000	6.6395e+010	2.2060e+000	8.1622e+004
Sb-124	1.0485e+000	3.8795e+010	1.2890e+000	4.7693e+004
Sb-125	1.4918e+001	5.5198e+011	1.8340e+001	6.7858e+005
Sb-126	4.7749e-001	1.7667e+010	5.8700e-001	2.1719e+004
Sb-126m	9.0617e-004	3.3528e+007	1.1140e-003	4.1218e+001
Sb-127	8.6469e+001	3.1993e+012	1.0630e+002	3.9331e+006
Sb-129	8.7282e+000	3.2294e+011	1.0730e+001	3.9701e+005
Sm-151	2.9731e-003	1.1001e+008	3.6550e-003	1.3524e+002
Sm-153	1.6131e+000	5.9683e+010	1.9830e+000	7.3371e+004
Sr-89	1.1055e+003	4.0902e+013	1.3590e+003	5.0283e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	2.4777e+002	9.1676e+012	3.0460e+002	1.1270e+007
Sr-92	3.2586e+000	1.2057e+011	4.0060e+000	1.4822e+005
Sr-93				
Tc-99	1.2015e-003	4.4454e+007	1.4770e-003	5.4649e+001
Tc-99m	8.2320e+001	3.0458e+012	1.0120e+002	3.7444e+006
Tc-101				
Te-123m	1.0477e-002	3.8765e+008	1.2880e-002	4.7656e+002
Te-125m	3.3018e+000	1.2216e+011	4.0590e+000	1.5018e+005
Te-127	9.3952e+001	3.4762e+012	1.1550e+002	4.2735e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	5.5452e+001	2.0517e+012	6.8170e+001	2.5223e+006
Te-129m	7.1412e+001	2.6422e+012	8.7790e+001	3.2482e+006
Te-131	3.0341e+001	1.1226e+012	3.7300e+001	1.3801e+006
Te-131m	1.3471e+002	4.9841e+012	1.6560e+002	6.1272e+006
Te-132	1.3552e+003	5.0142e+013	1.6660e+003	6.1642e+007
Te-133	3.6580e-006	1.3535e+005	4.4970e-006	1.6639e-001
Te-133m	1.6212e-005	5.9984e+005	1.9930e-005	7.3741e-001
Te-134	9.0617e-008	3.3528e+003	1.1140e-007	4.1218e-003
Y-90	5.8470e-001	2.1634e+010	7.1880e-001	2.6596e+004
Y-91	5.8202e+000	2.1535e+011	7.1550e+000	2.6473e+005
Y-91m	6.2846e-001	2.3253e+010	7.7260e-001	2.8586e+004
Y-92	1.9222e-001	7.1120e+009	2.3630e-001	8.7431e+003
Y-93	9.0454e-001	3.3468e+010	1.1120e+000	4.1144e+004
Zr-89	1.9449e-003	7.1963e+007	2.3910e-003	8.8467e+001
Zr-93	1.2934e-006	4.7855e+004	1.5900e-006	5.8830e-002
Zr-95	8.2401e+000	3.0489e+011	1.0130e+001	3.7481e+005
Zr-97	3.0854e+000	1.1416e+011	3.7930e+000	1.4034e+005

Buildup

The material reference is : Shield 1

Integration Parameters

Radial 20
 Circumferential 20
 Y Direction (axial) 25

Results

Circumferential 20
 Y Direction (axial) 25

Page : 4
 DOS File: 10SP24GR.MS5
 Run Date: August 19, 2005
 Run Time: 11:09:20 AM
 Duration: 00:00:25

EC-RADN-1135
 Page 175

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	2.894e+09	0.000e+00	2.369e-25	0.000e+00	2.032e-26
0.02	6.257e+11	0.000e+00	8.061e-23	0.000e+00	2.792e-24
0.03	6.438e+13	7.180e-308	1.834e-20	7.116e-310	1.818e-22
0.04	1.477e+12	1.142e-151	1.116e-21	5.052e-154	4.935e-24
0.05	6.604e+12	9.554e-95	1.631e-20	2.545e-97	4.345e-23
0.06	1.918e+12	3.345e-70	3.400e-20	6.643e-73	6.753e-23
0.08	7.443e+12	7.495e-49	3.139e-19	1.186e-51	4.968e-22
0.1	7.097e+12	1.534e-40	1.383e-18	2.347e-43	2.116e-21
0.15	1.207e+13	7.126e-32	1.289e-17	1.173e-34	2.123e-20
0.2	5.010e+13	3.252e-27	1.245e-16	5.739e-30	2.197e-19
0.3	4.153e+13	1.712e-22	1.363e-16	3.247e-25	2.585e-19
0.4	2.123e+14	1.138e-18	2.055e-15	2.218e-21	4.004e-18
0.5	3.238e+14	3.424e-16	2.921e-13	6.720e-19	5.734e-16
0.6	4.864e+14	3.202e-14	1.756e-11	6.250e-17	3.428e-14
0.8	3.895e+14	1.277e-11	3.436e-09	2.428e-14	6.536e-12
1.0	1.347e+14	4.156e-10	6.406e-08	7.660e-13	1.181e-10
1.5	7.849e+13	4.583e-07	2.906e-05	7.710e-10	4.889e-08
2.0	1.499e+13	8.942e-06	3.355e-04	1.383e-08	5.188e-07
3.0	2.521e+10	3.456e-06	6.876e-05	4.689e-09	9.328e-08
4.0	1.447e+05	4.515e-10	6.136e-09	5.586e-13	7.591e-12
5.0	6.857e+08	1.623e-05	1.685e-04	1.861e-08	1.932e-07
TOTALS:	1.833e+15	2.909e-05	6.019e-04	3.790e-08	8.543e-07

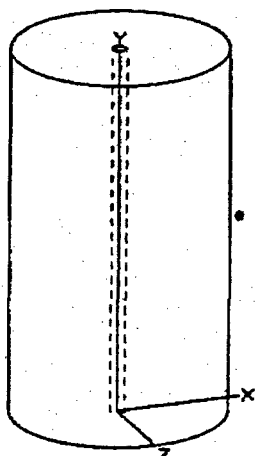
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 10SP24I.MS5
 Run Date: August 19, 2005
 Run Time: 11:09:45 AM
 Duration: 00:00:22

EC-RADN-1135
 Page 176

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 24 Hour, ICRP38
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X Y Z
 304.8 cm 457.2 cm 0 cm
 10 ft 0.0 in 15 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	243.84 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : ICRP-38

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Cs-135m	1.6749e-006	6.1970e+004	2.0590e-006	7.6183e-002
Eu-157	3.8573e-002	1.4272e+009	4.7420e-002	1.7545e+003
Eu-158	1.6659e-011	6.1639e-001	2.0480e-011	7.5776e-007
La-143				
Nd-151				
Pm-150	4.8546e-005	1.7962e+006	5.9680e-005	2.2082e+000
Pr-145	3.0927e-001	1.1443e+010	3.8020e-001	1.4067e+004
Pr-147				
Rh-106m	6.0268e-004	2.2299e+007	7.4090e-004	2.7413e+001
Rh-107				
Sb-128a	2.9015e+000	1.0736e+011	3.5670e+000	1.3198e+005
Sb-128b	9.2244e-006	3.4130e+005	1.1340e-005	4.1958e-001
Sb-130	1.3300e-009	4.9209e+001	1.6350e-009	6.0495e-005
Sb-131				
Se-81	1.6708e-007	6.1820e+003	2.0540e-007	7.5998e-003
Se-81m	1.1307e-007	4.1835e+003	1.3900e-007	5.1430e-003
Se-83				
Sm-155				
Sm-156	1.9051e-001	7.0488e+009	2.3420e-001	8.6654e+003
Y-94				
Y-95				

Buildup
 The material reference is : Shield 1

Y-94
 V-95

Page : 2
 DOS File: 10SP24I.MSS
 Run Date: August 19, 2005
 Run Time: 11:09:45 AM
 Duration: 00:00:22

EC-RADN-1135
 Page 177

Integration Parameters

Radial 20
 Circumferential 20
 Y Direction (axial) 25

Results

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.02	5.468e+08	0.000e+00	7.045e-26	0.000e+00	2.440e-27
0.03	3.045e+09	3.396e-312	8.675e-25	3.366e-314	8.598e-27
0.04	1.739e+09	1.345e-154	1.314e-24	5.947e-157	5.809e-27
0.05	4.414e+08	6.385e-99	1.090e-24	1.701e-101	2.904e-27
0.06	4.338e+08	7.566e-74	7.691e-24	1.503e-76	1.528e-26
0.08	1.709e+09	1.722e-52	7.210e-23	2.724e-55	1.141e-25
0.1	3.947e+03	8.532e-50	7.694e-28	1.305e-52	1.177e-30
0.15	1.037e+09	6.124e-36	1.108e-21	1.009e-38	1.825e-24
0.2	2.844e+09	1.846e-31	7.066e-21	3.258e-34	1.247e-23
0.3	9.911e+10	4.085e-25	3.252e-19	7.749e-28	6.169e-22
0.4	4.685e+08	2.513e-24	4.536e-21	4.896e-27	8.838e-24
0.5	8.020e+07	8.478e-23	7.234e-20	1.664e-25	1.420e-22
0.6	3.791e+09	2.496e-19	1.369e-16	4.873e-22	2.672e-19
0.8	2.246e+11	7.362e-15	1.982e-12	1.400e-17	3.769e-15
1.0	8.672e+09	2.675e-14	4.124e-12	4.931e-17	7.601e-15
1.5	1.511e+09	8.821e-12	5.593e-10	1.484e-14	9.410e-13
2.0	1.088e+06	6.490e-13	2.435e-11	1.004e-15	3.765e-14
3.0	2.211e+04	3.031e-12	6.030e-11	4.112e-15	8.181e-14
TOTALS:	3.500e+11	1.253e-11	6.500e-10	2.002e-14	1.072e-12

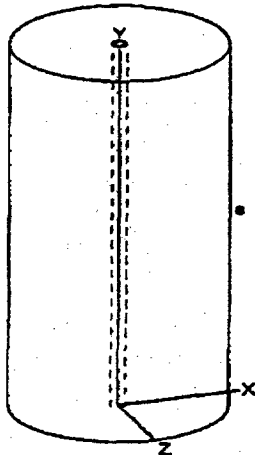
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 10SP24RD.MS5
 Run Date: August 19, 2005
 Run Time: 11:10:08 AM
 Duration: 00:00:24

EC-RADN-1135
 Page 178

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 24 Hour, RADTRAD
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 304.8 cm 457.2 cm Z 0 cm
 10 ft 0.0 in 15 ft 0.0 in

Shields			
Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	243.84 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded

Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	1.1103e-003	4.1083e+007	1.3650e-003	5.0505e+001
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	1.8042e-002	6.6756e+008	2.2180e-002	8.2066e+002
Ba-140	2.0198e+003	7.4732e+013	2.4830e+003	9.1871e+007
Ce-141	1.9205e+001	7.1060e+011	2.3610e+001	8.7357e+005
Ce-143	1.1055e+001	4.0902e+011	1.3590e+001	5.0283e+005
Ce-144	1.6375e+001	6.0586e+011	2.0130e+001	7.4481e+005
Cm-242	2.8999e-001	1.0730e+010	3.5650e-001	1.3191e+004
Cm-244	1.6993e-002	6.2873e+008	2.0890e-002	7.7293e+002
Co-58	3.1879e-001	1.1795e+010	3.9190e-001	1.4500e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-136	3.7866e+002	1.4010e+013	4.6550e+002	1.7223e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
I-131	6.5344e+003	2.4177e+014	8.0330e+003	2.9722e+008
I-132	8.3784e+003	3.1000e+014	1.0300e+004	3.8110e+008
I-133	6.6840e+003	2.4731e+014	8.2170e+003	3.0403e+008
I-134	3.7312e-004	1.3806e+007	4.5870e-004	1.6972e+001
I-135	1.0973e+003	4.0601e+013	1.3490e+003	4.9913e+007
La-140	8.8421e+000	3.2716e+011	1.0870e+001	4.0219e+005
La-141	1.2071e-001	4.4664e+009	1.4840e-001	5.4908e+003
La-142	1.4894e-004	5.5108e+006	1.8310e-004	6.7747e+000
Mo-99	8.5248e+001	3.1542e+012	1.0480e+002	3.8776e+006
Nb-95	8.3723e+000	3.2976e+011	1.0890e+001	4.0219e+005
La-141	1.2071e-001	4.4664e+009	1.4840e-001	5.4908e+003

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Nd-147	2.9593e+000	1.0949e+011	3.6380e+000	1.3461e+005
Np-239	1.7294e+002	6.3987e+012	2.1260e+002	7.8662e+006
Pr-143	6.9500e+000	2.5715e+011	8.5440e+000	3.1613e+005
Pr-144	6.5506e+000	2.4237e+011	8.0530e+000	2.9796e+005
Pu-238	4.9709e-002	1.8392e+009	6.1110e-002	2.2611e+003
Pu-239	5.2621e-003	1.9470e+008	6.4690e-003	2.3935e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1347e+001	4.1986e+011	1.3950e+001	5.1615e+005
Rh-103m	9.1431e+001	3.3829e+012	1.1240e+002	4.1588e+006
Rh-105	4.3641e+001	1.6147e+012	5.3650e+001	1.9851e+006
Rh-106	3.7199e+001	1.3763e+012	4.5730e+001	1.6920e+006
Ru-103	9.1837e+001	3.3980e+012	1.1290e+002	4.1773e+006
Ru-105	1.5716e+000	5.8148e+010	1.9320e+000	7.1484e+004
Ru-106	3.7199e+001	1.3763e+012	4.5730e+001	1.6920e+006
Sb-127	8.6469e+001	3.1993e+012	1.0630e+002	3.9331e+006
Sb-129	8.7282e+000	3.2294e+011	1.0730e+001	3.9701e+005
Sr-89	1.1055e+003	4.0902e+013	1.3590e+003	5.0283e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	2.4777e+002	9.1676e+012	3.0460e+002	1.1270e+007
Sr-92	3.2586e+000	1.2057e+011	4.0060e+000	1.4822e+005
Tc-99m	8.2320e+001	3.0458e+012	1.0120e+002	3.7444e+006
Te-127	9.3952e+001	3.4762e+012	1.1550e+002	4.2735e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	5.5452e+001	2.0517e+012	6.8170e+001	2.5223e+006
Te-129m	7.1412e+001	2.6422e+012	8.7790e+001	3.2482e+006
Te-131m	1.3471e+002	4.9841e+012	1.6560e+002	6.1272e+006
Te-132	1.3552e+003	5.0142e+013	1.6660e+003	6.1642e+007
Y-90	5.8470e-001	2.1634e+010	7.1880e-001	2.6596e+004
Y-91	5.8202e+000	2.1535e+011	7.1550e+000	2.6473e+005
Y-92	1.9222e-001	7.1120e+009	2.3630e-001	8.7431e+003
Y-93	9.0454e-001	3.3468e+010	1.1120e+000	4.1144e+004
Zr-95	8.2401e+000	3.0489e+011	1.0130e+001	3.7481e+005
Zr-97	3.0854e+000	1.1416e+011	3.7930e+000	1.4034e+005

Buildup

The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	2.845e+08	0.000e+00	2.329e-26	0.000e+00	1.998e-27
0.02	6.183e+11	0.000e+00	7.967e-23	0.000e+00	2.760e-24
0.03	6.381e+13	7.116e-308	1.818e-20	7.052e-310	1.802e-22
0.04	1.405e+12	1.086e-151	1.061e-21	4.805e-154	4.694e-24
0.05	6.594e+12	9.540e-95	1.629e-20	2.541e-97	4.338e-23
U.03	6.381e+13	7.116e-308	1.818e-20	7.052e-310	1.802e-22
0.04	1.405e+12	1.086e-151	1.061e-21	4.805e-154	4.694e-24

Page : 3
 DOS File: 10SP24RD.MS5
 Run Date: August 19, 2005
 Run Time: 11:10:08 AM
 Duration: 00:00:24

EC-RADN-1135
 Page 180

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.06	1.914e+12	3.338e-70	3.393e-20	6.630e-73	6.739e-23
0.08	7.437e+12	7.490e-49	3.137e-19	1.185e-51	4.964e-22
0.1	7.069e+12	1.528e-40	1.378e-18	2.338e-43	2.108e-21
0.15	1.128e+13	6.660e-32	1.205e-17	1.097e-34	1.984e-20
0.2	5.004e+13	3.248e-27	1.243e-16	5.733e-30	2.194e-19
0.3	4.150e+13	1.711e-22	1.362e-16	3.245e-25	2.583e-19
0.4	2.115e+14	1.134e-18	2.048e-15	2.210e-21	3.990e-18
0.5	3.218e+14	3.402e-16	2.903e-13	6.678e-19	5.698e-16
0.6	4.833e+14	3.182e-14	1.745e-11	6.211e-17	3.406e-14
0.8	3.873e+14	1.269e-11	3.417e-09	2.414e-14	6.499e-12
1.0	1.341e+14	4.136e-10	6.376e-08	7.624e-13	1.175e-10
1.5	7.817e+13	4.564e-07	2.894e-05	7.679e-10	4.869e-08
2.0	1.487e+13	8.871e-06	3.328e-04	1.372e-08	5.147e-07
3.0	1.165e+10	1.597e-06	3.177e-05	2.167e-09	4.311e-08
4.0	1.447e+05	4.515e-10	6.136e-09	5.586e-13	7.591e-12
TOTALS:	1.823e+15	1.093e-05	3.936e-04	1.665e-08	6.066e-07

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.

Date 08/19/2005

Designed By T.F. Mackay

Checked By M.M.Waselus

PROJECT

Justification Of AST 60 Isotope

RADTRAD Source Term For Direct

Shine Dose Calculations

Calc. No. EC-RADN-1135

Sh. No. 181

**ATTACHMENT 2
MICROSHIELD COMPUTER CODE OUTPUTS
AST DBA-LOCA AIRBORNE SOURCE**

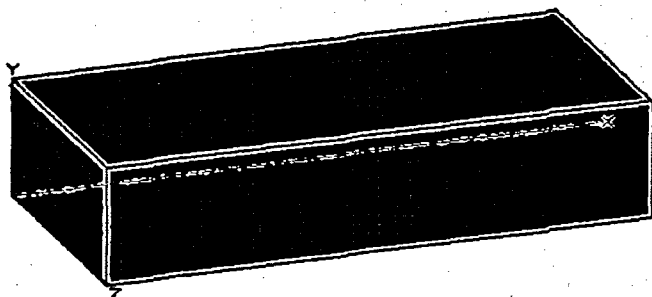
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1RB1GR.MS5
 Run Date: August 8, 2005
 Run Time: 5:37:49 PM
 Duration: 00:00:26

EC-RADN-1135
 Page 182

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 1 Hour, GROVE
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 14 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded

Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	5.6916e-001	2.1059e+010	8.6210e-005	3.1898e+000
Am-242	2.4513e+002	9.0699e+012	3.7130e-002	1.3738e+003
Am-242m	3.7202e-002	1.3765e+009	5.6350e-006	2.0849e-001
Am-243	7.0113e-002	2.5942e+009	1.0620e-005	3.9294e-001
Am-244	2.8976e+002	1.0721e+013	4.3890e-002	1.6239e+003
Ba-135m	2.2929e+002	8.4836e+012	3.4730e-002	1.2850e+003
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	7.5461e+005	2.7920e+016	1.1430e+002	4.2291e+006
Ba-140	1.0973e+006	4.0598e+016	1.6620e+002	6.1494e+006
Ba-141	1.0332e+005	3.8229e+015	1.5650e+001	5.7905e+005
Ba-142	1.8644e+004	6.8983e+014	2.8240e+000	1.0449e+005
Br-82	1.2630e+004	4.6730e+014	1.9130e+000	7.0781e+004
Br-83	3.4971e+005	1.2939e+016	5.2970e+001	1.9599e+006
Br-84	2.4223e+005	8.9624e+015	3.6690e+001	1.3575e+006
Ce-141	1.0075e+004	3.7276e+014	1.5260e+000	5.6462e+004
Ce-143	9.2164e+003	3.4101e+014	1.3960e+000	5.1652e+004
Ce-144	8.4836e+003	3.1389e+014	1.2850e+000	4.7545e+004
Cm-242	1.4967e+002	5.5377e+012	2.2670e-002	8.3879e+002
Cm-243	6.4462e-002	2.3851e+009	9.7640e-006	3.6127e-001
Cm-244	8.7410e+000	3.2342e+011	1.3240e-003	4.8988e+001
Co-58	1.6584e+002	6.1362e+012	2.5120e-002	9.2944e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Co-60m	2.7860e+000	1.0308e+011	4.2200e-004	1.5614e+001
Co-61	1.3092e+000	4.8439e+010	1.9830e-004	7.3371e+000
Cs-132	1.2148e+002	4.4946e+012	1.8400e-002	6.8080e+002
Cs-134	6.4501e+005	2.3856e+016	9.7700e+001	3.6148e+006
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Ce-144	8.4836e+003	3.1389e+014	1.2850e+000	4.7545e+004

Page : 2
 DOS File: 1RB1GR.MSS
 Run Date: August 8, 2005
 Run Time: 5:37:49 PM
 Duration: 00:00:26

EC-RADN-1135
 Page 183

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Cs-134m	1.0629e+005	3.9328e+015	1.6100e+001	5.9570e+005
Cs-136	2.0552e+005	7.6042e+015	3.1130e+001	1.1518e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
Cs-138	2.5074e+006	9.2775e+016	3.7980e+002	1.4053e+007
Cs-139	6.3432e+004	2.3470e+015	9.6080e+000	3.5550e+005
Eu-152m	5.1601e-001	1.9092e+010	7.8160e-005	2.8919e+000
Eu-154	2.3681e+001	8.7621e+011	3.5870e-003	1.3272e+002
Eu-155	9.7379e+000	3.6030e+011	1.4750e-003	5.4575e+001
Eu-156	6.1273e+002	2.2671e+013	9.2810e-002	3.4340e+003
I-128	7.5593e+003	2.7969e+014	1.1450e+000	4.2365e+004
I-130	8.4373e+004	3.1218e+015	1.2780e+001	4.7286e+005
I-131	3.6001e+006	1.3320e+017	5.4530e+002	2.0176e+007
I-132	5.2459e+006	1.9410e+017	7.9460e+002	2.9400e+007
I-133	7.3282e+006	2.7114e+017	1.1100e+003	4.1070e+007
I-134	5.8890e+006	2.1789e+017	8.9200e+002	3.3004e+007
I-135	6.4033e+006	2.3692e+017	9.6990e+002	3.5886e+007
Kr-83m	1.4141e+006	5.2323e+016	2.1420e+002	7.9254e+006
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	2.6058e+006	9.6415e+016	3.9470e+002	1.4604e+007
Kr-87	3.5314e+006	1.3066e+017	5.3490e+002	1.9791e+007
Kr-88	6.5578e+006	2.4264e+017	9.9330e+002	3.6752e+007
La-140	4.6973e+003	1.7380e+014	7.1150e-001	2.6325e+004
La-141	3.6001e+003	1.3320e+014	5.4530e-001	2.0176e+004
La-142	2.7775e+003	1.0277e+014	4.2070e-001	1.5566e+004
Mo-99	5.6150e+004	2.0775e+015	8.5050e+000	3.1469e+005
Mo-101	2.9999e+003	1.1100e+014	4.5440e-001	1.6813e+004
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nb-95m	4.7851e+001	1.7705e+012	7.2480e-003	2.6818e+002
Nb-96	6.7869e+000	2.5111e+011	1.0280e-003	3.8036e+001
Nb-97	4.2193e+003	1.5612e+014	6.3910e-001	2.3647e+004
Nb-97m	3.8833e+003	1.4368e+014	5.8820e-001	2.1763e+004
Nd-147	1.6201e+003	5.9945e+013	2.4540e-001	9.0798e+003
Nd-149	6.3775e+002	2.3597e+013	9.6600e-002	3.5742e+003
Np-236m	2.6362e-002	9.7539e+008	3.9930e-006	1.4774e-001
Np-238	2.6018e+003	9.6268e+013	3.9410e-001	1.4582e+004
Np-239	1.1831e+005	4.3774e+015	1.7920e+001	6.6304e+005
Np-240	1.1270e+002	4.1698e+012	1.7070e-002	6.3159e+002
Pd-109	1.1058e+004	4.0916e+014	1.6750e+000	6.1975e+004
Pm-147	5.6229e+002	2.0805e+013	8.5170e-002	3.1513e+003
Pm-148	4.5085e+002	1.6681e+013	6.8290e-002	2.5267e+003
Pm-148m	8.6948e+001	3.2171e+012	1.3170e-002	4.8729e+002
Pm-149	1.4399e+003	5.3276e+013	2.1810e-001	8.0697e+003
Pm-151	4.7831e+002	1.7698e+013	7.2450e-002	2.6807e+003
Pr-142	1.5878e+002	5.8748e+012	2.4050e-002	8.8985e+002
Pr-143	3.6172e+003	1.3384e+014	5.4790e-001	2.0272e+004
Pr-144	3.3947e+003	1.2561e+014	5.1420e-001	1.9025e+004
Pr-144m	4.7488e+001	1.7571e+012	7.1930e-003	2.6614e+002
Pu-237	3.7585e-002	1.3907e+009	5.6930e-006	2.1064e-001
Pu-238	2.5589e+001	9.4681e+011	3.8760e-003	1.4341e+002
Pu-239	2.7088e+000	1.0023e+011	4.1030e-004	1.5181e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Pu-243	2.0400e+003	7.5481e+013	3.0900e-001	1.1433e+004
Pu-239	2.7088e+000	1.0023e+011	4.1030e-004	1.5181e+001
Ru-86	3.3330e+003	2.2335e+013	5.1330e-001	3.3583e+003

Page : 3
 DOS File: 1RB1GR.MS5
 Run Date: August 8, 2005
 Run Time: 5:37:49 PM
 Duration: 00:00:26

EC-RADN-1135
 Page 184

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Rb-88	1.8109e+006	6.7004e+016	2.7430e+002	1.0149e+007
Rh-103m	4.8003e+004	1.7761e+015	7.2710e+000	2.6903e+005
Rh-105	3.1287e+004	1.1576e+015	4.7390e+000	1.7534e+005
Rh-105m	8.3779e+003	3.0998e+014	1.2690e+000	4.6953e+004
Rh-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Ru-103	4.8003e+004	1.7761e+015	7.2710e+000	2.6903e+005
Ru-105	2.9359e+004	1.0863e+015	4.4470e+000	1.6454e+005
Ru-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Sb-122	1.1870e+003	4.3920e+013	1.7980e-001	6.6526e+003
Sb-124	5.4526e+002	2.0175e+013	8.2590e-002	3.0558e+003
Sb-125	7.6913e+003	2.8458e+014	1.1650e+000	4.3105e+004
Sb-126	2.6005e+002	9.6219e+012	3.9390e-002	1.4574e+003
Sb-126m	3.4667e+001	1.2827e+012	5.2510e-003	1.9429e+002
Sb-127	5.2288e+004	1.9346e+015	7.9200e+000	2.9304e+005
Sb-129	1.6842e+005	6.2314e+015	2.5510e+001	9.4387e+005
Sm-151	1.5257e+000	5.6452e+010	2.3110e-004	8.5507e+000
Sm-153	1.1745e+003	4.3456e+013	1.7790e-001	6.5823e+003
Sr-89	5.7860e+005	2.1408e+016	8.7640e+001	3.2427e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	6.8133e+005	2.5209e+016	1.0320e+002	3.8184e+006
Sr-92	6.0435e+005	2.2361e+016	9.1540e+001	3.3870e+006
Sr-93	3.2746e+003	1.2116e+014	4.9600e-001	1.8352e+004
Tc-99	6.1933e-001	2.2915e+010	9.3810e-005	3.4710e+000
Tc-99m	5.0149e+004	1.8555e+015	7.5960e+000	2.8105e+005
Tc-101	1.1210e+004	4.1478e+014	1.6980e+000	6.2826e+004
Te-123m	5.4433e+000	2.0140e+011	8.2450e-004	3.0507e+001
Te-125m	1.6974e+003	6.2803e+013	2.5710e-001	9.5127e+003
Te-127	5.2288e+004	1.9346e+015	7.9200e+000	2.9304e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	1.7918e+005	6.6296e+015	2.7140e+001	1.0042e+006
Te-129m	3.7374e+004	1.3828e+015	5.6610e+000	2.0946e+005
Te-131	2.4817e+005	9.1823e+015	3.7590e+001	1.3908e+006
Te-131m	1.1831e+005	4.3774e+015	1.7920e+001	6.6304e+005
Te-132	8.5694e+005	3.1707e+016	1.2980e+002	4.8026e+006
Te-133	8.1865e+004	3.0290e+015	1.2400e+001	4.5880e+005
Te-133m	2.6316e+005	9.7368e+015	3.9860e+001	1.4748e+006
Te-134	4.0457e+005	1.4969e+016	6.1280e+001	2.2674e+006
Xe-129m	5.7688e+002	2.1345e+013	8.7380e-002	3.2331e+003
Xe-131m	1.6459e+005	6.0897e+015	2.4930e+001	9.2241e+005
Xe-133	2.3833e+007	8.8183e+017	3.6100e+003	1.3357e+008
Xe-133m	7.8366e+005	2.8995e+016	1.1870e+002	4.3919e+006
Xe-135	8.9985e+006	3.3295e+017	1.3630e+003	5.0431e+007
Xe-135m	3.5657e+006	1.3193e+017	5.4010e+002	1.9984e+007
Xe-137	4.4577e+002	1.6493e+013	6.7520e-002	2.4982e+003
Xe-138	1.1058e+006	4.0916e+016	1.6750e+002	6.1975e+006
Y-90	3.0580e+002	1.1315e+013	4.6320e-002	1.7138e+003
Y-91	3.0178e+003	1.1166e+014	4.5710e-001	1.6913e+004
Y-91m	1.6611e+003	6.1459e+013	2.5160e-001	9.3092e+003
Y-92	3.0686e+003	1.1354e+014	4.6480e-001	1.7198e+004
Y-93	2.2632e+003	8.3737e+013	3.4280e-001	1.2684e+004
Zr-89	1.2293e+000	4.5484e+010	1.8620e-004	6.8894e+000
Zr-93	6.6680e-004	2.4672e+007	1.0100e-007	3.7370e-003
Zr-95	4.2999e+003	1.5910e+014	6.5130e-001	2.4098e+004
Zr-97	4.0886e+003	1.5128e+014	6.1830e-001	2.2814e+004
Y-93 ⁷	2.2632e+003	8.3737e+013	3.4280e-001	1.2684e+004
Zr-99	4.0000e+000	4.5484e+010	3.8500e-004	6.2924e+000

Page : 4
 DOS File: 1RB1GR.MS5
 Run Date: August 8, 2005
 Run Time: 5:37:49 PM
 Duration: 00:00:26

EC-RADN-1135
 Page 185

Buildup
 The material reference is : Source

Integration Parameters
 X Direction 25
 Y Direction 25
 Z Direction 25

Results

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.015	4.629e+12	4.562e+02	5.468e+02	3.913e+01	4.690e+01
0.02	5.050e+14	1.456e+05	1.945e+05	5.043e+03	6.738e+03
0.03	5.384e+17	3.690e+08	5.755e+08	3.657e+06	5.704e+06
0.04	1.340e+15	1.381e+06	2.270e+06	6.110e+03	1.004e+04
0.05	4.175e+15	5.636e+06	9.387e+06	1.502e+04	2.501e+04
0.06	1.072e+15	1.777e+06	2.917e+06	3.529e+03	5.794e+03
0.08	3.315e+17	7.508e+08	1.167e+09	1.188e+06	1.847e+06
0.1	6.404e+15	1.840e+07	2.694e+07	2.814e+04	4.122e+04
0.15	1.155e+17	5.093e+08	6.912e+08	8.387e+05	1.138e+06
0.2	4.237e+17	2.532e+09	3.192e+09	4.470e+06	5.634e+06
0.3	7.316e+16	6.711e+08	7.994e+08	1.273e+06	1.516e+06
0.4	2.547e+17	3.164e+09	3.647e+09	6.166e+06	7.107e+06
0.5	5.066e+17	7.961e+09	8.979e+09	1.563e+07	1.763e+07
0.6	4.011e+17	7.636e+09	8.485e+09	1.491e+07	1.656e+07
0.8	7.365e+17	1.896e+10	2.063e+10	3.606e+07	3.924e+07
1.0	3.384e+17	1.100e+10	1.183e+10	2.028e+07	2.180e+07
1.5	3.451e+17	1.713e+10	1.807e+10	2.881e+07	3.040e+07
2.0	2.519e+17	1.685e+10	1.758e+10	2.605e+07	2.718e+07
3.0	3.077e+16	3.126e+09	3.225e+09	4.241e+06	4.376e+06
4.0	6.474e+14	8.835e+07	9.057e+07	1.093e+05	1.120e+05
5.0	9.607e+13	1.647e+07	1.682e+07	1.888e+04	1.928e+04
TOTALS:	4.362e+18	9.079e+10	9.902e+10	1.638e+08	1.804e+08

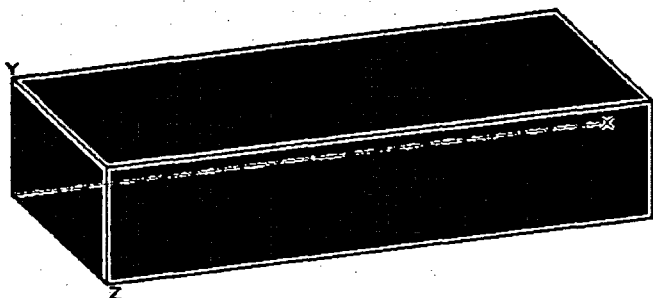
MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1RB1I38.MS5
 Run Date: August 8, 2005
 Run Time: 5:38:16 PM
 Duration: 00:00:26

EC-RADN-1135
 Page 186

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
Description: 1 Hour, ICRP38
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	4.0e+3 cm	131 ft 0.0 in
Width	1.9e+3 cm	63 ft
Height	861.06 cm	28 ft 3.0 in

Dose Points

	<u>X</u>	<u>Y</u>	<u>Z</u>
# 1	4297.68 cm	430.53 cm	960.12 cm
	141 ft 0.0 in	14 ft 1.5 in	31 ft 6.0 in

Shields

<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	6.60e+09 cm ³	Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 ; Excluded
Library : ICRP-38

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Cs-135m	5.9576e+004	2.2043e+015	9.0240e+000	3.3389e+005
Eu-157	5.6744e+001	2.0995e+012	8.5950e-003	3.1802e+002
Eu-158	9.6521e+000	3.5713e+011	1.4620e-003	5.4094e+001
La-143	1.9885e+002	7.3575e+012	3.0120e-002	1.1144e+003
Nd-151	1.7317e+001	6.4073e+011	2.6230e-003	9.7051e+001
Pm-150	9.5861e+000	3.5469e+011	1.4520e-003	5.3724e+001
Pr-145	2.2975e+003	8.5007e+013	3.4800e-001	1.2876e+004
Pr-147	8.1072e+001	2.9997e+012	1.2280e-002	4.5436e+002
Rh-106m	4.8861e+002	1.8079e+013	7.4010e-002	2.7384e+003
Rh-107	3.5360e+003	1.3083e+014	5.3560e-001	1.9817e+004
Sb-128a	8.5694e+003	3.1707e+014	1.2980e+000	4.8026e+004
Sb-128b	5.1000e+004	1.8870e+015	7.7250e+000	2.8583e+005
Sb-130	2.2585e+004	8.3566e+014	3.4210e+000	1.2658e+005
Sb-131	7.8432e+004	2.9020e+015	1.1880e+001	4.3956e+005
Se-81	4.5006e+003	1.6652e+014	6.8170e-001	2.5223e+004
Se-81m	1.0543e+003	3.9011e+013	1.5970e-001	5.9089e+003
Se-83	5.3146e+003	1.9664e+014	8.0500e-001	2.9785e+004
Sm-155	1.4762e+001	5.4620e+011	2.2360e-003	8.2732e+001
Sm-156	5.3489e+001	1.9791e+012	8.1020e-003	2.9977e+002
Y-94	4.3890e+002	1.6239e+013	6.6480e-002	2.4598e+003
Y-95	7.8036e+001	2.8873e+012	1.1820e-002	4.3734e+002

Buildup
The material reference is : Source

Integration Parameters

X Direction

Page : 2
 DOS File: 1RB1138.MS5
 Run Date: August 8, 2005
 Run Time: 5:38:16 PM
 Duration: 00:00:26

EC-RADN-1135
 Page 187

Y Direction 25
 Z Direction 25

Results

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec No Buildup	<u>Results</u>		<u>Exposure Rate</u> mR/hr No Buildup	<u>Exposure Rate</u> mR/hr With Buildup
			<u>Fluence Rate</u> MeV/cm ² /sec With Buildup			
0.015	1.062e+10	1.047e+00	1.255e+00		8.981e-02	1.076e-01
0.02	2.325e+12	6.702e+02	8.954e+02		2.321e+01	3.102e+01
0.03	2.884e+14	1.976e+05	3.083e+05		1.959e+03	3.055e+03
0.04	7.214e+12	7.439e+03	1.222e+04		3.290e+01	5.405e+01
0.05	6.034e+11	8.145e+02	1.356e+03		2.170e+00	3.614e+00
0.06	5.446e+11	9.030e+02	1.482e+03		1.794e+00	2.945e+00
0.08	1.240e+12	2.809e+03	4.367e+03		4.446e+00	6.911e+00
0.1	2.531e+13	7.271e+04	1.065e+05		1.112e+02	1.629e+02
0.15	9.182e+13	4.050e+05	5.496e+05		6.669e+02	9.050e+02
0.2	7.157e+14	4.278e+06	5.392e+06		7.550e+03	9.517e+03
0.3	2.724e+15	2.499e+07	2.977e+07		4.739e+04	5.646e+04
0.4	3.711e+14	4.610e+06	5.314e+06		8.983e+03	1.035e+04
0.5	1.298e+15	2.040e+07	2.301e+07		4.005e+04	4.517e+04
0.6	3.020e+15	5.748e+07	6.387e+07		1.122e+05	1.247e+05
0.8	1.161e+16	2.988e+08	3.252e+08		5.683e+05	6.185e+05
1.0	3.237e+15	1.053e+08	1.131e+08		1.940e+05	2.086e+05
1.5	8.197e+14	4.068e+07	4.292e+07		6.844e+04	7.222e+04
2.0	6.344e+14	4.243e+07	4.427e+07		6.561e+04	6.846e+04
3.0	4.001e+13	4.065e+06	4.194e+06		5.515e+03	5.690e+03
4.0	1.738e+11	2.372e+04	2.431e+04		2.934e+01	3.008e+01
TOTALS:	2.488e+16	6.037e+08	6.581e+08		1.121e+06	1.224e+06

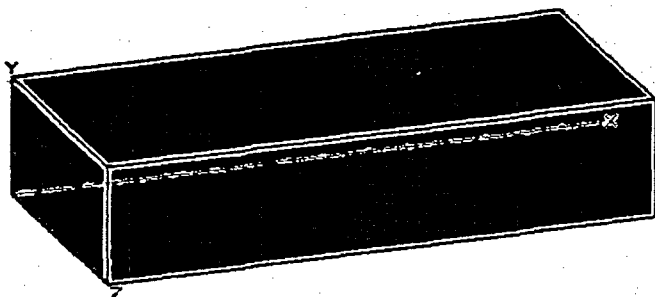
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1RB1RAD.MS5
 Run Date: August 8, 2005
 Run Time: 5:38:43 PM
 Duration: 00:00:28

EC-RADN-1135
 Page 188

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 1 Hour, RADTRAD
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 14 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	5.6916e-001	2.1059e+010	8.6210e-005	3.1898e+000
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	7.5461e+005	2.7920e+016	1.1430e+002	4.2291e+006
Ba-140	1.0973e+006	4.0598e+016	1.6620e+002	6.1494e+006
Ce-141	1.0075e+004	3.7276e+014	1.5260e+000	5.6462e+004
Ce-143	9.2164e+003	3.4101e+014	1.3960e+000	5.1652e+004
Ce-144	8.4836e+003	3.1389e+014	1.2850e+000	4.7545e+004
Cm-242	1.4967e+002	5.5377e+012	2.2670e-002	8.3879e+002
Cm-244	8.7410e+000	3.2342e+011	1.3240e-003	4.8988e+001
Co-58	1.6584e+002	6.1362e+012	2.5120e-002	9.2944e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Cs-134	6.4501e+005	2.3866e+016	9.7700e+001	3.6149e+006
Cs-136	2.0552e+005	7.6042e+015	3.1130e+001	1.1518e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
I-131	3.6001e+006	1.3320e+017	5.4530e+002	2.0176e+007
I-132	5.2459e+006	1.9410e+017	7.9460e+002	2.9400e+007
I-133	7.3282e+006	2.7114e+017	1.1100e+003	4.1070e+007
I-134	5.8890e+006	2.1789e+017	8.9200e+002	3.3004e+007
I-135	6.4033e+006	2.3692e+017	9.6990e+002	3.5886e+007
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	2.6058e+006	9.6415e+016	3.9470e+002	1.4604e+007
Kr-87	3.5314e+006	1.3066e+017	5.3490e+002	1.9791e+007
Kr-88	6.5578e+006	2.4264e+017	9.9330e+002	3.6752e+007
La-140	4.6973e+003	1.7380e+014	7.1150e-001	2.6325e+004
La-141	3.6001e+003	1.3320e+014	5.4530e-001	2.0176e+004
La-142	2.7775e+003	1.0277e+014	4.2070e-001	1.5565e+004
Kr-87	3.5314e+006	1.3066e+017	5.3490e+002	1.9791e+007
Xx 22.	6.5578e+006	2.4264e+017	9.9330e+002	3.6752e+007

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Mo-99	5.6150e+004	2.0775e+015	8.5050e+000	3.1469e+005
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nd-147	1.6201e+003	5.9945e+013	2.4540e-001	9.0798e+003
Np-239	1.1831e+005	4.3774e+015	1.7920e+001	6.6304e+005
Pr-143	3.6172e+003	1.3384e+014	5.4790e-001	2.0272e+004
Pr-144	3.3947e+003	1.2561e+014	5.1420e-001	1.9025e+004
Pu-238	2.5589e+001	9.4681e+011	3.8760e-003	1.4341e+002
Pu-239	2.7088e+000	1.0023e+011	4.1030e-004	1.5181e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Rb-86	6.0646e+003	2.2439e+014	9.1860e-001	3.3988e+004
Rh-103m	4.8003e+004	1.7761e+015	7.2710e+000	2.6903e+005
Rh-105	3.1287e+004	1.1576e+015	4.7390e+000	1.7534e+005
Rh-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Ru-103	4.8003e+004	1.7761e+015	7.2710e+000	2.6903e+005
Ru-105	2.9359e+004	1.0863e+015	4.4470e+000	1.6454e+005
Ru-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Sb-127	5.2288e+004	1.9346e+015	7.9200e+000	2.9304e+005
Sb-129	1.6842e+005	6.2314e+015	2.5510e+001	9.4387e+005
Sr-89	5.7860e+005	2.1408e+016	8.7640e+001	3.2427e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	6.8133e+005	2.5209e+016	1.0320e+002	3.8184e+006
Sr-92	6.0435e+005	2.2361e+016	9.1540e+001	3.3870e+006
Tc-99m	5.0149e+004	1.8555e+015	7.5960e+000	2.8105e+005
Te-127	5.2288e+004	1.9346e+015	7.9200e+000	2.9304e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	1.7918e+005	6.6296e+015	2.7140e+001	1.0042e+006
Te-129m	3.7374e+004	1.3828e+015	5.6610e+000	2.0946e+005
Te-131m	1.1831e+005	4.3774e+015	1.7920e+001	6.6304e+005
Te-132	8.5694e+005	3.1707e+016	1.2980e+002	4.8026e+006
Xe-133	2.3833e+007	8.8183e+017	3.6100e+003	1.3357e+008
Xe-135	8.9985e+006	3.3295e+017	1.3630e+003	5.0431e+007
Y-90	3.0580e+002	1.1315e+013	4.6320e-002	1.7138e+003
Y-91	3.0178e+003	1.1166e+014	4.5710e-001	1.6913e+004
Y-92	3.0686e+003	1.1354e+014	4.6480e-001	1.7198e+004
Y-93	2.2632e+003	8.3737e+013	3.4280e-001	1.2684e+004
Zr-95	4.2999e+003	1.5910e+014	6.5130e-001	2.4098e+004
Zr-97	4.0886e+003	1.5128e+014	6.1930e-001	2.2914e+004

Buildup

The material reference is : Source

Integration Parameters

X Direction	25
Y Direction	25
Z Direction	25

Results

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	2.084e+11	2.054e+01	2.461e+01	1.761e+00	2.111e+00
MeV	photons/sec	MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup

Page : 3
 DOS File: 1RB1RAD.MS5
 Run Date: August 8, 2005
 Run Time: 5:38:43 PM
 Duration: 00:00:28

EC-RADN-1135
 Page 190

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.02	3.638e+14	1.049e+05	1.401e+05	3.633e+03	4.855e+03
0.03	4.893e+17	3.353e+08	5.230e+08	3.323e+06	5.183e+06
0.04	1.009e+15	1.040e+06	1.709e+06	4.600e+03	7.557e+03
0.05	4.168e+15	5.627e+06	9.371e+06	1.499e+04	2.496e+04
0.06	1.066e+15	1.767e+06	2.901e+06	3.510e+03	5.762e+03
0.08	3.278e+17	7.425e+08	1.154e+09	1.175e+06	1.826e+06
0.1	5.296e+15	1.521e+07	2.228e+07	2.328e+04	3.409e+04
0.15	1.032e+17	4.551e+08	6.177e+08	7.495e+05	1.017e+06
0.2	4.067e+17	2.431e+09	3.064e+09	4.291e+06	5.408e+06
0.3	4.860e+16	4.458e+08	5.311e+08	8.456e+05	1.007e+06
0.4	2.314e+17	2.876e+09	3.314e+09	5.603e+06	6.458e+06
0.5	3.511e+17	5.517e+09	6.223e+09	1.083e+07	1.221e+07
0.6	3.884e+17	7.394e+09	8.216e+09	1.443e+07	1.604e+07
0.8	7.007e+17	1.804e+10	1.963e+10	3.431e+07	3.734e+07
1.0	2.897e+17	9.420e+09	1.013e+10	1.736e+07	1.867e+07
1.5	2.651e+17	1.315e+10	1.388e+10	2.213e+07	2.335e+07
2.0	2.020e+17	1.351e+10	1.410e+10	2.089e+07	2.180e+07
3.0	2.018e+16	2.050e+09	2.115e+09	2.781e+06	2.870e+06
4.0	2.698e+12	3.682e+05	3.774e+05	4.555e+02	4.669e+02
TOTALS:	3.836e+18	7.639e+10	8.353e+10	1.388e+08	1.533e+08

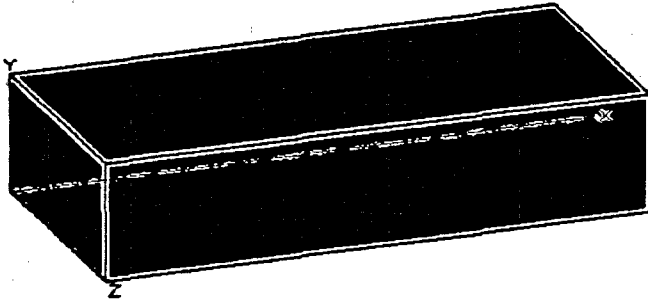
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1RB8GR.MS5
 Run Date: August 8, 2005
 Run Time: 5:40:36 PM
 Duration: 00:00:29

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

EC-RADN-1135
 Page 191

Case Title: Reactor Building Air
 Description: 8 Hour, GROVE
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 4 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	5.7087e-001	2.1122e+010	8.6470e-005	3.1994e+000
Am-242	1.8175e+002	6.7249e+012	2.7530e-002	1.0186e+003
Am-242m	3.7202e-002	1.3765e+009	5.6350e-006	2.0849e-001
Am-243	7.0113e-002	2.5942e+009	1.0620e-005	3.9294e-001
Am-244	1.7832e+002	6.5978e+012	2.7010e-002	9.9937e+002
Ba-135m	1.9370e+002	7.1670e+012	2.9340e-002	1.0856e+003
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	2.4216e+004	8.9600e+014	3.6680e+000	1.3572e+005
Ba-140	1.0801e+006	3.9963e+016	1.6360e+002	6.0532e+006
Ba-141	1.2385e-002	4.5826e+008	1.8760e-006	6.9412e-002
Ba-142	2.2070e-008	8.1661e+002	3.3430e-012	1.2369e-007
Br-82	1.1006e+004	4.0720e+014	1.6670e+000	6.1679e+004
Br-83	4.7059e+004	1.7412e+015	7.1280e+000	2.6374e+005
Br-84	2.5636e+001	9.4852e+011	3.8830e-003	1.4367e+002
Ce-141	1.0028e+004	3.7105e+014	1.5190e+000	5.6203e+004
Ce-143	7.9686e+003	2.9484e+014	1.2070e+000	4.4659e+004
Ce-144	8.4836e+003	3.1389e+014	1.2850e+000	4.7545e+004
Cm-242	1.4967e+002	5.5377e+012	2.2670e-002	8.3879e+002
Cm-243	6.4462e-002	2.3851e+009	9.7640e-006	3.6127e-001
Cm-244	8.7410e+000	3.2342e+011	1.3240e-003	4.8988e+001
Co-58	1.6545e+002	6.1215e+012	2.5060e-002	9.2722e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Co-60m				
Co-61	6.9189e-002	2.5600e+009	1.0480e-005	3.8776e-001
Cs-132	1.1785e+002	4.3603e+012	1.7850e-002	6.6045e+002
Cs-134	6.4501e+005	2.3866e+016	9.7700e+001	3.6149e+006
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Co-60*	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002

Page : 2
 DOS File: 1RB8GR.MS5
 Run Date: August 8, 2005
 Run Time: 5:40:36 PM
 Duration: 00:00:29

EC-RADN-1135
 Page 192

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Cs-134m	2.0077e+004	7.4284e+014	3.0410e+000	1.1252e+005
Cs-136	2.0229e+005	7.4845e+015	3.0640e+001	1.1337e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
Cs-138	3.2145e+002	1.1894e+013	4.8690e-002	1.8015e+003
Cs-139	1.4590e-009	5.3985e+001	2.2100e-013	8.1770e-009
Eu-152m	3.0686e-001	1.1354e+010	4.6480e-005	1.7198e+000
Eu-154	2.3681e+001	8.7621e+011	3.5870e-003	1.3272e+002
Eu-155	9.7379e+000	3.6030e+011	1.4750e-003	5.4575e+001
Eu-156	6.0573e+002	2.2412e+013	9.1750e-002	3.3948e+003
I-128	6.5835e-002	2.4359e+009	9.9720e-006	3.6896e-001
I-130	5.7087e+004	2.1122e+015	8.6470e+000	3.1994e+005
I-131	3.5228e+006	1.3034e+017	5.3360e+002	1.9743e+007
I-132	4.9891e+006	1.8460e+017	7.5570e+002	2.7961e+007
I-133	5.8632e+006	2.1694e+017	8.8810e+002	3.2860e+007
I-134	5.1430e+004	1.9029e+015	7.7900e+000	2.8823e+005
I-135	3.0600e+006	1.1322e+017	4.6350e+002	1.7150e+007
Kr-83m	4.0800e+005	1.5096e+016	6.1800e+001	2.2866e+006
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	8.8269e+005	3.2659e+016	1.3370e+002	4.9469e+006
Kr-87	7.7838e+004	2.8800e+015	1.1790e+001	4.3623e+005
Kr-88	1.1831e+006	4.3774e+016	1.7920e+002	6.6304e+006
La-140	4.6630e+003	1.7253e+014	7.0630e-001	2.6133e+004
La-141	1.0543e+003	3.9011e+013	1.5970e-001	5.9089e+003
La-142	1.1435e+002	4.2308e+012	1.7320e-002	6.4084e+002
Mo-99	5.2077e+004	1.9268e+015	7.8880e+000	2.9186e+005
Mo-101	6.5789e-006	2.4342e+005	9.9650e-010	3.6870e-005
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nb-95m	4.7851e+001	1.7705e+012	7.2480e-003	2.6818e+002
Nb-96	5.5080e+000	2.0380e+011	8.3430e-004	3.0869e+001
Nb-97	3.2865e+003	1.2160e+014	4.9780e-001	1.8419e+004
Nb-97m	2.9128e+003	1.0777e+014	4.4120e-001	1.6324e+004
Nd-147	1.5911e+003	5.8870e+013	2.4100e-001	8.9170e+003
Nd-149	3.8232e+001	1.4146e+012	5.7910e-003	2.1427e+002
Np-236m	2.1212e-002	7.8485e+008	3.2130e-006	1.1888e-001
Np-238	2.3662e+003	8.7548e+013	3.5840e-001	1.3261e+004
Np-239	1.0840e+005	4.0110e+015	1.6420e+001	6.0754e+005
Np-240	1.0200e+000	3.7740e+010	1.5450e-004	5.7165e+000
Pd-109	7.7573e+003	2.8702e+014	1.1750e+000	4.3475e+004
Pm-147	5.6229e+002	2.0805e+013	8.5170e-002	3.1513e+003
Pm-148	4.3547e+002	1.6112e+013	6.5960e-002	2.4405e+003
Pm-148m	8.6552e+001	3.2024e+012	1.3110e-002	4.8507e+002
Pm-149	1.3323e+003	4.9294e+013	2.0180e-001	7.4666e+003
Pm-151	4.0285e+002	1.4906e+013	6.1020e-002	2.2577e+003
Pr-142	1.2306e+002	4.5533e+012	1.8640e-002	6.8968e+002
Pr-143	3.6172e+003	1.3384e+014	5.4790e-001	2.0272e+004
Pr-144	3.3947e+003	1.2561e+014	5.1420e-001	1.9025e+004
Pr-144m	4.7488e+001	1.7571e+012	7.1930e-003	2.6614e+002
Pu-237	3.7414e-002	1.3843e+009	5.6670e-006	2.0968e-001
Pu-238	2.5589e+001	9.4681e+011	3.8760e-003	1.4341e+002
Pu-239	2.7088e+000	1.0023e+011	4.1030e-004	1.5181e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Pu-243	7.6715e+002	2.8385e+013	1.1620e-001	4.2994e+003
Pu-239	2.0086e+003	2.0023e+014	4.0830e-001	1.5181e+004
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001

Page : 3
 DOS File: 1RB8GR.MS5
 Run Date: August 8, 2005
 Run Time: 5:40:36 PM
 Duration: 00:00:29

EC-RADN-1135
 Page 193

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Rb-88	3.3215e+005	1.2289e+016	5.0310e+001	1.8615e+006
Rh-103m	4.7785e+004	1.7681e+015	7.2380e+000	2.6781e+005
Rh-105	2.9359e+004	1.0863e+015	4.4470e+000	1.6454e+005
Rh-105m	2.8072e+003	1.0387e+014	4.2520e-001	1.5732e+004
Rh-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Ru-103	4.7785e+004	1.7681e+015	7.2380e+000	2.6781e+005
Ru-105	9.8568e+003	3.6470e+014	1.4930e+000	5.5241e+004
Ru-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Sb-122	1.1012e+003	4.0745e+013	1.6680e-001	6.1716e+003
Sb-124	5.4519e+002	2.0172e+013	8.2580e-002	3.0555e+003
Sb-125	7.6913e+003	2.8458e+014	1.1650e+000	4.3105e+004
Sb-126	2.5589e+002	9.4681e+012	3.8760e-002	1.4341e+003
Sb-126m	4.6716e-001	1.7285e+010	7.0760e-005	2.6181e+000
Sb-127	5.0149e+004	1.8555e+015	7.5960e+000	2.8105e+005
Sb-129	5.5714e+004	2.0614e+015	8.4390e+000	3.1224e+005
Sm-151	1.5290e+000	5.6574e+010	2.3160e-004	8.5692e+000
Sm-153	1.0576e+003	3.9133e+013	1.6020e-001	5.9274e+003
Sr-89	5.7860e+005	2.1408e+016	8.7640e+001	3.2427e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	4.0972e+005	1.5160e+016	6.2060e+001	2.2962e+006
Sr-92	1.0075e+005	3.7276e+015	1.5260e+001	5.6462e+005
Sr-93				
Tc-99	6.1933e-001	2.2915e+010	9.3810e-005	3.4710e+000
Tc-99m	4.8643e+004	1.7998e+015	7.3680e+000	2.7262e+005
Tc-101	1.1725e-004	4.3383e+006	1.7760e-008	6.5712e-004
Te-123m	5.4433e+000	2.0140e+011	8.2450e-004	3.0507e+001
Te-125m	1.6974e+003	6.2803e+013	2.5710e-001	9.5127e+003
Te-127	5.1859e+004	1.9188e+015	7.8550e+000	2.9064e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	8.5694e+004	3.1707e+015	1.2980e+001	4.8026e+005
Te-129m	3.7242e+004	1.3779e+015	5.6410e+000	2.0872e+005
Te-131	2.2632e+004	8.3737e+014	3.4280e+000	1.2684e+005
Te-131m	1.0075e+005	3.7276e+015	1.5260e+001	5.6462e+005
Te-132	8.0544e+005	2.9801e+016	1.2200e+002	4.5140e+006
Te-133	3.1029e+002	1.1481e+013	4.7000e-002	1.7390e+003
Te-133m	1.3712e+003	5.0736e+013	2.0770e-001	7.6849e+003
Te-134	3.8232e+002	1.4146e+013	5.7910e-002	2.1427e+003
Xe-129m	5.6401e+002	2.0868e+013	8.5430e-002	3.1609e+003
Xe-131m	1.6459e+005	6.0897e+015	2.4930e+001	9.2241e+005
Xe-133	2.3747e+007	8.7865e+017	3.5970e+003	1.3309e+008
Xe-133m	7.6979e+005	2.8482e+016	1.1660e+002	4.3142e+006
Xe-135	1.1316e+007	4.1869e+017	1.7140e+003	6.3418e+007
Xe-135m	1.6630e+006	6.1533e+016	2.5190e+002	9.3203e+006
Xe-137				
Xe-138	1.1573e-003	4.2821e+007	1.7530e-007	6.4861e+003
Y-90	3.0376e+002	1.1239e+013	4.6010e-002	1.7024e+003
Y-91	3.0006e+003	1.1102e+014	4.5450e-001	1.6817e+004
Y-91m	1.0405e+003	3.8498e+013	1.5760e-001	5.8312e+003
Y-92	1.4656e+003	5.4229e+013	2.2200e-001	8.2140e+003
Y-93	1.3990e+003	5.1762e+013	2.1190e-001	7.8403e+003
Zr-89	1.1553e+000	4.2748e+010	1.7500e-004	6.4750e+000
Zr-93	6.6680e-004	2.4672e+007	1.0100e-007	3.7370e-003
Zr-95	4.2827e+003	1.5846e+014	6.4870e-001	2.4002e+004
Zr-97	3.0620e+003	1.1320e+014	4.6380e-001	1.7161e+004
Y-93	1.3990e+003	5.1762e+013	2.1190e-001	7.8403e+003
Zr-99	1.1553e+000	4.2748e+010	1.7500e-004	6.4750e+000

Page : 4
 DOS File: 1RB8GR.MS5
 Run Date: August 8, 2005
 Run Time: 5:40:36 PM
 Duration: 00:00:29

EC-RADN-1135
 Page 194

Buildup
 The material reference is : Source

Integration Parameters

X Direction	25
Y Direction	25
Z Direction	25

Energy MeV	Activity photons/sec	Results			
		Fluence Rate MeV/cm ² /sec <u>No Buildup</u>	Fluence Rate MeV/cm ² /sec <u>With Buildup</u>	Exposure Rate mR/hr <u>No Buildup</u>	Exposure Rate mR/hr <u>With Buildup</u>
0.015	2.286e+12	2.253e+02	2.700e+02	1.932e+01	2.316e+01
0.02	3.932e+14	1.133e+05	1.514e+05	3.926e+03	5.246e+03
0.03	5.094e+17	3.491e+08	5.446e+08	3.460e+06	5.397e+06
0.04	8.456e+14	8.719e+05	1.433e+06	3.856e+03	6.336e+03
0.05	3.925e+15	5.298e+06	8.823e+06	1.411e+04	2.350e+04
0.06	1.043e+15	1.729e+06	2.839e+06	3.434e+03	5.638e+03
0.08	3.265e+17	7.396e+08	1.150e+09	1.170e+06	1.819e+06
0.1	4.522e+15	1.299e+07	1.902e+07	1.987e+04	2.911e+04
0.15	3.463e+16	1.527e+08	2.073e+08	2.515e+05	3.413e+05
0.2	4.232e+17	2.530e+09	3.189e+09	4.465e+06	5.628e+06
0.3	3.190e+16	2.926e+08	3.485e+08	5.550e+05	6.611e+05
0.4	1.261e+17	1.567e+09	1.806e+09	3.053e+06	3.519e+06
0.5	3.121e+17	4.904e+09	5.532e+09	9.627e+06	1.086e+07
0.6	3.019e+17	5.747e+09	6.385e+09	1.122e+07	1.246e+07
0.8	2.566e+17	6.607e+09	7.190e+09	1.257e+07	1.368e+07
1.0	1.272e+17	4.137e+09	4.447e+09	7.625e+06	8.197e+06
1.5	1.086e+17	5.390e+09	5.687e+09	9.068e+06	9.569e+06
2.0	4.831e+16	3.231e+09	3.371e+09	4.996e+06	5.213e+06
3.0	1.097e+15	1.115e+08	1.150e+08	1.513e+05	1.561e+05
4.0	1.789e+11	2.442e+04	2.504e+04	3.021e+01	3.097e+01
5.0	1.762e+13	3.021e+06	3.085e+06	3.463e+03	3.536e+03
TOTALS:	2.618e+18	3.578e+10	4.001e+10	6.825e+07	7.757e+07

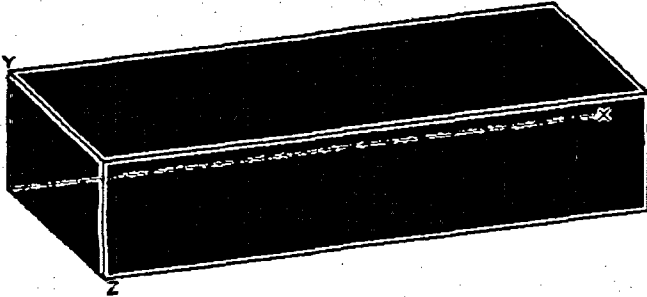
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1RB8I38.MS5
 Run Date: August 8, 2005
 Run Time: 5:41:05 PM
 Duration: 00:00:25

EC-RADN-1135
 Page 195

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 8 Hour, ICRP38
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points

	X	Y	Z
# 1	4297.68 cm	430.53 cm	960.12 cm
	141 ft 0.0 in	14 ft 1.5 in	31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : ICRP-38

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Cs-135m	2.4427e+002	9.0381e+012	3.7000e-002	1.3690e+003
Eu-157	4.1144e+001	1.5223e+012	6.2320e-003	2.3058e+002
Eu-158	1.6987e-002	6.2852e+008	2.5730e-006	9.5201e-002
La-143	2.2803e-007	8.4372e+003	3.4540e-011	1.2780e-006
Nd-151	1.1884e-009	4.3969e+001	1.8000e-013	6.6600e-009
Pm-150	1.5686e+000	5.8039e+010	2.3760e-004	8.7912e+000
Pr-145	1.0167e+003	3.7618e+013	1.5400e-001	5.6980e+003
Pr-147	4.0972e-008	1.5160e+003	6.2060e-012	2.2962e-007
Rh-106m	5.1859e+001	1.9188e+012	7.8550e-003	2.9064e+002
Rh-107	5.2717e-003	1.9505e+008	7.9850e-007	2.9544e-002
Sb-128a	5.1430e+003	1.9029e+014	7.7900e-001	2.8823e+004
Sb-128b	3.7077e+002	1.3718e+013	5.6160e-002	2.0779e+003
Sb-130	1.4227e+001	5.2641e+011	2.1550e-003	7.9735e+001
Sb-131	2.4942e-001	9.2287e+009	3.7780e-005	1.3979e+000
Se-81	9.5993e+000	3.5517e+011	1.4540e-003	5.3798e+001
Se-81m	6.5148e+000	2.4105e+012	9.8680e-004	3.6512e+001
Se-83	1.1402e-002	4.2186e+008	1.7270e-006	6.3899e-002
Sm-155	3.1544e-005	1.1671e+006	4.7780e-009	1.7679e-004
Sm-156	3.1888e+001	1.1798e+012	4.8300e-003	1.7871e+002
Y-94	7.6121e-005	2.8165e+006	1.1530e-008	4.2661e-004
Y-95				

Buildup
 The material reference is : Source

Integration Parameters

Page : 2
 DOS File: 1RB8I38.MS5
 Run Date: August 8, 2005
 Run Time: 5:41:05 PM
 Duration: 00:00:25

EC-RADN-1135
 Page 196

Y Direction 25
 Z Direction 25

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Results</u>			
		<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>No Buildup</u>	<u>Exposure Rate</u> <u>mR/hr</u> <u>With Buildup</u>
0.015	1.777e+03	1.751e-07	2.099e-07	1.502e-08	1.800e-08
0.02	1.117e+11	3.221e+01	4.303e+01	1.116e+00	1.491e+00
0.03	6.232e+12	4.271e+03	6.662e+03	4.232e+01	6.602e+01
0.04	1.231e+12	1.269e+03	2.085e+03	5.612e+00	9.220e+00
0.05	3.104e+11	4.191e+02	6.979e+02	1.116e+00	1.859e+00
0.06	3.758e+11	6.232e+02	1.023e+03	1.238e+00	2.032e+00
0.08	3.590e+11	8.133e+02	1.264e+03	1.287e+00	2.001e+00
0.1	1.680e+11	4.825e+02	7.066e+02	7.381e-01	1.081e+00
0.15	2.440e+11	1.076e+03	1.460e+03	1.772e+00	2.405e+00
0.2	3.447e+12	2.060e+04	2.597e+04	3.636e+01	4.584e+01
0.3	1.849e+14	1.696e+06	2.021e+06	3.217e+03	3.833e+03
0.4	1.814e+12	2.254e+04	2.598e+04	4.391e+01	5.061e+01
0.5	8.934e+12	1.404e+05	1.584e+05	2.756e+02	3.108e+02
0.6	2.044e+13	3.891e+05	4.323e+05	7.594e+02	8.438e+02
0.8	4.501e+14	1.159e+07	1.261e+07	2.204e+04	2.398e+04
1.0	1.914e+13	6.223e+05	6.690e+05	1.147e+03	1.233e+03
1.5	4.195e+12	2.082e+05	2.197e+05	3.502e+02	3.696e+02
2.0	1.819e+11	1.217e+04	1.269e+04	1.881e+01	1.963e+01
3.0	8.406e+08	8.541e+01	8.811e+01	1.159e-01	1.195e-01
TOTALS:	7.022e+14	1.471e+07	1.619e+07	2.794e+04	3.077e+04

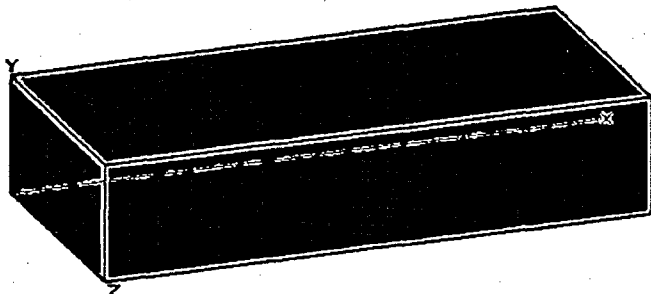
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1RB8RAD.MS5
 Run Date: August 8, 2005
 Run Time: 5:41:31 PM
 Duration: 00:00:25

EC-RADN-1135
 Page 197

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 8 Hour, RADTRAD
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 4 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	5.7087e-001	2.1122e+010	8.6470e-005	3.1994e+000
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	2.4216e+004	8.9600e+014	3.6680e+000	1.3572e+005
Ba-140	1.0801e+006	3.9963e+016	1.6360e+002	6.0532e+006
Ce-141	1.0028e+004	3.7105e+014	1.5190e+000	5.6203e+004
Ce-143	7.9686e+003	2.9484e+014	1.2070e+000	4.4659e+004
Ce-144	8.4836e+003	3.1389e+014	1.2850e+000	4.7545e+004
Cm-242	1.4967e+002	5.5377e+012	2.2670e-002	8.3879e+002
Cm-244	8.7410e+000	3.2342e+011	1.3240e-003	4.8988e+001
Co-58	1.6545e+002	6.1215e+012	2.5060e-002	9.2722e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Cs-134	6.4501e+005	2.3866e+016	9.7700e+001	3.6149e+006
Cs-136	2.0229e+005	7.4845e+015	3.0640e+001	1.1337e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
I-131	3.5228e+006	1.3034e+017	5.3360e+002	1.9743e+007
I-132	4.9891e+006	1.8460e+017	7.5570e+002	2.7961e+007
I-133	5.8632e+006	2.1694e+017	8.8810e+002	3.2860e+007
I-134	5.1430e+004	1.9029e+015	7.7900e+000	2.8823e+005
I-135	3.0600e+006	1.1322e+017	4.6350e+002	1.7150e+007
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	8.8269e+005	3.2659e+016	1.3370e+002	4.9469e+006
Kr-87	7.7838e+004	2.8800e+015	1.1790e+001	4.3623e+005
Kr-88	1.1831e+006	4.3774e+016	1.7920e+002	6.6304e+006
La-140	4.6630e+003	1.7253e+014	7.0630e-001	2.6133e+004
La-141	1.0543e+003	3.9011e+013	1.5970e-001	5.9089e+003
La-142	1.1435e+002	4.2308e+012	1.7320e-002	6.4084e+002
Kr-87	7.7838e+004	2.8800e+015	1.1790e+001	4.3623e+005
Xx 99	1.1831e+006	4.2334e+016	1.7920e+002	6.6304e+006

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Mo-99	5.2077e+004	1.9268e+015	7.8880e+000	2.9186e+005
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nd-147	1.5911e+003	5.8870e+013	2.4100e-001	8.9170e+003
Np-239	1.0840e+005	4.0110e+015	1.6420e+001	6.0754e+005
Pr-143	3.6172e+003	1.3384e+014	5.4790e-001	2.0272e+004
Pr-144	3.3947e+003	1.2561e+014	5.1420e-001	1.9025e+004
Pu-238	2.5589e+001	9.4681e+011	3.8760e-003	1.4341e+002
Pu-239	2.7088e+000	1.0023e+011	4.1030e-004	1.5181e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Rb-86	6.0006e+003	2.2202e+014	9.0890e-001	3.3629e+004
Rh-103m	4.7785e+004	1.7681e+015	7.2380e+000	2.6781e+005
Rh-105	2.9359e+004	1.0863e+015	4.4470e+000	1.6454e+005
Rh-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Ru-103	4.7785e+004	1.7681e+015	7.2380e+000	2.6781e+005
Ru-105	9.8568e+003	3.6470e+014	1.4930e+000	5.5241e+004
Ru-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Sb-127	5.0149e+004	1.8555e+015	7.5960e+000	2.8105e+005
Sb-129	5.5714e+004	2.0614e+015	8.4390e+000	3.1224e+005
Sr-89	5.7860e+005	2.1408e+016	8.7640e+001	3.2427e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	4.0972e+005	1.5160e+016	6.2060e+001	2.2962e+006
Sr-92	1.0075e+005	3.7276e+015	1.5260e+001	5.6462e+005
Tc-99m	4.8643e+004	1.7998e+015	7.3680e+000	2.7262e+005
Te-127	5.1859e+004	1.9188e+015	7.8550e+000	2.9064e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	8.5694e+004	3.1707e+015	1.2980e+001	4.8026e+005
Te-129m	3.7242e+004	1.3779e+015	5.6410e+000	2.0872e+005
Te-131m	1.0075e+005	3.7276e+015	1.5260e+001	5.6462e+005
Te-132	8.0544e+005	2.9801e+016	1.2200e+002	4.5140e+006
Xe-133	2.3747e+007	8.7865e+017	3.5970e+003	1.3309e+008
Xe-135	1.1316e+007	4.1869e+017	1.7140e+003	6.3418e+007
Y-90	3.0376e+002	1.1239e+013	4.6010e-002	1.7024e+003
Y-91	3.0006e+003	1.1102e+014	4.5450e-001	1.6817e+004
Y-92	1.4656e+003	5.4229e+013	2.2200e-001	8.2140e+003
Y-93	1.3990e+003	5.1762e+013	2.1190e-001	7.8403e+003
Zr-95	4.2827e+003	1.5846e+014	6.4870e-001	2.4002e+004
Zr-97	3.0620e+003	1.1329e+014	4.6380e-001	1.7161e+004

Buildup

The material reference is : Source

Integration Parameters

X Direction	25
Y Direction	25
Z Direction	25

Results

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u>		<u>Exposure Rate</u>	
		<u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>mR/hr</u> <u>No Buildup</u>	<u>mR/hr</u> <u>With Buildup</u>
0.015	1.787e+11	1.761e+01	2.110e+01	1.510e+00	1.810e+00
<u>MeV</u>	<u>photons/sec</u>	<u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>mR/hr</u> <u>No Buildup</u>	<u>mR/hr</u> <u>With Buildup</u>

Page : 3
 DOS File: 1RB8RAD.MS5
 Run Date: August 8, 2005
 Run Time: 5:41:31 PM
 Duration: 00:00:25

EC-RADN:1135
 Page 199

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		<u>MeV/cm²/sec</u> No Buildup	<u>MeV/cm²/sec</u> With Buildup	<u>mR/hr</u> No Buildup	<u>mR/hr</u> With Buildup
0.02	3.499e+14	1.009e+05	1.348e+05	3.494e+03	4.668e+03
0.03	4.812e+17	3.297e+08	5.143e+08	3.268e+06	5.097e+06
0.04	8.007e+14	8.256e+05	1.356e+06	3.651e+03	5.999e+03
0.05	3.918e+15	5.289e+06	8.809e+06	1.409e+04	2.347e+04
0.06	1.040e+15	1.725e+06	2.831e+06	3.425e+03	5.623e+03
0.08	3.265e+17	7.396e+08	1.150e+09	1.170e+06	1.819e+06
0.1	4.498e+15	1.292e+07	1.892e+07	1.977e+04	2.895e+04
0.15	3.380e+16	1.491e+08	2.023e+08	2.455e+05	3.332e+05
0.2	4.203e+17	2.512e+09	3.166e+09	4.433e+06	5.588e+06
0.3	3.185e+16	2.922e+08	3.481e+08	5.542e+05	6.602e+05
0.4	1.253e+17	1.556e+09	1.794e+09	3.032e+06	3.495e+06
0.5	2.598e+17	4.083e+09	4.605e+09	8.015e+06	9.040e+06
0.6	2.987e+17	5.687e+09	6.319e+09	1.110e+07	1.233e+07
0.8	2.525e+17	6.501e+09	7.075e+09	1.237e+07	1.346e+07
1.0	1.266e+17	4.116e+09	4.425e+09	7.587e+06	8.156e+06
1.5	1.082e+17	5.370e+09	5.667e+09	9.035e+06	9.534e+06
2.0	4.558e+16	3.048e+09	3.180e+09	4.713e+06	4.918e+06
3.0	7.478e+14	7.598e+07	7.838e+07	1.031e+05	1.063e+05
4.0	1.111e+11	1.516e+04	1.554e+04	1.875e+01	1.922e+01
TOTALS:	2.522e+18	3.448e+10	3.856e+10	6.567e+07	7.461e+07

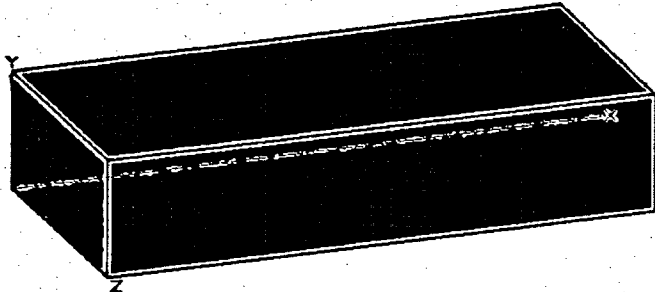
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1RB24GR.MS5
 Run Date: August 8, 2005
 Run Time: 5:39:12 PM
 Duration: 00:00:30

EC-RADN-1135
 Page 200

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 24 Hour, GROVE
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 14 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	5.7259e-001	2.1186e+010	8.6730e-005	3.2090e+000
Am-242	9.0711e+001	3.3563e+012	1.3740e-002	5.0838e+002
Am-242m	3.7202e-002	1.3765e+009	5.6350e-006	2.0849e-001
Am-243	7.0311e-002	2.6015e+009	1.0650e-005	3.9405e-001
Am-244	5.9662e+001	2.2075e+012	9.0370e-003	3.3437e+002
Ba-135m	1.3158e+002	4.8684e+012	1.9930e-002	7.3741e+002
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	9.3022e+000	3.4418e+011	1.4090e-003	5.2133e+001
Ba-140	1.0418e+006	3.8546e+016	1.5780e+002	5.8386e+006
Ba-141				
Ba-142				
Br-82	8.0214e+003	2.9679e+014	1.2150e+000	4.4955e+004
Br-83	4.6287e+002	1.7126e+013	7.0110e-002	2.5941e+003
Br-84	2.0935e-008	7.7459e+002	3.1710e-012	1.1733e-007
Ce-141	9.9030e+003	3.6641e+014	1.5000e+000	5.5500e+004
Ce-143	5.7002e+003	2.1091e+014	8.6340e-001	3.1946e+004
Ce-144	8.4440e+003	3.1243e+014	1.2790e+000	4.7323e+004
Cm-242	1.4947e+002	5.5304e+012	2.2640e-002	8.3768e+002
Cm-243	6.4462e-002	2.3851e+009	9.7640e-006	3.6127e-001
Cm-244	8.7608e+000	3.2415e+011	1.3270e-003	4.9099e+001
Co-58	1.6439e+002	6.0824e+012	2.4900e-002	9.2130e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Co-60m				
Co-61	8.3383e-005	3.0852e+006	1.2630e-008	4.6731e-004
Cs-132	1.0973e+002	4.0598e+012	1.6620e-002	6.1494e+002
Cs-134	8.4591e+005	3.3866e+016	9.7700e+001	3.6149e+006
Co-60 ⁴	8.4591e+005	3.3866e+016	1.3540e-002	5.0098e+002
Co-60 ^π				

Page : 2
 DOS File: 1RB24GR.MS5
 Run Date: August 8, 2005
 Run Time: 5:39:12 PM
 Duration: 00:00:30

EC-RADN-1135
 Page 201

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Cs-134m	4.4577e+002	1.6493e+013	6.7520e-002	2.4982e+003
Cs-136	1.9522e+005	7.2232e+015	2.9570e+001	1.0941e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
Cs-138	3.4073e-007	1.2607e+004	5.1610e-011	1.9096e-006
Cs-139				
Eu-152m	9.3088e-002	3.4443e+009	1.4100e-005	5.2170e-001
Eu-154	2.3681e+001	8.7621e+011	3.5870e-003	1.3272e+002
Eu-155	9.7379e+000	3.6030e+011	1.4750e-003	5.4575e+001
Eu-156	5.8830e+002	2.1767e+013	8.9110e-002	3.2971e+003
I-128				
I-130	2.3246e+004	8.6009e+014	3.5210e+000	1.3028e+005
I-131	3.3690e+006	1.2465e+017	5.1030e+002	1.8881e+007
I-132	4.3203e+006	1.5985e+017	6.5440e+002	2.4213e+007
I-133	3.4462e+006	1.2751e+017	5.2200e+002	1.9314e+007
I-134	1.9238e-001	7.1181e+009	2.9140e-005	1.0782e+000
I-135	5.6572e+005	2.0932e+016	8.5690e+001	3.1705e+006
Kr-83m	5.9147e+003	2.1884e+014	8.9590e-001	3.3148e+004
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	7.4206e+004	2.7456e+015	1.1240e+001	4.1588e+005
Kr-87	1.2689e+001	4.6949e+011	1.9220e-003	7.1114e+001
Kr-88	2.3833e+004	8.8183e+014	3.6100e+000	1.3357e+005
La-140	4.5600e+003	1.6872e+014	6.9070e-001	2.5556e+004
La-141	6.2230e+001	2.3025e+012	9.4260e-003	3.4876e+002
La-142	7.6781e-002	2.8409e+009	1.1630e-005	4.3031e-001
Mo-99	4.3936e+004	1.6256e+015	6.6550e+000	2.4624e+005
Mo-101				
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nb-95m	4.7680e+001	1.7641e+012	7.2220e-003	2.6721e+002
Nb-96	3.4357e+000	1.2712e+011	5.2040e-004	1.9255e+001
Nb-97	1.5997e+003	5.9188e+013	2.4230e-001	8.9651e+003
Nb-97m	1.5105e+003	5.5890e+013	2.2880e-001	8.4656e+003
Nd-147	1.5257e+003	5.6452e+013	2.3110e-001	8.5507e+003
Nd-149	6.1715e-002	2.2835e+009	9.3480e-006	3.4588e-001
Np-236m	1.2986e-002	4.8049e+008	1.9670e-006	7.2779e-002
Np-238	1.9027e+003	7.0400e+013	2.8820e-001	1.0663e+004
Np-239	8.9127e+004	3.2977e+015	1.3500e+001	4.9950e+005
Np-240	2.1899e-005	8.1026e+005	3.3170e-009	1.2273e-004
Pd-109	3.4502e+003	1.2766e+014	5.2260e-001	1.9336e+004
Pm-147	5.6401e+002	2.0868e+013	8.5430e-002	3.1609e+003
Pm-148	3.9942e+002	1.4779e+013	6.0500e-002	2.2385e+003
Pm-148m	8.5562e+001	3.1658e+012	1.2960e-002	4.7952e+002
Pm-149	1.0821e+003	4.0036e+013	1.6390e-001	6.0643e+003
Pm-151	2.7260e+002	1.0086e+013	4.1290e-002	1.5277e+003
Pr-142	6.8925e+001	2.5502e+012	1.0440e-002	3.8628e+002
Pr-143	3.5829e+003	1.3257e+014	5.4270e-001	2.0080e+004
Pr-144	3.3776e+003	1.2497e+014	5.1160e-001	1.8929e+004
Pr-144m	4.7316e+001	1.7507e+012	7.1670e-003	2.6518e+002
Pu-237	3.7031e-002	1.3701e+009	5.6090e-006	2.0753e-001
Pu-238	2.5629e+001	9.4827e+011	3.8820e-003	1.4363e+002
Pu-239	2.7128e+000	1.0037e+011	4.1090e-004	1.5203e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Pu-243	8.1865e+001	3.0290e+012	1.2400e-002	4.5880e+002
Pu-243	5.8500e+003	2.1645e+014	8.8610e-001	3.2860e+004
Pu-239	2.7128e+000	1.0037e+011	4.1090e-004	1.5203e+001
Ru-86	3.3330e+003	2.1635e+014	6.6020e-001	3.4783e+004

Page : 3
 DOS File: 1RB24GR.MS5
 Run Date: August 8, 2005
 Run Time: 5:39:12 PM
 Duration: 00:00:30

EC-RADN-1135
 Page 202

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Rb-88	6.6614e+003	2.4647e+014	1.0090e+000	3.7333e+004
Rh-103m	4.7145e+004	1.7444e+015	7.1410e+000	2.6422e+005
Rh-105	2.2500e+004	8.3249e+014	3.4080e+000	1.2610e+005
Rh-105m	2.3147e+002	8.5642e+012	3.5060e-002	1.2972e+003
Rh-106	1.9179e+004	7.0962e+014	2.9050e+000	1.0748e+005
Ru-103	4.7363e+004	1.7524e+015	7.1740e+000	2.6544e+005
Ru-105	8.1006e+002	2.9972e+013	1.2270e-001	4.5399e+003
Ru-106	1.9179e+004	7.0962e+014	2.9050e+000	1.0748e+005
Sb-122	9.2560e+002	3.4247e+013	1.4020e-001	5.1874e+003
Sb-124	5.4064e+002	2.0004e+013	8.1890e-002	3.0299e+003
Sb-125	7.6913e+003	2.8458e+014	1.1650e+000	4.3105e+004
Sb-126	2.4619e+002	9.1090e+012	3.7290e-002	1.3797e+003
Sb-126m	4.6716e-001	1.7285e+010	7.0760e-005	2.6181e+000
Sb-127	4.4577e+004	1.6493e+015	6.7520e+000	2.4982e+005
Sb-129	4.5006e+003	1.6652e+014	6.8170e-001	2.5223e+004
Sm-151	1.5330e+000	5.6720e+010	2.3220e-004	8.5914e+000
Sm-153	8.3119e+002	3.0754e+013	1.2590e-001	4.6583e+003
Sr-89	5.7008e+005	2.1093e+016	8.6350e+001	3.1950e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	1.2775e+005	4.7267e+015	1.9350e+001	7.1595e+005
Sr-92	1.6802e+003	6.2168e+013	2.5450e-001	9.4165e+003
Sr-93				
Tc-99	6.1933e-001	2.2915e+010	9.3810e-005	3.4710e+000
Tc-99m	4.2431e+004	1.5699e+015	6.4270e+000	2.3780e+005
Tc-101				
Te-123m	5.4004e+000	1.9982e+011	8.1800e-004	3.0266e+001
Te-125m	1.7027e+003	6.2998e+013	2.5790e-001	9.5423e+003
Te-127	4.8432e+004	1.7920e+015	7.3360e+000	2.7143e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	2.8587e+004	1.0577e+015	4.3300e+000	1.6021e+005
Te-129m	3.6819e+004	1.3623e+015	5.5770e+000	2.0635e+005
Te-131	1.5647e+004	5.7893e+014	2.3700e+000	8.7690e+004
Te-131m	6.9453e+004	2.5698e+015	1.0520e+001	3.8924e+005
Te-132	6.9849e+005	2.5844e+016	1.0580e+002	3.9146e+006
Te-133	1.8855e-003	6.9765e+007	2.8560e-007	1.0567e-002
Te-133m	8.3581e-003	3.0925e+008	1.2660e-006	4.6842e-002
Te-134	4.6716e-005	1.7285e+006	7.0760e-009	2.6181e-004
Xe-129m	5.3575e+002	1.9823e+013	8.1150e-002	3.0026e+003
Xe-131m	1.6287e+005	6.0262e+015	2.4670e+001	9.1279e+005
Xe-133	2.3061e+007	8.5325e+017	3.4930e+003	1.2924e+008
Xe-133m	7.0575e+005	2.6113e+016	1.0690e+002	3.9553e+006
Xe-135	6.3003e+006	2.3311e+017	9.5430e+002	3.5309e+007
Xe-135m	3.0772e+005	1.1386e+016	4.6610e+001	1.7246e+006
Xe-137				
Xe-138				
Y-90	3.0145e+002	1.1154e+013	4.5660e-002	1.6894e+003
Y-91	3.0006e+003	1.1102e+014	4.5450e-001	1.6817e+004
Y-91m	3.2403e+002	1.1989e+013	4.9080e-002	1.8160e+003
Y-92	9.9096e+001	3.6665e+012	1.5010e-002	5.5537e+002
Y-93	4.6630e+002	1.7253e+013	7.0630e-002	2.6133e+003
Zr-89	1.0028e+000	3.7105e+010	1.5190e-004	5.6203e+000
Zr-93	6.6680e-004	2.4672e+007	1.0100e-007	3.7370e-003
Zr-95	4.2464e+003	1.5712e+014	6.4320e-001	2.3798e+004
Zr-97	1.5904e+003	5.8845e+013	2.4090e-001	8.9133e+003
Y-93	4.6630e+002	1.7253e+013	7.0630e-002	2.6133e+003
Zr-99	1.0038e+000	3.3305e+010	1.5190e-004	5.6203e+000

Page : 4
 DOS File: 1RB24GR.MS5
 Run Date: August 8, 2005
 Run Time: 5:39:12 PM
 Duration: 00:00:30

EC-RADN-1135
 Page 203

Buildup
 The material reference is : Source

Integration Parameters
 X Direction 25
 Y Direction 25
 Z Direction 25

Energy MeV	Activity photons/sec	Results		Exposure Rate	
		Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	1.492e+12	1.470e+02	1.762e+02	1.261e+01	1.512e+01
0.02	3.226e+14	9.299e+04	1.242e+05	3.221e+03	4.304e+03
0.03	4.739e+17	3.247e+08	5.066e+08	3.218e+06	5.020e+06
0.04	7.630e+14	7.867e+05	1.293e+06	3.479e+03	5.717e+03
0.05	3.404e+15	4.594e+06	7.652e+06	1.224e+04	2.038e+04
0.06	9.887e+14	1.640e+06	2.692e+06	3.257e+03	5.346e+03
0.08	3.170e+17	7.180e+08	1.115e+09	1.136e+06	1.766e+06
0.1	3.659e+15	1.051e+07	1.540e+07	1.608e+04	2.355e+04
0.15	9.116e+15	4.021e+07	5.456e+07	6.621e+04	8.985e+04
0.2	2.389e+17	1.428e+09	1.800e+09	2.520e+06	3.177e+06
0.3	2.180e+16	1.999e+08	2.382e+08	3.793e+05	4.518e+05
0.4	1.108e+17	1.377e+09	1.587e+09	2.683e+06	3.092e+06
0.5	1.762e+17	2.770e+09	3.124e+09	5.437e+06	6.132e+06
0.6	2.580e+17	4.912e+09	5.458e+09	9.588e+06	1.065e+07
0.8	2.010e+17	5.174e+09	5.630e+09	9.841e+06	1.071e+07
1.0	6.954e+16	2.261e+09	2.431e+09	4.168e+06	4.480e+06
1.5	4.063e+16	2.016e+09	2.127e+09	3.392e+06	3.579e+06
2.0	8.266e+15	5.528e+08	5.768e+08	8.549e+05	8.920e+05
3.0	1.987e+13	2.019e+06	2.082e+06	2.739e+03	2.825e+03
4.0	7.457e+07	1.018e+01	1.043e+01	1.259e-02	1.291e-02
5.0	3.534e+11	6.058e+04	6.186e+04	6.945e+01	7.092e+01
TOTALS:	1.934e+18	2.179e+10	2.468e+10	4.332e+07	5.010e+07

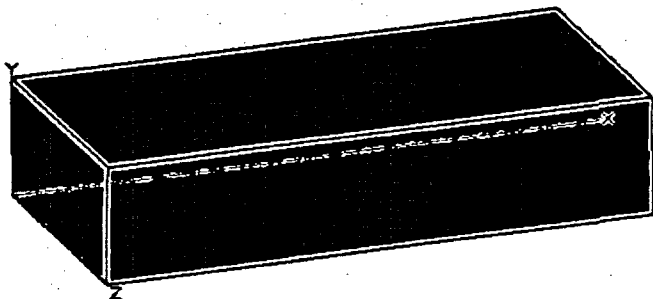
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1RB24I38.MS5
 Run Date: August 8, 2005
 Run Time: 5:39:43 PM
 Duration: 00:00:24

EC-RADN-1135
 Page 204

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 24 Hour, ICRP38
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 4 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : ICRP-38

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Cs-135m	8.6354e-004	3.1951e+007	1.3080e-007	4.8396e-003
Eu-157	1.9885e+001	7.3575e+011	3.0120e-003	1.1144e+002
Eu-158	8.5892e-009	3.1780e+002	1.3010e-012	4.8137e-008
La-143				
Nd-151				
Pm-150	2.5028e-002	9.2604e+008	3.7910e-006	1.4027e-001
Pr-145	1.5944e+002	5.8992e+012	2.4150e-002	8.9355e+002
Pr-147				
Rh-106m	3.1076e-001	1.1498e+010	4.7070e-005	1.7416e+000
Rh-107				
Sb-128a	1.4960e+003	5.5352e+013	2.2660e-001	8.3842e+003
Sb-128b	4.7574e-003	1.7602e+008	7.2060e-007	2.6662e-002
Sb-130	6.8595e-007	2.5380e+004	1.0390e-010	3.8443e-006
Sb-131				
Se-81	8.6156e-005	3.1878e+006	1.3050e-008	4.8285e-004
Se-81m	5.8289e-005	2.1567e+006	8.8290e-009	3.2667e-004
Se-83				
Sm-155				
Sm-156	9.8238e+000	3.6348e+011	1.4880e-003	5.5056e+001
Y-94				
Y-95				

Buildup
 The material reference is : Source

Integration Parameters

-----Buildup-----
 X Direction 25

Page : 2
 DOS File: 1RB24I38.MS5
 Run Date: August 8, 2005
 Run Time: 5:39:43 PM
 Duration: 00:00:24

EC-RADN-1135
 Page 205

Y Direction 25
 Z Direction 25

Energy MeV	Activity photons/sec	Results			
		Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate MeV/cm ² /sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	2.831e+10	8.160e+00	1.090e+01	2.827e-01	3.777e-01
0.03	1.561e+12	1.070e+03	1.669e+03	1.060e+01	1.654e+01
0.04	4.803e+11	4.953e+02	8.137e+02	2.190e+00	3.599e+00
0.05	1.443e+11	1.948e+02	3.244e+02	5.189e-01	8.641e-01
0.06	1.754e+11	2.909e+02	4.775e+02	5.777e-01	9.484e-01
0.08	9.951e+10	2.254e+02	3.504e+02	3.567e-01	5.545e-01
0.1	2.036e+06	5.847e-03	8.564e-03	8.946e-06	1.310e-05
0.15	5.428e+10	2.394e+02	3.249e+02	3.942e-01	5.350e-01
0.2	6.472e+11	3.868e+03	4.876e+03	6.827e+00	8.606e+00
0.3	5.094e+13	4.672e+05	5.566e+05	8.863e+02	1.056e+03
0.4	2.415e+11	3.001e+03	3.459e+03	5.847e+00	6.739e+00
0.5	4.135e+10	6.498e+02	7.329e+02	1.275e+00	1.439e+00
0.6	1.955e+12	3.721e+04	4.135e+04	7.264e+01	8.071e+01
0.8	1.158e+14	2.981e+06	3.244e+06	5.670e+03	6.171e+03
1.0	4.471e+12	1.454e+05	1.563e+05	2.680e+02	2.881e+02
1.5	7.790e+11	3.865e+04	4.079e+04	6.503e+01	6.862e+01
2.0	5.610e+08	3.752e+01	3.915e+01	5.802e-02	6.054e-02
3.0	1.140e+07	1.158e+00	1.195e+00	1.571e-03	1.621e-03
TOTALS:	1.774e+14	3.680e+06	4.052e+06	6.991e+03	7.704e+03

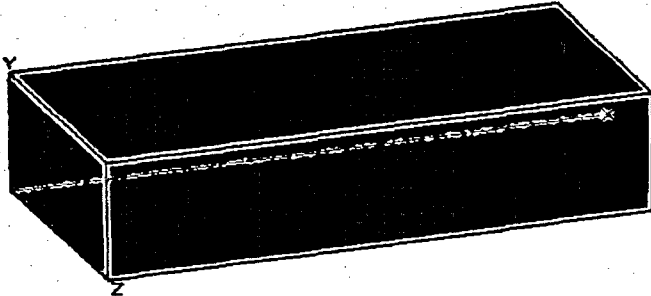
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1RB24RAD.MS5
 Run Date: August 8, 2005
 Run Time: 5:40:07 PM
 Duration: 00:00:28

EC-RADN-1135
 Page 206

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 24 Hour, RADTRAD
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 14 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	5.7259e-001	2.1186e+010	8.6730e-005	3.2090e+000
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	9.3022e+000	3.4418e+011	1.4090e-003	5.2133e+001
Ba-140	1.0418e+006	3.8546e+016	1.5780e+002	5.8386e+006
Ce-141	9.9030e+003	3.6641e+014	1.5000e+000	5.5500e+004
Ce-143	5.7002e+003	2.1091e+014	8.6340e-001	3.1946e+004
Ce-144	8.4440e+003	3.1243e+014	1.2790e+000	4.7323e+004
Cm-242	1.4947e+002	5.5304e+012	2.2640e-002	8.3768e+002
Cm-244	8.7608e+000	3.2415e+011	1.3270e-003	4.9099e+001
Co-58	1.6439e+002	6.0824e+012	2.4900e-002	9.2130e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Cs-134	6.4501e+005	2.3866e+016	9.7700e+001	3.6149e+006
Cs-136	1.9522e+005	7.2232e+015	2.9570e+001	1.0941e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
I-131	3.3690e+006	1.2465e+017	5.1030e+002	1.8881e+007
I-132	4.3203e+006	1.5985e+017	6.5440e+002	2.4213e+007
I-133	3.4462e+006	1.2751e+017	5.2200e+002	1.9314e+007
I-134	1.9238e-001	7.1181e+009	2.9140e-005	1.0782e+000
I-135	5.6572e+005	2.0932e+016	8.5690e+001	3.1705e+006
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	7.4206e+004	2.7456e+015	1.1240e+001	4.1588e+005
Kr-87	1.2689e+001	4.6949e+011	1.9220e-003	7.1114e+001
Kr-88	2.3833e+004	8.8183e+014	3.6100e+000	1.3357e+005
La-140	4.5600e+003	1.6872e+014	6.9070e-001	2.5556e+004
La-141	6.2230e+001	2.3025e+012	9.4260e-003	3.4876e+002
La-142	1.5689e+001	4.6949e+011	1.9220e-003	7.1114e+001
Kr-88	7.3833e+004	2.8183e+014	3.6100e+000	1.3357e+005

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Mo-99	4.3936e+004	1.6256e+015	6.6550e+000	2.4624e+005
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nd-147	1.5257e+003	5.6452e+013	2.3110e-001	8.5507e+003
Np-239	8.9127e+004	3.2977e+015	1.3500e+001	4.9950e+005
Pr-143	3.5829e+003	1.3257e+014	5.4270e-001	2.0080e+004
Pr-144	3.3776e+003	1.2497e+014	5.1160e-001	1.8929e+004
Pu-238	2.5629e+001	9.4827e+011	3.8820e-003	1.4363e+002
Pu-239	2.7128e+000	1.0037e+011	4.1090e-004	1.5203e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Rb-86	5.8500e+003	2.1645e+014	8.8610e-001	3.2786e+004
Rh-103m	4.7145e+004	1.7444e+015	7.1410e+000	2.6422e+005
Rh-105	2.2500e+004	8.3249e+014	3.4080e+000	1.2610e+005
Rh-106	1.9179e+004	7.0962e+014	2.9050e+000	1.0748e+005
Ru-103	4.7363e+004	1.7524e+015	7.1740e+000	2.6544e+005
Ru-105	8.1006e+002	2.9972e+013	1.2270e-001	4.5399e+003
Ru-106	1.9179e+004	7.0962e+014	2.9050e+000	1.0748e+005
Sb-127	4.4577e+004	1.6493e+015	6.7520e+000	2.4982e+005
Sb-129	4.5006e+003	1.6652e+014	6.8170e-001	2.5223e+004
Sr-89	5.7008e+005	2.1093e+016	8.6350e+001	3.1950e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	1.2775e+005	4.7267e+015	1.9350e+001	7.1595e+005
Sr-92	1.6802e+003	6.2168e+013	2.5450e-001	9.4165e+003
Tc-99m	4.2431e+004	1.5699e+015	6.4270e+000	2.3780e+005
Te-127	4.8432e+004	1.7920e+015	7.3360e+000	2.7143e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	2.8587e+004	1.0577e+015	4.3300e+000	1.6021e+005
Te-129m	3.6819e+004	1.3623e+015	5.5770e+000	2.0635e+005
Te-131m	6.9453e+004	2.5698e+015	1.0520e+001	3.8924e+005
Te-132	6.9849e+005	2.5844e+016	1.0580e+002	3.9146e+006
Xe-133	2.3061e+007	8.5325e+017	3.4930e+003	1.2924e+008
Xe-135	6.3003e+006	2.3311e+017	9.5430e+002	3.5309e+007
Y-90	3.0145e+002	1.1154e+013	4.5660e-002	1.6894e+003
Y-91	3.0006e+003	1.1102e+014	4.5450e-001	1.6817e+004
Y-92	9.9096e+001	3.6665e+012	1.5010e-002	5.5537e+002
Y-93	4.6630e+002	1.7253e+013	7.0630e-002	2.6133e+003
Zr-95	4.2464e+003	1.5712e+014	6.4320e-001	2.3798e+004
Zr-97	1.5904e+003	5.8846e+013	2.4090e-001	8.9133e+003

Buildup

The material reference is : Source

Integration Parameters

X Direction	25
Y Direction	25
Z Direction	25

Results

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u>		<u>Exposure Rate</u>	
		<u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>mR/hr</u> <u>No Buildup</u>	<u>mR/hr</u> <u>With Buildup</u>
0.015	1.466e+11	1.445e+01	1.732e+01	1.240e+00	1.486e+00
<u>MeV</u>	<u>photons/sec</u>	<u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>mR/hr</u> <u>No Buildup</u>	<u>mR/hr</u> <u>With Buildup</u>

Page : 3
 DOS File: 1RB24RAD.MS5
 Run Date: August 8, 2005
 Run Time: 5:40:07 PM
 Duration: 00:00:28

EC-RADN-1135
 Page 208

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.02	3.188e+14	9.190e+04	1.228e+05	3.183e+03	4.253e+03
0.03	4.540e+17	3.111e+08	4.853e+08	3.084e+06	4.810e+06
0.04	7.243e+14	7.468e+05	1.227e+06	3.303e+03	5.427e+03
0.05	3.399e+15	4.588e+06	7.641e+06	1.222e+04	2.035e+04
0.06	9.867e+14	1.636e+06	2.686e+06	3.250e+03	5.335e+03
0.08	3.170e+17	7.180e+08	1.116e+09	1.136e+06	1.766e+06
0.1	3.645e+15	1.047e+07	1.533e+07	1.602e+04	2.346e+04
0.15	8.591e+15	3.789e+07	5.142e+07	6.240e+04	8.468e+04
0.2	2.362e+17	1.412e+09	1.780e+09	2.492e+06	3.141e+06
0.3	2.178e+16	1.998e+08	2.380e+08	3.790e+05	4.515e+05
0.4	1.104e+17	1.372e+09	1.581e+09	2.673e+06	3.081e+06
0.5	1.660e+17	2.608e+09	2.942e+09	5.120e+06	5.775e+06
0.6	2.564e+17	4.882e+09	5.424e+09	9.529e+06	1.059e+07
0.8	1.998e+17	5.144e+09	5.598e+09	9.784e+06	1.065e+07
1.0	6.921e+16	2.250e+09	2.419e+09	4.148e+06	4.459e+06
1.5	4.046e+16	2.008e+09	2.119e+09	3.378e+06	3.565e+06
2.0	8.205e+15	5.487e+08	5.725e+08	8.485e+05	8.854e+05
3.0	1.288e+13	1.308e+06	1.350e+06	1.775e+03	1.831e+03
4.0	7.457e+07	1.018e+01	1.043e+01	1.259e-02	1.291e-02
TOTALS:	1.897e+18	2.151e+10	2.435e+10	4.267e+07	4.931e+07

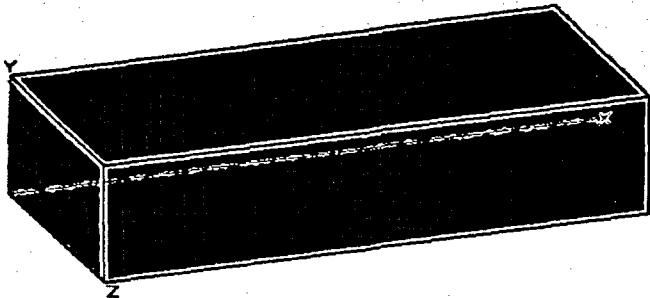
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2RB1GR.MS5
 Run Date: August 19, 2005
 Run Time: 1:52:10 PM
 Duration: 00:03:14

EC-RADN-1135
 Page 209

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 1 Hour, GROVE
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X 4297.68 cm 141 ft 0.0 in
 Y 430.53 cm 14 ft 1.5 in
 Z 960.12 cm 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Shield 1	15.24 cm	Concrete	2.35
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	5.6916e-001	2.1059e+010	8.6210e-005	3.1898e+000
Am-242	2.4513e+002	9.0699e+012	3.7130e-002	1.3738e+003
Am-242m	3.7202e-002	1.3765e+009	5.6350e-006	2.0849e-001
Am-243	7.0113e-002	2.5942e+009	1.0620e-005	3.9294e-001
Am-244	2.8976e+002	1.0721e+013	4.3890e-002	1.6239e+003
Ba-135m	2.2929e+002	8.4836e+012	3.4730e-002	1.2850e+003
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	7.5461e+005	2.7920e+016	1.1430e+002	4.2291e+006
Ba-140	1.0973e+006	4.0598e+016	1.6620e+002	6.1494e+006
Ba-141	1.0332e+005	3.8229e+015	1.5650e+001	5.7905e+005
Ba-142	1.8644e+004	6.8983e+014	2.8240e+000	1.0449e+005
Br-82	1.2630e+004	4.6730e+014	1.9130e+000	7.0781e+004
Br-83	3.4971e+005	1.2939e+016	5.2970e+001	1.9599e+006
Br-84	2.4223e+005	8.9624e+015	3.6690e+001	1.3575e+006
Ce-141	1.0075e+004	3.7276e+014	1.5260e+000	5.6462e+004
Ce-143	9.2164e+003	3.4101e+014	1.3960e+000	5.1652e+004
Ce-144	8.4836e+003	3.1389e+014	1.2850e+000	4.7545e+004
Cm-242	1.4967e+002	5.5377e+012	2.2670e-002	8.3879e+002
Cm-243	6.4462e-002	2.3851e+009	9.7640e-006	3.6127e-001
Cm-244	8.7410e+000	3.2342e+011	1.3240e-003	4.8988e+001
Co-58	1.6584e+002	6.1362e+012	2.5120e-002	9.2944e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Co-60m	2.7860e+000	1.0308e+011	4.2200e-004	1.5614e+001
Co-61	1.3092e+000	4.8439e+010	1.9830e-004	7.3371e+000
Co-58	1.2168e+002	4.4946e+012	1.8420e-002	6.8082e+002
Co-58	1.6584e+002	6.1362e+012	2.5120e-002	9.2944e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002

Page : 2
 DOS File: 2RB1GR.MS5
 Run Date: August 19, 2005
 Run Time: 1:52:10 PM
 Duration: 00:03:14

EC-RADN-1135
 Page 210

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Cs-134	6.4501e+005	2.3866e+016	9.7700e+001	3.6149e+006
Cs-134m	1.0629e+005	3.9328e+015	1.6100e+001	5.9570e+005
Cs-136	2.0552e+005	7.6042e+015	3.1130e+001	1.1518e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
Cs-138	2.5074e+006	9.2775e+016	3.7980e+002	1.4053e+007
Cs-139	6.3432e+004	2.3470e+015	9.6080e+000	3.5550e+005
Eu-152m	5.1601e-001	1.9092e+010	7.8160e-005	2.8919e+000
Eu-154	2.3681e+001	8.7621e+011	3.5870e-003	1.3272e+002
Eu-155	9.7379e+000	3.6030e+011	1.4750e-003	5.4575e+001
Eu-156	6.1273e+002	2.2671e+013	9.2810e-002	3.4340e+003
I-128	7.5593e+003	2.7969e+014	1.1450e+000	4.2365e+004
I-130	8.4373e+004	3.1218e+015	1.2780e+001	4.7286e+005
I-131	3.6001e+006	1.3320e+017	5.4530e+002	2.0176e+007
I-132	5.2459e+006	1.9410e+017	7.9460e+002	2.9400e+007
I-133	7.3282e+006	2.7114e+017	1.1100e+003	4.1070e+007
I-134	5.8890e+006	2.1789e+017	8.9200e+002	3.3004e+007
I-135	6.4033e+006	2.3692e+017	9.6990e+002	3.5886e+007
Kr-83m	1.4141e+006	5.2323e+016	2.1420e+002	7.9254e+006
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	2.6058e+006	9.6415e+016	3.9470e+002	1.4604e+007
Kr-87	3.5314e+006	1.3066e+017	5.3490e+002	1.9791e+007
Kr-88	6.5578e+006	2.4264e+017	9.9330e+002	3.6752e+007
La-140	4.6973e+003	1.7380e+014	7.1150e-001	2.6325e+004
La-141	3.6001e+003	1.3320e+014	5.4530e-001	2.0176e+004
La-142	2.7775e+003	1.0277e+014	4.2070e-001	1.5566e+004
Mo-99	5.6150e+004	2.0775e+015	8.5050e+000	3.1469e+005
Mo-101	2.9999e+003	1.1100e+014	4.5440e-001	1.6813e+004
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nb-95m	4.7851e+001	1.7705e+012	7.2480e-003	2.6818e+002
Nb-96	6.7869e+000	2.5111e+011	1.0280e-003	3.8036e+001
Nb-97	4.2193e+003	1.5612e+014	6.3910e-001	2.3647e+004
Nb-97m	3.8833e+003	1.4368e+014	5.8820e-001	2.1763e+004
Nd-147	1.6201e+003	5.9945e+013	2.4540e-001	9.0798e+003
Nd-149	6.3775e+002	2.3597e+013	9.6600e-002	3.5742e+003
Np-236m	2.6362e-002	9.7539e+008	3.9930e-006	1.4774e-001
Np-238	2.6018e+003	9.6268e+013	3.9410e-001	1.4582e+004
Np-239	1.1831e+005	4.3774e+015	1.7920e+001	6.6304e+005
Np-240	1.1270e+002	4.1698e+012	1.7070e-002	6.3159e+002
Pd-109	1.1058e+004	4.0916e+014	1.6750e+000	6.1975e+004
Pm-147	5.6229e+002	2.0805e+013	8.5170e-002	3.1513e+003
Pm-148	4.5085e+002	1.6681e+013	6.8290e-002	2.5267e+003
Pm-148m	8.6948e+001	3.2171e+012	1.3170e-002	4.8729e+002
Pm-149	1.4399e+003	5.3276e+013	2.1810e-001	8.0697e+003
Pm-151	4.7831e+002	1.7698e+013	7.2450e-002	2.6807e+003
Pr-142	1.5878e+002	5.8748e+012	2.4050e-002	8.8985e+002
Pr-143	3.6172e+003	1.3384e+014	5.4790e-001	2.0272e+004
Pr-144	3.3947e+003	1.2561e+014	5.1420e-001	1.9025e+004
Pr-144m	4.7488e+001	1.7571e+012	7.1930e-003	2.6614e+002
Pu-237	3.7585e-002	1.3907e+009	5.6930e-006	2.1064e-001
Pu-238	2.5589e+001	9.4681e+011	3.8760e-003	1.4341e+002
Pu-239	2.7088e+000	1.0023e+011	4.1030e-004	1.5181e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Pu-243	2.5400e+003	9.4681e+013	3.8760e-003	1.4341e+002
Pu-243	2.5589e+001	9.4681e+011	3.8760e-003	1.4341e+002
Pu-239	2.7088e+000	1.0023e+011	4.1030e-004	1.5181e+001

Page : 3
 DOS File: 2RB1GR.MS5
 Run Date: August 19, 2005
 Run Time: 1:52:10 PM
 Duration: 00:03:14

EC-RADN-1135
 Page 211

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Rb-86	6.0646e+003	2.2439e+014	9.1860e-001	3.3988e+004
Rb-88	1.8109e+006	6.7004e+016	2.7430e+002	1.0149e+007
Rh-103m	4.8003e+004	1.7761e+015	7.2710e+000	2.6903e+005
Rh-105	3.1287e+004	1.1576e+015	4.7390e+000	1.7534e+005
Rh-105m	8.3779e+003	3.0998e+014	1.2690e+000	4.6953e+004
Rh-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Ru-103	4.8003e+004	1.7761e+015	7.2710e+000	2.6903e+005
Ru-105	2.9359e+004	1.0863e+015	4.4470e+000	1.6454e+005
Ru-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Sb-122	1.1870e+003	4.3920e+013	1.7980e-001	6.6526e+003
Sb-124	5.4526e+002	2.0175e+013	8.2590e-002	3.0558e+003
Sb-125	7.6913e+003	2.8458e+014	1.1650e+000	4.3105e+004
Sb-126	2.6005e+002	9.6219e+012	3.9390e-002	1.4574e+003
Sb-126m	3.4667e+001	1.2827e+012	5.2510e-003	1.9429e+002
Sb-127	5.2288e+004	1.9346e+015	7.9200e+000	2.9304e+005
Sb-129	1.6842e+005	6.2314e+015	2.5510e+001	9.4387e+005
Sm-151	1.5257e+000	5.6452e+010	2.3110e-004	8.5507e+000
Sm-153	1.1745e+003	4.3456e+013	1.7790e-001	6.5823e+003
Sr-89	5.7860e+005	2.1408e+016	8.7640e+001	3.2427e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	6.8133e+005	2.5209e+016	1.0320e+002	3.8184e+006
Sr-92	6.0435e+005	2.2361e+016	9.1540e+001	3.3870e+006
Sr-93	3.2746e+003	1.2116e+014	4.9600e-001	1.8352e+004
Tc-99	6.1933e-001	2.2915e+010	9.3810e-005	3.4710e+000
Tc-99m	5.0149e+004	1.8555e+015	7.5960e+000	2.8105e+005
Tc-101	1.1210e+004	4.1478e+014	1.6980e+000	6.2826e+004
Te-123m	5.4433e+000	2.0140e+011	8.2450e-004	3.0507e+001
Te-125m	1.6974e+003	6.2803e+013	2.5710e-001	9.5127e+003
Te-127	5.2288e+004	1.9346e+015	7.9200e+000	2.9304e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	1.7918e+005	6.6296e+015	2.7140e+001	1.0042e+006
Te-129m	3.7374e+004	1.3828e+015	5.6610e+000	2.0946e+005
Te-131	2.4817e+005	9.1823e+015	3.7590e+001	1.3908e+006
Te-131m	1.1831e+005	4.3774e+015	1.7920e+001	6.6304e+005
Te-132	8.5694e+005	3.1707e+016	1.2980e+002	4.8026e+006
Te-133	8.1865e+004	3.0290e+015	1.2400e+001	4.5880e+005
Te-133m	2.6316e+005	9.7368e+015	3.9860e+001	1.4748e+006
Te-134	4.0457e+005	1.4969e+016	6.1280e+001	2.2674e+006
Xe-129m	5.7688e+002	2.1345e+013	8.7380e-002	3.2331e+003
Xe-131m	1.6459e+005	6.0897e+015	2.4930e+001	9.2241e+005
Xe-133	2.3833e+007	8.8183e+017	3.6100e+003	1.3357e+008
Xe-133m	7.8366e+005	2.8995e+016	1.1870e+002	4.3919e+006
Xe-135	8.9985e+006	3.3295e+017	1.3630e+003	5.0431e+007
Xe-135m	3.5657e+006	1.3193e+017	5.4010e+002	1.9984e+007
Xe-137	4.4577e+002	1.6493e+013	6.7520e-002	2.4982e+003
Xe-138	1.1058e+006	4.0916e+016	1.6750e+002	6.1975e+006
Y-90	3.0580e+002	1.1315e+013	4.6320e-002	1.7138e+003
Y-91	3.0178e+003	1.1166e+014	4.5710e-001	1.6913e+004
Y-91m	1.6611e+003	6.1459e+013	2.5160e-001	9.3092e+003
Y-92	3.0686e+003	1.1354e+014	4.6480e-001	1.7198e+004
Y-93	2.2632e+003	8.3737e+013	3.4280e-001	1.2684e+004
Zr-89	1.2293e+000	4.5484e+010	1.8620e-004	6.8894e+000
Zr-93	6.6680e-004	2.4672e+007	1.0100e-007	3.7370e-003
Zr-95	4.2999e+003	1.5910e+014	6.5130e-001	2.4098e+004
Zr-95m	3.0688e+003	1.1354e+014	4.6480e-001	1.7198e+004
Zr-93	2.2632e+003	8.3737e+013	3.4280e-001	1.2684e+004

Nuclide curies becquerels µCi/cm³ Bq/cm³
 Zr-97 4.0886e+003 1.5128e+014 6.1930e-001 2.2914e+004

Buildup
 The material reference is : Shield 1

Integration Parameters

X Direction 25
 Y Direction 25
 Z Direction 25

Results

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm²/sec	MeV/cm²/sec	mR/hr	mR/hr
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	4.629e+12	1.421e-125	2.412e-23	1.219e-126	2.068e-24
0.02	5.050e+14	1.280e-51	4.139e-21	4.433e-53	1.434e-22
0.03	5.384e+17	7.476e-11	1.515e-10	7.410e-13	1.502e-12
0.04	1.340e+15	4.170e-04	1.394e-03	1.844e-06	6.167e-06
0.05	4.175e+15	3.362e+00	1.807e+01	8.957e-03	4.815e-02
0.06	1.072e+15	3.203e+01	2.533e+02	6.361e-02	5.030e-01
0.08	3.315e+17	2.327e+05	2.894e+06	3.682e+02	4.580e+03
0.1	6.404e+15	1.808e+04	2.869e+05	2.767e+01	4.389e+02
0.15	1.155e+17	1.644e+06	2.945e+07	2.707e+03	4.850e+04
0.2	4.237e+17	1.463e+07	2.409e+08	2.582e+04	4.251e+05
0.3	7.316e+16	7.812e+06	9.775e+07	1.482e+04	1.854e+05
0.4	2.547e+17	5.821e+07	5.695e+08	1.134e+05	1.110e+06
0.5	5.066e+17	2.054e+08	1.633e+09	4.031e+05	3.206e+06
0.6	4.011e+17	2.567e+08	1.720e+09	5.010e+05	3.358e+06
0.8	7.365e+17	9.491e+08	4.895e+09	1.805e+06	9.311e+06
1.0	3.384e+17	7.373e+08	3.135e+09	1.359e+06	5.779e+06
1.5	3.451e+17	1.862e+09	5.771e+09	3.133e+06	9.709e+06
2.0	2.519e+17	2.462e+09	6.361e+09	3.808e+06	9.836e+06
3.0	3.077e+16	6.450e+08	1.344e+09	8.751e+05	1.824e+06
4.0	6.474e+14	2.216e+07	4.072e+07	2.741e+04	5.037e+04
5.0	9.607e+13	4.678e+06	7.804e+06	5.363e+03	8.946e+03
TOTALS:	4.362e+18	7.228e+09	2.585e+10	1.207e+07	4.486e+07

	Sensitivity	Variable		(1 of 5)	(30.48 cm)
0.015	4.629e+12	1.863e-251	2.412e-23	1.598e-252	2.068e-24
0.02	5.050e+14	1.686e-106	4.139e-21	5.839e-108	1.434e-22
0.03	5.384e+17	7.264e-29	9.760e-18	7.199e-31	9.672e-20
0.04	1.340e+15	3.655e-13	1.483e-12	1.616e-15	6.560e-15
0.05	4.175e+15	4.510e-06	3.493e-05	1.201e-08	9.305e-08
0.06	1.072e+15	1.125e-03	1.466e-02	2.235e-06	2.912e-05
0.08	3.315e+17	1.221e+02	3.022e+03	1.932e-01	4.782e+00
0.1	6.404e+15	2.821e+01	1.041e+03	4.315e-02	1.592e+00
0.15	1.155e+17	7.827e+03	3.822e+05	1.289e+01	6.294e+02
0.2	4.237e+17	1.200e+05	5.652e+06	2.117e+02	9.976e+03
0.3	7.316e+16	1.231e+05	4.316e+06	2.335e+02	8.186e+03
0.4	2.547e+17	1.403e+06	3.610e+07	2.733e+03	7.035e+04
0.5	5.066e+17	6.771e+06	1.334e+08	1.329e+04	2.619e+05
0.3	7.316e+16	1.231e+05	4.316e+06	2.335e+02	8.186e+03
0.4	2.547e+17	1.403e+06	3.610e+07	2.733e+03	7.035e+04

Page : 5
 DOS File: 2RB1GR.M55
 Run Date: August 19, 2005
 Run Time: 1:52:10 PM
 Duration: 00:03:14

EC-RADN-1135
 Page 213

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.6	4.011e+17	1.081e+07	1.698e+08	2.110e+04	3.315e+05
0.8	7.365e+17	5.777e+07	6.401e+08	1.099e+05	1.217e+06
1.0	3.384e+17	5.876e+07	5.008e+08	1.083e+05	9.232e+05
1.5	3.451e+17	2.319e+08	1.276e+09	3.902e+05	2.147e+06
2.0	2.519e+17	4.028e+08	1.708e+09	6.229e+05	2.641e+06
3.0	3.077e+16	1.450e+08	4.479e+08	1.967e+05	6.077e+05
4.0	6.474e+14	5.967e+06	1.521e+07	7.382e+03	1.881e+04
5.0	9.607e+13	1.413e+06	3.160e+06	1.620e+03	3.623e+03
TOTALS:	4.362e+18	9.229e+08	4.941e+09	1.475e+06	8.241e+06

Energy	Sensitivity	Variable		(2 of 5)	
		Variable	Variable	(2 of 5)	(45.72 cm)
0.015	4.629e+12	0.000e+00	2.412e-23	0.000e+00	2.068e-24
0.02	5.050e+14	2.913e-161	4.139e-21	1.009e-162	1.434e-22
0.03	5.384e+17	8.774e-47	9.760e-18	8.696e-49	9.672e-20
0.04	1.340e+15	3.837e-22	6.440e-20	1.697e-24	2.848e-22
0.05	4.175e+15	7.085e-12	6.713e-11	1.887e-14	1.788e-13
0.06	1.072e+15	4.566e-08	8.494e-07	9.069e-11	1.687e-09
0.08	3.315e+17	7.284e-02	2.835e+00	1.153e-04	4.487e-03
0.1	6.404e+15	4.963e-02	3.229e+00	7.592e-05	4.941e-03
0.15	1.155e+17	4.160e+01	4.065e+03	6.851e-02	6.694e+00
0.2	4.237e+17	1.092e+03	1.074e+05	1.927e+00	1.896e+02
0.3	7.316e+16	2.134e+03	1.531e+05	4.047e+00	2.904e+02
0.4	2.547e+17	3.697e+04	1.861e+06	7.204e+01	3.627e+03
0.5	5.066e+17	2.430e+05	8.979e+06	4.770e+02	1.762e+04
0.6	4.011e+17	4.938e+05	1.408e+07	9.639e+02	2.748e+04
0.8	7.365e+17	3.788e+06	7.167e+07	7.205e+03	1.363e+05
1.0	3.384e+17	5.016e+06	6.918e+07	9.246e+03	1.275e+05
1.5	3.451e+17	3.064e+07	2.520e+08	5.155e+04	4.239e+05
2.0	2.519e+17	6.943e+07	4.179e+08	1.074e+05	6.463e+05
3.0	3.077e+16	3.405e+07	1.403e+08	4.620e+04	1.904e+05
4.0	6.474e+14	1.669e+06	5.462e+06	2.065e+03	6.757e+03
5.0	9.607e+13	4.420e+05	1.228e+06	5.067e+02	1.408e+03
TOTALS:	4.362e+18	1.458e+08	9.829e+08	2.257e+05	1.582e+06

Energy	Sensitivity	Variable		(3 of 5)	
		Variable	Variable	(3 of 5)	(60.96 cm)
0.015	4.629e+12	0.000e+00	2.412e-23	0.000e+00	2.068e-24
0.02	5.050e+14	5.658e-216	4.139e-21	1.960e-217	1.434e-22
0.03	5.384e+17	1.168e-64	9.760e-18	1.157e-66	9.672e-20
0.04	1.340e+15	4.374e-31	6.440e-20	1.934e-33	2.848e-22
0.05	4.175e+15	1.198e-17	1.221e-16	3.191e-20	3.253e-19
0.06	1.072e+15	1.983e-12	5.354e-11	3.938e-15	1.063e-13
0.08	3.315e+17	4.622e-05	2.530e-03	7.314e-08	4.003e-06
0.1	6.404e+15	9.255e-05	9.277e-03	1.416e-07	1.419e-05
0.15	1.155e+17	2.334e-01	3.915e+01	3.844e-04	6.447e-02
0.2	4.237e+17	1.046e+01	1.834e+03	1.847e-02	3.238e+00
0.3	7.316e+16	3.883e+01	4.873e+03	7.366e-02	9.244e+00
0.4	2.547e+17	1.021e+03	8.663e+04	1.989e+00	1.688e+02
0.5	5.066e+17	9.115e+03	5.488e+05	1.789e+01	1.077e+03
0.6	4.011e+17	3.883e+01	4.873e+03	7.366e-02	9.244e+00
0.8	7.365e+17	1.021e+03	8.663e+04	1.989e+00	1.688e+02

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.6	4.011e+17	2.353e+04	1.058e+06	4.593e+01	2.064e+03
0.8	7.365e+17	2.584e+05	7.321e+06	4.916e+02	1.393e+04
1.0	3.384e+17	4.446e+05	8.910e+06	8.196e+02	1.642e+04
1.5	3.451e+17	4.186e+06	4.700e+07	7.042e+03	7.907e+04
2.0	2.519e+17	1.234e+07	9.764e+07	1.908e+04	1.510e+05
3.0	3.077e+16	8.210e+06	4.250e+07	1.114e+04	5.765e+04
4.0	6.474e+14	4.782e+05	1.910e+06	5.916e+02	2.362e+03
5.0	9.607e+13	1.413e+05	4.698e+05	1.620e+02	5.385e+02
TOTALS:	4.362e+18	2.609e+07	2.074e+08	3.939e+04	3.243e+05

Sensitivity	Variable	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec	MeV/cm ² /sec	mR/hr	mR/hr
0.015	4.629e+12	0.000e+00	2.412e-23	0.000e+00	2.068e-24
0.02	5.050e+14	1.173e-270	4.139e-21	4.062e-272	1.434e-22
0.03	5.384e+17	1.642e-82	9.760e-18	1.628e-84	9.672e-20
0.04	1.340e+15	5.232e-40	6.440e-20	2.314e-42	2.848e-22
0.05	4.175e+15	2.115e-23	6.561e-19	5.634e-26	1.748e-21
0.06	1.072e+15	8.962e-17	3.589e-15	1.780e-19	7.128e-18
0.08	3.315e+17	3.042e-08	2.162e-06	4.814e-11	3.422e-09
0.1	6.404e+15	1.787e-07	2.541e-05	2.734e-10	3.888e-08
0.15	1.155e+17	1.353e-03	3.519e-01	2.228e-06	5.795e-04
0.2	4.237e+17	1.035e-01	2.918e+01	1.826e-04	5.150e-02
0.3	7.316e+16	7.280e-01	1.452e+02	1.381e-03	2.753e-01
0.4	2.547e+17	2.898e+01	3.770e+03	5.647e-02	7.345e+00
0.5	5.066e+17	3.514e+02	3.149e+04	6.897e-01	6.181e+01
0.6	4.011e+17	1.151e+03	7.509e+04	2.247e+00	1.466e+02
0.8	7.365e+17	1.808e+04	7.151e+05	3.439e+01	1.360e+03
1.0	3.384e+17	4.036e+04	1.096e+06	7.440e+01	2.019e+03
1.5	3.451e+17	5.842e+05	8.439e+06	9.829e+02	1.420e+04
2.0	2.519e+17	2.236e+06	2.216e+07	3.457e+03	3.426e+04
3.0	3.077e+16	2.015e+06	1.259e+07	2.733e+03	1.708e+04
4.0	6.474e+14	1.392e+05	6.575e+05	1.722e+02	8.134e+02
5.0	9.607e+13	4.587e+04	1.775e+05	5.258e+01	2.035e+02
TOTALS:	4.362e+18	5.080e+06	4.595e+07	7.510e+03	7.016e+04

Sensitivity	Variable	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec	MeV/cm ² /sec	mR/hr	mR/hr
0.015	4.629e+12	0.000e+00	2.412e-23	0.000e+00	2.068e-24
0.02	5.050e+14	0.000e+00	4.139e-21	0.000e+00	1.434e-22
0.03	5.384e+17	2.396e-100	9.760e-18	2.374e-102	9.672e-20
0.04	1.340e+15	6.462e-49	6.440e-20	2.858e-51	2.848e-22
0.05	4.175e+15	3.843e-29	6.561e-19	1.024e-31	1.748e-21
0.06	1.072e+15	4.161e-21	1.243e-18	8.265e-24	2.468e-21
0.08	3.315e+17	2.052e-11	1.780e-09	3.248e-14	2.818e-12
0.1	6.404e+15	3.534e-10	6.799e-08	5.406e-13	1.040e-10
0.15	1.155e+17	8.020e-06	3.043e-03	1.321e-08	5.012e-06
0.2	4.237e+17	1.045e-03	4.425e-01	1.845e-06	7.810e-04
0.3	7.316e+16	1.393e-02	4.112e+00	2.642e-05	7.800e-03
0.4	2.547e+17	8.392e-01	1.568e+02	1.635e-03	3.055e-01
0.5	5.066e+17	1.380e+01	1.734e+03	2.709e-02	3.403e+00
0.3	7.316e+16	1.393e-02	4.112e+00	2.642e-05	7.800e-03
0.4	2.547e+17	8.392e-01	1.568e+02	1.635e-03	3.055e-01

Page : 7
DOS File: 2RB1GR.MS5
Run Date: August 19, 2005
Run Time: 1:52:10 PM
Duration: 00:03:14

EC-RADN-1135
Page 215

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u>		<u>Exposure Rate</u>	
		<u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>mR/hr</u> <u>No Buildup</u>	<u>mR/hr</u> <u>With Buildup</u>
0.6	4.011e+17	5.737e+01	5.132e+03	1.120e-01	1.002e+01
0.8	7.365e+17	1.287e+03	6.749e+04	2.447e+00	1.284e+02
1.0	3.384e+17	3.725e+03	1.304e+05	6.866e+00	2.404e+02
1.5	3.451e+17	8.278e+04	1.480e+06	1.393e+02	2.490e+03
2.0	2.519e+17	4.110e+05	4.927e+06	6.356e+02	7.619e+03
3.0	3.077e+16	5.007e+05	3.684e+06	6.793e+02	4.998e+03
4.0	6.474e+14	4.101e+04	2.239e+05	5.074e+01	2.770e+02
5.0	9.607e+13	1.505e+04	6.651e+04	1.726e+01	7.624e+01
TOTALS:	4.362e+18	1.056e+06	1.059e+07	1.532e+03	1.584e+04

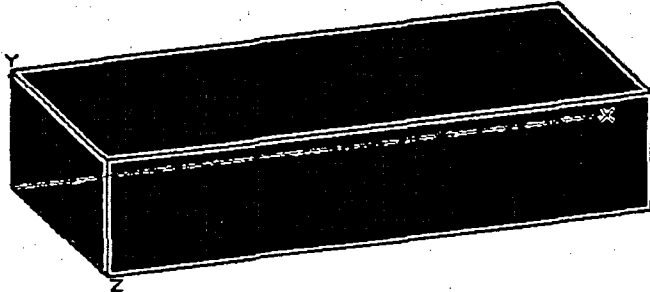
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2RB1138.MS5
 Run Date: August 19, 2005
 Run Time: 1:55:26 PM
 Duration: 00:03:05

EC-RADN-1135
 Page 216

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 1 Hour, ICRP38
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 14 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Shield 1	15.24 cm	Concrete	2.35
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : ICRP-38

Nuclide	curies	becquerels	µCi/cm ³	Bq/cm ³
Cs-135m	5.9576e+004	2.2043e+015	9.0240e+000	3.3389e+005
Eu-157	5.6744e+001	2.0995e+012	8.5950e-003	3.1802e+002
Eu-158	9.6521e+000	3.5713e+011	1.4620e-003	5.4094e+001
La-143	1.9885e+002	7.3575e+012	3.0120e-002	1.1144e+003
Nd-151	1.7317e+001	6.4073e+011	2.6230e-003	9.7051e+001
Pm-150	9.5861e+000	3.5469e+011	1.4520e-003	5.3724e+001
Pr-145	2.2975e+003	8.5007e+013	3.4800e-001	1.2876e+004
Pr-147	8.1072e+001	2.9997e+012	1.2280e-002	4.5436e+002
Rh-106m	4.8861e+002	1.8079e+013	7.4010e-002	2.7384e+003
Rh-107	3.5360e+003	1.3083e+014	5.3560e-001	1.9817e+004
Sb-128a	8.5694e+003	3.1707e+014	1.2980e+000	4.8026e+004
Sb-128b	5.1000e+004	1.8870e+015	7.7250e+000	2.8583e+005
Sb-130	2.2585e+004	8.3566e+014	3.4210e+000	1.2658e+005
Sb-131	7.8432e+004	2.9020e+015	1.1880e+001	4.3956e+005
Se-81	4.5006e+003	1.6652e+014	6.8170e-001	2.5223e+004
Se-81m	1.0543e+003	3.9011e+013	1.5970e-001	5.9089e+003
Se-83	5.3146e+003	1.9664e+014	8.0500e-001	2.9785e+004
Sm-155	1.4762e+001	5.4620e+011	2.2360e-003	8.2732e+001
Sm-156	5.3489e+001	1.9791e+012	8.1020e-003	2.9977e+002
Y-94	4.3890e+002	1.6239e+013	6.6480e-002	2.4598e+003
Y-95	7.8036e+001	2.8873e+012	1.1820e-002	4.3734e+002

Buildup
 The material reference is : Shield 1

Y-95 7.8036e+001 2.8873e+012 1.1820e-002 4.3734e+002

Integration Parameters

X Direction 25
 Y Direction 25
 Z Direction 25

Results

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	1.062e+10	3.262e-128	5.535e-26	2.798e-129	4.747e-27
0.02	2.325e+12	5.891e-54	1.906e-23	2.041e-55	6.601e-25
0.03	2.884e+14	4.005e-14	8.116e-14	3.969e-16	8.043e-16
0.04	7.214e+12	2.245e-06	7.508e-06	9.931e-09	3.321e-08
0.05	6.034e+11	4.859e-04	2.612e-03	1.294e-06	6.957e-06
0.06	5.446e+11	1.628e-02	1.287e-01	3.233e-05	2.557e-04
0.08	1.240e+12	8.706e-01	1.083e+01	1.378e-03	1.714e-02
0.1	2.531e+13	7.148e+01	1.134e+03	1.094e-01	1.735e+00
0.15	9.182e+13	1.307e+03	2.342e+04	2.153e+00	3.856e+01
0.2	7.157e+14	2.471e+04	4.069e+05	4.361e+01	7.181e+02
0.3	2.724e+15	2.909e+05	3.640e+06	5.518e+02	6.904e+03
0.4	3.711e+14	8.481e+04	8.298e+05	1.652e+02	1.617e+03
0.5	1.298e+15	5.264e+05	4.186e+06	1.033e+03	8.217e+03
0.6	3.020e+15	1.932e+06	1.295e+07	3.772e+03	2.528e+04
0.8	1.161e+16	1.496e+07	7.715e+07	2.845e+04	1.467e+05
1.0	3.237e+15	7.053e+06	2.999e+07	1.300e+04	5.528e+04
1.5	8.197e+14	4.423e+06	1.371e+07	7.442e+03	2.306e+04
2.0	6.344e+14	6.201e+06	1.602e+07	9.590e+03	2.477e+04
3.0	4.001e+13	8.388e+05	1.748e+06	1.138e+03	2.372e+03
4.0	1.738e+11	5.949e+03	1.093e+04	7.360e+00	1.352e+01
TOTALS:	2.488e+16	3.634e+07	1.607e+08	6.520e+04	2.950e+05

Energy MeV	Sensitivity photons/sec	Variable		(1 of 5)		(30.48 cm)	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	1.062e+10	4.275e-254	5.535e-26	3.667e-255	4.747e-27	3.667e-255	4.747e-27
0.02	2.325e+12	7.760e-109	1.906e-23	2.688e-110	6.601e-25	2.688e-110	6.601e-25
0.03	2.884e+14	3.891e-32	5.228e-21	3.856e-34	5.181e-23	3.856e-34	5.181e-23
0.04	7.214e+12	1.968e-15	7.986e-15	8.703e-18	3.532e-17	8.703e-18	3.532e-17
0.05	6.034e+11	6.517e-10	5.048e-09	1.736e-12	1.345e-11	1.736e-12	1.345e-11
0.06	5.446e+11	5.718e-07	7.451e-06	1.136e-09	1.480e-08	1.136e-09	1.480e-08
0.08	1.240e+12	4.567e-04	1.131e-02	7.228e-07	1.789e-05	7.228e-07	1.789e-05
0.1	2.531e+13	1.115e-01	4.113e+00	1.706e-04	6.293e-03	1.706e-04	6.293e-03
0.15	9.182e+13	6.223e+00	3.039e+02	1.025e-02	5.005e-01	1.025e-02	5.005e-01
0.2	7.157e+14	2.026e+02	9.547e+03	3.577e-01	1.685e+01	3.577e-01	1.685e+01
0.3	2.724e+15	4.582e+03	1.607e+05	8.692e+00	3.048e+02	8.692e+00	3.048e+02
0.4	3.711e+14	2.044e+03	5.260e+04	3.982e+00	1.025e+02	3.982e+00	1.025e+02
0.5	1.298e+15	1.735e+04	3.420e+05	3.406e+01	6.712e+02	3.406e+01	6.712e+02
0.6	3.020e+15	8.139e+04	1.278e+06	1.589e+02	2.495e+03	1.589e+02	2.495e+03
0.8	1.161e+16	9.105e+05	1.009e+07	1.732e+03	1.919e+04	1.732e+03	1.919e+04
1.0	3.237e+15	5.620e+05	4.791e+06	1.036e+03	8.831e+03	1.036e+03	8.831e+03
1.5	8.197e+14	5.509e+05	3.031e+06	9.268e+02	5.099e+03	9.268e+02	5.099e+03
2.0	6.344e+14	1.014e+06	4.301e+06	1.569e+03	6.651e+03	1.569e+03	6.651e+03
3.0	4.001e+13	1.886e+05	5.825e+05	2.558e+02	7.903e+02	2.558e+02	7.903e+02
4.0	1.738e+11	1.602e+03	4.083e+03	1.982e+00	5.051e+00	1.982e+00	5.051e+00
2.0	6.344e+14	1.014e+06	4.301e+06	1.569e+03	6.651e+03	1.569e+03	6.651e+03
3.0	4.001e+13	1.886e+05	5.825e+05	2.558e+02	7.903e+02	2.558e+02	7.903e+02

Page : 3
 DOS File: 2RB1I38.MS5
 Run Date: August 19, 2005
 Run Time: 1:55:26 PM
 Duration: 00:03:05

EC-RADN-1135
 Page 218

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
TOTALS:	2.488e+16	3.334e+06	2.464e+07	5.727e+03	4.415e+04
	Sensitivity	Variable		(2 of 5)	(45.72 cm)
0.015	1.062e+10	0.000e+00	5.535e-26	0.000e+00	4.747e-27
0.02	2.325e+12	1.341e-163	1.906e-23	4.646e-165	6.601e-25
0.03	2.884e+14	4.700e-50	5.228e-21	4.658e-52	5.181e-23
0.04	7.214e+12	2.066e-24	3.468e-22	9.137e-27	1.534e-24
0.05	6.034e+11	1.024e-15	9.700e-15	2.727e-18	2.584e-17
0.06	5.446e+11	2.320e-11	4.317e-10	4.609e-14	8.574e-13
0.08	1.240e+12	2.725e-07	1.061e-05	4.313e-10	1.679e-08
0.1	2.531e+13	1.961e-04	1.276e-02	3.001e-07	1.953e-05
0.15	9.182e+13	3.308e-02	3.232e+00	5.447e-05	5.322e-03
0.2	7.157e+14	1.844e+00	1.815e+02	3.255e-03	3.203e-01
0.3	2.724e+15	7.944e+01	5.701e+03	1.507e-01	1.081e+01
0.4	3.711e+14	5.387e+01	2.712e+03	1.050e-01	5.284e+00
0.5	1.298e+15	6.228e+02	2.301e+04	1.222e+00	4.517e+01
0.6	3.020e+15	3.717e+03	1.060e+05	7.256e+00	2.069e+02
0.8	1.161e+16	5.970e+04	1.129e+06	1.135e+02	2.148e+03
1.0	3.237e+15	4.798e+04	6.617e+05	8.845e+01	1.220e+03
1.5	8.197e+14	7.278e+04	5.985e+05	1.225e+02	1.007e+03
2.0	6.344e+14	1.749e+05	1.052e+06	2.704e+02	1.628e+03
3.0	4.001e+13	4.428e+04	1.825e+05	6.008e+01	2.476e+02
4.0	1.738e+11	4.481e+02	1.466e+03	5.544e-01	1.814e+00
TOTALS:	2.488e+16	4.045e+05	3.764e+06	6.642e+02	6.520e+03
	Sensitivity	Variable		(3 of 5)	(60.96 cm)
0.015	1.062e+10	0.000e+00	5.535e-26	0.000e+00	4.747e-27
0.02	2.325e+12	2.605e-218	1.906e-23	9.023e-220	6.601e-25
0.03	2.884e+14	6.254e-68	5.228e-21	6.198e-70	5.181e-23
0.04	7.214e+12	2.355e-33	3.468e-22	1.042e-35	1.534e-24
0.05	6.034e+11	1.731e-21	1.765e-20	4.611e-24	4.701e-23
0.06	5.446e+11	1.008e-15	2.721e-14	2.001e-18	5.405e-17
0.08	1.240e+12	1.729e-10	9.466e-09	2.737e-13	1.498e-11
0.1	2.531e+13	3.658e-07	3.667e-05	5.596e-10	5.610e-08
0.15	9.182e+13	1.856e-04	3.113e-02	3.056e-07	5.126e-05
0.2	7.157e+14	1.767e-02	3.099e+00	3.119e-05	5.469e-03
0.3	2.724e+15	1.446e+00	1.815e+02	2.742e-03	3.442e-01
0.4	3.711e+14	1.487e+00	1.262e+02	2.897e-03	2.459e-01
0.5	1.298e+15	2.336e+01	1.407e+03	4.585e-02	2.761e+00
0.6	3.020e+15	1.771e+02	7.961e+03	3.457e-01	1.554e+01
0.8	1.161e+16	4.073e+03	1.154e+05	7.747e+00	2.195e+02
1.0	3.237e+15	4.253e+03	8.523e+04	7.840e+00	1.571e+02
1.5	8.197e+14	9.942e+03	1.116e+05	1.673e+01	1.878e+02
2.0	6.344e+14	3.107e+04	2.459e+05	4.804e+01	3.803e+02
3.0	4.001e+13	1.068e+04	5.526e+04	1.448e+01	7.498e+01
4.0	1.738e+11	1.284e+02	5.127e+02	1.588e-01	6.342e-01
TOTALS:	2.488e+16	6.034e+04	6.236e+05	9.539e+01	1.039e+03
4.0	1.738e+11	1.284e+02	5.127e+02	1.588e-01	6.342e-01

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
	Sensitivity	Variable		(4 of 5)	(76.2 cm)
0.015	1.062e+10	0.000e+00	5.535e-26	0.000e+00	4.747e-27
0.02	2.325e+12	5.398e-273	1.906e-23	1.870e-274	6.601e-25
0.03	2.884e+14	8.797e-86	5.228e-21	8.719e-88	5.181e-23
0.04	7.214e+12	2.817e-42	3.468e-22	1.246e-44	1.534e-24
0.05	6.034e+11	3.056e-27	9.481e-23	8.141e-30	2.526e-25
0.06	5.446e+11	4.555e-20	1.824e-18	9.047e-23	3.623e-21
0.08	1.240e+12	1.138e-13	8.091e-12	1.801e-16	1.280e-14
0.1	2.531e+13	7.064e-10	1.004e-07	1.081e-12	1.537e-10
0.15	9.182e+13	1.076e-06	2.798e-04	1.772e-09	4.608e-07
0.2	7.157e+14	1.748e-04	4.928e-02	3.085e-07	8.698e-05
0.3	2.724e+15	2.710e-02	5.404e+00	5.141e-05	1.025e-02
0.4	3.711e+14	4.223e-02	5.492e+00	8.228e-05	1.070e-02
0.5	1.298e+15	9.005e-01	8.070e+01	1.768e-03	1.584e-01
0.6	3.020e+15	8.667e+00	5.652e+02	1.692e-02	1.103e+00
0.8	1.161e+16	2.849e+02	1.127e+04	5.419e-01	2.144e+01
1.0	3.237e+15	3.861e+02	1.048e+04	7.117e-01	1.932e+01
1.5	8.197e+14	1.388e+03	2.005e+04	2.335e+00	3.373e+01
2.0	6.344e+14	5.631e+03	5.580e+04	8.707e+00	8.629e+01
3.0	4.001e+13	2.620e+03	1.638e+04	3.554e+00	2.222e+01
4.0	1.738e+11	3.737e+01	1.765e+02	4.624e-02	2.184e-01
TOTALS:	2.488e+16	1.036e+04	1.148e+05	1.591e+01	1.845e+02
	Sensitivity	Variable		(5 of 5)	(91.44 cm)
0.015	1.062e+10	0.000e+00	5.535e-26	0.000e+00	4.747e-27
0.02	2.325e+12	0.000e+00	1.906e-23	0.000e+00	6.601e-25
0.03	2.884e+14	1.283e-103	5.228e-21	1.272e-105	5.181e-23
0.04	7.214e+12	3.480e-51	3.468e-22	1.539e-53	1.534e-24
0.05	6.034e+11	5.553e-33	9.481e-23	1.479e-35	2.526e-25
0.06	5.446e+11	2.115e-24	6.315e-22	4.201e-27	1.254e-24
0.08	1.240e+12	7.680e-17	6.662e-15	1.215e-19	1.054e-17
0.1	2.531e+13	1.397e-12	2.687e-10	2.137e-15	4.112e-13
0.15	9.182e+13	6.377e-09	2.420e-06	1.050e-11	3.985e-09
0.2	7.157e+14	1.766e-06	7.475e-04	3.117e-09	1.319e-06
0.3	2.724e+15	5.185e-04	1.531e-01	9.835e-07	2.904e-04
0.4	3.711e+14	1.223e-03	2.284e-01	2.382e-06	4.451e-04
0.5	1.298e+15	3.537e-02	4.443e+00	6.943e-05	8.721e-03
0.6	3.020e+15	4.319e-01	3.863e+01	8.430e-04	7.541e-02
0.8	1.161e+16	2.028e+01	1.064e+03	3.857e-02	2.023e+00
1.0	3.237e+15	3.563e+01	1.248e+03	6.568e-02	2.300e+00
1.5	8.197e+14	1.966e+02	3.516e+03	3.308e-01	5.915e+00
2.0	6.344e+14	1.035e+03	1.241e+04	1.601e+00	1.919e+01
3.0	4.001e+13	6.511e+02	4.791e+03	8.834e-01	6.500e+00
4.0	1.738e+11	1.101e+01	6.010e+01	1.362e-02	7.436e-02
TOTALS:	2.488e+16	1.950e+03	2.313e+04	2.934e+00	3.608e+01
TOTALS:	2.488e+16	1.950e+03	2.313e+04	2.934e+00	3.608e+01

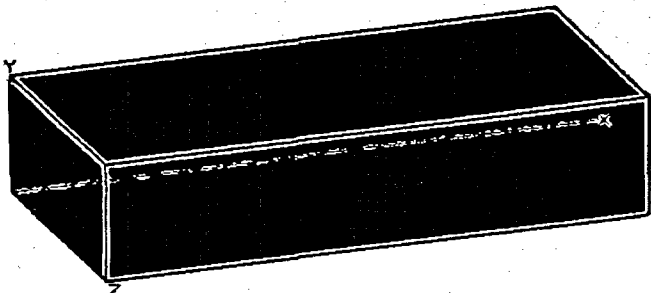
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2RB1RAD.MS5
 Run Date: August 19, 2005
 Run Time: 1:58:32 PM
 Duration: 00:03:03

EC-RADN-1135
 Page 220

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 1 Hour, RADTRAD
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 4 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Shield 1	15.24 cm	Concrete	2.35
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	5.6916e-001	2.1059e+010	8.6210e-005	3.1898e+000
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	7.5461e+005	2.7920e+016	1.1430e+002	4.2291e+006
Ba-140	1.0973e+006	4.0598e+016	1.6620e+002	6.1494e+006
Ce-141	1.0075e+004	3.7276e+014	1.5260e+000	5.6462e+004
Ce-143	9.2164e+003	3.4101e+014	1.3960e+000	5.1652e+004
Ce-144	8.4836e+003	3.1389e+014	1.2850e+000	4.7545e+004
Cm-242	1.4967e+002	5.5377e+012	2.2670e-002	8.3879e+002
Cm-244	8.7410e+000	3.2342e+011	1.3240e-003	4.8988e+001
Co-58	1.6584e+002	6.1362e+012	2.5120e-002	9.2944e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Cs-134	6.4501e+005	2.3866e+016	9.7700e+001	3.6149e+006
Cs-136	2.0552e+005	7.6042e+015	3.1130e+001	1.1518e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
I-131	3.6001e+006	1.3320e+017	5.4530e+002	2.0176e+007
I-132	5.2459e+006	1.9410e+017	7.9460e+002	2.9400e+007
I-133	7.3282e+006	2.7114e+017	1.1100e+003	4.1070e+007
I-134	5.8890e+006	2.1789e+017	8.9200e+002	3.3004e+007
I-135	6.4033e+006	2.3692e+017	9.6990e+002	3.5886e+007
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	2.6058e+006	9.6415e+016	3.9470e+002	1.4604e+007
Kr-87	3.5314e+006	1.3066e+017	5.3490e+002	1.9791e+007
Kr-88	6.5578e+006	2.4264e+017	9.9330e+002	3.6752e+007
La-140	4.6973e+003	1.7380e+014	7.1150e-001	2.6325e+004
La-141	3.6001e+003	1.3320e+014	5.4530e-001	2.0176e+004
Kr-85m	2.6058e+006	9.6415e+016	3.9470e+002	1.4604e+007
Kr-87	3.5314e+006	1.3066e+017	5.3490e+002	1.9791e+007

Page : 2
 DOS File: 2RB1RAD.MS5
 Run Date: August 19, 2005
 Run Time: 1:58:32 PM
 Duration: 00:03:03

EC-RADN-1135
 Page 221

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
La-142	2.7775e+003	1.0277e+014	4.2070e-001	1.5566e+004
Mo-99	5.6150e+004	2.0775e+015	8.5050e+000	3.1469e+005
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nd-147	1.6201e+003	5.9945e+013	2.4540e-001	9.0798e+003
Np-239	1.1831e+005	4.3774e+015	1.7920e+001	6.6304e+005
Pr-143	3.6172e+003	1.3384e+014	5.4790e-001	2.0272e+004
Pr-144	3.3947e+003	1.2561e+014	5.1420e-001	1.9025e+004
Pu-238	2.5589e+001	9.4681e+011	3.8760e-003	1.4341e+002
Pu-239	2.7088e+000	1.0023e+011	4.1030e-004	1.5181e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Rb-86	6.0646e+003	2.2439e+014	9.1860e-001	3.3988e+004
Rh-103m	4.8003e+004	1.7761e+015	7.2710e+000	2.6903e+005
Rh-105	3.1287e+004	1.1576e+015	4.7390e+000	1.7534e+005
Rh-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Ru-103	4.8003e+004	1.7761e+015	7.2710e+000	2.6903e+005
Ru-105	2.9359e+004	1.0863e+015	4.4470e+000	1.6454e+005
Ru-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Sb-127	5.2288e+004	1.9346e+015	7.9200e+000	2.9304e+005
Sb-129	1.6842e+005	6.2314e+015	2.5510e+001	9.4387e+005
Sr-89	5.7860e+005	2.1408e+016	8.7640e+001	3.2427e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	6.8133e+005	2.5209e+016	1.0320e+002	3.8184e+006
Sr-92	6.0435e+005	2.2361e+016	9.1540e+001	3.3870e+006
Tc-99m	5.0149e+004	1.8555e+015	7.5960e+000	2.8105e+005
Te-127	5.2288e+004	1.9346e+015	7.9200e+000	2.9304e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	1.7918e+005	6.6296e+015	2.7140e+001	1.0042e+006
Te-129m	3.7374e+004	1.3828e+015	5.6610e+000	2.0946e+005
Te-131m	1.1831e+005	4.3774e+015	1.7920e+001	6.6304e+005
Te-132	8.5694e+005	3.1707e+016	1.2980e+002	4.8026e+006
Xe-133	2.3833e+007	8.8183e+017	3.6100e+003	1.3357e+008
Xe-135	8.9985e+006	3.3295e+017	1.3630e+003	5.0431e+007
Y-90	3.0580e+002	1.1315e+013	4.6320e-002	1.7138e+003
Y-91	3.0178e+003	1.1166e+014	4.5710e-001	1.6913e+004
Y-92	3.0686e+003	1.1354e+014	4.6480e-001	1.7198e+004
Y-93	2.2632e+003	8.3737e+013	3.4280e-001	1.2684e+004
Zr-95	4.2999e+003	1.5910e+014	6.5130e-001	2.4098e+004
Zr-97	4.0886e+003	1.5128e+014	6.1930e-001	2.2914e+004

Buildup
 The material reference is : Shield 1

Integration Parameters

X Direction	25
Y Direction	25
Z Direction	25

Results

<u>Energy</u>	<u>Activity</u>	<u>Fluence Rate</u>	<u>Fluence Rate</u>	<u>Exposure Rate</u>	<u>Exposure Rate</u>
<u>MeV</u>	<u>photons/sec</u>	<u>MeV/cm²/sec</u>	<u>MeV/cm²/sec</u>	<u>mR/hr</u>	<u>mR/hr</u>
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.015	2.084e+11	6.396e-127	1.085e-24	5.486e-128	9.310e-26
<u>Energy</u>	<u>Activity</u>	<u>Fluence Rate</u>	<u>Fluence Rate</u>	<u>Exposure Rate</u>	<u>Exposure Rate</u>
<u>MeV</u>	<u>photons/sec</u>	<u>MeV/cm²/sec</u>	<u>MeV/cm²/sec</u>	<u>mR/hr</u>	<u>mR/hr</u>

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.02	3.638e+14	9.221e-52	2.982e-21	3.194e-53	1.033e-22
0.03	4.893e+17	6.794e-11	1.377e-10	6.733e-13	1.365e-12
0.04	1.009e+15	3.139e-04	1.050e-03	1.388e-06	4.643e-06
0.05	4.168e+15	3.357e+00	1.804e+01	8.942e-03	4.806e-02
0.06	1.066e+15	3.185e+01	2.519e+02	6.326e-02	5.002e-01
0.08	3.278e+17	2.301e+05	2.862e+06	3.641e+02	4.530e+03
0.1	5.296e+15	1.496e+04	2.373e+05	2.288e+01	3.630e+02
0.15	1.032e+17	1.469e+06	2.632e+07	2.419e+03	4.334e+04
0.2	4.067e+17	1.404e+07	2.312e+08	2.478e+04	4.081e+05
0.3	4.860e+16	5.190e+06	6.494e+07	9.845e+03	1.232e+05
0.4	2.314e+17	5.290e+07	5.175e+08	1.031e+05	1.008e+06
0.5	3.511e+17	1.423e+08	1.132e+09	2.794e+05	2.222e+06
0.6	3.884e+17	2.485e+08	1.666e+09	4.851e+05	3.251e+06
0.8	7.007e+17	9.030e+08	4.658e+09	1.718e+06	8.859e+06
1.0	2.897e+17	6.313e+08	2.684e+09	1.164e+06	4.947e+06
1.5	2.651e+17	1.430e+09	4.432e+09	2.407e+06	7.457e+06
2.0	2.020e+17	1.975e+09	5.100e+09	3.054e+06	7.887e+06
3.0	2.018e+16	4.230e+08	8.816e+08	5.739e+05	1.196e+06
4.0	2.698e+12	9.234e+04	1.697e+05	1.142e+02	2.099e+02
TOTALS:	3.836e+18	5.827e+09	2.140e+10	9.820e+06	3.741e+07

Energy	Sensitivity	Variable	(1 of 5)		
			(1 of 5)	(30.48 cm)	(30.48 cm)
0.015	2.084e+11	8.384e-253	1.085e-24	7.191e-254	9.310e-26
0.02	3.638e+14	1.214e-106	2.982e-21	4.207e-108	1.033e-22
0.03	4.893e+17	6.600e-29	8.869e-18	6.541e-31	8.789e-20
0.04	1.009e+15	2.751e-13	1.117e-12	1.217e-15	4.938e-15
0.05	4.168e+15	4.502e-06	3.487e-05	1.199e-08	9.290e-08
0.06	1.066e+15	1.119e-03	1.458e-02	2.222e-06	2.896e-05
0.08	3.278e+17	1.207e+02	2.989e+03	1.910e-01	4.729e+00
0.1	5.296e+15	2.333e+01	8.606e+02	3.569e-02	1.317e+00
0.15	1.032e+17	6.994e+03	3.416e+05	1.152e+01	5.625e+02
0.2	4.067e+17	1.152e+05	5.426e+06	2.033e+02	9.576e+03
0.3	4.860e+16	8.176e+04	2.867e+06	1.551e+02	5.438e+03
0.4	2.314e+17	1.275e+06	3.281e+07	2.484e+03	6.393e+04
0.5	3.511e+17	4.692e+06	9.247e+07	9.210e+03	1.815e+05
0.6	3.884e+17	1.047e+07	1.644e+08	2.043e+04	3.209e+05
0.8	7.007e+17	5.497e+07	6.090e+08	1.046e+05	1.158e+06
1.0	2.897e+17	5.030e+07	4.288e+08	9.272e+04	7.903e+05
1.5	2.651e+17	1.781e+08	9.801e+08	2.997e+05	1.649e+06
2.0	2.020e+17	3.230e+08	1.369e+09	4.995e+05	2.118e+06
3.0	2.018e+16	9.510e+07	2.938e+08	1.290e+05	3.985e+05
4.0	2.698e+12	2.486e+04	6.337e+04	3.076e+01	7.840e+01
TOTALS:	3.836e+18	7.182e+08	3.979e+09	1.158e+06	6.696e+06

Energy	Sensitivity	Variable	(2 of 5)		
			(2 of 5)	(45.72 cm)	(45.72 cm)
0.015	2.084e+11	0.000e+00	1.085e-24	0.000e+00	9.310e-26
0.02	3.638e+14	2.099e-161	2.982e-21	7.271e-163	1.033e-22
0.03	4.893e+17	7.973e-47	8.869e-18	7.902e-49	8.789e-20
U.015	2.084e+11	0.000e+00	1.085e-24	0.000e+00	9.310e-26
0.02	3.638e+14	2.099e-161	2.982e-21	7.271e-163	1.033e-22

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.04	1.009e+15	2.888e-22	4.848e-20	1.277e-24	2.144e-22
0.05	4.168e+15	7.073e-12	6.702e-11	1.884e-14	1.785e-13
0.06	1.066e+15	4.540e-08	8.447e-07	9.018e-11	1.678e-09
0.08	3.278e+17	7.203e-02	2.804e+00	1.140e-04	4.437e-03
0.1	5.296e+15	4.104e-02	2.671e+00	6.279e-05	4.086e-03
0.15	1.032e+17	3.717e+01	3.632e+03	6.122e-02	5.981e+00
0.2	4.067e+17	1.048e+03	1.031e+05	1.850e+00	1.820e+02
0.3	4.860e+16	1.417e+03	1.017e+05	2.689e+00	1.929e+02
0.4	2.314e+17	3.360e+04	1.691e+06	6.547e+01	3.296e+03
0.5	3.511e+17	1.684e+05	6.222e+06	3.305e+02	1.221e+04
0.6	3.884e+17	4.781e+05	1.363e+07	9.332e+02	2.661e+04
0.8	7.007e+17	3.604e+06	6.819e+07	6.855e+03	1.297e+05
1.0	2.897e+17	4.294e+06	5.922e+07	7.916e+03	1.092e+05
1.5	2.651e+17	2.354e+07	1.935e+08	3.960e+04	3.256e+05
2.0	2.020e+17	5.567e+07	3.351e+08	8.609e+04	5.182e+05
3.0	2.018e+16	2.233e+07	9.203e+07	3.030e+04	1.249e+05
4.0	2.698e+12	6.956e+03	2.276e+04	8.605e+00	2.816e+01
TOTALS:	3.836e+18	1.101e+08	7.699e+08	1.721e+05	1.250e+06

Energy MeV	Sensitivity Variable	Variable	(3 of 5)		(60.96 cm)
			MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup
0.015	2.084e+11	0.000e+00	1.085e-24	0.000e+00	9.310e-26
0.02	3.638e+14	4.077e-216	2.982e-21	1.412e-217	1.033e-22
0.03	4.893e+17	1.061e-64	8.869e-18	1.051e-66	8.789e-20
0.04	1.009e+15	3.293e-31	4.848e-20	1.456e-33	2.144e-22
0.05	4.168e+15	1.196e-17	1.219e-16	3.186e-20	3.248e-19
0.06	1.066e+15	1.972e-12	5.324e-11	3.916e-15	1.058e-13
0.08	3.278e+17	4.570e-05	2.502e-03	7.232e-08	3.959e-06
0.1	5.296e+15	7.653e-05	7.672e-03	1.171e-07	1.174e-05
0.15	1.032e+17	2.086e-01	3.499e+01	3.435e-04	5.761e-02
0.2	4.067e+17	1.004e+01	1.761e+03	1.773e-02	3.108e+00
0.3	4.860e+16	2.580e+01	3.237e+03	4.893e-02	6.141e+00
0.4	2.314e+17	9.274e+02	7.872e+04	1.807e+00	1.534e+02
0.5	3.511e+17	6.316e+03	3.803e+05	1.240e+01	7.465e+02
0.6	3.884e+17	2.278e+04	1.024e+06	4.447e+01	1.999e+03
0.8	7.007e+17	2.459e+05	6.966e+06	4.677e+02	1.325e+04
1.0	2.897e+17	3.807e+05	7.628e+06	7.017e+02	1.406e+04
1.5	2.651e+17	3.215e+06	3.610e+07	5.409e+03	6.073e+04
2.0	2.020e+17	9.892e+06	7.830e+07	1.530e+04	1.211e+05
3.0	2.018e+16	5.384e+06	2.787e+07	7.305e+03	3.781e+04
4.0	2.698e+12	1.993e+03	7.958e+03	2.465e+00	9.844e+00
TOTALS:	3.836e+18	1.915e+07	1.584e+08	2.924e+04	2.498e+05

Energy MeV	Sensitivity Variable	Variable	(4 of 5)		(76.2 cm)
			MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup
0.015	2.084e+11	0.000e+00	1.085e-24	0.000e+00	9.310e-26
0.02	3.638e+14	8.449e-271	2.982e-21	2.927e-272	1.033e-22
0.03	4.893e+17	1.492e-82	8.869e-18	1.479e-84	8.789e-20
0.04	1.009e+15	3.939e-40	4.848e-20	1.742e-42	2.144e-22
0.05	4.168e+15	2.111e-23	6.550e-19	5.624e-26	1.745e-21
0.06	1.066e+15	1.492e-82	8.869e-18	1.479e-84	8.789e-20
0.04	1.009e+15	3.939e-40	4.848e-20	1.742e-42	2.144e-22

Page : 5
 DOS File: 2RB1RAD.MS5
 Run Date: August 19, 2005
 Run Time: 1:58:32 PM
 Duration: 00:03:03

EC-RADN-1135
 Page 224

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec		Exposure Rate mR/hr	
		No Buildup	With Buildup	No Buildup	With Buildup
0.06	1.066e+15	8.912e-17	3.569e-15	1.770e-19	7.089e-18
0.08	3.278e+17	3.008e-08	2.138e-06	4.761e-11	3.384e-09
0.1	5.296e+15	1.478e-07	2.102e-05	2.261e-10	3.215e-08
0.15	1.032e+17	1.209e-03	3.145e-01	1.991e-06	5.179e-04
0.2	4.067e+17	9.933e-02	2.801e+01	1.753e-04	4.943e-02
0.3	4.860e+16	4.836e-01	9.642e+01	9.173e-04	1.829e-01
0.4	2.314e+17	2.634e+01	3.426e+03	5.132e-02	6.675e+00
0.5	3.511e+17	2.435e+02	2.182e+04	4.779e-01	4.283e+01
0.6	3.884e+17	1.115e+03	7.270e+04	2.176e+00	1.419e+02
0.8	7.007e+17	1.720e+04	6.804e+05	3.272e+01	1.294e+03
1.0	2.897e+17	3.455e+04	9.379e+05	6.369e+01	1.729e+03
1.5	2.651e+17	4.487e+05	6.482e+06	7.549e+02	1.091e+04
2.0	2.020e+17	1.793e+06	1.777e+07	2.772e+03	2.748e+04
3.0	2.018e+16	1.321e+06	8.258e+06	1.792e+03	1.120e+04
4.0	2.698e+12	5.801e+02	2.740e+03	7.177e-01	3.390e+00
TOTALS:	3.836e+18	3.616e+06	3.423e+07	5.420e+03	5.280e+04
	Sensitivity	Variable		(5 of 5)	(91.44 cm)
0.015	2.084e+11	0.000e+00	1.085e-24	0.000e+00	9.310e-26
0.02	3.638e+14	0.000e+00	2.982e-21	0.000e+00	1.033e-22
0.03	4.893e+17	2.177e-100	8.869e-18	2.158e-102	8.789e-20
0.04	1.009e+15	4.865e-49	4.848e-20	2.152e-51	2.144e-22
0.05	4.168e+15	3.836e-29	6.550e-19	1.022e-31	1.745e-21
0.06	1.066e+15	4.138e-21	1.236e-18	8.219e-24	2.454e-21
0.08	3.278e+17	2.030e-11	1.761e-09	3.212e-14	2.786e-12
0.1	5.296e+15	2.922e-10	5.623e-08	4.471e-13	8.603e-11
0.15	1.032e+17	7.167e-06	2.720e-03	1.180e-08	4.478e-06
0.2	4.067e+17	1.004e-03	4.248e-01	1.771e-06	7.497e-04
0.3	4.860e+16	9.251e-03	2.732e+00	1.755e-05	5.182e-03
0.4	2.314e+17	7.626e-01	1.425e+02	1.486e-03	2.776e-01
0.5	3.511e+17	9.564e+00	1.201e+03	1.877e-02	2.358e+00
0.6	3.884e+17	5.555e+01	4.969e+03	1.084e-01	9.699e+00
0.8	7.007e+17	1.224e+03	6.421e+04	2.328e+00	1.221e+02
1.0	2.897e+17	3.189e+03	1.117e+05	5.878e+00	2.058e+02
1.5	2.651e+17	6.358e+04	1.137e+06	1.070e+02	1.913e+03
2.0	2.020e+17	3.296e+05	3.951e+06	5.096e+02	6.110e+03
3.0	2.018e+16	3.283e+05	2.416e+06	4.455e+02	3.278e+03
4.0	2.698e+12	1.709e+02	9.329e+02	2.114e-01	1.154e+00
TOTALS:	3.836e+18	7.261e+05	7.687e+06	1.071e+03	1.164e+04

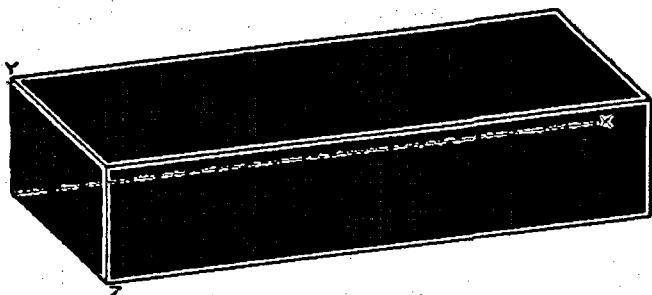
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2RB8GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:10:40 PM
 Duration: 00:03:18

EC-RADN-1135
 Page 225

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 8 Hour, GROVE
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 14 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Shield 1	15.24 cm	Concrete	2.35
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	5.7087e-001	2.1122e+010	8.6470e-005	3.1994e+000
Am-242	1.8175e+002	6.7249e+012	2.7530e-002	1.0186e+003
Am-242m	3.7202e-002	1.3765e+009	5.6350e-006	2.0849e-001
Am-243	7.0113e-002	2.5942e+009	1.0620e-005	3.9294e-001
Am-244	1.7832e+002	6.5978e+012	2.7010e-002	9.9937e+002
Ba-135m	1.9370e+002	7.1670e+012	2.9340e-002	1.0856e+003
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	2.4216e+004	8.9600e+014	3.6680e+000	1.3572e+005
Ba-140	1.0801e+006	3.9963e+016	1.6360e+002	6.0532e+006
Ba-141	1.2385e-002	4.5826e+008	1.8760e-006	6.9412e-002
Ba-142	2.2070e-008	8.1661e+002	3.3430e-012	1.2369e-007
Br-82	1.1006e+004	4.0720e+014	1.6670e+000	6.1679e+004
Br-83	4.7059e+004	1.7412e+015	7.1280e+000	2.6374e+005
Br-84	2.5636e+001	9.4852e+011	3.8830e-003	1.4367e+002
Ce-141	1.0028e+004	3.7105e+014	1.5190e+000	5.6203e+004
Ce-143	7.9686e+003	2.9484e+014	1.2070e+000	4.4659e+004
Ce-144	8.4836e+003	3.1389e+014	1.2850e+000	4.7545e+004
Cm-242	1.4967e+002	5.5377e+012	2.2670e-002	8.3879e+002
Cm-243	6.4462e-002	2.3851e+009	9.7640e-006	3.6127e-001
Cm-244	8.7410e+000	3.2342e+011	1.3240e-003	4.8988e+001
Co-58	1.6545e+002	6.1215e+012	2.5060e-002	9.2722e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Co-60m				
Co-61	6.9189e-002	2.5600e+009	1.0480e-005	3.8776e-001
Cs-132	1.1785e+002	4.3603e+012	2.3850e-002	9.2952e+002
Cs-134	1.6545e+002	6.1215e+012	2.5060e-002	9.2722e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Cs-134	6.4501e+005	2.3866e+016	9.7700e+001	3.6149e+006
Cs-134m	2.0077e+004	7.4284e+014	3.0410e+000	1.1252e+005
Cs-136	2.0229e+005	7.4845e+015	3.0640e+001	1.1337e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
Cs-138	3.2145e+002	1.1894e+013	4.8690e-002	1.8015e+003
Cs-139	1.4590e-009	5.3985e+001	2.2100e-013	8.1770e-009
Eu-152m	3.0686e-001	1.1354e+010	4.6480e-005	1.7198e+000
Eu-154	2.3681e+001	8.7621e+011	3.5870e-003	1.3272e+002
Eu-155	9.7379e+000	3.6030e+011	1.4750e-003	5.4575e+001
Eu-156	6.0573e+002	2.2412e+013	9.1750e-002	3.3948e+003
I-128	6.5835e-002	2.4359e+009	9.9720e-006	3.6896e-001
I-130	5.7087e+004	2.1122e+015	8.6470e+000	3.1994e+005
I-131	3.5228e+006	1.3034e+017	5.3360e+002	1.9743e+007
I-132	4.9891e+006	1.8460e+017	7.5570e+002	2.7961e+007
I-133	5.8632e+006	2.1694e+017	8.8810e+002	3.2860e+007
I-134	5.1430e+004	1.9029e+015	7.7900e+000	2.8823e+005
I-135	3.0600e+006	1.1322e+017	4.6350e+002	1.7150e+007
Kr-83m	4.0800e+005	1.5096e+016	6.1800e+001	2.2866e+006
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	8.8269e+005	3.2659e+016	1.3370e+002	4.9469e+006
Kr-87	7.7838e+004	2.8800e+015	1.1790e+001	4.3623e+005
Kr-88	1.1831e+006	4.3774e+016	1.7920e+002	6.6304e+006
La-140	4.6630e+003	1.7253e+014	7.0630e-001	2.6133e+004
La-141	1.0543e+003	3.9011e+013	1.5970e-001	5.9089e+003
La-142	1.1435e+002	4.2308e+012	1.7320e-002	6.4084e+002
Mo-99	5.2077e+004	1.9268e+015	7.8880e+000	2.9186e+005
Mo-101	6.5789e-006	2.4342e+005	9.9650e-010	3.6870e-005
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nb-95m	4.7851e+001	1.7705e+012	7.2480e-003	2.6818e+002
Nb-96	5.5080e+000	2.0380e+011	8.3430e-004	3.0869e+001
Nb-97	3.2865e+003	1.2160e+014	4.9780e-001	1.8419e+004
Nb-97m	2.9128e+003	1.0777e+014	4.4120e-001	1.6324e+004
Nd-147	1.5911e+003	5.8870e+013	2.4100e-001	8.9170e+003
Nd-149	3.8232e+001	1.4146e+012	5.7910e-003	2.1427e+002
Np-236m	2.1212e-002	7.8485e+008	3.2130e-006	1.1888e-001
Np-238	2.3662e+003	8.7548e+013	3.5840e-001	1.3261e+004
Np-239	1.0840e+005	4.0110e+015	1.6420e+001	6.0754e+005
Np-240	1.0200e+000	3.7740e+010	1.5450e-004	5.7165e+000
Pd-109	7.7573e+003	2.8702e+014	1.1750e+000	4.3475e+004
Pm-147	5.6229e+002	2.0805e+013	8.5170e-002	3.1513e+003
Pm-148	4.3547e+002	1.6112e+013	6.5960e-002	2.4405e+003
Pm-148m	8.6552e+001	3.2024e+012	1.3110e-002	4.8507e+002
Pm-149	1.3323e+003	4.9294e+013	2.0180e-001	7.4666e+003
Pm-151	4.0285e+002	1.4906e+013	6.1020e-002	2.2577e+003
Pr-142	1.2306e+002	4.5533e+012	1.8640e-002	6.8968e+002
Pr-143	3.6172e+003	1.3384e+014	5.4790e-001	2.0272e+004
Pr-144	3.3947e+003	1.2561e+014	5.1420e-001	1.9025e+004
Pr-144m	4.7488e+001	1.7571e+012	7.1930e-003	2.6614e+002
Pu-237	3.7414e-002	1.3843e+009	5.6670e-006	2.0968e-001
Pu-238	2.5589e+001	9.4681e+011	3.8760e-003	1.4341e+002
Pu-239	2.7088e+000	1.0023e+011	4.1030e-004	1.5181e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Pu-243	7.6715e+002	2.8385e+013	1.1520e-001	4.2994e+003
Pu-238	2.5589e+001	9.4681e+011	3.8760e-003	1.4341e+002
Pu-239	2.7088e+000	1.0023e+011	4.1030e-004	1.5191e+001

Page : 3
 DOS File: 2RB8GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:10:40 PM
 Duration: 00:03:18

EC-RADN-1135
 Page 227

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Rb-86	6.0006e+003	2.2202e+014	9.0890e-001	3.3629e+004
Rb-88	3.3215e+005	1.2289e+016	5.0310e+001	1.8615e+006
Rh-103m	4.7785e+004	1.7681e+015	7.2380e+000	2.6781e+005
Rh-105	2.9359e+004	1.0863e+015	4.4470e+000	1.6454e+005
Rh-105m	2.8072e+003	1.0387e+014	4.2520e-001	1.5732e+004
Rh-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Ru-103	4.7785e+004	1.7681e+015	7.2380e+000	2.6781e+005
Ru-105	9.8568e+003	3.6470e+014	1.4930e+000	5.5241e+004
Ru-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Sb-122	1.1012e+003	4.0745e+013	1.6680e-001	6.1716e+003
Sb-124	5.4519e+002	2.0172e+013	8.2580e-002	3.0555e+003
Sb-125	7.6913e+003	2.8458e+014	1.1650e+000	4.3105e+004
Sb-126	2.5589e+002	9.4681e+012	3.8760e-002	1.4341e+003
Sb-126m	4.6716e-001	1.7285e+010	7.0760e-005	2.6181e+000
Sb-127	5.0149e+004	1.8555e+015	7.5960e+000	2.8105e+005
Sb-129	5.5714e+004	2.0614e+015	8.4390e+000	3.1224e+005
Sm-151	1.5290e+000	5.6574e+010	2.3160e-004	8.5692e+000
Sm-153	1.0576e+003	3.9133e+013	1.6020e-001	5.9274e+003
Sr-89	5.7860e+005	2.1408e+016	8.7640e+001	3.2427e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	4.0972e+005	1.5160e+016	6.2060e+001	2.2962e+006
Sr-92	1.0075e+005	3.7276e+015	1.5260e+001	5.6462e+005
Sr-93				
Tc-99	6.1933e-001	2.2915e+010	9.3810e-005	3.4710e+000
Tc-99m	4.8643e+004	1.7998e+015	7.3680e+000	2.7262e+005
Tc-101	1.1725e-004	4.3383e+006	1.7760e-008	6.5712e-004
Te-123m	5.4433e+000	2.0140e+011	8.2450e-004	3.0507e+001
Te-125m	1.6974e+003	6.2803e+013	2.5710e-001	9.5127e+003
Te-127	5.1859e+004	1.9188e+015	7.8550e+000	2.9064e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	8.5694e+004	3.1707e+015	1.2980e+001	4.8026e+005
Te-129m	3.7242e+004	1.3779e+015	5.6410e+000	2.0872e+005
Te-131	2.2632e+004	8.3737e+014	3.4280e+000	1.2684e+005
Te-131m	1.0075e+005	3.7276e+015	1.5260e+001	5.6462e+005
Te-132	8.0544e+005	2.9801e+016	1.2200e+002	4.5140e+006
Te-133	3.1029e+002	1.1481e+013	4.7000e-002	1.7390e+003
Te-133m	1.3712e+003	5.0736e+013	2.0770e-001	7.6849e+003
Te-134	3.8232e+002	1.4146e+013	5.7910e-002	2.1427e+003
Xe-129m	5.6401e+002	2.0868e+013	8.5430e-002	3.1609e+003
Xe-131m	1.6459e+005	6.0897e+015	2.4930e+001	9.2241e+005
Xe-133	2.3747e+007	8.7865e+017	3.5970e+003	1.3309e+008
Xe-133m	7.6979e+005	2.8482e+016	1.1660e+002	4.3142e+006
Xe-135	1.1316e+007	4.1869e+017	1.7140e+003	6.3418e+007
Xe-135m	1.6630e+006	6.1533e+016	2.5190e+002	9.3203e+006
Xe-137				
Xe-138	1.1573e-003	4.2821e+007	1.7530e-007	6.4861e-003
Y-90	3.0376e+002	1.1239e+013	4.6010e-002	1.7024e+003
Y-91	3.0006e+003	1.1102e+014	4.5450e-001	1.6817e+004
Y-91m	1.0405e+003	3.8498e+013	1.5760e-001	5.8312e+003
Y-92	1.4656e+003	5.4229e+013	2.2200e-001	8.2140e+003
Y-93	1.3990e+003	5.1762e+013	2.1190e-001	7.8403e+003
Zr-89	1.1553e+000	4.2748e+010	1.7500e-004	6.4750e+000
Zr-93	6.6680e-004	2.4672e+007	1.0100e-007	3.7370e-003
Zr-95	4.2827e+003	1.5846e+014	6.4870e-001	2.4002e+004
Zr-95m	1.4656e+003	5.4229e+013	2.2200e-001	8.2140e+003
Zr-93	1.3990e+003	5.1762e+013	2.1190e-001	7.8403e+003

Nuclide curies becquerels µCi/cm³ Bq/cm³
 Zr-97 3.0620e+003 1.1329e+014 4.6380e-001 1.7161e+004

Buildup
 The material reference is : Shield 1

Integration Parameters
 X Direction 25
 Y Direction 25
 Z Direction 25

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm²/sec	MeV/cm²/sec	mR/hr	mR/hr
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	2.286e+12	7.017e-126	1.191e-23	6.018e-127	1.021e-24
0.02	3.932e+14	9.964e-52	3.223e-21	3.451e-53	1.116e-22
0.03	5.094e+17	7.074e-11	1.434e-10	7.011e-13	1.421e-12
0.04	8.456e+14	2.632e-04	8.801e-04	1.164e-06	3.892e-06
0.05	3.925e+15	3.160e+00	1.699e+01	8.419e-03	4.525e-02
0.06	1.043e+15	3.116e+01	2.465e+02	6.190e-02	4.895e-01
0.08	3.265e+17	2.292e+05	2.851e+06	3.627e+02	4.512e+03
0.1	4.522e+15	1.277e+04	2.026e+05	1.954e+01	3.099e+02
0.15	3.463e+16	4.930e+05	8.831e+06	8.119e+02	1.454e+04
0.2	4.232e+17	1.461e+07	2.406e+08	2.579e+04	4.247e+05
0.3	3.190e+16	3.406e+06	4.262e+07	6.461e+03	8.084e+04
0.4	1.261e+17	2.882e+07	2.820e+08	5.616e+04	5.494e+05
0.5	3.121e+17	1.265e+08	1.006e+09	2.483e+05	1.975e+06
0.6	3.019e+17	1.932e+08	1.295e+09	3.770e+05	2.527e+06
0.8	2.566e+17	3.307e+08	1.706e+09	6.291e+05	3.245e+06
1.0	1.272e+17	2.772e+08	1.179e+09	5.110e+05	2.172e+06
1.5	1.086e+17	5.861e+08	1.816e+09	9.861e+05	3.056e+06
2.0	4.831e+16	4.723e+08	1.220e+09	7.303e+05	1.886e+06
3.0	1.097e+15	2.300e+07	4.795e+07	3.121e+04	6.505e+04
4.0	1.789e+11	6.126e+03	1.125e+04	7.578e+00	1.392e+01
5.0	1.762e+13	8.580e+05	1.431e+06	9.836e+02	1.641e+03
TOTALS:	2.618e+18	2.057e+09	8.848e+09	3.604e+06	1.600e+07

Energy	Activity	Variable	(1 of 5)			(30.48 cm)		
			Fluence Rate	Exposure Rate	Sensitivity	Fluence Rate	Exposure Rate	Sensitivity
0.015	2.286e+12	9.197e-252	1.191e-23	7.888e-253	1.021e-24	1.191e-23	7.888e-253	1.021e-24
0.02	3.932e+14	1.312e-106	3.223e-21	4.546e-108	1.116e-22	3.223e-21	4.546e-108	1.116e-22
0.03	5.094e+17	6.873e-29	9.234e-18	6.811e-31	9.152e-20	9.234e-18	6.811e-31	9.152e-20
0.04	8.456e+14	2.307e-13	9.361e-13	1.020e-15	4.140e-15	9.361e-13	1.020e-15	4.140e-15
0.05	3.925e+15	4.239e-06	3.283e-05	1.129e-08	8.746e-08	3.283e-05	1.129e-08	8.746e-08
0.06	1.043e+15	1.095e-03	1.427e-02	2.175e-06	2.834e-05	1.427e-02	2.175e-06	2.834e-05
0.08	3.265e+17	1.202e+02	2.977e+03	1.903e-01	4.711e+00	2.977e+03	1.903e-01	4.711e+00
0.1	4.522e+15	1.992e+01	7.348e+02	3.047e-02	1.124e+00	7.348e+02	3.047e-02	1.124e+00
0.15	3.463e+16	2.347e+03	1.146e+05	3.865e+00	1.888e+02	1.146e+05	3.865e+00	1.888e+02
0.2	4.232e+17	1.198e+05	5.646e+06	2.115e+02	9.965e+03	5.646e+06	2.115e+02	9.965e+03
0.3	3.190e+16	5.366e+04	1.882e+06	1.018e+02	3.569e+03	1.882e+06	1.018e+02	3.569e+03
0.4	1.261e+17	6.945e+05	1.788e+07	1.353e+03	3.483e+04	1.788e+07	1.353e+03	3.483e+04
0.5	3.121e+17	4.171e+06	8.220e+07	8.187e+03	1.613e+05	8.220e+07	8.187e+03	1.613e+05
0.3	3.190e+16	5.366e+04	1.882e+06	1.018e+02	3.569e+03	1.882e+06	1.018e+02	3.569e+03
0.4	1.261e+17	6.945e+05	1.788e+07	1.353e+03	3.483e+04	1.788e+07	1.353e+03	3.483e+04

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.6	3.019e+17	8.137e+06	1.278e+08	1.588e+04	2.494e+05
0.8	2.566e+17	2.013e+07	2.231e+08	3.829e+04	4.243e+05
1.0	1.272e+17	2.209e+07	1.883e+08	4.072e+04	3.471e+05
1.5	1.086e+17	7.299e+07	4.016e+08	1.228e+05	6.756e+05
2.0	4.831e+16	7.725e+07	3.275e+08	1.195e+05	5.065e+05
3.0	1.097e+15	5.172e+06	1.598e+07	7.017e+03	2.167e+04
4.0	1.789e+11	1.649e+03	4.204e+03	2.041e+00	5.201e+00
5.0	1.762e+13	2.592e+05	5.797e+05	2.972e+02	6.645e+02

TOTALS: 2.618e+18 2.111e+08 1.392e+09 3.543e+05 2.435e+06

Sensitivity		Variable	(2 of 5)		(45.72 cm)
0.015	2.286e+12	0.000e+00	1.191e-23	0.000e+00	1.021e-24
0.02	3.932e+14	2.268e-161	3.223e-21	7.858e-163	1.116e-22
0.03	5.094e+17	8.302e-47	9.234e-18	8.228e-49	9.152e-20
0.04	8.456e+14	2.422e-22	4.065e-20	1.071e-24	1.798e-22
0.05	3.925e+15	6.660e-12	6.310e-11	1.774e-14	1.681e-13
0.06	1.043e+15	4.443e-08	8.266e-07	8.825e-11	1.642e-09
0.08	3.265e+17	7.175e-02	2.793e+00	1.135e-04	4.420e-03
0.1	4.522e+15	3.504e-02	2.280e+00	5.361e-05	3.489e-03
0.15	3.463e+16	1.248e+01	1.219e+03	2.054e-02	2.007e+00
0.2	4.232e+17	1.091e+03	1.073e+05	1.925e+00	1.894e+02
0.3	3.190e+16	9.302e+02	6.675e+04	1.765e+00	1.266e+02
0.4	1.261e+17	1.831e+04	9.216e+05	3.567e+01	1.796e+03
0.5	3.121e+17	1.497e+05	5.531e+06	2.938e+02	1.086e+04
0.6	3.019e+17	3.716e+05	1.059e+07	7.253e+02	2.068e+04
0.8	2.566e+17	1.320e+06	2.497e+07	2.511e+03	4.750e+04
1.0	1.272e+17	1.886e+06	2.601e+07	3.476e+03	4.794e+04
1.5	1.086e+17	9.643e+06	7.930e+07	1.622e+04	1.334e+05
2.0	4.831e+16	1.332e+07	8.015e+07	2.059e+04	1.239e+05
3.0	1.097e+15	1.215e+06	5.005e+06	1.648e+03	6.790e+03
4.0	1.789e+11	4.614e+02	1.510e+03	5.708e-01	1.868e+00
5.0	1.762e+13	8.108e+04	2.252e+05	9.294e+01	2.582e+02

TOTALS: 2.618e+18 2.800e+07 2.329e+08 4.560e+04 3.935e+05

Sensitivity		Variable	(3 of 5)		(60.96 cm)
0.015	2.286e+12	0.000e+00	1.191e-23	0.000e+00	1.021e-24
0.02	3.932e+14	4.405e-216	3.223e-21	1.526e-217	1.116e-22
0.03	5.094e+17	1.105e-64	9.234e-18	1.095e-66	9.152e-20
0.04	8.456e+14	2.761e-31	4.065e-20	1.221e-33	1.798e-22
0.05	3.925e+15	1.126e-17	1.148e-16	2.999e-20	3.058e-19
0.06	1.043e+15	1.929e-12	5.210e-11	3.832e-15	1.035e-13
0.08	3.265e+17	4.553e-05	2.492e-03	7.205e-08	3.944e-06
0.1	4.522e+15	6.535e-05	6.550e-03	9.997e-08	1.002e-05
0.15	3.463e+16	7.000e-02	1.174e+01	1.153e-04	1.933e-02
0.2	4.232e+17	1.045e+01	1.832e+03	1.845e-02	3.234e+00
0.3	3.190e+16	1.693e+01	2.125e+03	3.211e-02	4.030e+00
0.4	1.261e+17	5.053e+02	4.289e+04	9.846e-01	8.357e+01
0.5	3.121e+17	5.615e+03	3.381e+05	1.102e+01	6.636e+02

0.3 3.190e+16 1.693e+01 2.125e+03 3.211e-02 4.030e+00
 0.4 1.261e+17 5.053e+02 4.289e+04 9.846e-01 8.357e+01

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec		Exposure Rate mR/hr	
		No Buildup	With Buildup	No Buildup	With Buildup
0.6	3.019e+17	1.771e+04	7.958e+05	3.456e+01	1.553e+03
0.8	2.566e+17	9.006e+04	2.551e+06	1.713e+02	4.853e+03
1.0	1.272e+17	1.672e+05	3.350e+06	3.081e+02	6.174e+03
1.5	1.086e+17	1.317e+06	1.479e+07	2.216e+03	2.488e+04
2.0	4.831e+16	2.366e+06	1.873e+07	3.658e+03	2.896e+04
3.0	1.097e+15	2.928e+05	1.516e+06	3.973e+02	2.056e+03
4.0	1.789e+11	1.322e+02	5.279e+02	1.635e-01	6.530e-01
5.0	1.762e+13	2.592e+04	8.616e+04	2.971e+01	9.877e+01
TOTALS:	2.618e+18	4.283e+06	4.220e+07	6.828e+03	6.933e+04

Energy MeV	Activity photons/sec	Sensitivity Variable		Exposure Rate mR/hr	
		0.000e+00	(4 of 5)	0.000e+00	(76.2 cm)
0.015	2.286e+12	0.000e+00	1.191e-23	0.000e+00	1.021e-24
0.02	3.932e+14	9.130e-271	3.223e-21	3.163e-272	1.116e-22
0.03	5.094e+17	1.554e-82	9.234e-18	1.540e-84	9.152e-20
0.04	8.456e+14	3.302e-40	4.065e-20	1.461e-42	1.798e-22
0.05	3.925e+15	1.988e-23	6.167e-19	5.295e-26	1.643e-21
0.06	1.043e+15	8.721e-17	3.492e-15	1.732e-19	6.937e-18
0.08	3.265e+17	2.997e-08	2.130e-06	4.742e-11	3.371e-09
0.1	4.522e+15	1.262e-07	1.794e-05	1.931e-10	2.745e-08
0.15	3.463e+16	4.058e-04	1.055e-01	6.682e-07	1.738e-04
0.2	4.232e+17	1.034e-01	2.915e+01	1.824e-04	5.144e-02
0.3	3.190e+16	3.174e-01	6.328e+01	6.020e-04	1.200e-01
0.4	1.261e+17	1.435e+01	1.867e+03	2.796e-02	3.637e+00
0.5	3.121e+17	2.164e+02	1.940e+04	4.249e-01	3.808e+01
0.6	3.019e+17	8.665e+02	5.650e+04	1.691e+00	1.103e+02
0.8	2.566e+17	6.300e+03	2.492e+05	1.198e+01	4.740e+02
1.0	1.272e+17	1.517e+04	4.118e+05	2.797e+01	7.592e+02
1.5	1.086e+17	1.839e+05	2.656e+06	3.093e+02	4.469e+03
2.0	4.831e+16	4.288e+05	4.249e+06	6.631e+02	6.571e+03
3.0	1.097e+15	7.185e+04	4.491e+05	9.748e+01	6.093e+02
4.0	1.789e+11	3.848e+01	1.818e+02	4.761e-02	2.248e-01
5.0	1.762e+13	8.412e+03	3.256e+04	9.644e+00	3.732e+01
TOTALS:	2.618e+18	7.155e+05	8.126e+06	1.122e+03	1.307e+04

Energy MeV	Activity photons/sec	Sensitivity Variable		Exposure Rate mR/hr	
		0.000e+00	(5 of 5)	0.000e+00	(91.44 cm)
0.015	2.286e+12	0.000e+00	1.191e-23	0.000e+00	1.021e-24
0.02	3.932e+14	0.000e+00	3.223e-21	0.000e+00	1.116e-22
0.03	5.094e+17	2.267e-100	9.234e-18	2.247e-102	9.152e-20
0.04	8.456e+14	4.079e-49	4.065e-20	1.804e-51	1.798e-22
0.05	3.925e+15	3.612e-29	6.167e-19	9.621e-32	1.643e-21
0.06	1.043e+15	4.049e-21	1.209e-18	8.043e-24	2.402e-21
0.08	3.265e+17	2.022e-11	1.754e-09	3.199e-14	2.775e-12
0.1	4.522e+15	2.495e-10	4.801e-08	3.817e-13	7.345e-11
0.15	3.463e+16	2.405e-06	9.127e-04	3.961e-09	1.503e-06
0.2	4.232e+17	1.044e-03	4.420e-01	1.843e-06	7.802e-04
0.3	3.190e+16	6.071e-03	1.793e+00	1.152e-05	3.401e-03
0.4	1.261e+17	4.155e-01	7.763e+01	8.096e-04	1.513e-01
0.5	3.121e+17	8.502e+00	1.068e+03	1.669e-02	2.096e+00
0.3	3.190e+16	6.071e-03	1.793e+00	1.152e-05	3.401e-03
0.4	1.261e+17	4.155e-01	7.763e+01	8.096e-04	1.513e-01

Page : 7
 DOS File: 2RB8GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:10:40 PM
 Duration: 00:03:18

EC-RADN-1135
 Page 231

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.6	3.019e+17	4.318e+01	3.862e+03	8.427e-02	7.539e+00
0.8	2.566e+17	4.484e+02	2.352e+04	8.529e-01	4.473e+01
1.0	1.272e+17	1.400e+03	4.903e+04	2.581e+00	9.038e+01
1.5	1.086e+17	2.605e+04	4.658e+05	4.383e+01	7.837e+02
2.0	4.831e+16	7.882e+04	9.449e+05	1.219e+02	1.461e+03
3.0	1.097e+15	1.786e+04	1.314e+05	2.423e+01	1.783e+02
4.0	1.789e+11	1.134e+01	6.189e+01	1.402e-02	7.656e-02
5.0	1.762e+13	2.761e+03	1.220e+04	3.165e+00	1.398e+01
TOTALS:	2.618e+18	1.274e+05	1.632e+06	1.967e+02	2.582e+03

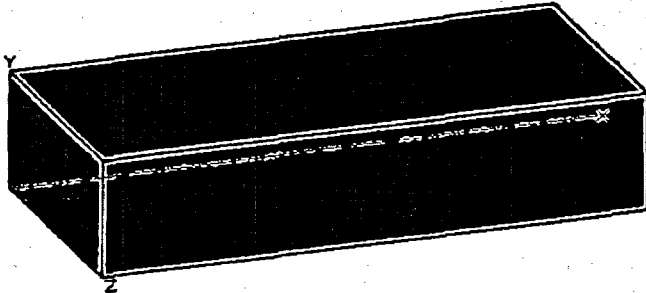
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2RB8I38.MS5
 Run Date: August 19, 2005
 Run Time: 2:13:59 PM
 Duration: 00:02:55

EC-RADN-1135
 Page 232

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 8 Hour, ICRP38
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 14 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Shield 1	15.24 cm	Concrete	2.35
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : ICRP-38

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm ³
Cs-135m	2.4427e+002	9.0381e+012	3.7000e-002	1.3690e+003
Eu-157	4.1144e+001	1.5223e+012	6.2320e-003	2.3058e+002
Eu-158	1.6987e-002	6.2852e+008	2.5730e-006	9.5201e-002
La-143	2.2803e-007	8.4372e+003	3.4540e-011	1.2780e-006
Nd-151	1.1884e-009	4.3969e+001	1.8000e-013	6.6600e-009
Pm-150	1.5686e+000	5.8039e+010	2.3760e-004	8.7912e+000
Pr-145	1.0167e+003	3.7618e+013	1.5400e-001	5.6980e+003
Pr-147	4.0972e-008	1.5160e+003	6.2060e-012	2.2962e-007
Rh-106m	5.1859e+001	1.9188e+012	7.8550e-003	2.9064e+002
Rh-107	5.2717e-003	1.9505e+008	7.9850e-007	2.9544e-002
Sb-128a	5.1430e+003	1.9029e+014	7.7900e-001	2.8823e+004
Sb-128b	3.7077e+002	1.3718e+013	5.6160e-002	2.0779e+003
Sb-130	1.4227e+001	5.2641e+011	2.1550e-003	7.9735e+001
Sb-131	2.4942e-001	9.2287e+009	3.7780e-005	1.3979e+000
Se-81	9.5993e+000	3.5517e+011	1.4540e-003	5.3798e+001
Se-81m	6.5148e+000	2.4105e+011	9.8680e-004	3.6512e+001
Se-83	1.1402e-002	4.2186e+008	1.7270e-006	6.3899e-002
Sm-155	3.1544e-005	1.1671e+006	4.7780e-009	1.7679e-004
Sm-156	3.1888e+001	1.1798e+012	4.8300e-003	1.7871e+002
Y-94	7.6121e-005	2.8165e+006	1.1530e-008	4.2661e-004
Y-95				

Buildup
 The material reference is : Shield 1

Integration Parameters

X Direction 25
 Y Direction 25
 Z Direction 25

Energy MeV	Activity photons/sec	Results			
		Fluence Rate	Fluence Rate	Exposure Rate	Exposure Rate
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	1.777e+03	5.454e-135	9.255e-33	4.678e-136	7.939e-34
0.02	1.117e+11	2.831e-55	9.158e-25	9.808e-57	3.172e-26
0.03	6.232e+12	8.654e-16	1.754e-15	8.577e-18	1.738e-17
0.04	1.231e+12	3.830e-07	1.281e-06	1.694e-09	5.664e-09
0.05	3.104e+11	2.500e-04	1.344e-03	6.660e-07	3.580e-06
0.06	3.758e+11	1.123e-02	8.883e-02	2.231e-05	1.764e-04
0.08	3.590e+11	2.520e-01	3.135e+00	3.988e-04	4.961e-03
0.1	1.680e+11	4.743e-01	7.524e+00	7.256e-04	1.151e-02
0.15	2.440e+11	3.474e+00	6.222e+01	5.720e-03	1.025e-01
0.2	3.447e+12	1.190e+02	1.960e+03	2.100e-01	3.458e+00
0.3	1.849e+14	1.975e+04	2.471e+05	3.746e+01	4.687e+02
0.4	1.814e+12	4.146e+02	4.056e+03	8.078e-01	7.903e+00
0.5	8.934e+12	3.622e+03	2.881e+04	7.110e+00	5.654e+01
0.6	2.044e+13	1.308e+04	8.765e+04	2.553e+01	1.711e+02
0.8	4.501e+14	5.800e+05	2.992e+06	1.103e+03	5.690e+03
1.0	1.914e+13	4.170e+04	1.773e+05	7.687e+01	3.268e+02
1.5	4.195e+12	2.264e+04	7.014e+04	3.809e+01	1.180e+02
2.0	1.819e+11	1.778e+03	4.594e+03	2.750e+00	7.103e+00
3.0	8.406e+08	1.762e+01	3.673e+01	2.391e-02	4.983e-02
TOTALS:	7.022e+14	6.831e+05	3.613e+06	1.292e+03	6.850e+03

Energy MeV	Sensitivity	Variable	(1 of 5) (30.48 cm)		
			Fluence Rate	Fluence Rate	Exposure Rate
			MeV/cm ² /sec	MeV/cm ² /sec	mR/hr
0.015	1.777e+03	7.149e-261	9.255e-33	6.132e-262	7.939e-34
0.02	1.117e+11	3.729e-110	9.158e-25	1.292e-111	3.172e-26
0.03	6.232e+12	8.408e-34	1.130e-22	8.332e-36	1.120e-24
0.04	1.231e+12	3.357e-16	1.362e-15	1.485e-18	6.025e-18
0.05	3.104e+11	3.353e-10	2.597e-09	8.932e-13	6.918e-12
0.06	3.758e+11	3.946e-07	5.142e-06	7.838e-10	1.021e-08
0.08	3.590e+11	1.322e-04	3.274e-03	2.092e-07	5.180e-06
0.1	1.680e+11	7.397e-04	2.729e-02	1.132e-06	4.175e-05
0.15	2.440e+11	1.654e-02	8.076e-01	2.723e-05	1.330e-03
0.2	3.447e+12	9.760e-01	4.598e+01	1.723e-03	8.115e-02
0.3	1.849e+14	3.111e+02	1.091e+04	5.900e-01	2.069e+01
0.4	1.814e+12	9.990e+00	2.571e+02	1.946e-02	5.010e-01
0.5	8.934e+12	1.194e+02	2.353e+03	2.344e-01	4.619e+00
0.6	2.044e+13	5.509e+02	8.652e+03	1.075e+00	1.689e+01
0.8	4.501e+14	3.531e+04	3.912e+05	6.716e+01	7.440e+02
1.0	1.914e+13	3.323e+03	2.833e+04	6.125e+00	5.221e+01
1.5	4.195e+12	2.819e+03	1.551e+04	4.743e+00	2.609e+01
2.0	1.819e+11	2.909e+02	1.233e+03	4.498e-01	1.907e+00
3.0	8.406e+08	3.962e+00	1.224e+01	5.375e-03	1.660e-02
TOTALS:	7.022e+14	4.274e+04	4.585e+05	8.040e+01	8.670e+02
3.0	8.406e+08	3.962e+00	1.224e+01	5.375e-03	1.660e-02

Energy MeV	Activity photons/sec	Fluence Rate	Fluence Rate	Exposure Rate	Exposure Rate
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
	Sensitivity	Variable		(2 of 5)	(45.72 cm)
0.015	1.777e+03	0.000e+00	9.255e-33	0.000e+00	7.939e-34
0.02	1.117e+11	6.446e-165	9.158e-25	2.233e-166	3.172e-26
0.03	6.232e+12	1.016e-51	1.130e-22	1.007e-53	1.120e-24
0.04	1.231e+12	3.524e-25	5.915e-23	1.558e-27	2.616e-25
0.05	3.104e+11	5.268e-16	4.991e-15	1.403e-18	1.330e-17
0.06	3.758e+11	1.601e-11	2.979e-10	3.181e-14	5.917e-13
0.08	3.590e+11	7.889e-08	3.071e-06	1.248e-10	4.860e-09
0.1	1.680e+11	1.301e-06	8.469e-05	1.991e-09	1.296e-07
0.15	2.440e+11	8.790e-05	8.588e-03	1.447e-07	1.414e-05
0.2	3.447e+12	8.881e-03	8.740e-01	1.568e-05	1.542e-03
0.3	1.849e+14	5.393e+00	3.870e+02	1.023e-02	7.340e-01
0.4	1.814e+12	2.633e-01	1.326e+01	5.131e-04	2.583e-02
0.5	8.934e+12	4.286e+00	1.584e+02	8.412e-03	3.108e-01
0.6	2.044e+13	2.516e+01	7.173e+02	4.911e-02	1.400e+00
0.8	4.501e+14	2.315e+03	4.380e+04	4.403e+00	8.331e+01
1.0	1.914e+13	2.837e+02	3.912e+03	5.229e-01	7.212e+00
1.5	4.195e+12	3.725e+02	3.063e+03	6.266e-01	5.153e+00
2.0	1.819e+11	5.014e+01	3.018e+02	7.754e-02	4.667e-01
3.0	8.406e+08	9.303e-01	3.834e+00	1.262e-03	5.201e-03
TOTALS:	7.022e+14	3.057e+03	5.236e+04	5.700e+00	9.861e+01

	Sensitivity	Variable		(3 of 5)	(60.96 cm)
0.015	1.777e+03	0.000e+00	9.255e-33	0.000e+00	7.939e-34
0.02	1.117e+11	1.252e-219	9.158e-25	4.336e-221	3.172e-26
0.03	6.232e+12	1.351e-69	1.130e-22	1.339e-71	1.120e-24
0.04	1.231e+12	4.017e-34	5.915e-23	1.777e-36	2.616e-25
0.05	3.104e+11	8.906e-22	9.080e-21	2.373e-24	2.419e-23
0.06	3.758e+11	6.954e-16	1.878e-14	1.381e-18	3.730e-17
0.08	3.590e+11	5.006e-11	2.740e-09	7.922e-14	4.336e-12
0.1	1.680e+11	2.427e-09	2.433e-07	3.713e-12	3.722e-10
0.15	2.440e+11	4.932e-07	8.272e-05	8.121e-10	1.362e-07
0.2	3.447e+12	8.512e-05	1.492e-02	1.502e-07	2.634e-05
0.3	1.849e+14	9.814e-02	1.232e+01	1.862e-04	2.337e-02
0.4	1.814e+12	7.269e-03	6.169e-01	1.416e-05	1.202e-03
0.5	8.934e+12	1.607e-01	9.679e+00	3.155e-04	1.900e-02
0.6	2.044e+13	1.199e+00	5.388e+01	2.340e-03	1.052e-01
0.8	4.501e+14	1.579e+02	4.474e+03	3.004e-01	8.510e+00
1.0	1.914e+13	2.515e+01	5.039e+02	4.635e-02	9.289e-01
1.5	4.195e+12	5.088e+01	5.712e+02	8.560e-02	9.611e-01
2.0	1.819e+11	8.909e+00	7.052e+01	1.378e-02	1.090e-01
3.0	8.406e+08	2.243e-01	1.161e+00	3.043e-04	1.575e-03
TOTALS:	7.022e+14	2.446e+02	5.697e+03	4.493e-01	1.066e+01

	Sensitivity	Variable		(4 of 5)	(76.2 cm)
0.015	1.777e+03	0.000e+00	9.255e-33	0.000e+00	7.939e-34
0.02	1.117e+11	2.594e-274	9.158e-25	8.987e-276	3.172e-26

	Sensitivity	Variable		(4 of 5)	(76.2 cm)
0.015	1.777e+03	0.000e+00	9.255e-33	0.000e+00	7.939e-34

Page : 4
 DOS File: 2RB8I38.MS5
 Run Date: August 19, 2005
 Run Time: 2:13:59 PM
 Duration: 00:02:55

EC-RADN-1135
 Page 235

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec		Exposure Rate mR/hr	
		No Buildup	With Buildup	No Buildup	With Buildup
0.03	6.232e+12	1.901e-87	1.130e-22	1.884e-89	1.120e-24
0.04	1.231e+12	4.806e-43	5.915e-23	2.125e-45	2.616e-25
0.05	3.104e+11	1.572e-27	4.878e-23	4.189e-30	1.300e-25
0.06	3.758e+11	3.143e-20	1.259e-18	6.244e-23	2.500e-21
0.08	3.590e+11	3.295e-14	2.342e-12	5.215e-17	3.707e-15
0.1	1.680e+11	4.687e-12	6.664e-10	7.171e-15	1.020e-12
0.15	2.440e+11	2.859e-09	7.436e-07	4.708e-12	1.224e-09
0.2	3.447e+12	8.418e-07	2.374e-04	1.486e-09	4.189e-07
0.3	1.849e+14	1.840e-03	3.669e-01	3.490e-06	6.959e-04
0.4	1.814e+12	2.064e-04	2.685e-02	4.022e-07	5.231e-05
0.5	8.934e+12	6.197e-03	5.554e-01	1.216e-05	1.090e-03
0.6	2.044e+13	5.866e-02	3.826e+00	1.145e-04	7.467e-03
0.8	4.501e+14	1.105e+01	4.370e+02	2.101e-02	8.312e-01
1.0	1.914e+13	2.283e+00	6.196e+01	4.208e-03	1.142e-01
1.5	4.195e+12	7.101e+00	1.026e+02	1.195e-02	1.726e-01
2.0	1.819e+11	1.615e+00	1.600e+01	2.497e-03	2.475e-02
3.0	8.406e+08	5.504e-02	3.440e-01	7.467e-05	4.667e-04
TOTALS:	7.022e+14	2.217e+01	6.227e+02	3.987e-02	1.153e+00
	Sensitivity	Variable		(5 of 5)	(91.44 cm)
0.015	1.777e+03	0.000e+00	9.255e-33	0.000e+00	7.939e-34
0.02	1.117e+11	0.000e+00	9.158e-25	0.000e+00	3.172e-26
0.03	6.232e+12	2.773e-105	1.130e-22	2.748e-107	1.120e-24
0.04	1.231e+12	5.935e-52	5.915e-23	2.625e-54	2.616e-25
0.05	3.104e+11	2.857e-33	4.878e-23	7.610e-36	1.300e-25
0.06	3.758e+11	1.460e-24	4.358e-22	2.899e-27	8.657e-25
0.08	3.590e+11	2.223e-17	1.929e-15	3.518e-20	3.052e-18
0.1	1.680e+11	9.267e-15	1.783e-12	1.418e-17	2.728e-15
0.15	2.440e+11	1.695e-11	6.430e-09	2.791e-14	1.059e-11
0.2	3.447e+12	8.505e-09	3.600e-06	1.501e-11	6.354e-09
0.3	1.849e+14	3.520e-05	1.039e-02	6.676e-08	1.972e-05
0.4	1.814e+12	5.976e-06	1.117e-03	1.164e-08	2.176e-06
0.5	8.934e+12	2.434e-04	3.057e-02	4.777e-07	6.001e-05
0.6	2.044e+13	2.923e-03	2.615e-01	5.706e-06	5.104e-04
0.8	4.501e+14	7.863e-01	4.124e+01	1.496e-03	7.845e-02
1.0	1.914e+13	2.107e-01	7.377e+00	3.883e-04	1.360e-02
1.5	4.195e+12	1.006e+00	1.799e+01	1.693e-03	3.027e-02
2.0	1.819e+11	2.968e-01	3.558e+00	4.590e-04	5.502e-03
3.0	8.406e+08	1.368e-02	1.006e-01	1.856e-05	1.366e-04
TOTALS:	7.022e+14	2.317e+00	7.057e+01	4.061e-03	1.285e-01

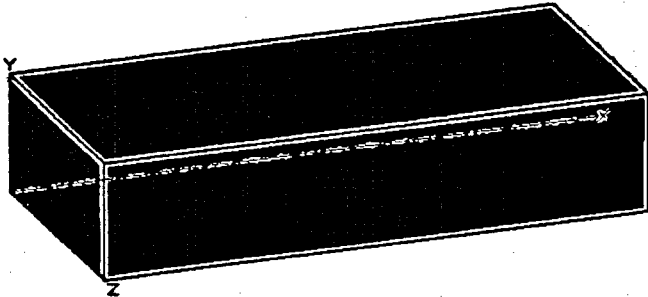
**MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.**

Page : 1
 DOS File: 2RB8RAD.MS5
 Run Date: August 19, 2005
 Run Time: 2:16:55 PM
 Duration: 00:03:03

EC-RADN-1135
 Page 236

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

**Case Title: Reactor Building Air
 Description: 8 Hour, RADTRAD
 Geometry: 13 - Rectangular Volume**



Source Dimensions

Length	4.0e+3 cm	131 ft 0.0 in
Width	1.9e+3 cm	63 ft
Height	861.06 cm	28 ft 3.0 in

Dose Points

	X	Y	Z
# 1	4297.68 cm	430.53 cm	960.12 cm
	141 ft 0.0 in	14 ft 1.5 in	31 ft 6.0 in

Shields

<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	6.60e+09 cm ³	Air	0.00122
Shield 1	15.24 cm	Concrete	2.35
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Am-241	5.7087e-001	2.1122e+010	8.6470e-005	3.1994e+000
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	2.4216e+004	8.9600e+014	3.6680e+000	1.3572e+005
Ba-140	1.0801e+006	3.9963e+016	1.6360e+002	6.0532e+006
Ce-141	1.0028e+004	3.7105e+014	1.5190e+000	5.6203e+004
Ce-143	7.9686e+003	2.9484e+014	1.2070e+000	4.4659e+004
Ce-144	8.4836e+003	3.1389e+014	1.2850e+000	4.7545e+004
Cm-242	1.4967e+002	5.5377e+012	2.2670e-002	8.3879e+002
Cm-244	8.7410e+000	3.2342e+011	1.3240e-003	4.8988e+001
Co-58	1.6545e+002	6.1215e+012	2.5060e-002	9.2722e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Cs-134	6.4501e+005	2.3866e+016	9.7700e+001	3.6149e+006
Cs-136	2.0229e+005	7.4845e+015	3.0640e+001	1.1337e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
I-131	3.5228e+006	1.3034e+017	5.3360e+002	1.9743e+007
I-132	4.9891e+006	1.8460e+017	7.5570e+002	2.7961e+007
I-133	5.8632e+006	2.1694e+017	8.8810e+002	3.2860e+007
I-134	5.1430e+004	1.9029e+015	7.7900e+000	2.8823e+005
I-135	3.0600e+006	1.1322e+017	4.6350e+002	1.7150e+007
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	8.8269e+005	3.2659e+016	1.3370e+002	4.9469e+006
Kr-87	7.7838e+004	2.8800e+015	1.1790e+001	4.3623e+005
Kr-88	1.1831e+006	4.3774e+016	1.7920e+002	6.6304e+006
La-140	4.6630e+003	1.7253e+014	7.0630e-001	2.6133e+004
La-141	1.0543e+003	3.9011e+013	1.5970e-001	5.9089e+003
Kr-85m	8.8269e+005	3.2659e+016	1.3370e+002	4.9469e+006
Kr-87	7.7838e+004	2.8800e+015	1.1790e+001	4.3623e+005

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
La-142	1.1435e+002	4.2308e+012	1.7320e-002	6.4084e+002
Mo-99	5.2077e+004	1.9268e+015	7.8880e+000	2.9186e+005
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nd-147	1.5911e+003	5.8870e+013	2.4100e-001	8.9170e+003
Np-239	1.0840e+005	4.0110e+015	1.6420e+001	6.0754e+005
Pr-143	3.6172e+003	1.3384e+014	5.4790e-001	2.0272e+004
Pr-144	3.3947e+003	1.2561e+014	5.1420e-001	1.9025e+004
Pu-238	2.5589e+001	9.4681e+011	3.8760e-003	1.4341e+002
Pu-239	2.7088e+000	1.0023e+011	4.1030e-004	1.5181e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Rb-86	6.0006e+003	2.2202e+014	9.0890e-001	3.3629e+004
Rh-103m	4.7785e+004	1.7681e+015	7.2380e+000	2.6781e+005
Rh-105	2.9359e+004	1.0863e+015	4.4470e+000	1.6454e+005
Rh-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Ru-103	4.7785e+004	1.7681e+015	7.2380e+000	2.6781e+005
Ru-105	9.8568e+003	3.6470e+014	1.4930e+000	5.5241e+004
Ru-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Sb-127	5.0149e+004	1.8555e+015	7.5960e+000	2.8105e+005
Sb-129	5.5714e+004	2.0614e+015	8.4390e+000	3.1224e+005
Sr-89	5.7860e+005	2.1408e+016	8.7640e+001	3.2427e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	4.0972e+005	1.5160e+016	6.2060e+001	2.2962e+006
Sr-92	1.0075e+005	3.7276e+015	1.5260e+001	5.6462e+005
Tc-99m	4.8643e+004	1.7998e+015	7.3680e+000	2.7262e+005
Te-127	5.1859e+004	1.9188e+015	7.8550e+000	2.9064e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	8.5694e+004	3.1707e+015	1.2980e+001	4.8026e+005
Te-129m	3.7242e+004	1.3779e+015	5.6410e+000	2.0872e+005
Te-131m	1.0075e+005	3.7276e+015	1.5260e+001	5.6462e+005
Te-132	8.0544e+005	2.9801e+016	1.2200e+002	4.5140e+006
Xe-133	2.3747e+007	8.7865e+017	3.5970e+003	1.3309e+008
Xe-135	1.1316e+007	4.1869e+017	1.7140e+003	6.3418e+007
Y-90	3.0376e+002	1.1239e+013	4.6010e-002	1.7024e+003
Y-91	3.0006e+003	1.1102e+014	4.5450e-001	1.6817e+004
Y-92	1.4656e+003	5.4229e+013	2.2200e-001	8.2140e+003
Y-93	1.3990e+003	5.1762e+013	2.1190e-001	7.8403e+003
Zr-95	4.2827e+003	1.5846e+014	6.4870e-001	2.4002e+004
Zr-97	3.0620e+003	1.1329e+014	4.6380e-001	1.7161e+004

Buildup
 The material reference is : Shield 1

Integration Parameters

X Direction	25
Y Direction	25
Z Direction	25

Results

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>	<u>Exposure Rate</u> <u>mR/hr</u>
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.015	1.787e+11	5.485e-127	9.308e-25	4.705e-128	7.984e-26
<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u>	<u>Fluence Rate</u> <u>MeV/cm²/sec</u>	<u>Exposure Rate</u> <u>mR/hr</u>	<u>Exposure Rate</u> <u>mR/hr</u>

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.02	3.499e+14	8.867e-52	2.868e-21	3.072e-53	9.935e-23
0.03	4.812e+17	6.681e-11	1.354e-10	6.622e-13	1.342e-12
0.04	8.007e+14	2.492e-04	8.333e-04	1.102e-06	3.685e-06
0.05	3.918e+15	3.155e+00	1.696e+01	8.405e-03	4.518e-02
0.06	1.040e+15	3.108e+01	2.458e+02	6.174e-02	4.883e-01
0.08	3.265e+17	2.292e+05	2.851e+06	3.627e+02	4.512e+03
0.1	4.498e+15	1.270e+04	2.015e+05	1.943e+01	3.083e+02
0.15	3.380e+16	4.812e+05	8.621e+06	7.925e+02	1.420e+04
0.2	4.203e+17	1.451e+07	2.389e+08	2.561e+04	4.217e+05
0.3	3.185e+16	3.401e+06	4.256e+07	6.452e+03	8.073e+04
0.4	1.253e+17	2.863e+07	2.801e+08	5.578e+04	5.458e+05
0.5	2.598e+17	1.053e+08	8.378e+08	2.068e+05	1.644e+06
0.6	2.987e+17	1.912e+08	1.281e+09	3.731e+05	2.501e+06
0.8	2.525e+17	3.254e+08	1.679e+09	6.190e+05	3.193e+06
1.0	1.266e+17	2.758e+08	1.173e+09	5.084e+05	2.162e+06
1.5	1.082e+17	5.840e+08	1.810e+09	9.825e+05	3.044e+06
2.0	4.558e+16	4.455e+08	1.151e+09	6.889e+05	1.780e+06
3.0	7.478e+14	1.568e+07	3.267e+07	2.127e+04	4.433e+04
4.0	1.111e+11	3.802e+03	6.985e+03	4.703e+00	8.641e+00
TOTALS:	2.522e+18	1.990e+09	8.537e+09	3.489e+06	1.544e+07

Energy	Sensitivity	Variable	(1 of 5)		
			MeV/cm ² /sec	mR/hr	cm
0.015	1.787e+11	7.189e-253	9.308e-25	6.166e-254	7.984e-26
0.02	3.499e+14	1.168e-106	2.868e-21	4.046e-108	9.935e-23
0.03	4.812e+17	6.491e-29	8.722e-18	6.433e-31	8.644e-20
0.04	8.007e+14	2.184e-13	8.864e-13	9.660e-16	3.920e-15
0.05	3.918e+15	4.232e-06	3.278e-05	1.127e-08	8.732e-08
0.06	1.040e+15	1.092e-03	1.423e-02	2.169e-06	2.826e-05
0.08	3.265e+17	1.202e+02	2.977e+03	1.903e-01	4.711e+00
0.1	4.498e+15	1.981e+01	7.309e+02	3.031e-02	1.118e+00
0.15	3.380e+16	2.291e+03	1.119e+05	3.773e+00	1.843e+02
0.2	4.203e+17	1.190e+05	5.606e+06	2.100e+02	9.895e+03
0.3	3.185e+16	5.358e+04	1.879e+06	1.016e+02	3.564e+03
0.4	1.253e+17	6.899e+05	1.776e+07	1.344e+03	3.460e+04
0.5	2.598e+17	3.473e+06	6.844e+07	6.816e+03	1.343e+05
0.6	2.987e+17	8.052e+06	1.265e+08	1.572e+04	2.468e+05
0.8	2.525e+17	1.981e+07	2.195e+08	3.768e+04	4.175e+05
1.0	1.266e+17	2.198e+07	1.873e+08	4.051e+04	3.453e+05
1.5	1.082e+17	7.273e+07	4.001e+08	1.224e+05	6.732e+05
2.0	4.558e+16	7.288e+07	3.090e+08	1.127e+05	4.778e+05
3.0	7.478e+14	3.524e+06	1.089e+07	4.781e+03	1.477e+04
4.0	1.111e+11	1.024e+03	2.609e+03	1.266e+00	3.228e+00
TOTALS:	2.522e+18	2.033e+08	1.347e+09	3.422e+05	2.358e+06

Energy	Sensitivity	Variable	(2 of 5)		
			MeV/cm ² /sec	mR/hr	cm
0.015	1.787e+11	0.000e+00	9.308e-25	0.000e+00	7.984e-26
0.02	3.499e+14	2.019e-161	2.868e-21	6.993e-163	9.935e-23
0.03	4.812e+17	7.841e-47	8.722e-18	7.771e-49	8.644e-20
0.015	1.787e+11	0.000e+00	9.308e-25	0.000e+00	7.984e-26
0.02	3.499e+14	2.019e-161	2.868e-21	6.993e-163	9.935e-23

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.04	8.007e+14	2.293e-22	3.849e-20	1.014e-24	1.702e-22
0.05	3.918e+15	6.649e-12	6.299e-11	1.771e-14	1.678e-13
0.06	1.040e+15	4.432e-08	8.244e-07	8.802e-11	1.638e-09
0.08	3.265e+17	7.175e-02	2.793e+00	1.135e-04	4.420e-03
0.1	4.498e+15	3.485e-02	2.268e+00	5.332e-05	3.470e-03
0.15	3.380e+16	1.218e+01	1.190e+03	2.005e-02	1.959e+00
0.2	4.203e+17	1.083e+03	1.066e+05	1.911e+00	1.881e+02
0.3	3.185e+16	9.289e+02	6.666e+04	1.762e+00	1.264e+02
0.4	1.253e+17	1.818e+04	9.154e+05	3.543e+01	1.784e+03
0.5	2.598e+17	1.246e+05	4.605e+06	2.446e+02	9.040e+03
0.6	2.987e+17	3.677e+05	1.048e+07	7.178e+02	2.047e+04
0.8	2.525e+17	1.299e+06	2.458e+07	2.471e+03	4.674e+04
1.0	1.266e+17	1.876e+06	2.588e+07	3.459e+03	4.770e+04
1.5	1.082e+17	9.609e+06	7.901e+07	1.617e+04	1.329e+05
2.0	4.558e+16	1.256e+07	7.561e+07	1.942e+04	1.169e+05
3.0	7.478e+14	8.276e+05	3.411e+06	1.123e+03	4.627e+03
4.0	1.111e+11	2.864e+02	9.370e+02	3.543e-01	1.159e+00
TOTALS:	2.522e+18	2.669e+07	2.247e+08	4.365e+04	3.805e+05

Energy	Sensitivity	Variable		(3 of 5)	
		Variable	Variable	(3 of 5)	(60.96 cm)
0.015	1.787e+11	0.000e+00	9.308e-25	0.000e+00	7.984e-26
0.02	3.499e+14	3.920e-216	2.868e-21	1.358e-217	9.935e-23
0.03	4.812e+17	1.043e-64	8.722e-18	1.034e-66	8.644e-20
0.04	8.007e+14	2.614e-31	3.849e-20	1.156e-33	1.702e-22
0.05	3.918e+15	1.124e-17	1.146e-16	2.995e-20	3.053e-19
0.06	1.040e+15	1.924e-12	5.196e-11	3.822e-15	1.032e-13
0.08	3.265e+17	4.553e-05	2.492e-03	7.204e-08	3.943e-06
0.1	4.498e+15	6.500e-05	6.516e-03	9.944e-08	9.968e-06
0.15	3.380e+16	6.833e-02	1.146e+01	1.125e-04	1.887e-02
0.2	4.203e+17	1.038e+01	1.820e+03	1.832e-02	3.211e+00
0.3	3.185e+16	1.691e+01	2.122e+03	3.207e-02	4.025e+00
0.4	1.253e+17	5.019e+02	4.260e+04	9.780e-01	8.301e+01
0.5	2.598e+17	4.675e+03	2.815e+05	9.176e+00	5.525e+02
0.6	2.987e+17	1.752e+04	7.876e+05	3.421e+01	1.537e+03
0.8	2.525e+17	8.862e+04	2.511e+06	1.686e+02	4.775e+03
1.0	1.266e+17	1.663e+05	3.333e+06	3.066e+02	6.143e+03
1.5	1.082e+17	1.313e+06	1.474e+07	2.208e+03	2.479e+04
2.0	4.558e+16	2.232e+06	1.767e+07	3.451e+03	2.732e+04
3.0	7.478e+14	1.995e+05	1.033e+06	2.707e+02	1.401e+03
4.0	1.111e+11	8.204e+01	3.276e+02	1.015e-01	4.053e-01
TOTALS:	2.522e+18	4.022e+06	4.040e+07	6.450e+03	6.661e+04

Energy	Sensitivity	Variable		(4 of 5)	
		Variable	Variable	(4 of 5)	(76.2 cm)
0.015	1.787e+11	0.000e+00	9.308e-25	0.000e+00	7.984e-26
0.02	3.499e+14	8.125e-271	2.868e-21	2.814e-272	9.935e-23
0.03	4.812e+17	1.468e-82	8.722e-18	1.455e-84	8.644e-20
0.04	8.007e+14	3.127e-40	3.849e-20	1.383e-42	1.702e-22
0.05	3.918e+15	1.984e-23	6.157e-19	5.287e-26	1.640e-21
0.06	1.040e+15	1.924e-12	5.196e-11	3.822e-15	1.032e-13
0.08	3.265e+17	4.553e-05	2.492e-03	7.204e-08	3.943e-06
0.1	4.498e+15	6.500e-05	6.516e-03	9.944e-08	9.968e-06
0.15	3.380e+16	6.833e-02	1.146e+01	1.125e-04	1.887e-02
0.2	4.203e+17	1.038e+01	1.820e+03	1.832e-02	3.211e+00
0.3	3.185e+16	1.691e+01	2.122e+03	3.207e-02	4.025e+00
0.4	1.253e+17	5.019e+02	4.260e+04	9.780e-01	8.301e+01
0.5	2.598e+17	4.675e+03	2.815e+05	9.176e+00	5.525e+02
0.6	2.987e+17	1.752e+04	7.876e+05	3.421e+01	1.537e+03
0.8	2.525e+17	8.862e+04	2.511e+06	1.686e+02	4.775e+03
1.0	1.266e+17	1.663e+05	3.333e+06	3.066e+02	6.143e+03
1.5	1.082e+17	1.313e+06	1.474e+07	2.208e+03	2.479e+04
2.0	4.558e+16	2.232e+06	1.767e+07	3.451e+03	2.732e+04
3.0	7.478e+14	1.995e+05	1.033e+06	2.707e+02	1.401e+03
4.0	1.111e+11	8.204e+01	3.276e+02	1.015e-01	4.053e-01
TOTALS:	2.522e+18	4.022e+06	4.040e+07	6.450e+03	6.661e+04

Page : 5
 DOS File: 2RB8RAD.MS5
 Run Date: August 19, 2005
 Run Time: 2:16:55 PM
 Duration: 00:03:03

EC-RADN-1135
 Page 240

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.06	1.040e+15	8.699e-17	3.483e-15	1.728e-19	6.919e-18
0.08	3.265e+17	2.997e-08	2.130e-06	4.742e-11	3.371e-09
0.1	4.498e+15	1.255e-07	1.785e-05	1.920e-10	2.731e-08
0.15	3.380e+16	3.961e-04	1.030e-01	6.523e-07	1.696e-04
0.2	4.203e+17	1.026e-01	2.894e+01	1.812e-04	5.108e-02
0.3	3.185e+16	3.169e-01	6.319e+01	6.012e-04	1.199e-01
0.4	1.253e+17	1.425e+01	1.854e+03	2.777e-02	3.613e+00
0.5	2.598e+17	1.802e+02	1.615e+04	3.537e-01	3.170e+01
0.6	2.987e+17	8.575e+02	5.592e+04	1.674e+00	1.091e+02
0.8	2.525e+17	6.199e+03	2.452e+05	1.179e+01	4.664e+02
1.0	1.266e+17	1.510e+04	4.098e+05	2.783e+01	7.554e+02
1.5	1.082e+17	1.832e+05	2.646e+06	3.082e+02	4.453e+03
2.0	4.558e+16	4.045e+05	4.009e+06	6.255e+02	6.199e+03
3.0	7.478e+14	4.896e+04	3.060e+05	6.643e+01	4.152e+02
4.0	1.111e+11	2.388e+01	1.128e+02	2.955e-02	1.395e-01
TOTALS:	2.522e+18	6.590e+05	7.690e+06	1.042e+03	1.243e+04

Energy	Sensitivity		Variable (5 of 5) (91.44 cm)		
	MeV	photons/sec	MeV/cm ² /sec	mR/hr	mR/hr
0.015	1.787e+11	0.000e+00	9.308e-25	0.000e+00	7.984e-26
0.02	3.499e+14	0.000e+00	2.868e-21	0.000e+00	9.935e-23
0.03	4.812e+17	2.141e-100	8.722e-18	2.122e-102	8.644e-20
0.04	8.007e+14	3.862e-49	3.849e-20	1.708e-51	1.702e-22
0.05	3.918e+15	3.606e-29	6.157e-19	9.605e-32	1.640e-21
0.06	1.040e+15	4.039e-21	1.206e-18	8.022e-24	2.396e-21
0.08	3.265e+17	2.022e-11	1.754e-09	3.199e-14	2.775e-12
0.1	4.498e+15	2.482e-10	4.776e-08	3.797e-13	7.306e-11
0.15	3.380e+16	2.348e-06	8.909e-04	3.866e-09	1.467e-06
0.2	4.203e+17	1.037e-03	4.389e-01	1.830e-06	7.747e-04
0.3	3.185e+16	6.063e-03	1.790e+00	1.150e-05	3.396e-03
0.4	1.253e+17	4.127e-01	7.712e+01	8.042e-04	1.503e-01
0.5	2.598e+17	7.078e+00	8.891e+02	1.389e-02	1.745e+00
0.6	2.987e+17	4.273e+01	3.822e+03	8.340e-02	7.460e+00
0.8	2.525e+17	4.412e+02	2.314e+04	8.392e-01	4.402e+01
1.0	1.266e+17	1.393e+03	4.879e+04	2.568e+00	8.993e+01
1.5	1.082e+17	2.596e+04	4.641e+05	4.367e+01	7.809e+02
2.0	4.558e+16	7.436e+04	8.914e+05	1.150e+02	1.378e+03
3.0	7.478e+14	1.217e+04	8.954e+04	1.651e+01	1.215e+02
4.0	1.111e+11	7.036e+00	3.841e+01	8.704e-03	4.752e-02
TOTALS:	2.522e+18	1.144e+05	1.522e+06	1.787e+02	2.424e+03

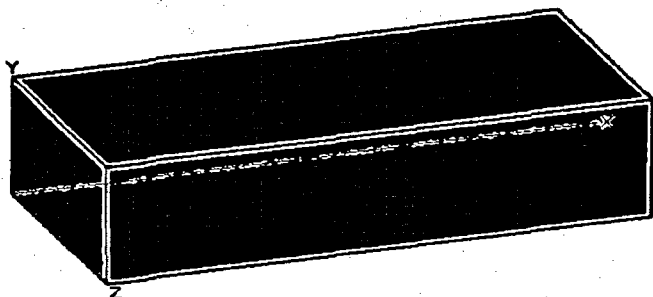
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2RB24GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:01:37 PM
 Duration: 00:03:11

EC-RADN-1135
 Page 241

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 24 Hour, GROVE
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 4 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Shield 1	15.24 cm	Concrete	2.35
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	5.7259e-001	2.1186e+010	8.6730e-005	3.2090e+000
Am-242	9.0711e+001	3.3563e+012	1.3740e-002	5.0838e+002
Am-242m	3.7202e-002	1.3765e+009	5.6350e-006	2.0849e-001
Am-243	7.0311e-002	2.6015e+009	1.0650e-005	3.9405e-001
Am-244	5.9662e+001	2.2075e+012	9.0370e-003	3.3437e+002
Ba-135m	1.3158e+002	4.8684e+012	1.9930e-002	7.3741e+002
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	9.3022e+000	3.4418e+011	1.4090e-003	5.2133e+001
Ba-140	1.0418e+006	3.8546e+016	1.5780e+002	5.8386e+006
Ba-141				
Ba-142				
Br-82	8.0214e+003	2.9679e+014	1.2150e+000	4.4955e+004
Br-83	4.6287e+002	1.7126e+013	7.0110e-002	2.5941e+003
Br-84	2.0935e-008	7.7459e+002	3.1710e-012	1.1733e-007
Ce-141	9.9030e+003	3.6641e+014	1.5000e+000	5.5500e+004
Ce-143	5.7002e+003	2.1091e+014	8.6340e-001	3.1946e+004
Ce-144	8.4440e+003	3.1243e+014	1.2790e+000	4.7323e+004
Cm-242	1.4947e+002	5.5304e+012	2.2640e-002	8.3768e+002
Cm-243	6.4462e-002	2.3851e+009	9.7640e-006	3.6127e-001
Cm-244	8.7608e+000	3.2415e+011	1.3270e-003	4.9099e+001
Co-58	1.6439e+002	6.0824e+012	2.4900e-002	9.2130e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Co-60m				
Co-61	8.3383e-005	3.0852e+006	1.2630e-008	4.6731e-004
Cs-132	1.0973e+002	4.0598e+012	1.6620e-002	6.1494e+002
Co-58	1.6439e+002	6.0824e+012	2.4900e-002	9.2130e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0099e+002

Page : 2
 DOS File: 2RB24GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:01:37 PM
 Duration: 00:03:11

EC-RADN-1135
 Page 242

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Cs-134	6.4501e+005	2.3866e+016	9.7700e+001	3.6149e+006
Cs-134m	4.4577e+002	1.6493e+013	6.7520e-002	2.4982e+003
Cs-136	1.9522e+005	7.2232e+015	2.9570e+001	1.0941e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
Cs-138	3.4073e-007	1.2607e+004	5.1610e-011	1.9096e-006
Cs-139				
Eu-152m	9.3088e-002	3.4443e+009	1.4100e-005	5.2170e-001
Eu-154	2.3681e+001	8.7621e+011	3.5870e-003	1.3272e+002
Eu-155	9.7379e+000	3.6030e+011	1.4750e-003	5.4575e+001
Eu-156	5.8830e+002	2.1767e+013	8.9110e-002	3.2971e+003
I-128				
I-130	2.3246e+004	8.6009e+014	3.5210e+000	1.3028e+005
I-131	3.3690e+006	1.2465e+017	5.1030e+002	1.8881e+007
I-132	4.3203e+006	1.5985e+017	6.5440e+002	2.4213e+007
I-133	3.4462e+006	1.2751e+017	5.2200e+002	1.9314e+007
I-134	1.9238e-001	7.1181e+009	2.9140e-005	1.0782e+000
I-135	5.6572e+005	2.0932e+016	8.5690e+001	3.1705e+006
Kr-83m	5.9147e+003	2.1884e+014	8.9590e-001	3.3148e+004
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	7.4206e+004	2.7456e+015	1.1240e+001	4.1588e+005
Kr-87	1.2689e+001	4.6949e+011	1.9220e-003	7.1114e+001
Kr-88	2.3833e+004	8.8183e+014	3.6100e+000	1.3357e+005
La-140	4.5600e+003	1.6872e+014	6.9070e-001	2.5556e+004
La-141	6.2230e+001	2.3025e+012	9.4260e-003	3.4876e+002
La-142	7.6781e-002	2.8409e+009	1.1630e-005	4.3031e-001
Mo-99	4.3936e+004	1.6256e+015	6.6550e+000	2.4624e+005
Mo-101				
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nb-95m	4.7680e+001	1.7641e+012	7.2220e-003	2.6721e+002
Nb-96	3.4357e+000	1.2712e+011	5.2040e-004	1.9255e+001
Nb-97	1.5997e+003	5.9188e+013	2.4230e-001	8.9651e+003
Nb-97m	1.5105e+003	5.5890e+013	2.2880e-001	8.4656e+003
Nd-147	1.5257e+003	5.6452e+013	2.3110e-001	8.5507e+003
Nd-149	6.1715e-002	2.2835e+009	9.3480e-006	3.4588e-001
Np-236m	1.2986e-002	4.8049e+008	1.9670e-006	7.2779e-002
Np-238	1.9027e+003	7.0400e+013	2.8820e-001	1.0663e+004
Np-239	8.9127e+004	3.2977e+015	1.3500e+001	4.9950e+005
Np-240	2.1899e-005	8.1026e+005	3.3170e-009	1.2273e-004
Pd-109	3.4502e+003	1.2766e+014	5.2260e-001	1.9336e+004
Pm-147	5.6401e+002	2.0868e+013	8.5430e-002	3.1609e+003
Pm-148	3.9942e+002	1.4779e+013	6.0500e-002	2.2385e+003
Pm-148m	8.5562e+001	3.1658e+012	1.2960e-002	4.7952e+002
Pm-149	1.0821e+003	4.0036e+013	1.6390e-001	6.0643e+003
Pm-151	2.7260e+002	1.0086e+013	4.1290e-002	1.5277e+003
Pr-142	6.8925e+001	2.5502e+012	1.0440e-002	3.8628e+002
Pr-143	3.5829e+003	1.3257e+014	5.4270e-001	2.0080e+004
Pr-144	3.3776e+003	1.2497e+014	5.1160e-001	1.8929e+004
Pr-144m	4.7316e+001	1.7507e+012	7.1670e-003	2.6518e+002
Pu-237	3.7031e-002	1.3701e+009	5.6090e-006	2.0753e-001
Pu-238	2.5629e+001	9.4827e+011	3.8820e-003	1.4363e+002
Pu-239	2.7128e+000	1.0037e+011	4.1090e-004	1.5203e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Pu-243	8.1865e+001	3.0290e+012	1.2400e-002	4.5880e+002
Pu-238	2.5629e+001	9.4827e+011	3.8820e-003	1.4363e+002
Pu-239	2.7128e+000	1.0037e+011	4.1090e-004	1.5203e+001

Page : 3
 DOS File: 2RB24GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:01:37 PM
 Duration: 00:03:11

EC-RADN-1135
 Page 243

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Rb-86	5.8500e+003	2.1645e+014	8.8610e-001	3.2786e+004
Rb-88	6.6614e+003	2.4647e+014	1.0090e+000	3.7333e+004
Rh-103m	4.7145e+004	1.7444e+015	7.1410e+000	2.6422e+005
Rh-105	2.2500e+004	8.3249e+014	3.4080e+000	1.2610e+005
Rh-105m	2.3147e+002	8.5642e+012	3.5060e-002	1.2972e+003
Rh-106	1.9179e+004	7.0962e+014	2.9050e+000	1.0748e+005
Ru-103	4.7363e+004	1.7524e+015	7.1740e+000	2.6544e+005
Ru-105	8.1006e+002	2.9972e+013	1.2270e-001	4.5399e+003
Ru-106	1.9179e+004	7.0962e+014	2.9050e+000	1.0748e+005
Sb-122	9.2560e+002	3.4247e+013	1.4020e-001	5.1874e+003
Sb-124	5.4064e+002	2.0004e+013	8.1890e-002	3.0299e+003
Sb-125	7.6913e+003	2.8458e+014	1.1650e+000	4.3105e+004
Sb-126	2.4619e+002	9.1090e+012	3.7290e-002	1.3797e+003
Sb-126m	4.6716e-001	1.7285e+010	7.0760e-005	2.6181e+000
Sb-127	4.4577e+004	1.6493e+015	6.7520e+000	2.4982e+005
Sb-129	4.5006e+003	1.6652e+014	6.8170e-001	2.5223e+004
Sm-151	1.5330e+000	5.6720e+010	2.3220e-004	8.5914e+000
Sm-153	8.3119e+002	3.0754e+013	1.2590e-001	4.6583e+003
Sr-89	5.7008e+005	2.1093e+016	8.6350e+001	3.1950e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	1.2775e+005	4.7267e+015	1.9350e+001	7.1595e+005
Sr-92	1.6802e+003	6.2168e+013	2.5450e-001	9.4165e+003
Sr-93				
Tc-99	6.1933e-001	2.2915e+010	9.3810e-005	3.4710e+000
Tc-99m	4.2431e+004	1.5699e+015	6.4270e+000	2.3780e+005
Tc-101				
Te-123m	5.4004e+000	1.9982e+011	8.1800e-004	3.0266e+001
Te-125m	1.7027e+003	6.2998e+013	2.5790e-001	9.5423e+003
Te-127	4.8432e+004	1.7920e+015	7.3360e+000	2.7143e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	2.8587e+004	1.0577e+015	4.3300e+000	1.6021e+005
Te-129m	3.6819e+004	1.3623e+015	5.5770e+000	2.0635e+005
Te-131	1.5647e+004	5.7893e+014	2.3700e+000	8.7690e+004
Te-131m	6.9453e+004	2.5698e+015	1.0520e+001	3.8924e+005
Te-132	6.9849e+005	2.5844e+016	1.0580e+002	3.9146e+006
Te-133	1.8855e-003	6.9765e+007	2.8560e-007	1.0567e-002
Te-133m	8.3581e-003	3.0925e+008	1.2660e-006	4.6842e-002
Te-134	4.6716e-005	1.7285e+006	7.0760e-009	2.6181e-004
Xe-129m	5.3575e+002	1.9823e+013	8.1150e-002	3.0026e+003
Xe-131m	1.6287e+005	6.0262e+015	2.4670e+001	9.1279e+005
Xe-133	2.3061e+007	8.5325e+017	3.4930e+003	1.2924e+008
Xe-133m	7.0575e+005	2.6113e+016	1.0690e+002	3.9553e+006
Xe-135	6.3003e+006	2.3311e+017	9.5430e+002	3.5309e+007
Xe-135m	3.0772e+005	1.1386e+016	4.6610e+001	1.7246e+006
Xe-137				
Xe-138				
Y-90	3.0145e+002	1.1154e+013	4.5660e-002	1.6894e+003
Y-91	3.0006e+003	1.1102e+014	4.5450e-001	1.6817e+004
Y-91m	3.2403e+002	1.1989e+013	4.9080e-002	1.8160e+003
Y-92	9.9096e+001	3.6665e+012	1.5010e-002	5.5537e+002
Y-93	4.6630e+002	1.7253e+013	7.0630e-002	2.6133e+003
Zr-89	1.0028e+000	3.7105e+010	1.5190e-004	5.6203e+000
Zr-93	6.6680e-004	2.4672e+007	1.0100e-007	3.7370e-003
Zr-95	4.2664e+003	1.5712e+014	6.4220e-001	2.3799e+004
Y-92	9.9096e+001	3.6665e+012	1.5010e-002	5.5537e+002
Y-93	4.6630e+002	1.7253e+013	7.0630e-002	2.6133e+003

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Zr-97	1.5904e+003	5.8846e+013	2.4090e-001	8.9133e+003

Buildup
 The material reference is : Shield 1

Integration Parameters	
X Direction	25
Y Direction	25
Z Direction	25

Results

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u>		<u>Exposure Rate</u>	
		<u>MeV/cm²/sec</u> No Buildup	<u>MeV/cm²/sec</u> With Buildup	<u>mR/hr</u> No Buildup	<u>mR/hr</u> With Buildup
0.015	1.492e+12	4.580e-126	7.773e-24	3.929e-127	6.667e-25
0.02	3.226e+14	8.174e-52	2.644e-21	2.832e-53	9.159e-23
0.03	4.739e+17	6.580e-11	1.334e-10	6.522e-13	1.322e-12
0.04	7.630e+14	2.375e-04	7.941e-04	1.050e-06	3.512e-06
0.05	3.404e+15	2.741e+00	1.473e+01	7.301e-03	3.925e-02
0.06	9.887e+14	2.955e+01	2.337e+02	5.870e-02	4.642e-01
0.08	3.170e+17	2.225e+05	2.768e+06	3.521e+02	4.380e+03
0.1	3.659e+15	1.033e+04	1.639e+05	1.581e+01	2.508e+02
0.15	9.116e+15	1.298e+05	2.325e+06	2.137e+02	3.828e+03
0.2	2.389e+17	8.249e+06	1.358e+08	1.456e+04	2.397e+05
0.3	2.180e+16	2.328e+06	2.913e+07	4.415e+03	5.525e+04
0.4	1.108e+17	2.533e+07	2.478e+08	4.935e+04	4.828e+05
0.5	1.762e+17	7.145e+07	5.682e+08	1.402e+05	1.115e+06
0.6	2.580e+17	1.651e+08	1.107e+09	3.223e+05	2.160e+06
0.8	2.010e+17	2.590e+08	1.336e+09	4.926e+05	2.541e+06
1.0	6.954e+16	1.515e+08	6.442e+08	2.793e+05	1.187e+06
1.5	4.063e+16	2.192e+08	6.793e+08	3.688e+05	1.143e+06
2.0	8.266e+15	8.081e+07	2.087e+08	1.250e+05	3.228e+05
3.0	1.987e+13	4.165e+05	8.681e+05	5.650e+02	1.178e+03
4.0	7.457e+07	2.553e+00	4.690e+00	3.158e-03	5.803e-03
5.0	3.534e+11	1.721e+04	2.871e+04	1.973e+01	3.291e+01
TOTALS:	1.934e+18	9.838e+08	4.962e+09	1.798e+06	9.257e+06

	<u>Sensitivity</u>	<u>Variable</u>		(1 of 5)	(30.48 cm)
0.015	1.492e+12	6.003e-252	7.773e-24	5.149e-253	6.667e-25
0.02	3.226e+14	1.077e-106	2.644e-21	3.730e-108	9.159e-23
0.03	4.739e+17	6.393e-29	8.590e-18	6.336e-31	8.513e-20
0.04	7.630e+14	2.081e-13	8.446e-13	9.205e-16	3.736e-15
0.05	3.404e+15	3.676e-06	2.847e-05	9.792e-09	7.585e-08
0.06	9.887e+14	1.038e-03	1.353e-02	2.062e-06	2.687e-05
0.08	3.170e+17	1.167e+02	2.890e+03	1.847e-01	4.573e+00
0.1	3.659e+15	1.612e+01	5.946e+02	2.466e-02	9.097e-01
0.15	9.116e+15	6.179e+02	3.017e+04	1.017e+00	4.969e+01
0.2	2.389e+17	6.765e+04	3.187e+06	1.194e+02	5.625e+03
0.3	2.180e+16	3.667e+04	1.286e+06	6.956e+01	2.439e+03
0.4	1.108e+17	6.103e+05	1.571e+07	1.189e+03	3.061e+04
0.5	1.762e+17	2.355e+06	4.642e+07	4.623e+03	9.111e+04
0.3	2.180e+16	3.667e+04	1.286e+06	6.956e+01	2.439e+03
0.4	1.108e+17	6.103e+05	1.571e+07	1.189e+03	3.061e+04

Page : 5
 DOS File: 2RB24GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:01:37 PM
 Duration: 00:03:11

EC-RADN-1135
 Page 245

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec		Exposure Rate mR/hr	
		No Buildup	With Buildup	No Buildup	With Buildup
0.6	2.580e+17	6.955e+06	1.092e+08	1.357e+04	2.132e+05
0.8	2.010e+17	1.577e+07	1.747e+08	2.999e+04	3.322e+05
1.0	6.954e+16	1.207e+07	1.029e+08	2.226e+04	1.897e+05
1.5	4.063e+16	2.730e+07	1.502e+08	4.593e+04	2.527e+05
2.0	8.266e+15	1.322e+07	5.604e+07	2.044e+04	8.666e+04
3.0	1.987e+13	9.363e+04	2.892e+05	1.270e+02	3.924e+02
4.0	7.457e+07	6.874e-01	1.752e+00	8.504e-04	2.167e-03
5.0	3.534e+11	5.199e+03	1.163e+04	5.960e+00	1.333e+01
TOTALS:	1.934e+18	7.848e+07	6.600e+08	1.383e+05	1.205e+06

Sensitivity	Variable	Fluence Rate		Exposure Rate	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	1.492e+12	0.000e+00	7.773e-24	0.000e+00	6.667e-25
0.02	3.226e+14	1.861e-161	2.644e-21	6.446e-163	9.159e-23
0.03	4.739e+17	7.722e-47	8.590e-18	7.653e-49	8.513e-20
0.04	7.630e+14	2.185e-22	3.668e-20	9.663e-25	1.622e-22
0.05	3.404e+15	5.776e-12	5.472e-11	1.539e-14	1.458e-13
0.06	9.887e+14	4.213e-08	7.838e-07	8.368e-11	1.557e-09
0.08	3.170e+17	6.965e-02	2.711e+00	1.102e-04	4.291e-03
0.1	3.659e+15	2.836e-02	1.845e+00	4.338e-05	2.823e-03
0.15	9.116e+15	3.284e+00	3.209e+02	5.408e-03	5.284e-01
0.2	2.389e+17	6.156e+02	6.058e+04	1.087e+00	1.069e+02
0.3	2.180e+16	6.357e+02	4.562e+04	1.206e+00	8.653e+01
0.4	1.108e+17	1.609e+04	8.099e+05	3.135e+01	1.578e+03
0.5	1.762e+17	8.453e+04	3.124e+06	1.659e+02	6.131e+03
0.6	2.580e+17	3.176e+05	9.056e+06	6.200e+02	1.768e+04
0.8	2.010e+17	1.034e+06	1.956e+07	1.966e+03	3.720e+04
1.0	6.954e+16	1.031e+06	1.422e+07	1.900e+03	2.620e+04
1.5	4.063e+16	3.607e+06	2.966e+07	6.069e+03	4.990e+04
2.0	8.266e+15	2.278e+06	1.371e+07	3.523e+03	2.121e+04
3.0	1.987e+13	2.199e+04	9.061e+04	2.983e+01	1.229e+02
4.0	7.457e+07	1.923e-01	6.292e-01	2.379e-04	7.784e-04
5.0	3.534e+11	1.626e+03	4.517e+03	1.864e+00	5.178e+00
TOTALS:	1.934e+18	8.393e+06	9.034e+07	1.431e+04	1.602e+05

Sensitivity	Variable	Fluence Rate		Exposure Rate	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	1.492e+12	0.000e+00	7.773e-24	0.000e+00	6.667e-25
0.02	3.226e+14	3.614e-216	2.644e-21	1.252e-217	9.159e-23
0.03	4.739e+17	1.028e-64	8.590e-18	1.018e-66	8.513e-20
0.04	7.630e+14	2.491e-31	3.668e-20	1.102e-33	1.622e-22
0.05	3.404e+15	9.765e-18	9.955e-17	2.601e-20	2.652e-19
0.06	9.887e+14	1.830e-12	4.940e-11	3.634e-15	9.812e-14
0.08	3.170e+17	4.420e-05	2.419e-03	6.994e-08	3.828e-06
0.1	3.659e+15	5.288e-05	5.301e-03	8.090e-08	8.110e-06
0.15	9.116e+15	1.843e-02	3.091e+00	3.034e-05	5.089e-03
0.2	2.389e+17	5.900e+00	1.034e+03	1.041e-02	1.826e+00
0.3	2.180e+16	1.157e+01	1.452e+03	2.195e-02	2.754e+00
0.4	1.108e+17	4.441e+02	3.769e+04	8.653e-01	7.344e+01
0.5	1.762e+17	3.171e+03	1.909e+05	6.224e+00	3.748e+02
0.3	2.180e+16	1.157e+01	1.452e+03	2.195e-02	2.754e+00
0.4	1.108e+17	4.441e+02	3.769e+04	8.653e-01	7.344e+01

Page : 6
 DOS File: 2RB24GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:01:37 PM
 Duration: 00:03:11

EC-RADN-1135
 Page 246

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.6	2.580e+17	1.514e+04	6.802e+05	2.954e+01	1.328e+03
0.8	2.010e+17	7.052e+04	1.998e+06	1.341e+02	3.800e+03
1.0	6.954e+16	9.137e+04	1.831e+06	1.684e+02	3.375e+03
1.5	4.063e+16	4.927e+05	5.532e+06	8.290e+02	9.308e+03
2.0	8.266e+15	4.048e+05	3.204e+06	6.260e+02	4.955e+03
3.0	1.987e+13	5.301e+03	2.744e+04	7.192e+00	3.723e+01
4.0	7.457e+07	5.509e-02	2.200e-01	6.815e-05	2.721e-04
5.0	3.534e+11	5.198e+02	1.728e+03	5.959e-01	1.981e+00
TOTALS:	1.934e+18	1.084e+06	1.351e+07	1.802e+03	2.326e+04

Sensitivity	Variable	Variable		(4 of 5)	
		0.000e+00	7.773e-24	0.000e+00	(76.2 cm)
0.015	1.492e+12	0.000e+00	7.773e-24	0.000e+00	6.667e-25
0.02	3.226e+14	7.490e-271	2.644e-21	2.595e-272	9.159e-23
0.03	4.739e+17	1.446e-82	8.590e-18	1.433e-84	8.513e-20
0.04	7.630e+14	2.980e-40	3.668e-20	1.318e-42	1.622e-22
0.05	3.404e+15	1.724e-23	5.348e-19	4.592e-26	1.425e-21
0.06	9.887e+14	8.270e-17	3.311e-15	1.643e-19	6.577e-18
0.08	3.170e+17	2.909e-08	2.068e-06	4.604e-11	3.272e-09
0.1	3.659e+15	1.021e-07	1.452e-05	1.562e-10	2.221e-08
0.15	9.116e+15	1.068e-04	2.778e-02	1.759e-07	4.575e-05
0.2	2.389e+17	5.835e-02	1.645e+01	1.030e-04	2.904e-02
0.3	2.180e+16	2.169e-01	4.325e+01	4.114e-04	8.204e-02
0.4	1.108e+17	1.261e+01	1.640e+03	2.457e-02	3.196e+00
0.5	1.762e+17	1.222e+02	1.095e+04	2.399e-01	2.150e+01
0.6	2.580e+17	7.406e+02	4.830e+04	1.446e+00	9.427e+01
0.8	2.010e+17	4.933e+03	1.952e+05	9.384e+00	3.712e+02
1.0	6.954e+16	8.294e+03	2.251e+05	1.529e+01	4.150e+02
1.5	4.063e+16	6.877e+04	9.935e+05	1.157e+02	1.671e+03
2.0	8.266e+15	7.337e+04	7.271e+05	1.135e+02	1.124e+03
3.0	1.987e+13	1.301e+03	8.131e+03	1.765e+00	1.103e+01
4.0	7.457e+07	1.604e-02	7.574e-02	1.984e-05	9.370e-05
5.0	3.534e+11	1.687e+02	6.530e+02	1.934e-01	7.486e-01
TOTALS:	1.934e+18	1.577e+05	2.211e+06	2.575e+02	3.713e+03

Sensitivity	Variable	Variable		(5 of 5)	
		0.000e+00	7.773e-24	0.000e+00	(91.44 cm)
0.015	1.492e+12	0.000e+00	7.773e-24	0.000e+00	6.667e-25
0.02	3.226e+14	0.000e+00	2.644e-21	0.000e+00	9.159e-23
0.03	4.739e+17	2.109e-100	8.590e-18	2.090e-102	8.513e-20
0.04	7.630e+14	3.680e-49	3.668e-20	1.628e-51	1.622e-22
0.05	3.404e+15	3.132e-29	5.348e-19	8.344e-32	1.425e-21
0.06	9.887e+14	3.840e-21	1.147e-18	7.627e-24	2.277e-21
0.08	3.170e+17	1.963e-11	1.703e-09	3.106e-14	2.694e-12
0.1	3.659e+15	2.019e-10	3.885e-08	3.089e-13	5.944e-11
0.15	9.116e+15	6.331e-07	2.402e-04	1.043e-09	3.956e-07
0.2	2.389e+17	5.895e-04	2.495e-01	1.040e-06	4.404e-04
0.3	2.180e+16	4.149e-03	1.225e+00	7.870e-06	2.324e-03
0.4	1.108e+17	3.651e-01	6.822e+01	7.114e-04	1.329e-01
0.5	1.762e+17	4.801e+00	6.031e+02	9.424e-03	1.184e+00
0.6	2.580e+17	4.149e+03	1.225e+00	7.870e-06	2.324e-03
0.8	2.010e+17	3.651e-01	6.822e+01	7.114e-04	1.329e-01

Page : 7
 DOS File: 2RB24GR.MS5
 Run Date: August 19, 2005
 Run Time: 2:01:37 PM
 Duration: 00:03:11

EC-RADN-1135
 Page 247

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.6	2.580e+17	3.690e+01	3.301e+03	7.203e-02	6.444e+00
0.8	2.010e+17	3.511e+02	1.842e+04	6.679e-01	3.503e+01
1.0	6.954e+16	7.654e+02	2.680e+04	1.411e+00	4.940e+01
1.5	4.063e+16	9.745e+03	1.742e+05	1.640e+01	2.931e+02
2.0	8.266e+15	1.349e+04	1.617e+05	2.086e+01	2.500e+02
3.0	1.987e+13	3.233e+02	2.379e+03	4.386e-01	3.227e+00
4.0	7.457e+07	4.724e-03	2.579e-02	5.845e-06	3.191e-05
5.0	3.534e+11	5.537e+01	2.446e+02	6.348e-02	2.805e-01
TOTALS:	1.934e+18	2.477e+04	3.877e+05	3.991e+01	6.389e+02

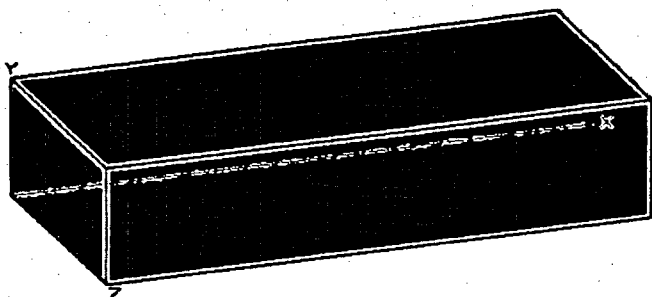
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2RB24I38.MS5
 Run Date: August 19, 2005
 Run Time: 2:04:49 PM
 Duration: 00:02:45

EC-RADN-1135
 Page 248

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 24 Hour, ICRP38
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 14 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Shield 1	15.24 cm	Concrete	2.35
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : ICRP-38

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Cs-135m	8.6354e-004	3.1951e+007	1.3080e-007	4.8396e-003
Eu-157	1.9885e+001	7.3575e+011	3.0120e-003	1.1144e+002
Eu-158	8.5892e-009	3.1780e+002	1.3010e-012	4.8137e-008
La-143				
Nd-151				
Pm-150	2.5028e-002	9.2604e+008	3.7910e-006	1.4027e-001
Pr-145	1.5944e+002	5.8992e+012	2.4150e-002	8.9355e+002
Pr-147				
Rh-106m	3.1076e-001	1.1498e+010	4.7070e-005	1.7416e+000
Rh-107				
Sb-128a	1.4960e+003	5.5352e+013	2.2660e-001	8.3842e+003
Sb-128b	4.7574e-003	1.7602e+008	7.2050e-007	2.6662e-002
Sb-130	6.8595e-007	2.5380e+004	1.0390e-010	3.8443e-006
Sb-131				
Se-81	8.6156e-005	3.1878e+006	1.3050e-008	4.8285e-004
Se-81m	5.8289e-005	2.1567e+006	8.8290e-009	3.2667e-004
Se-83				
Sm-155				
Sm-156	9.8238e+000	3.6348e+011	1.4880e-003	5.5056e+001
Y-94				
Y-95				

Buildup
 The material reference is : Shield 1

Integration Parameters

X Direction 25
 Y Direction 25
 Z Direction 25

Energy MeV	Activity photons/sec	Results			
		Fluence Rate	Fluence Rate	Exposure Rate	Exposure Rate
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.02	2.831e+10	7.174e-56	2.320e-25	2.485e-57	8.037e-27
0.03	1.561e+12	2.168e-16	4.394e-16	2.149e-18	4.354e-18
0.04	4.803e+11	1.495e-07	4.999e-07	6.612e-10	2.211e-09
0.05	1.443e+11	1.162e-04	6.245e-04	3.095e-07	1.664e-06
0.06	1.754e+11	5.242e-03	4.146e-02	1.041e-05	8.234e-05
0.08	9.951e+10	6.985e-02	8.689e-01	1.105e-04	1.375e-03
0.1	2.036e+06	5.748e-06	9.119e-05	8.794e-09	1.395e-07
0.15	5.428e+10	7.727e-01	1.384e+01	1.272e-03	2.279e-02
0.2	6.472e+11	2.234e+01	3.679e+02	3.944e-02	6.494e-01
0.3	5.094e+13	5.439e+03	6.806e+04	1.032e+01	1.291e+02
0.4	2.415e+11	5.520e+01	5.401e+02	1.076e-01	1.052e+00
0.5	4.135e+10	1.676e+01	1.333e+02	3.290e-02	2.617e-01
0.6	1.955e+12	1.251e+03	8.384e+03	2.442e+00	1.636e+01
0.8	1.158e+14	1.492e+05	7.698e+05	2.839e+02	1.464e+03
1.0	4.471e+12	9.743e+03	4.142e+04	1.796e+01	7.636e+01
1.5	7.790e+11	4.203e+03	1.302e+04	7.072e+00	2.191e+01
2.0	5.610e+08	5.484e+00	1.417e+01	8.480e-03	2.191e-02
3.0	1.140e+07	2.390e-01	4.981e-01	3.242e-04	6.757e-04
TOTALS:	1.774e+14	1.700e+05	9.017e+05	3.218e+02	1.710e+03

Energy	Activity	Variable	(1 of 5)		
			Sensitivity	Variable	(30.48 cm)
0.02	2.831e+10	9.449e-111	2.320e-25	3.273e-112	8.037e-27
0.03	1.561e+12	2.106e-34	2.830e-23	2.087e-36	2.805e-25
0.04	4.803e+11	1.310e-16	5.317e-16	5.795e-19	2.352e-18
0.05	1.443e+11	1.558e-10	1.207e-09	4.151e-13	3.216e-12
0.06	1.754e+11	1.842e-07	2.400e-06	3.658e-10	4.767e-09
0.08	9.951e+10	3.664e-05	9.073e-04	5.799e-08	1.436e-06
0.1	2.036e+06	8.965e-09	3.308e-07	1.372e-11	5.060e-10
0.15	5.428e+10	3.679e-03	1.797e-01	6.058e-06	2.958e-04
0.2	6.472e+11	1.832e-01	8.633e+00	3.234e-04	1.524e-02
0.3	5.094e+13	8.569e+01	3.005e+03	1.625e-01	5.700e+00
0.4	2.415e+11	1.330e+00	3.424e+01	2.592e-03	6.671e-02
0.5	4.135e+10	5.526e-01	1.089e+01	1.085e-03	2.138e-02
0.6	1.955e+12	5.269e+01	8.275e+02	1.028e-01	1.615e+00
0.8	1.158e+14	9.085e+03	1.006e+05	1.728e+01	1.914e+02
1.0	4.471e+12	7.763e+02	6.617e+03	1.431e+00	1.220e+01
1.5	7.790e+11	5.235e+02	2.880e+03	8.807e-01	4.845e+00
2.0	5.610e+08	8.971e-01	3.803e+00	1.387e-03	5.881e-03
3.0	1.140e+07	5.372e-02	1.660e-01	7.289e-05	2.252e-04
TOTALS:	1.774e+14	1.053e+04	1.140e+05	1.986e+01	2.159e+02

Energy	Activity	Variable	(2 of 5)		
			Sensitivity	Variable	(45.72 cm)
TOTALS:	1.774e+14	1.053e+04	1.140e+05	1.986e+01	2.159e+02

Page : 3
 DOS File: 2RB24I38.MS5
 Run Date: August 19, 2005
 Run Time: 2:04:49 PM
 Duration: 00:02:45

EC-RADN-1135
 Page 250

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.02	2.831e+10	1.633e-165	2.320e-25	5.657e-167	8.037e-27
0.03	1.561e+12	2.544e-52	2.830e-23	2.522e-54	2.805e-25
0.04	4.803e+11	1.375e-25	2.309e-23	6.083e-28	1.021e-25
0.05	1.443e+11	2.448e-16	2.320e-15	6.522e-19	6.180e-18
0.06	1.754e+11	7.474e-12	1.390e-10	1.485e-14	2.762e-13
0.08	9.951e+10	2.187e-08	8.512e-07	3.460e-11	1.347e-09
0.1	2.036e+06	1.577e-11	1.026e-09	2.413e-14	1.570e-12
0.15	5.428e+10	1.955e-05	1.911e-03	3.220e-08	3.146e-06
0.2	6.472e+11	1.668e-03	1.641e-01	2.943e-06	2.896e-04
0.3	5.094e+13	1.486e+00	1.066e+02	2.818e-03	2.022e-01
0.4	2.415e+11	3.506e-02	1.765e+00	6.832e-05	3.439e-03
0.5	4.135e+10	1.983e-02	7.328e-01	3.893e-05	1.438e-03
0.6	1.955e+12	2.406e+00	6.861e+01	4.697e-03	1.339e-01
0.8	1.158e+14	5.956e+02	1.127e+04	1.133e+00	2.144e+01
1.0	4.471e+12	6.628e+01	9.140e+02	1.222e-01	1.685e+00
1.5	7.790e+11	6.916e+01	5.687e+02	1.164e-01	9.568e-01
2.0	5.610e+08	1.546e-01	9.307e-01	2.391e-04	1.439e-03
3.0	1.140e+07	1.262e-02	5.199e-02	1.712e-05	7.054e-05
TOTALS:	1.774e+14	7.352e+02	1.293e+04	1.379e+00	2.442e+01

Energy	Activity	Sensitivity Variable		(3 of 5) (60.96 cm)	
		Variable	Variable	Variable	Variable
0.02	2.831e+10	3.172e-220	2.320e-25	1.099e-221	8.037e-27
0.03	1.561e+12	3.386e-70	2.830e-23	3.355e-72	2.805e-25
0.04	4.803e+11	1.568e-34	2.309e-23	6.935e-37	1.021e-25
0.05	1.443e+11	4.140e-22	4.220e-21	1.103e-24	1.124e-23
0.06	1.754e+11	3.246e-16	8.764e-15	6.447e-19	1.741e-17
0.08	9.951e+10	1.387e-11	7.595e-10	2.196e-14	1.202e-12
0.1	2.036e+06	2.942e-14	2.949e-12	4.500e-17	4.511e-15
0.15	5.428e+10	1.097e-07	1.840e-05	1.807e-10	3.030e-08
0.2	6.472e+11	1.598e-05	2.802e-03	2.821e-08	4.946e-06
0.3	5.094e+13	2.704e-02	3.393e+00	5.129e-05	6.437e-03
0.4	2.415e+11	9.678e-04	8.215e-02	1.886e-06	1.601e-04
0.5	4.135e+10	7.439e-04	4.479e-02	1.460e-06	8.792e-05
0.6	1.955e+12	1.147e-01	5.153e+00	2.238e-04	1.006e-02
0.8	1.158e+14	4.064e+01	1.151e+03	7.730e-02	2.190e+00
1.0	4.471e+12	5.875e+00	1.177e+02	1.083e-02	2.170e-01
1.5	7.790e+11	9.447e+00	1.061e+02	1.589e-02	1.785e-01
2.0	5.610e+08	2.747e-02	2.175e-01	4.248e-05	3.363e-04
3.0	1.140e+07	3.042e-03	1.574e-02	4.127e-06	2.136e-05
TOTALS:	1.774e+14	5.613e+01	1.384e+03	1.043e-01	2.602e+00

Energy	Activity	Sensitivity Variable		(4 of 5) (76.2 cm)	
		Variable	Variable	Variable	Variable
0.02	2.831e+10	6.573e-275	2.320e-25	2.277e-276	8.037e-27
0.03	1.561e+12	4.763e-88	2.830e-23	4.720e-90	2.805e-25
0.04	4.803e+11	1.876e-43	2.309e-23	8.296e-46	1.021e-25
0.05	1.443e+11	7.308e-28	2.267e-23	1.947e-30	6.040e-26
0.06	1.754e+11	1.467e-20	5.875e-19	2.914e-23	1.167e-21
0.08	9.951e+10	9.133e-15	6.492e-13	1.445e-17	1.027e-15
0.05	1.443e+11	7.308e-28	2.267e-23	1.947e-30	6.040e-26
0.06	1.754e+11	1.467e-20	5.875e-19	2.914e-23	1.167e-21

Page : 4
 DOS File: 2RB24I38.MS5
 Run Date: August 19, 2005
 Run Time: 2:04:49 PM
 Duration: 00:02:45

EC-RADN-1135
 Page 251

Energy MeV	Activity photons/sec	Fluence Rate	Fluence Rate	Exposure Rate	Exposure Rate
		MeV/cm ² /sec <u>No Buildup</u>	MeV/cm ² /sec <u>With Buildup</u>	mR/hr <u>No Buildup</u>	mR/hr <u>With Buildup</u>
0.1	2.036e+06	5.681e-17	8.077e-15	8.691e-20	1.236e-17
0.15	5.428e+10	6.360e-10	1.654e-07	1.047e-12	2.724e-10
0.2	6.472e+11	1.581e-07	4.457e-05	2.790e-10	7.866e-08
0.3	5.094e+13	5.069e-04	1.011e-01	9.615e-07	1.917e-04
0.4	2.415e+11	2.748e-05	3.575e-03	5.355e-08	6.966e-06
0.5	4.135e+10	2.868e-05	2.570e-03	5.629e-08	5.045e-06
0.6	1.955e+12	5.611e-03	3.659e-01	1.095e-05	7.142e-04
0.8	1.158e+14	2.843e+00	1.124e+02	5.407e-03	2.139e-01
1.0	4.471e+12	5.333e-01	1.448e+01	9.830e-04	2.668e-02
1.5	7.790e+11	1.319e+00	1.905e+01	2.218e-03	3.205e-02
2.0	5.610e+08	4.979e-03	4.935e-02	7.700e-06	7.631e-05
3.0	1.140e+07	7.464e-04	4.665e-03	1.013e-06	6.329e-06
TOTALS:	1.774e+14	4.706e+00	1.465e+02	8.629e-03	2.736e-01
	Sensitivity	Variable		(5 of 5)	(91.44 cm)
0.02	2.831e+10	0.000e+00	2.320e-25	0.000e+00	8.037e-27
0.03	1.561e+12	6.947e-106	2.830e-23	6.885e-108	2.805e-25
0.04	4.803e+11	2.317e-52	2.309e-23	1.025e-54	1.021e-25
0.05	1.443e+11	1.328e-33	2.267e-23	3.537e-36	6.040e-26
0.06	1.754e+11	6.812e-25	2.034e-22	1.353e-27	4.040e-25
0.08	9.951e+10	6.161e-18	5.345e-16	9.750e-21	8.458e-19
0.1	2.036e+06	1.123e-19	2.161e-17	1.718e-22	3.306e-20
0.15	5.428e+10	3.770e-12	1.430e-09	6.208e-15	2.355e-12
0.2	6.472e+11	1.597e-09	6.759e-07	2.818e-12	1.193e-09
0.3	5.094e+13	9.696e-06	2.863e-03	1.839e-08	5.431e-06
0.4	2.415e+11	7.958e-07	1.487e-04	1.551e-09	2.897e-07
0.5	4.135e+10	1.126e-06	1.415e-04	2.211e-09	2.777e-07
0.6	1.955e+12	2.796e-04	2.501e-02	5.457e-07	4.882e-05
0.8	1.158e+14	2.023e-01	1.061e+01	3.848e-04	2.018e-02
1.0	4.471e+12	4.922e-02	1.723e+00	9.072e-05	3.177e-03
1.5	7.790e+11	1.868e-01	3.341e+00	3.144e-04	5.621e-03
2.0	5.610e+08	9.153e-04	1.097e-02	1.415e-06	1.697e-05
3.0	1.140e+07	1.855e-04	1.365e-03	2.517e-07	1.852e-06
TOTALS:	1.774e+14	4.398e-01	1.572e+01	7.921e-04	2.906e-02

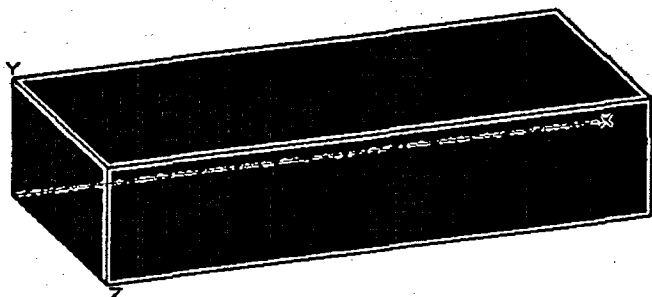
**MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.**

Page : 1
 DOS File: 2RB24RAD.MS5
 Run Date: August 19, 2005
 Run Time: 2:07:35 PM
 Duration: 00:03:04

EC-RADN-1135
 Page 252

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

**Case Title: Reactor Building Air
 Description: 24 Hour, RADTRAD
 Geometry: 13 - Rectangular Volume**



Source Dimensions

Length	4.0e+3 cm	131 ft	0.0 in
Width	1.9e+3 cm		63 ft
Height	861.06 cm	28 ft	3.0 in

Dose Points

	<u>X</u>	<u>Y</u>	<u>Z</u>
# 1	4297.68 cm	430.53 cm	960.12 cm
	141 ft	0.0 in	14 ft 1.5 in
			31 ft 6.0 in

Shields

<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	6.60e+09 cm ³	Air	0.00122
Shield 1	15.24 cm	Concrete	2.35
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Am-241	5.7259e-001	2.1186e+010	8.6730e-005	3.2090e+000
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	9.3022e+000	3.4418e+011	1.4090e-003	5.2133e+001
Ba-140	1.0418e+006	3.8546e+016	1.5780e+002	5.8386e+006
Ce-141	9.9030e+003	3.6641e+014	1.5000e+000	5.5500e+004
Ce-143	5.7002e+003	2.1091e+014	8.6340e-001	3.1946e+004
Ce-144	8.4440e+003	3.1243e+014	1.2790e+000	4.7323e+004
Cm-242	1.4947e+002	5.5304e+012	2.2640e-002	8.3768e+002
Cm-244	8.7608e+000	3.2415e+011	1.3270e-003	4.9099e+001
Co-58	1.6439e+002	6.0824e+012	2.4900e-002	9.2130e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Cs-134	6.4501e+005	2.3866e+016	9.7700e+001	3.6149e+006
Cs-136	1.9522e+005	7.2232e+015	2.9570e+001	1.0941e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
I-131	3.3690e+006	1.2465e+017	5.1030e+002	1.8881e+007
I-132	4.3203e+006	1.5985e+017	6.5440e+002	2.4213e+007
I-133	3.4462e+006	1.2751e+017	5.2200e+002	1.9314e+007
I-134	1.9238e-001	7.1181e+009	2.9140e-005	1.0782e+000
I-135	5.6572e+005	2.0932e+016	8.5690e+001	3.1705e+006
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	7.4206e+004	2.7456e+015	1.1240e+001	4.1588e+005
Kr-87	1.2689e+001	4.6949e+011	1.9220e-003	7.1114e+001
Kr-88	2.3833e+004	8.8183e+014	3.6100e+000	1.3357e+005
La-140	4.5600e+003	1.6872e+014	6.9070e-001	2.5556e+004
La-141	6.2230e+001	2.3025e+012	9.4260e-003	3.4826e+002
Kr-85m	7.4206e+004	2.7456e+015	1.1240e+001	4.1588e+005
Kr-87	1.2689e+001	4.6949e+011	1.9220e-003	7.1114e+001

Page : 2
 DOS File: 2RB24RAD.MS5
 Run Date: August 19, 2005
 Run Time: 2:07:35 PM
 Duration: 00:03:04

EC-RADN-1135
 Page 253

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
La-142	7.6781e-002	2.8409e+009	1.1630e-005	4.3031e-001
Mo-99	4.3936e+004	1.6256e+015	6.6550e+000	2.4624e+005
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nd-147	1.5257e+003	5.6452e+013	2.3110e-001	8.5507e+003
Np-239	8.9127e+004	3.2977e+015	1.3500e+001	4.9950e+005
Pr-143	3.5829e+003	1.3257e+014	5.4270e-001	2.0080e+004
Pr-144	3.3776e+003	1.2497e+014	5.1160e-001	1.8929e+004
Pu-238	2.5629e+001	9.4827e+011	3.8820e-003	1.4363e+002
Pu-239	2.7128e+000	1.0037e+011	4.1090e-004	1.5203e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Rb-86	5.8500e+003	2.1645e+014	8.8610e-001	3.2786e+004
Rh-103m	4.7145e+004	1.7444e+015	7.1410e+000	2.6422e+005
Rh-105	2.2500e+004	8.3249e+014	3.4080e+000	1.2610e+005
Rh-106	1.9179e+004	7.0962e+014	2.9050e+000	1.0748e+005
Ru-103	4.7363e+004	1.7524e+015	7.1740e+000	2.6544e+005
Ru-105	8.1006e+002	2.9972e+013	1.2270e-001	4.5399e+003
Ru-106	1.9179e+004	7.0962e+014	2.9050e+000	1.0748e+005
Sb-127	4.4577e+004	1.6493e+015	6.7520e+000	2.4982e+005
Sb-129	4.5006e+003	1.6652e+014	6.8170e-001	2.5223e+004
Sr-89	5.7008e+005	2.1093e+016	8.6350e+001	3.1950e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	1.2775e+005	4.7267e+015	1.9350e+001	7.1595e+005
Sr-92	1.6802e+003	6.2168e+013	2.5450e-001	9.4165e+003
Tc-99m	4.2431e+004	1.5699e+015	6.4270e+000	2.3780e+005
Te-127	4.8432e+004	1.7920e+015	7.3360e+000	2.7143e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	2.8587e+004	1.0577e+015	4.3300e+000	1.6021e+005
Te-129m	3.6819e+004	1.3623e+015	5.5770e+000	2.0635e+005
Te-131m	6.9453e+004	2.5698e+015	1.0520e+001	3.8924e+005
Te-132	6.9849e+005	2.5844e+016	1.0580e+002	3.9146e+006
Xe-133	2.3061e+007	8.5325e+017	3.4930e+003	1.2924e+008
Xe-135	6.3003e+006	2.3311e+017	9.5430e+002	3.5309e+007
Y-90	3.0145e+002	1.1154e+013	4.5660e-002	1.6894e+003
Y-91	3.0006e+003	1.1102e+014	4.5450e-001	1.6817e+004
Y-92	9.9096e+001	3.6665e+012	1.5010e-002	5.5537e+002
Y-93	4.6630e+002	1.7253e+013	7.0630e-002	2.6133e+003
Zr-95	4.2464e+003	1.5712e+014	6.4320e-001	2.3798e+004
Zr-97	1.5904e+003	5.8846e+013	2.4090e-001	8.9133e+003

Buildup

The material reference is : Shield 1

Integration Parameters

X Direction	25
Y Direction	25
Z Direction	25

Results

<u>Energy</u>	<u>Activity</u>	<u>Fluence Rate</u>	<u>Fluence Rate</u>	<u>Exposure Rate</u>	<u>Exposure Rate</u>
<u>MeV</u>	<u>photons/sec</u>	<u>MeV/cm²/sec</u>	<u>MeV/cm²/sec</u>	<u>mR/hr</u>	<u>mR/hr</u>
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.015	1.466e+11	4.502e-127	7.639e-25	3.861e-128	6.552e-26
<u>Energy</u>	<u>Activity</u>	<u>Fluence Rate</u>	<u>Fluence Rate</u>	<u>Exposure Rate</u>	<u>Exposure Rate</u>
<u>MeV</u>	<u>photons/sec</u>	<u>MeV/cm²/sec</u>	<u>MeV/cm²/sec</u>	<u>mR/hr</u>	<u>mR/hr</u>

Page : 3
 DOS File: 2RB24RAD.MS5
 Run Date: August 19, 2005
 Run Time: 2:07:35 PM
 Duration: 00:03:04

EC-RADN-1135
 Page 254

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.02	3.188e+14	8.079e-52	2.613e-21	2.798e-53	9.051e-23
0.03	4.540e+17	6.305e-11	1.278e-10	6.249e-13	1.266e-12
0.04	7.243e+14	2.254e-04	7.538e-04	9.970e-07	3.334e-06
0.05	3.399e+15	2.737e+00	1.471e+01	7.291e-03	3.919e-02
0.06	9.867e+14	2.949e+01	2.332e+02	5.858e-02	4.632e-01
0.08	3.170e+17	2.225e+05	2.768e+06	3.521e+02	4.380e+03
0.1	3.645e+15	1.029e+04	1.633e+05	1.575e+01	2.498e+02
0.15	8.591e+15	1.223e+05	2.191e+06	2.014e+02	3.608e+03
0.2	2.362e+17	8.155e+06	1.343e+08	1.439e+04	2.370e+05
0.3	2.178e+16	2.326e+06	2.911e+07	4.412e+03	5.521e+04
0.4	1.104e+17	2.524e+07	2.469e+08	4.917e+04	4.811e+05
0.5	1.660e+17	6.729e+07	5.352e+08	1.321e+05	1.050e+06
0.6	2.564e+17	1.641e+08	1.100e+09	3.203e+05	2.147e+06
0.8	1.998e+17	2.575e+08	1.328e+09	4.898e+05	2.526e+06
1.0	6.921e+16	1.508e+08	6.412e+08	2.780e+05	1.182e+06
1.5	4.046e+16	2.183e+08	6.765e+08	3.673e+05	1.138e+06
2.0	8.205e+15	8.020e+07	2.072e+08	1.240e+05	3.204e+05
3.0	1.288e+13	2.700e+05	5.627e+05	3.663e+02	7.634e+02
4.0	7.457e+07	2.553e+00	4.690e+00	3.158e-03	5.803e-03
TOTALS:	1.897e+18	9.746e+08	4.904e+09	1.780e+06	9.146e+06

Sensitivity		Variable	(1 of 5)		(30.48 cm)
0.015	1.466e+11	5.900e-253	7.639e-25	5.061e-254	6.552e-26
0.02	3.188e+14	1.064e-106	2.613e-21	3.686e-108	9.051e-23
0.03	4.540e+17	6.125e-29	8.230e-18	6.071e-31	8.157e-20
0.04	7.243e+14	1.976e-13	8.018e-13	8.738e-16	3.546e-15
0.05	3.399e+15	3.671e-06	2.843e-05	9.778e-09	7.574e-08
0.06	9.867e+14	1.036e-03	1.350e-02	2.058e-06	2.682e-05
0.08	3.170e+17	1.167e+02	2.890e+03	1.847e-01	4.573e+00
0.1	3.645e+15	1.605e+01	5.923e+02	2.456e-02	9.061e-01
0.15	8.591e+15	5.823e+02	2.844e+04	9.589e-01	4.683e+01
0.2	2.362e+17	6.688e+04	3.151e+06	1.180e+02	5.561e+03
0.3	2.178e+16	3.664e+04	1.285e+06	6.951e+01	2.437e+03
0.4	1.104e+17	6.081e+05	1.565e+07	1.185e+03	3.050e+04
0.5	1.660e+17	2.218e+06	4.372e+07	4.354e+03	8.581e+04
0.6	2.564e+17	6.912e+06	1.086e+08	1.349e+04	2.119e+05
0.8	1.998e+17	1.568e+07	1.737e+08	2.982e+04	3.303e+05
1.0	6.921e+16	1.202e+07	1.024e+08	2.215e+04	1.888e+05
1.5	4.046e+16	2.719e+07	1.496e+08	4.575e+04	2.517e+05
2.0	8.205e+15	1.312e+07	5.562e+07	2.029e+04	8.601e+04
3.0	1.288e+13	6.069e+04	1.875e+05	8.234e+01	2.544e+02
4.0	7.457e+07	6.874e-01	1.752e+00	8.504e-04	2.167e-03
TOTALS:	1.897e+18	7.791e+07	6.539e+08	1.373e+05	1.193e+06

Sensitivity		Variable	(2 of 5)		(45.72 cm)
0.015	1.466e+11	0.000e+00	7.639e-25	0.000e+00	6.552e-26
0.02	3.188e+14	1.839e-161	2.613e-21	6.371e-163	9.051e-23
0.03	4.540e+17	7.399e-47	8.230e-18	7.333e-49	8.157e-20
0.015	1.466e+11	0.000e+00	7.639e-25	0.000e+00	6.552e-26
0.02	3.188e+14	1.839e-161	2.613e-21	6.371e-163	9.051e-23

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.04	7.243e+14	2.074e-22	3.482e-20	9.173e-25	1.540e-22
0.05	3.399e+15	5.767e-12	5.464e-11	1.536e-14	1.456e-13
0.06	9.867e+14	4.205e-08	7.822e-07	8.351e-11	1.554e-09
0.08	3.170e+17	6.965e-02	2.711e+00	1.102e-04	4.291e-03
0.1	3.645e+15	2.824e-02	1.838e+00	4.321e-05	2.812e-03
0.15	8.591e+15	3.095e+00	3.024e+02	5.096e-03	4.980e-01
0.2	2.362e+17	6.086e+02	5.989e+04	1.074e+00	1.057e+02
0.3	2.178e+16	6.353e+02	4.559e+04	1.205e+00	8.647e+01
0.4	1.104e+17	1.603e+04	8.070e+05	3.123e+01	1.572e+03
0.5	1.660e+17	7.961e+04	2.942e+06	1.563e+02	5.774e+03
0.6	2.564e+17	3.157e+05	9.000e+06	6.162e+02	1.757e+04
0.8	1.998e+17	1.028e+06	1.945e+07	1.955e+03	3.699e+04
1.0	6.921e+16	1.026e+06	1.415e+07	1.891e+03	2.608e+04
1.5	4.046e+16	3.592e+06	2.954e+07	6.044e+03	4.970e+04
2.0	8.205e+15	2.261e+06	1.361e+07	3.497e+03	2.105e+04
3.0	1.288e+13	1.425e+04	5.874e+04	1.934e+01	7.969e+01
4.0	7.457e+07	1.923e-01	6.292e-01	2.379e-04	7.784e-04
TOTALS:	1.897e+18	8.334e+06	8.966e+07	1.421e+04	1.590e+05

Energy	Sensitivity	Variable		(3 of 5)	
		Variable	Variable	(3 of 5)	(60.96 cm)
0.015	1.466e+11	0.000e+00	7.639e-25	0.000e+00	6.552e-26
0.02	3.188e+14	3.572e-216	2.613e-21	1.237e-217	9.051e-23
0.03	4.540e+17	9.846e-65	8.230e-18	9.758e-67	8.157e-20
0.04	7.243e+14	2.364e-31	3.482e-20	1.046e-33	1.540e-22
0.05	3.399e+15	9.750e-18	9.940e-17	2.597e-20	2.648e-19
0.06	9.867e+14	1.826e-12	4.930e-11	3.627e-15	9.793e-14
0.08	3.170e+17	4.420e-05	2.419e-03	6.994e-08	3.828e-06
0.1	3.645e+15	5.267e-05	5.280e-03	8.059e-08	8.078e-06
0.15	8.591e+15	1.736e-02	2.913e+00	2.859e-05	4.796e-03
0.2	2.362e+17	5.833e+00	1.023e+03	1.029e-02	1.805e+00
0.3	2.178e+16	1.156e+01	1.451e+03	2.193e-02	2.753e+00
0.4	1.104e+17	4.425e+02	3.756e+04	8.621e-01	7.318e+01
0.5	1.660e+17	2.986e+03	1.798e+05	5.862e+00	3.529e+02
0.6	2.564e+17	1.504e+04	6.760e+05	2.936e+01	1.320e+03
0.8	1.998e+17	7.012e+04	1.986e+06	1.334e+02	3.778e+03
1.0	6.921e+16	9.093e+04	1.822e+06	1.676e+02	3.359e+03
1.5	4.046e+16	4.907e+05	5.510e+06	8.256e+02	9.270e+03
2.0	8.205e+15	4.018e+05	3.180e+06	6.213e+02	4.918e+03
3.0	1.288e+13	3.436e+03	1.779e+04	4.662e+00	2.413e+01
4.0	7.457e+07	5.509e-02	2.200e-01	6.815e-05	2.721e-04
TOTALS:	1.897e+18	1.075e+06	1.341e+07	1.789e+03	2.310e+04

Energy	Sensitivity	Variable		(4 of 5)	
		Variable	Variable	(4 of 5)	(76.2 cm)
0.015	1.466e+11	0.000e+00	7.639e-25	0.000e+00	6.552e-26
0.02	3.188e+14	7.402e-271	2.613e-21	2.564e-272	9.051e-23
0.03	4.540e+17	1.385e-82	8.230e-18	1.373e-84	8.157e-20
0.04	7.243e+14	2.829e-40	3.482e-20	1.251e-42	1.540e-22
0.05	3.399e+15	1.721e-23	5.341e-19	4.585e-26	1.423e-21
0.03	4.540e+17	1.385e-82	8.230e-18	1.373e-84	8.157e-20
0.04	7.243e+14	2.829e-40	3.482e-20	1.251e-42	1.540e-22

Page : 5
 DOS File: 2RB24RAD.MS5
 Run Date: August 19, 2005
 Run Time: 2:07:35 PM
 Duration: 00:03:04

EC-RADN-1135
 Page 256

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec		Exposure Rate mR/hr	
		No Buildup	With Buildup	No Buildup	With Buildup
0.06	9.867e+14	8.253e-17	3.305e-15	1.639e-19	6.564e-18
0.08	3.170e+17	2.909e-08	2.068e-06	4.604e-11	3.272e-09
0.1	3.645e+15	1.017e-07	1.446e-05	1.556e-10	2.213e-08
0.15	8.591e+15	1.007e-04	2.618e-02	1.658e-07	4.311e-05
0.2	2.362e+17	5.769e-02	1.626e+01	1.018e-04	2.871e-02
0.3	2.178e+16	2.167e-01	4.322e+01	4.112e-04	8.198e-02
0.4	1.104e+17	1.257e+01	1.634e+03	2.448e-02	3.185e+00
0.5	1.660e+17	1.151e+02	1.032e+04	2.260e-01	2.025e+01
0.6	2.564e+17	7.361e+02	4.800e+04	1.437e+00	9.369e+01
0.8	1.998e+17	4.905e+03	1.940e+05	9.330e+00	3.691e+02
1.0	6.921e+16	8.254e+03	2.240e+05	1.522e+01	4.130e+02
1.5	4.046e+16	6.849e+04	9.894e+05	1.152e+02	1.665e+03
2.0	8.205e+15	7.282e+04	7.217e+05	1.126e+02	1.116e+03
3.0	1.288e+13	8.432e+02	5.271e+03	1.144e+00	7.151e+00
4.0	7.457e+07	1.604e-02	7.574e-02	1.984e-05	9.370e-05
TOTALS:	1.897e+18	1.562e+05	2.194e+06	2.552e+02	3.687e+03

Sensitivity	Variable	(5 of 5)			
		(5 of 5)	(91.44 cm)	(91.44 cm)	(91.44 cm)
0.015	1.466e+11	0.000e+00	7.639e-25	0.000e+00	6.552e-26
0.02	3.188e+14	0.000e+00	2.613e-21	0.000e+00	9.051e-23
0.03	4.540e+17	2.020e-100	8.230e-18	2.002e-102	8.157e-20
0.04	7.243e+14	3.493e-49	3.482e-20	1.545e-51	1.540e-22
0.05	3.399e+15	3.128e-29	5.341e-19	8.332e-32	1.423e-21
0.06	9.867e+14	3.832e-21	1.144e-18	7.611e-24	2.273e-21
0.08	3.170e+17	1.963e-11	1.703e-09	3.106e-14	2.694e-12
0.1	3.645e+15	2.011e-10	3.870e-08	3.077e-13	5.921e-11
0.15	8.591e+15	5.967e-07	2.264e-04	9.826e-10	3.728e-07
0.2	2.362e+17	5.828e-04	2.467e-01	1.029e-06	4.354e-04
0.3	2.178e+16	4.146e-03	1.224e+00	7.865e-06	2.323e-03
0.4	1.104e+17	3.638e-01	6.798e+01	7.089e-04	1.325e-01
0.5	1.660e+17	4.521e+00	5.679e+02	8.875e-03	1.115e+00
0.6	2.564e+17	3.668e+01	3.281e+03	7.159e-02	6.404e+00
0.8	1.998e+17	3.491e+02	1.831e+04	6.640e-01	3.483e+01
1.0	6.921e+16	7.618e+02	2.668e+04	1.404e+00	4.917e+01
1.5	4.046e+16	9.705e+03	1.735e+05	1.633e+01	2.920e+02
2.0	8.205e+15	1.339e+04	1.605e+05	2.070e+01	2.482e+02
3.0	1.288e+13	2.096e+02	1.542e+03	2.843e-01	2.092e+00
4.0	7.457e+07	4.724e-03	2.579e-02	5.845e-06	3.191e-05
TOTALS:	1.897e+18	2.445e+04	3.845e+05	3.946e+01	6.339e+02

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.

Date 08/19/2005

Designed By T.F. Mackay

Checked By M.M.Waselus

PROJECT

Justification Of AST 60 Isotope

RADTRAD Source Term For Direct

Shine Dose Calculations

Calc. No. EC-RADN-1135

Sh. No. 257

ATTACHMENT 3
MICROSHIELD COMPUTER CODE OUTPUTS
AST DBA-LOCA LIQUID SOURCE
ADDITION OF ISOTOPES TO RADTRAD SOURCE

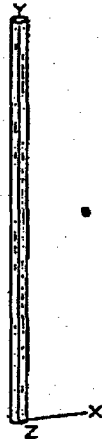
MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1SP1RADP.MS5
 Run Date: August 18, 2005
 Run Time: 10:32:46 AM
 Duration: 00:00:22

EC-RADN-1135
 Page 258

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
Description: 1 Hour, RADTRAD + Cs-138, Rb-88, Br-84
Geometry: 7 - Cylinder Volume - Side Shields



	Source Dimensions		
Height	914.4 cm	30 ft	
Radius	16.828 cm	6.6 in	

	Dose Points		
	<u>X</u>	<u>Y</u>	<u>Z</u>
# 1	152.4 cm	457.2 cm	0 cm
	5 ft 0.0 in	15 ft	0.0 in

	Shields		
<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	8.13e+05 cm ³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded
Library : Grove

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Am-241	1.1038e-003	4.0841e+007	1.3570e-003	5.0207e+001
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	1.4634e+003	5.4145e+013	1.7990e+003	6.6563e+007
Ba-140	2.1280e+003	7.8734e+013	2.6160e+003	9.6792e+007
Br-84	4.6984e+002	1.7384e+013	5.7760e+002	2.1371e+007
Ce-141	1.9539e+001	7.2294e+011	2.4020e+001	8.8874e+005
Ce-143	1.7871e+001	6.6124e+011	2.1970e+001	8.1289e+005
Ce-144	1.6464e+001	6.0917e+011	2.0240e+001	7.4888e+005
Cm-242	2.9032e-001	1.0742e+010	3.5690e-001	1.3205e+004
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2172e-001	1.1903e+010	3.9550e-001	1.4633e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-136	3.9859e+002	1.4748e+013	4.9000e+002	1.8130e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
Cs-138	4.8636e+003	1.7995e+014	5.9790e+003	2.2122e+008
I-131	6.9834e+003	2.5839e+014	8.5850e+003	3.1764e+008
I-132	1.0176e+004	3.7652e+014	1.2510e+004	4.6287e+008
I-133	1.4219e+004	5.2610e+014	1.7480e+004	6.4676e+008
I-134	1.1421e+004	4.2257e+014	1.4040e+004	5.1948e+008
I-135	1.2421e+004	4.5959e+014	1.5270e+004	5.6499e+008
La-140	9.1105e+000	3.3709e+011	1.1200e+001	4.1440e+005
La-141	6.9834e+000	2.5839e+011	8.5850e+000	3.1764e+005
La-142	5.3866e+000	1.9930e+011	6.6220e+000	2.4501e+005
Mo-99	1.2421e+004	4.5959e+014	1.5270e+004	5.6499e+008
I-135	1.2421e+004	4.5959e+014	1.5270e+004	5.6499e+008
La-140	9.1105e+000	3.3709e+011	1.1200e+001	4.1440e+005

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nd-147	3.1423e+000	1.1627e+011	3.8630e+000	1.4293e+005
Np-239	2.2947e+002	8.4904e+012	2.8210e+002	1.0438e+007
Pr-143	7.0167e+000	2.5962e+011	8.6260e+000	3.1916e+005
Pr-144	6.5840e+000	2.4361e+011	8.0940e+000	2.9948e+005
Pu-238	4.9628e-002	1.8362e+009	6.1010e-002	2.2574e+003
Pu-239	5.2540e-003	1.9440e+008	6.4590e-003	2.3898e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1762e+001	4.3521e+011	1.4460e+001	5.3502e+005
Rb-88	3.5124e+003	1.2996e+014	4.3180e+003	1.5977e+008
Rh-103m	9.3139e+001	3.4461e+012	1.1450e+002	4.2365e+006
Rh-105	6.0683e+001	2.2453e+012	7.4600e+001	2.7602e+006
Rh-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Ru-103	9.3139e+001	3.4461e+012	1.1450e+002	4.2365e+006
Ru-105	5.6949e+001	2.1071e+012	7.0010e+001	2.5904e+006
Ru-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Sb-127	1.0144e+002	3.7531e+012	1.2470e+002	4.6139e+006
Sb-129	3.2668e+002	1.2087e+013	4.0160e+002	1.4859e+007
Sr-89	1.1225e+003	4.1534e+013	1.3800e+003	5.1060e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	1.3218e+003	4.8908e+013	1.6250e+003	6.0125e+007
Sr-92	1.1722e+003	4.3370e+013	1.4410e+003	5.3317e+007
Tc-99m	9.7287e+001	3.5996e+012	1.1960e+002	4.4252e+006
Te-127	1.0144e+002	3.7531e+012	1.2470e+002	4.6139e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	3.4750e+002	1.2858e+013	4.2720e+002	1.5806e+007
Te-129m	7.2494e+001	2.6823e+012	8.9120e+001	3.2974e+006
Te-131m	2.2947e+002	8.4904e+012	2.8210e+002	1.0438e+007
Te-132	1.6627e+003	6.1519e+013	2.0440e+003	7.5628e+007
Y-90	5.9308e-001	2.1944e+010	7.2910e-001	2.6977e+004
Y-91	5.8535e+000	2.1658e+011	7.1960e+000	2.6625e+005
Y-92	5.9528e+000	2.2025e+011	7.3180e+000	2.7077e+005
Y-93	4.3893e+000	1.6240e+011	5.3960e+000	1.9965e+005
Zr-95	8.3378e+000	3.0850e+011	1.0250e+001	3.7925e+005
Zr-97	7.9310e+000	2.9345e+011	9.7500e+000	3.6075e+005

Buildup

The material reference is : Source

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Results

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u>		<u>Exposure Rate</u>	
		<u>MeV/cm²/sec</u> No Buildup	<u>MeV/cm²/sec</u> With Buildup	<u>mR/hr</u> No Buildup	<u>mR/hr</u> With Buildup
0.015	4.042e+08	1.910e-187	1.482e-25	1.638e-188	1.271e-26
0.02	7.059e+11	5.885e-82	7.839e-22	2.039e-83	2.715e-23
0.03	8.749e+13	1.339e-22	2.105e-18	1.327e-24	2.086e-20
0.015	4.042e+08	1.910e-187	1.482e-25	1.638e-188	1.271e-26
0.02	7.059e+11	5.885e-82	7.839e-22	2.039e-83	2.715e-23

Page : 3
 DOS File: 1SP1RADP.MS5
 Run Date: August 18, 2005
 Run Time: 10:32:46 AM
 Duration: 00:00:22

EC-RADN-1135
 Page 260

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		No Buildup	With Buildup	No Buildup	With Buildup
0.04	2.305e+12	4.272e-09	6.257e-07	1.889e-11	2.767e-09
0.05	8.088e+12	7.321e-03	1.499e+00	1.950e-05	3.992e-03
0.06	2.067e+12	8.282e-01	1.474e+02	1.645e-03	2.929e-01
0.08	8.077e+12	6.250e+02	5.659e+04	9.891e-01	8.955e+01
0.1	9.578e+12	6.359e+03	3.107e+05	9.728e+00	4.754e+02
0.15	4.502e+13	2.301e+05	4.458e+06	3.789e+02	7.342e+03
0.2	8.823e+13	1.032e+06	1.287e+07	1.821e+03	2.272e+04
0.3	6.744e+13	1.888e+06	1.402e+07	3.581e+03	2.659e+04
0.4	3.156e+14	1.522e+07	8.526e+07	2.966e+04	1.661e+05
0.5	7.531e+14	5.440e+07	2.503e+08	1.068e+05	4.913e+05
0.6	7.279e+14	7.265e+07	2.892e+08	1.418e+05	5.644e+05
0.8	1.308e+15	2.158e+08	6.963e+08	4.104e+05	1.324e+06
1.0	5.812e+14	1.409e+08	3.945e+08	2.596e+05	7.272e+05
1.5	5.699e+14	2.729e+08	6.098e+08	4.591e+05	1.026e+06
2.0	1.595e+14	1.210e+08	2.380e+08	1.871e+05	3.680e+05
3.0	2.054e+13	2.868e+07	4.865e+07	3.892e+04	6.601e+04
4.0	1.249e+12	2.616e+06	4.072e+06	3.236e+03	5.038e+03
5.0	1.863e+11	5.255e+05	7.688e+05	6.024e+02	8.814e+02
TOTALS:	4.756e+15	9.278e+08	2.649e+09	1.643e+06	4.797e+06

MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1SP8RADP.MS5
 Run Date: August 18, 2005
 Run Time: 10:33:32 AM
 Duration: 00:00:22

EC-RADN-1135
 Page 261

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 1 Hour, RADTRAD + Cs-138, Rb-88, Br-84
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 152.4 cm 457.2 cm Z 0 cm
 5 ft 0.0 in 15 ft 0.0 in

Shields			
Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded

Nuclide	curies	becquerels	µCi/cm ³	Bq/cm ³
Am-241	1.1071e-003	4.0963e+007	1.3610e-003	5.0357e+001
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	4.6968e+001	1.7378e+012	5.7740e+001	2.1364e+006
Ba-140	2.0946e+003	7.7500e+013	2.5750e+003	9.5275e+007
Br-84	4.9701e-002	1.8389e+009	6.1100e-002	2.2607e+003
Ce-141	1.9449e+001	7.1963e+011	2.3910e+001	8.8467e+005
Ce-143	1.5463e+001	5.7215e+011	1.9010e+001	7.0337e+005
Ce-144	1.6464e+001	6.0917e+011	2.0240e+001	7.4888e+005
Cm-242	2.9032e-001	1.0742e+010	3.5690e-001	1.3205e+004
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2090e-001	1.1873e+010	3.9450e-001	1.4597e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-136	3.9240e+002	1.4519e+013	4.8240e+002	1.7849e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
Cs-138	6.2350e-001	2.3070e+010	7.6650e-001	2.8361e+004
I-131	6.8337e+003	2.5285e+014	8.4010e+003	3.1084e+008
I-132	9.6799e+003	3.5816e+014	1.1900e+004	4.4030e+008
I-133	1.1372e+004	4.2076e+014	1.3980e+004	5.1726e+008
I-134	9.9728e+001	3.6899e+012	1.2260e+002	4.5362e+006
I-135	5.9357e+003	2.1962e+014	7.2970e+003	2.6999e+008
La-140	9.0454e+000	3.3468e+011	1.1120e+001	4.1144e+005
La-141	2.0450e+000	7.5665e+010	2.5140e+000	9.3018e+004
La-142	2.2182e-001	8.2075e+009	2.7270e-001	1.0090e+004
Mo-99	1.0103e+002	3.7381e+012	1.2420e+002	4.5954e+006
I-135	5.9357e+003	2.1962e+014	7.2970e+003	2.6999e+008
La-140	9.0454e+000	3.3468e+011	1.1120e+001	4.1144e+005

Page : 2
 DOS File: 1SP8RADP.MS5
 Run Date: August 18, 2005
 Run Time: 10:33:32 AM
 Duration: 00:00:22

EC-RADN-1135
 Page 262

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nd-147	3.0862e+000	1.1419e+011	3.7940e+000	1.4038e+005
Np-239	2.1036e+002	7.7832e+012	2.5860e+002	9.5682e+006
Pr-143	7.0167e+000	2.5962e+011	8.6260e+000	3.1916e+005
Pr-144	6.5840e+000	2.4361e+011	8.0940e+000	2.9948e+005
Pu-238	4.9628e-002	1.8362e+009	6.1010e-002	2.2574e+003
Pu-239	5.2540e-003	1.9440e+008	6.4590e-003	2.3898e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1640e+001	4.3069e+011	1.4310e+001	5.2947e+005
Rb-88	6.4424e+002	2.3837e+013	7.9200e+002	2.9304e+007
Rh-103m	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Rh-105	5.6949e+001	2.1071e+012	7.0010e+001	2.5904e+006
Rh-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Ru-103	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Ru-105	1.9124e+001	7.0759e+011	2.3510e+001	8.6987e+005
Ru-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Sb-127	9.7287e+001	3.5996e+012	1.1960e+002	4.4252e+006
Sb-129	1.0811e+002	3.9999e+012	1.3290e+002	4.9173e+006
Sr-89	1.1225e+003	4.1534e+013	1.3800e+003	5.1060e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	7.9473e+002	2.9405e+013	9.7700e+002	3.6149e+007
Sr-92	1.9539e+002	7.2294e+012	2.4020e+002	8.8874e+006
Tc-99m	9.4359e+001	3.4913e+012	1.1600e+002	4.2920e+006
Te-127	1.0062e+002	3.7230e+012	1.2370e+002	4.5769e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	1.6627e+002	6.1519e+012	2.0440e+002	7.5628e+006
Te-129m	7.2242e+001	2.6729e+012	8.8810e+001	3.2860e+006
Te-131m	1.9539e+002	7.2294e+012	2.4020e+002	8.8874e+006
Te-132	1.5626e+003	5.7817e+013	1.9210e+003	7.1077e+007
Y-90	5.8917e-001	2.1799e+010	7.2430e-001	2.6799e+004
Y-91	5.8202e+000	2.1535e+011	7.1550e+000	2.6473e+005
Y-92	2.8430e+000	1.0519e+011	3.4950e+000	1.2932e+005
Y-93	2.7136e+000	1.0040e+011	3.3360e+000	1.2343e+005
Zr-95	8.3052e+000	3.0729e+011	1.0210e+001	3.7777e+005
Zr-97	5.9389e+000	2.1974e+011	7.3010e+000	2.7014e+005

Buildup
 The material reference is : Source

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec No Buildup	Fluence Rate		Exposure Rate	
			MeV/cm ² /sec With Buildup		mR/hr No Buildup	mR/hr With Buildup
0.015	3.466e+08	1.638e-187	1.271e-25		1.405e-188	1.090e-26
0.02	6.789e+11	5.660e-82	7.539e-22		1.961e-83	2.612e-23
0.03	7.273e+13	1.113e-22	1.749e-18		1.103e-24	1.734e-20
0.015	3.466e+08	1.638e-187	1.271e-25		1.405e-188	1.090e-26
0.02	6.789e+11	5.660e-82	7.539e-22		1.961e-83	2.612e-23

Page : 3
 DOS File: 1SP8RADP.MS5
 Run Date: August 18, 2005
 Run Time: 10:33:32 AM
 Duration: 00:00:22

EC-RADN-1135
 Page 263

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.04	1.553e+12	2.878e-09	4.216e-07	1.273e-11	1.865e-09
0.05	7.602e+12	6.881e-03	1.409e+00	1.833e-05	3.752e-03
0.06	2.018e+12	8.086e-01	1.439e+02	1.606e-03	2.859e-01
0.08	7.859e+12	6.081e+02	5.506e+04	9.623e-01	8.713e+01
0.1	8.560e+12	5.682e+03	2.777e+05	8.693e+00	4.248e+02
0.15	1.271e+13	6.497e+04	1.259e+06	1.070e+02	2.073e+03
0.2	6.160e+13	7.203e+05	8.989e+06	1.271e+03	1.586e+04
0.3	5.271e+13	1.475e+06	1.096e+07	2.799e+03	2.079e+04
0.4	2.330e+14	1.123e+07	6.293e+07	2.189e+04	1.226e+05
0.5	5.033e+14	3.636e+07	1.673e+08	7.137e+04	3.284e+05
0.6	5.541e+14	5.530e+07	2.201e+08	1.079e+05	4.296e+05
0.8	4.805e+14	7.929e+07	2.559e+08	1.508e+05	4.867e+05
1.0	2.388e+14	5.787e+07	1.621e+08	1.067e+05	2.988e+05
1.5	1.952e+14	9.345e+07	2.088e+08	1.572e+05	3.513e+05
2.0	4.189e+13	3.177e+07	6.249e+07	4.913e+04	9.664e+04
3.0	6.922e+11	9.665e+05	1.639e+06	1.311e+03	2.224e+03
4.0	3.471e+08	7.266e+02	1.131e+03	8.989e-01	1.399e+00
5.0	3.418e+10	9.638e+04	1.410e+05	1.105e+02	1.617e+02
TOTALS:	2.476e+15	3.686e+08	1.163e+09	6.707e+05	2.156e+06

MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1SP24RDP.MS5
 Run Date: August 18, 2005
 Run Time: 10:33:08 AM
 Duration: 00:00:23

EC-RADN-1135
 Page 264

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 24 Hour, RADTRAD + Cs-138, Rb-88, Br-84
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 152.4 cm 457.2 cm Z 0 cm
 5 ft 0.0 in 15 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded

Nuclide	curies	becquerels	µCi/cm ³	Bq/cm ³
Am-241	1.1103e-003	4.1081e+007	1.3649e-003	5.0503e+001
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	1.8042e-002	6.6756e+008	2.2180e-002	8.2066e+002
Ba-140	2.0198e+003	7.4732e+013	2.4830e+003	9.1871e+007
Br-84	4.0591e-011	1.5019e+000	4.9900e-011	1.8463e-006
Ce-141	1.9205e+001	7.1060e+011	2.3610e+001	8.7357e+005
Ce-143	1.1055e+001	4.0902e+011	1.3590e+001	5.0283e+005
Ce-144	1.6375e+001	6.0586e+011	2.0130e+001	7.4481e+005
Cm-242	2.8999e-001	1.0730e+010	3.5650e-001	1.3191e+004
Cm-244	1.6993e-002	6.2873e+008	2.0890e-002	7.7293e+002
Co-58	3.1879e-001	1.1795e+010	3.9190e-001	1.4500e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-135				
Cs-136	3.7866e+002	1.4010e+013	4.6550e+002	1.7223e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
Cs-138	6.6092e-011	2.4454e+000	8.1250e-011	3.0063e-006
I-131	6.5344e+003	2.4177e+014	8.0330e+003	2.9722e+008
I-132	8.3784e+003	3.1000e+014	1.0300e+004	3.8110e+008
I-133	6.6840e+003	2.4731e+014	8.2170e+003	3.0403e+008
I-134	3.7312e-004	1.3806e+007	4.5870e-004	1.6972e+001
I-135	1.0973e+003	4.0601e+013	1.3490e+003	4.9913e+007
La-140	8.8421e+000	3.2716e+011	1.0870e+001	4.0219e+005
La-141	1.2071e-001	4.4664e+009	1.4840e-001	5.4908e+003
La-142	1.4894e-004	5.5108e+006	1.8310e-004	6.7347e+000
I-134	3.7312e-004	1.3806e+007	4.5870e-004	1.6972e+001
I-135	1.0973e+003	4.0601e+013	1.3490e+003	4.9913e+007

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Mo-99	8.5248e+001	3.1542e+012	1.0480e+002	3.8776e+006
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nd-147	2.9593e+000	1.0949e+011	3.6380e+000	1.3461e+005
Np-239	1.7294e+002	6.3987e+012	2.1260e+002	7.8662e+006
Pr-143	6.9500e+000	2.5715e+011	8.5440e+000	3.1613e+005
Pr-144	6.5506e+000	2.4237e+011	8.0530e+000	2.9796e+005
Pu-238	4.9709e-002	1.8392e+009	6.1110e-002	2.2611e+003
Pu-239	5.2621e-003	1.9470e+008	6.4690e-003	2.3935e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1347e+001	4.1986e+011	1.3950e+001	5.1615e+005
Rb-88	1.2926e+001	4.7825e+011	1.5890e+001	5.8793e+005
Rh-103m	9.1431e+001	3.3829e+012	1.1240e+002	4.1588e+006
Rh-105	4.3641e+001	1.6147e+012	5.3650e+001	1.9851e+006
Rh-106	3.7199e+001	1.3763e+012	4.5730e+001	1.6920e+006
Ru-103	9.1837e+001	3.3980e+012	1.1290e+002	4.1773e+006
Ru-105	1.5716e+000	5.8148e+010	1.9320e+000	7.1484e+004
Ru-106	3.7199e+001	1.3763e+012	4.5730e+001	1.6920e+006
Sb-127	8.6469e+001	3.1993e+012	1.0630e+002	3.9331e+006
Sb-129	8.7282e+000	3.2294e+011	1.0730e+001	3.9701e+005
Sr-89	1.1055e+003	4.0902e+013	1.3590e+003	5.0283e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	2.4777e+002	9.1676e+012	3.0460e+002	1.1270e+007
Sr-92	3.2586e+000	1.2057e+011	4.0060e+000	1.4822e+005
Tc-99m	8.2320e+001	3.0458e+012	1.0120e+002	3.7444e+006
Te-127	9.3952e+001	3.4762e+012	1.1550e+002	4.2735e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	5.5452e+001	2.0517e+012	6.8170e+001	2.5223e+006
Te-129m	7.1412e+001	2.6422e+012	8.7790e+001	3.2482e+006
Te-131m	1.3471e+002	4.9841e+012	1.6560e+002	6.1272e+006
Te-132	1.3552e+003	5.0142e+013	1.6660e+003	6.1642e+007
Y-90	5.8470e-001	2.1634e+010	7.1880e-001	2.6596e+004
Y-91	5.8202e+000	2.1535e+011	7.1550e+000	2.6473e+005
Y-92	1.9222e-001	7.1120e+009	2.3630e-001	8.7431e+003
Y-93	9.0454e-001	3.3468e+010	1.1120e+000	4.1144e+004
Zr-95	8.2401e+000	3.0489e+011	1.0130e+001	3.7481e+005
Zr-97	3.0854e+000	1.1416e+011	3.7930e+000	1.4034e+005

Buildup

The material reference is : Source

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Results

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u>		<u>Exposure Rate</u>	
		<u>MeV/cm²/sec</u> No Buildup	<u>MeV/cm²/sec</u> With Buildup	<u>mR/hr</u> No Buildup	<u>mR/hr</u> With Buildup
0.015	2.845e+08	1.344e-187	1.043e-25	1.153e-188	8.944e-27
0.02	6.183e+11	5.156e-82	6.867e-22	1.786e-83	2.379e-23
0.015	2.845e+08	1.344e-187	1.043e-25	1.153e-188	8.944e-27

Page : 3
 DOS File: 1SP24RDP.MS5
 Run Date: August 18, 2005
 Run Time: 10:33:08 AM
 Duration: 00:00:23

EC-RADN-1135
 Page 266

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		No Buildup	With Buildup	No Buildup	With Buildup
0.03	6.381e+13	9.769e-23	1.535e-18	9.681e-25	1.521e-20
0.04	1.405e+12	2.603e-09	3.813e-07	1.151e-11	1.686e-09
0.05	6.594e+12	5.969e-03	1.222e+00	1.590e-05	3.255e-03
0.06	1.914e+12	7.671e-01	1.366e+02	1.524e-03	2.712e-01
0.08	7.437e+12	5.755e+02	5.210e+04	9.107e-01	8.245e+01
0.1	7.069e+12	4.692e+03	2.293e+05	7.179e+00	3.508e+02
0.15	1.128e+13	5.764e+04	1.117e+06	9.492e+01	1.839e+03
0.2	5.004e+13	5.852e+05	7.302e+06	1.033e+03	1.289e+04
0.3	4.150e+13	1.162e+06	8.627e+06	2.204e+03	1.636e+04
0.4	2.115e+14	1.020e+07	5.713e+07	1.987e+04	1.113e+05
0.5	3.218e+14	2.325e+07	1.070e+08	4.564e+04	2.100e+05
0.6	4.833e+14	4.824e+07	1.920e+08	9.416e+04	3.747e+05
0.8	3.874e+14	6.391e+07	2.063e+08	1.216e+05	3.923e+05
1.0	1.341e+14	3.249e+07	9.102e+07	5.990e+04	1.678e+05
1.5	7.818e+13	3.743e+07	8.364e+07	6.298e+04	1.407e+05
2.0	1.498e+13	1.136e+07	2.235e+07	1.757e+04	3.456e+04
3.0	2.521e+10	3.520e+04	5.971e+04	4.776e+01	8.101e+01
4.0	1.447e+05	3.028e-01	4.715e-01	3.747e-04	5.833e-04
5.0	6.857e+08	1.934e+03	2.829e+03	2.217e+00	3.243e+00
TOTALS:	1.823e+15	2.287e+08	7.768e+08	4.251e+05	1.463e+06

MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2SP1RADP.MS5
 Run Date: August 18, 2005
 Run Time: 10:33:54 AM
 Duration: 00:01:28

EC-RADN-1135
 Page 267

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
Description: 1 Hour, RADTRAD + Cs-138, Br-84, Rb-88
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	914.4 cm	30 ft
Radius	16.828 cm	6.6 in

Dose Points

	<u>X</u>	<u>Y</u>	<u>Z</u>
# 1	304.8 cm 10 ft 0.0 in	457.2 cm 15 ft	0 cm 0.0 in

Shields

<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	8.13e+05 cm ³	Water	1
Shield 1	15.24 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0.015
Photons < 0.015 : Excluded

Library : Grove

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Am-241	1.1038e-003	4.0842e+007	1.3570e-003	5.0209e+001
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	1.4634e+003	5.4145e+013	1.7990e+003	6.6563e+007
Ba-140	2.1280e+003	7.8734e+013	2.6160e+003	9.6792e+007
Br-84	4.6984e+002	1.7384e+013	5.7760e+002	2.1371e+007
Ce-141	1.9539e+001	7.2294e+011	2.4020e+001	8.8874e+005
Ce-143	1.7871e+001	6.6124e+011	2.1970e+001	8.1289e+005
Ce-144	1.6464e+001	6.0917e+011	2.0240e+001	7.4888e+005
Cm-242	2.9032e-001	1.0742e+010	3.5690e-001	1.3205e+004
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2172e-001	1.1903e+010	3.9550e-001	1.4633e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-136	3.9859e+002	1.4748e+013	4.9000e+002	1.8130e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
Cs-138	4.8636e+003	1.7995e+014	5.9790e+003	2.2122e+008
I-130	1.6358e+002	6.0526e+012	2.0110e+002	7.4407e+006
I-131	6.9834e+003	2.5839e+014	8.5850e+003	3.1764e+008
I-132	1.0176e+004	3.7652e+014	1.2510e+004	4.6287e+008
I-133	1.4219e+004	5.2610e+014	1.7480e+004	6.4676e+008
I-134	1.1421e+004	4.2257e+014	1.4040e+004	5.1948e+008
I-135	1.2421e+004	4.5959e+014	1.5270e+004	5.6499e+008
La-140	9.1105e+000	3.3709e+011	1.1200e+001	4.1440e+005
La-141	6.9834e+000	2.5839e+011	8.5850e+000	3.1764e+005
I-133	1.4219e+004	5.2610e+014	1.7480e+004	6.4676e+008
La-141	3.1431e+004	4.3357e+014	3.4040e+004	5.1948e+008

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
La-142	5.3866e+000	1.9930e+011	6.6220e+000	2.4501e+005
Mo-99	1.0892e+002	4.0300e+012	1.3390e+002	4.9543e+006
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nd-147	3.1423e+000	1.1627e+011	3.8630e+000	1.4293e+005
Np-239	2.2947e+002	8.4904e+012	2.8210e+002	1.0438e+007
Pr-143	7.0167e+000	2.5962e+011	8.6260e+000	3.1916e+005
Pr-144	6.5840e+000	2.4361e+011	8.0940e+000	2.9948e+005
Pu-238	4.9628e-002	1.8362e+009	6.1010e-002	2.2574e+003
Pu-239	5.2540e-003	1.9440e+008	6.4590e-003	2.3898e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1762e+001	4.3521e+011	1.4460e+001	5.3502e+005
Rb-88	3.5124e+003	1.2996e+014	4.3180e+003	1.5977e+008
Rh-103m	9.3139e+001	3.4461e+012	1.1450e+002	4.2365e+006
Rh-105	6.0683e+001	2.2453e+012	7.4600e+001	2.7602e+006
Rh-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Ru-103	9.3139e+001	3.4461e+012	1.1450e+002	4.2365e+006
Ru-105	5.6949e+001	2.1071e+012	7.0010e+001	2.5904e+006
Ru-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Sb-127	1.0144e+002	3.7531e+012	1.2470e+002	4.6139e+006
Sb-129	3.2668e+002	1.2087e+013	4.0160e+002	1.4859e+007
Sr-89	1.1225e+003	4.1534e+013	1.3800e+003	5.1060e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	1.3218e+003	4.8908e+013	1.6250e+003	6.0125e+007
Sr-92	1.1722e+003	4.3370e+013	1.4410e+003	5.3317e+007
Tc-99m	9.7287e+001	3.5996e+012	1.1960e+002	4.4252e+006
Te-127	1.0144e+002	3.7531e+012	1.2470e+002	4.6139e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	3.4750e+002	1.2858e+013	4.2720e+002	1.5806e+007
Te-129m	7.2494e+001	2.6823e+012	8.9120e+001	3.2974e+006
Te-131m	2.2947e+002	8.4904e+012	2.8210e+002	1.0438e+007
Te-132	1.6627e+003	6.1519e+013	2.0440e+003	7.5628e+007
Y-90	5.9308e-001	2.1944e+010	7.2910e-001	2.6977e+004
Y-91	5.8535e+000	2.1658e+011	7.1960e+000	2.6625e+005
Y-92	5.9528e+000	2.2025e+011	7.3180e+000	2.7077e+005
Y-93	4.3893e+000	1.6240e+011	5.3960e+000	1.9965e+005
Zr-95	8.3378e+000	3.0850e+011	1.0250e+001	3.7925e+005
Zr-97	7.9310e+000	2.9345e+011	9.7500e+000	3.6075e+005

Buildup
 The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Results

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u>		<u>Exposure Rate</u>	
		<u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>mR/hr</u> <u>No Buildup</u>	<u>mR/hr</u> <u>With Buildup</u>
0.015	4.042e+08	1.191e-313	3.309e-26	1.022e-314	2.838e-27
<u>MeV</u>	<u>photons/sec</u>	<u>MeV/cm²/sec</u> <u>No Buildup</u>	<u>MeV/cm²/sec</u> <u>With Buildup</u>	<u>mR/hr</u> <u>No Buildup</u>	<u>mR/hr</u> <u>With Buildup</u>

Page : 3
 DOS File: 2SP1RADP.MS5
 Run Date: August 18, 2005
 Run Time: 10:33:54 AM
 Duration: 00:01:28

EC-RADN-1135
 Page 269

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.02	7.059e+11	4.582e-137	9.094e-23	1.587e-138	3.150e-24
0.03	8.758e+13	7.352e-41	2.495e-20	7.286e-43	2.473e-22
0.04	2.305e+12	1.951e-18	7.960e-18	8.630e-21	3.521e-20
0.05	8.088e+12	4.711e-09	3.774e-08	1.255e-11	1.005e-10
0.06	2.067e+12	1.295e-05	1.660e-04	2.573e-08	3.297e-07
0.08	8.077e+12	1.293e-01	2.724e+00	2.046e-04	4.310e-03
0.1	9.578e+12	3.607e+00	9.863e+01	5.519e-03	1.509e-01
0.15	4.502e+13	3.655e+02	1.123e+04	6.018e-01	1.849e+01
0.2	8.823e+13	2.775e+03	7.882e+04	4.898e+00	1.391e+02
0.3	6.744e+13	9.844e+03	2.125e+05	1.867e+01	4.032e+02
0.4	3.177e+14	1.243e+05	2.056e+06	2.423e+02	4.006e+03
0.5	7.592e+14	6.190e+05	8.169e+06	1.215e+03	1.604e+04
0.6	7.339e+14	1.071e+06	1.169e+07	2.091e+03	2.281e+04
0.8	1.313e+15	4.682e+06	3.794e+07	8.905e+03	7.216e+04
1.0	5.820e+14	4.060e+06	2.629e+07	7.484e+03	4.847e+04
1.5	5.700e+14	1.265e+07	5.631e+07	2.128e+04	9.474e+04
2.0	1.595e+14	7.504e+06	2.673e+07	1.160e+04	4.133e+04
3.0	2.054e+13	2.498e+06	6.784e+06	3.390e+03	9.204e+03
4.0	1.249e+12	2.762e+05	6.341e+05	3.417e+02	7.845e+02
5.0	1.863e+11	6.272e+04	1.284e+05	7.190e+01	1.472e+02
TOTALS:	4.776e+15	3.356e+07	1.770e+08	5.665e+04	3.103e+05

	Sensitivity	Variable		(1 of 3)	(30.48 cm)
0.015	4.042e+08	0.000e+00	3.309e-26	0.000e+00	2.838e-27
0.02	7.059e+11	9.497e-192	9.094e-23	3.290e-193	3.150e-24
0.03	8.758e+13	1.035e-58	2.495e-20	1.026e-60	2.473e-22
0.04	2.305e+12	2.279e-27	1.742e-21	1.008e-29	7.703e-24
0.05	8.088e+12	7.914e-15	7.615e-14	2.108e-17	2.029e-16
0.06	2.067e+12	5.446e-10	9.958e-09	1.082e-12	1.978e-11
0.08	8.077e+12	7.656e-05	2.645e-03	1.212e-07	4.186e-06
0.1	9.578e+12	6.145e-03	3.215e-01	9.402e-06	4.918e-04
0.15	4.502e+13	1.835e+00	1.276e+02	3.022e-03	2.101e-01
0.2	8.823e+13	2.369e+01	1.602e+03	4.181e-02	2.828e+00
0.3	6.744e+13	1.596e+02	8.008e+03	3.028e-01	1.519e+01
0.4	3.177e+14	3.067e+03	1.117e+05	5.975e+00	2.176e+02
0.5	7.592e+14	2.081e+04	5.732e+05	4.084e+01	1.125e+03
0.6	7.339e+14	4.587e+04	9.993e+05	8.954e+01	1.951e+03
0.8	1.313e+15	2.885e+05	4.334e+06	5.488e+02	8.243e+03
1.0	5.820e+14	3.266e+05	3.691e+06	6.021e+02	6.804e+03
1.5	5.700e+14	1.583e+06	1.118e+07	2.664e+03	1.881e+04
2.0	1.595e+14	1.231e+06	6.540e+06	1.904e+03	1.011e+04
3.0	2.054e+13	5.626e+05	2.109e+06	7.633e+02	2.861e+03
4.0	1.249e+12	7.445e+04	2.256e+05	9.211e+01	2.791e+02
5.0	1.863e+11	1.897e+04	4.942e+04	2.175e+01	5.665e+01
TOTALS:	4.776e+15	4.156e+06	2.982e+07	6.733e+03	5.048e+04

	Sensitivity	Variable		(2 of 3)	(60.96 cm)
0.015	4.042e+08	0.000e+00	3.309e-26	0.000e+00	2.838e-27

Sensitivity Variable (2 of 3) (60.96 cm)

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.02	7.059e+11	4.764e-301	9.094e-23	1.650e-302	3.150e-24
0.03	8.758e+13	2.419e-94	2.495e-20	2.397e-96	2.473e-22
0.04	2.305e+12	3.693e-45	1.742e-21	1.633e-47	7.703e-24
0.05	8.088e+12	2.694e-26	1.998e-20	7.176e-29	5.321e-23
0.06	2.067e+12	1.181e-18	4.626e-17	2.345e-21	9.187e-20
0.08	8.077e+12	3.387e-11	2.240e-09	5.359e-14	3.545e-12
0.1	9.578e+12	2.290e-08	2.818e-06	3.504e-11	4.311e-09
0.15	4.502e+13	6.030e-05	1.249e-02	9.930e-08	2.056e-05
0.2	8.823e+13	2.248e-03	4.910e-01	3.968e-06	8.666e-04
0.3	6.744e+13	5.411e-02	8.442e+00	1.026e-04	1.601e-02
0.4	3.177e+14	2.379e+00	2.486e+02	4.635e-03	4.843e-01
0.5	7.592e+14	2.969e+01	2.183e+03	5.827e-02	4.285e+00
0.6	7.339e+14	1.053e+02	5.738e+03	2.056e-01	1.120e+01
0.8	1.313e+15	1.352e+03	4.586e+04	2.571e+00	8.722e+01
1.0	5.820e+14	2.575e+03	6.113e+04	4.746e+00	1.127e+02
1.5	5.700e+14	2.947e+04	3.845e+05	4.959e+01	6.469e+02
2.0	1.595e+14	3.865e+04	3.516e+05	5.977e+01	5.438e+02
3.0	2.054e+13	3.241e+04	1.898e+05	4.398e+01	2.575e+02
4.0	1.249e+12	6.050e+03	2.707e+04	7.484e+00	3.348e+01
5.0	1.863e+11	1.919e+03	7.092e+03	2.200e+00	8.130e+00

TOTALS: 4.776e+15 1.126e+05 1.075e+06 1.706e+02 1.706e+03

Energy MeV	Activity photons/sec	Sensitivity		Variable	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	4.042e+08	0.000e+00	3.309e-26	0.000e+00	2.838e-27
0.02	7.059e+11	0.000e+00	9.094e-23	0.000e+00	3.150e-24
0.03	8.758e+13	6.192e-130	2.495e-20	6.136e-132	2.473e-22
0.04	2.305e+12	6.574e-63	1.742e-21	2.907e-65	7.703e-24
0.05	8.088e+12	1.013e-37	1.998e-20	2.699e-40	5.321e-23
0.06	2.067e+12	2.845e-27	3.663e-20	5.651e-30	7.277e-23
0.08	8.077e+12	1.682e-17	1.611e-15	2.662e-20	2.549e-18
0.1	9.578e+12	9.644e-14	2.157e-11	1.475e-16	3.301e-14
0.15	4.502e+13	2.249e-09	9.942e-07	3.703e-12	1.637e-09
0.2	8.823e+13	2.420e-07	1.200e-04	4.272e-10	2.118e-07
0.3	6.744e+13	2.073e-05	7.145e-03	3.933e-08	1.355e-05
0.4	3.177e+14	2.079e-03	4.502e-01	4.050e-06	8.772e-04
0.5	7.592e+14	4.757e-02	6.881e+00	9.338e-05	1.351e-02
0.6	7.339e+14	2.709e-01	2.775e+01	5.288e-04	5.416e-02
0.8	1.313e+15	7.062e+00	4.200e+02	1.343e-02	7.990e-01
1.0	5.820e+14	2.253e+01	8.878e+02	4.154e-02	1.636e+00
1.5	5.700e+14	6.042e+02	1.201e+04	1.017e+00	2.021e+01
2.0	1.595e+14	1.328e+03	1.758e+04	2.053e+00	2.718e+01
3.0	2.054e+13	2.024e+03	1.628e+04	2.746e+00	2.209e+01
4.0	1.249e+12	5.290e+02	3.137e+03	6.544e-01	3.881e+00
5.0	1.863e+11	2.079e+02	9.940e+02	2.383e-01	1.140e+00

TOTALS: 4.776e+15 4.723e+03 5.134e+04 6.764e+00 7.700e+01

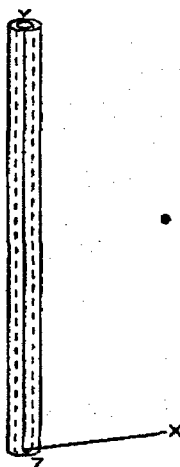
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2SP8RADP.MS5
 Run Date: August 18, 2005
 Run Time: 10:36:53 AM
 Duration: 00:01:29

EC-RADN-1135
 Page 271

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 1 Hour, RADTRAD + Cs-138, Rb-88, Br-84
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 304.8 cm 457.2 cm Z 0 cm
 10 ft 0.0 in 15 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	15.24 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	1.1071e-003	4.0963e+007	1.3610e-003	5.0357e+001
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	4.6968e+001	1.7378e+012	5.7740e+001	2.1364e+006
Ba-140	2.0946e+003	7.7500e+013	2.5750e+003	9.5275e+007
Br-84	4.9701e-002	1.8389e+009	6.1100e-002	2.2607e+003
Ce-141	1.9449e+001	7.1963e+011	2.3910e+001	8.8467e+005
Ce-143	1.5463e+001	5.7215e+011	1.9010e+001	7.0337e+005
Ce-144	1.6464e+001	6.0917e+011	2.0240e+001	7.4888e+005
Cm-242	2.9032e-001	1.0742e+010	3.5690e-001	1.3205e+004
Cm-244	1.6960e-002	6.2753e+008	2.0850e-002	7.7145e+002
Co-58	3.2090e-001	1.1873e+010	3.9450e-001	1.4597e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-136	3.9240e+002	1.4519e+013	4.8240e+002	1.7849e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
Cs-138	6.2350e-001	2.3070e+010	7.6650e-001	2.8361e+004
I-131	6.8337e+003	2.5285e+014	8.4010e+003	3.1084e+008
I-132	9.6799e+003	3.5816e+014	1.1900e+004	4.4030e+008
I-133	1.1372e+004	4.2076e+014	1.3980e+004	5.1726e+008
I-134	9.9728e+001	3.6899e+012	1.2260e+002	4.5362e+006
I-135	5.9357e+003	2.1962e+014	7.2970e+003	2.6999e+008
La-140	9.0454e+000	3.3468e+011	1.1120e+001	4.1144e+005
La-141	2.0450e+000	7.5665e+010	2.5140e+000	9.3018e+004
La-142	2.2182e-001	8.2075e+009	2.7270e-001	1.0090e+004
I-134	9.9728e+001	3.6899e+012	1.2260e+002	4.5362e+006
I-135	5.9357e+003	2.1962e+014	7.2970e+003	2.6999e+008

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Mo-99	1.0103e+002	3.7381e+012	1.2420e+002	4.5954e+006
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nd-147	3.0862e+000	1.1419e+011	3.7940e+000	1.4038e+005
Np-239	2.1036e+002	7.7832e+012	2.5860e+002	9.5682e+006
Pr-143	7.0167e+000	2.5962e+011	8.6260e+000	3.1916e+005
Pr-144	6.5840e+000	2.4361e+011	8.0940e+000	2.9948e+005
Pu-238	4.9628e-002	1.8362e+009	6.1010e-002	2.2574e+003
Pu-239	5.2540e-003	1.9440e+008	6.4590e-003	2.3898e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1640e+001	4.3069e+011	1.4310e+001	5.2947e+005
Rb-88	6.4424e+002	2.3837e+013	7.9200e+002	2.9304e+007
Rh-103m	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Rh-105	5.6949e+001	2.1071e+012	7.0010e+001	2.5904e+006
Rh-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Ru-103	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Ru-105	1.9124e+001	7.0759e+011	2.3510e+001	8.6987e+005
Ru-106	3.7239e+001	1.3779e+012	4.5780e+001	1.6939e+006
Sb-127	9.7287e+001	3.5996e+012	1.1960e+002	4.4252e+006
Sb-129	1.0811e+002	3.9999e+012	1.3290e+002	4.9173e+006
Sr-89	1.1225e+003	4.1534e+013	1.3800e+003	5.1060e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	7.9473e+002	2.9405e+013	9.7700e+002	3.6149e+007
Sr-92	1.9539e+002	7.2294e+012	2.4020e+002	8.8874e+006
Tc-99m	9.4359e+001	3.4913e+012	1.1600e+002	4.2920e+006
Te-127	1.0062e+002	3.7230e+012	1.2370e+002	4.5769e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	1.6627e+002	6.1519e+012	2.0440e+002	7.5628e+006
Te-129m	7.2242e+001	2.6729e+012	8.8810e+001	3.2860e+006
Te-131m	1.9539e+002	7.2294e+012	2.4020e+002	8.8874e+006
Te-132	1.5626e+003	5.7817e+013	1.9210e+003	7.1077e+007
Y-90	5.8917e-001	2.1799e+010	7.2430e-001	2.6799e+004
Y-91	5.8202e+000	2.1535e+011	7.1550e+000	2.6473e+005
Y-92	2.8430e+000	1.0519e+011	3.4950e+000	1.2932e+005
Y-93	2.7136e+000	1.0040e+011	3.3360e+000	1.2343e+005
Zr-95	8.3052e+000	3.0729e+011	1.0210e+001	3.7777e+005
Zr-97	5.9389e+000	2.1974e+011	7.3010e+000	2.7014e+005

Buildup
 The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Results

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u>		<u>Exposure Rate</u>	
		<u>MeV/cm²/sec</u>	<u>MeV/cm²/sec</u>	<u>mR/hr</u>	<u>mR/hr</u>
0.015	3.466e+08	<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
		1.022e-313	2.838e-26	8.764e-315	2.434e-27
0.02	6.789e+11	<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
		4.406e-137	8.746e-23	1.526e-138	3.030e-24
0.015	3.466e+08	<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
		1.022e-313	2.838e-26	8.764e-315	2.434e-27

Page : 3
 DOS File: 2SP8RADP.MS5
 Run Date: August 18, 2005
 Run Time: 10:36:53 AM
 Duration: 00:01:29

EC-RADN-1135
 Page 273

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec		Exposure Rate mR/hr	
		No Buildup	With Buildup	No Buildup	With Buildup
0.03	7.273e+13	6.105e-41	2.072e-20	6.051e-43	2.053e-22
0.04	1.553e+12	1.315e-18	5.364e-18	5.815e-21	2.372e-20
0.05	7.602e+12	4.428e-09	3.547e-08	1.179e-11	9.449e-11
0.06	2.018e+12	1.264e-05	1.620e-04	2.512e-08	3.218e-07
0.08	7.859e+12	1.258e-01	2.650e+00	1.991e-04	4.194e-03
0.1	8.560e+12	3.223e+00	8.814e+01	4.932e-03	1.348e-01
0.15	1.271e+13	1.032e+02	3.170e+03	1.699e-01	5.220e+00
0.2	6.160e+13	1.937e+03	5.503e+04	3.419e+00	9.712e+01
0.3	5.271e+13	7.693e+03	1.661e+05	1.459e+01	3.151e+02
0.4	2.330e+14	9.118e+04	1.508e+06	1.777e+02	2.938e+03
0.5	5.033e+14	4.103e+05	5.416e+06	8.054e+02	1.063e+04
0.6	5.541e+14	8.087e+05	8.822e+06	1.578e+03	1.722e+04
0.8	4.805e+14	1.714e+06	1.389e+07	3.260e+03	2.642e+04
1.0	2.388e+14	1.666e+06	1.079e+07	3.071e+03	1.989e+04
1.5	1.952e+14	4.331e+06	1.928e+07	7.287e+03	3.244e+04
2.0	4.189e+13	1.970e+06	7.018e+06	3.047e+03	1.085e+04
3.0	6.922e+11	8.419e+04	2.286e+05	1.142e+02	3.101e+02
4.0	3.471e+08	7.672e+01	1.761e+02	9.491e-02	2.179e-01
5.0	3.418e+10	1.150e+04	2.355e+04	1.319e+01	2.700e+01
TOTALS:	2.476e+15	1.110e+07	6.720e+07	1.937e+04	1.211e+05

Energy	Sensitivity	Variable	(1 of 3)		(30.48 cm)
			(1 of 3)	(30.48 cm)	
0.015	3.466e+08	0.000e+00	2.838e-26	0.000e+00	2.434e-27
0.02	6.789e+11	9.134e-192	8.746e-23	3.164e-193	3.030e-24
0.03	7.273e+13	8.596e-59	2.072e-20	8.519e-61	2.053e-22
0.04	1.553e+12	1.536e-27	1.174e-21	6.791e-30	5.190e-24
0.05	7.602e+12	7.438e-15	7.157e-14	1.982e-17	1.907e-16
0.06	2.018e+12	5.317e-10	9.722e-09	1.056e-12	1.931e-11
0.08	7.859e+12	7.449e-05	2.574e-03	1.179e-07	4.073e-06
0.1	8.560e+12	5.492e-03	2.873e-01	8.402e-06	4.395e-04
0.15	1.271e+13	5.182e-01	3.603e+01	8.533e-04	5.933e-02
0.2	6.160e+13	1.654e+01	1.119e+03	2.919e-02	1.975e+00
0.3	5.271e+13	1.248e+02	6.259e+03	2.367e-01	1.187e+01
0.4	2.330e+14	2.249e+03	8.190e+04	4.382e+00	1.596e+02
0.5	5.033e+14	1.379e+04	3.800e+05	2.707e+01	7.459e+02
0.6	5.541e+14	3.463e+04	7.544e+05	6.759e+01	1.473e+03
0.8	4.805e+14	1.056e+05	1.586e+06	2.009e+02	3.018e+03
1.0	2.388e+14	1.340e+05	1.515e+06	2.470e+02	2.792e+03
1.5	1.952e+14	5.422e+05	3.828e+06	9.122e+02	6.441e+03
2.0	4.189e+13	3.234e+05	1.717e+06	5.000e+02	2.656e+03
3.0	6.922e+11	1.896e+04	7.106e+04	2.572e+01	9.641e+01
4.0	3.471e+08	2.068e+01	6.267e+01	2.559e-02	7.753e-02
5.0	3.418e+10	3.479e+03	9.064e+03	3.989e+00	1.039e+01
TOTALS:	2.476e+15	1.178e+06	9.950e+06	1.989e+03	1.740e+04

Energy	Sensitivity	Variable	(2 of 3)		(60.96 cm)
			(2 of 3)	(60.96 cm)	
0.015	3.466e+08	0.000e+00	2.838e-26	0.000e+00	2.434e-27
0.02	6.789e+11	4.581e-301	8.746e-23	1.587e-302	3.030e-24

Energy	Sensitivity	Variable	(2 of 3)		(60.96 cm)
			(2 of 3)	(60.96 cm)	
0.015	3.466e+08	0.000e+00	2.838e-26	0.000e+00	2.434e-27

Page : 4
 DOS File: 2SP8RADP.MS5
 Run Date: August 18, 2005
 Run Time: 10:36:53 AM
 Duration: 00:01:29

EC-RADN-1135
 Page 274

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec		Exposure Rate mR/hr	
		No Buildup	With Buildup	No Buildup	With Buildup
0.03	7.273e+13	2.009e-94	2.072e-20	1.991e-96	2.053e-22
0.04	1.553e+12	2.488e-45	1.174e-21	1.101e-47	5.190e-24
0.05	7.602e+12	2.532e-26	1.877e-20	6.745e-29	5.001e-23
0.06	2.018e+12	1.153e-18	4.516e-17	2.289e-21	8.970e-20
0.08	7.859e+12	3.295e-11	2.179e-09	5.214e-14	3.449e-12
0.1	8.560e+12	2.047e-08	2.518e-06	3.132e-11	3.853e-09
0.15	1.271e+13	1.703e-05	3.526e-03	2.804e-08	5.806e-06
0.2	6.160e+13	1.570e-03	3.428e-01	2.770e-06	6.050e-04
0.3	5.271e+13	4.229e-02	6.598e+00	8.022e-05	1.252e-02
0.4	2.330e+14	1.744e+00	1.823e+02	3.399e-03	3.551e-01
0.5	5.033e+14	1.968e+01	1.447e+03	3.863e-02	2.841e+00
0.6	5.541e+14	7.952e+01	4.332e+03	1.552e-01	8.456e+00
0.8	4.805e+14	4.949e+02	1.679e+04	9.413e-01	3.193e+01
1.0	2.388e+14	1.056e+03	2.508e+04	1.947e+00	4.623e+01
1.5	1.952e+14	1.009e+04	1.316e+05	1.698e+01	2.215e+02
2.0	4.189e+13	1.015e+04	9.233e+04	1.570e+01	1.428e+02
3.0	6.922e+11	1.092e+03	6.396e+03	1.482e+00	8.677e+00
4.0	3.471e+08	1.680e+00	7.518e+00	2.079e-03	9.301e-03
5.0	3.418e+10	3.520e+02	1.301e+03	4.035e-01	1.491e+00
TOTALS:	2.476e+15	2.334e+04	2.795e+05	3.765e+01	4.643e+02

Energy MeV	Activity photons/sec	Sensitivity Variable		(3 of 3) (91.44 cm)	
		Variable	Variable	Variable	Variable
0.015	3.466e+08	0.000e+00	2.838e-26	0.000e+00	2.434e-27
0.02	6.789e+11	0.000e+00	8.746e-23	0.000e+00	3.030e-24
0.03	7.273e+13	5.142e-130	2.072e-20	5.096e-132	2.053e-22
0.04	1.553e+12	4.429e-63	1.174e-21	1.959e-65	5.190e-24
0.05	7.602e+12	9.521e-38	1.877e-20	2.536e-40	5.001e-23
0.06	2.018e+12	2.777e-27	3.577e-20	5.517e-30	7.104e-23
0.08	7.859e+12	1.637e-17	1.567e-15	2.590e-20	2.480e-18
0.1	8.560e+12	8.618e-14	1.928e-11	1.318e-16	2.950e-14
0.15	1.271e+13	6.349e-10	2.807e-07	1.046e-12	4.623e-10
0.2	6.160e+13	1.690e-07	8.380e-05	2.982e-10	1.479e-07
0.3	5.271e+13	1.620e-05	5.584e-03	3.074e-08	1.059e-05
0.4	2.330e+14	1.524e-03	3.301e-01	2.970e-06	6.432e-04
0.5	5.033e+14	3.154e-02	4.562e+00	6.191e-05	8.954e-03
0.6	5.541e+14	2.045e-01	2.095e+01	3.992e-04	4.089e-02
0.8	4.805e+14	2.585e+00	1.538e+02	4.917e-03	2.925e-01
1.0	2.388e+14	9.246e+00	3.643e+02	1.704e-02	6.714e-01
1.5	1.952e+14	2.069e+02	4.113e+03	3.481e-01	6.920e+00
2.0	4.189e+13	3.486e+02	4.615e+03	5.391e-01	7.136e+00
3.0	6.922e+11	6.820e+01	5.486e+02	9.253e-02	7.443e-01
4.0	3.471e+08	1.469e-01	8.714e-01	1.818e-04	1.078e-03
5.0	3.418e+10	3.812e+01	1.823e+02	4.370e-02	2.090e-01
TOTALS:	2.476e+15	6.741e+02	1.000e+04	1.046e+00	1.602e+01

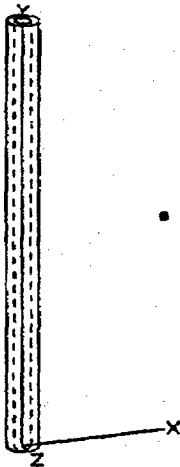
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2SP24RDP.MS5
 Run Date: August 18, 2005
 Run Time: 10:35:23 AM
 Duration: 00:01:29

EC-RADN-1135
 Page 275

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Suppression Pool
 Description: 24 Hour, RADTRAD + Cs-138, Rb-88, Br-84
 Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions
 Height 914.4 cm 30 ft
 Radius 16.828 cm 6.6 in

Dose Points
 # 1 X 304.8 cm 457.2 cm Z 0 cm
 10 ft 0.0 in 15 ft 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm ³	Water	1
Shield 1	15.24 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.953 cm	Iron	7.86

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded

Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	1.1103e-003	4.1081e+007	1.3649e-003	5.0503e+001
Ba-137m	1.7871e+002	6.6124e+012	2.1970e+002	8.1289e+006
Ba-139	1.8042e-002	6.6756e+008	2.2180e-002	8.2066e+002
Ba-140	2.0198e+003	7.4732e+013	2.4830e+003	9.1871e+007
Br-84	4.0591e-011	1.5019e+000	4.9900e-011	1.8463e-006
Ce-141	1.9205e+001	7.1060e+011	2.3610e+001	8.7357e+005
Ce-143	1.1055e+001	4.0902e+011	1.3590e+001	5.0283e+005
Ce-144	1.6375e+001	6.0586e+011	2.0130e+001	7.4481e+005
Cm-242	2.8999e-001	1.0730e+010	3.5650e-001	1.3191e+004
Cm-244	1.6993e-002	6.2873e+008	2.0890e-002	7.7293e+002
Co-58	3.1879e-001	1.1795e+010	3.9190e-001	1.4500e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2511e+003	4.6290e+013	1.5380e+003	5.6906e+007
Cs-136	3.7866e+002	1.4010e+013	4.6550e+002	1.7223e+007
Cs-137	9.4359e+002	3.4913e+013	1.1600e+003	4.2920e+007
Cs-138	6.6092e-010	2.4454e+001	8.1250e-010	3.0063e-005
I-131	6.5344e+003	2.4177e+014	8.0330e+003	2.9722e+008
I-132	8.3784e+003	3.1000e+014	1.0300e+004	3.8110e+008
I-133	6.6840e+003	2.4731e+014	8.2170e+003	3.0403e+008
I-134	3.7312e-004	1.3806e+007	4.5870e-004	1.6972e+001
I-135	1.0973e+003	4.0601e+013	1.3490e+003	4.9913e+007
La-140	8.8421e+000	3.2716e+011	1.0870e+001	4.0219e+005
La-141	1.2071e-001	4.4664e+009	1.4840e-001	5.4908e+003
La-142	1.4894e-004	5.5108e+006	1.8310e-004	6.7747e+000
La-143	3.7312e-004	1.3806e+007	4.5870e-004	1.6972e+001
La-145	1.0973e+003	4.0601e+013	1.3490e+003	4.9913e+007

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
Mo-99	8.5248e+001	3.1542e+012	1.0480e+002	3.8776e+006
Nb-95	8.3703e+000	3.0970e+011	1.0290e+001	3.8073e+005
Nd-147	2.9593e+000	1.0949e+011	3.6380e+000	1.3461e+005
Np-239	1.7294e+002	6.3987e+012	2.1260e+002	7.8662e+006
Pr-143	6.9500e+000	2.5715e+011	8.5440e+000	3.1613e+005
Pr-144	6.5506e+000	2.4237e+011	8.0530e+000	2.9796e+005
Pu-238	4.9709e+002	1.8392e+009	6.1110e-002	2.2611e+003
Pu-239	5.2621e-003	1.9470e+008	6.4690e-003	2.3935e+002
Pu-240	8.4760e-003	3.1361e+008	1.0420e-002	3.8554e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1347e+001	4.1986e+011	1.3950e+001	5.1615e+005
Rb-88	1.2926e+001	4.7825e+011	1.5890e+001	5.8793e+005
Rh-103m	9.1431e+001	3.3829e+012	1.1240e+002	4.1588e+006
Rh-105	4.3641e+001	1.6147e+012	5.3650e+001	1.9851e+006
Rh-106	3.7199e+001	1.3763e+012	4.5730e+001	1.6920e+006
Ru-103	9.1837e+001	3.3980e+012	1.1290e+002	4.1773e+006
Ru-105	1.5716e+000	5.8148e+010	1.9320e+000	7.1484e+004
Ru-106	3.7199e+001	1.3763e+012	4.5730e+001	1.6920e+006
Sb-127	8.6469e+001	3.1993e+012	1.0630e+002	3.9331e+006
Sb-129	8.7282e+000	3.2294e+011	1.0730e+001	3.9701e+005
Sr-89	1.1055e+003	4.0902e+013	1.3590e+003	5.0283e+007
Sr-90	1.4219e+002	5.2610e+012	1.7480e+002	6.4676e+006
Sr-91	2.4777e+002	9.1676e+012	3.0460e+002	1.1270e+007
Sr-92	3.2586e+000	1.2057e+011	4.0060e+000	1.4822e+005
Tc-99m	8.2320e+001	3.0458e+012	1.0120e+002	3.7444e+006
Te-127	9.3952e+001	3.4762e+012	1.1550e+002	4.2735e+006
Te-127m	1.7294e+001	6.3987e+011	2.1260e+001	7.8662e+005
Te-129	5.5452e+001	2.0517e+012	6.8170e+001	2.5223e+006
Te-129m	7.1412e+001	2.6422e+012	8.7790e+001	3.2482e+006
Te-131m	1.3471e+002	4.9841e+012	1.6560e+002	6.1272e+006
Te-132	1.3552e+003	5.0142e+013	1.6660e+003	6.1642e+007
Y-90	5.8470e-001	2.1634e+010	7.1880e-001	2.6596e+004
Y-91	5.8202e+000	2.1535e+011	7.1550e+000	2.6473e+005
Y-92	1.9222e-001	7.1120e+009	2.3630e-001	8.7431e+003
Y-93	9.0454e-001	3.3468e+010	1.1120e+000	4.1144e+004
Zr-95	8.2401e+000	3.0489e+011	1.0130e+001	3.7481e+005
Zr-97	3.0854e+000	1.1416e+011	3.7930e+000	1.4034e+005

Buildup
 The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec	MeV/cm ² /sec	mR/hr	mR/hr
0.015	2.845e+08	8.385e-314	2.329e-26	7.192e-315	1.998e-27
0.02	6.183e+11	4.014e-137	7.967e-23	1.390e-138	2.760e-24
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.015	2.845e+08	8.385e-314	2.329e-26	7.192e-315	1.998e-27

Page : 3
 DOS File: 2SP24RDP.MS5
 Run Date: August 18, 2005
 Run Time: 10:35:23 AM
 Duration: 00:01:29

EC-RADN-1135
 Page 277

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.03	6.381e+13	5.357e-41	1.818e-20	5.309e-43	1.802e-22
0.04	1.405e+12	1.189e-18	4.850e-18	5.258e-21	2.145e-20
0.05	6.594e+12	3.841e-09	3.077e-08	1.023e-11	8.196e-11
0.06	1.914e+12	1.200e-05	1.537e-04	2.383e-08	3.053e-07
0.08	7.437e+12	1.190e-01	2.508e+00	1.884e-04	3.969e-03
0.1	7.069e+12	2.662e+00	7.279e+01	4.073e-03	1.114e-01
0.15	1.128e+13	9.156e+01	2.812e+03	1.508e-01	4.631e+00
0.2	5.004e+13	1.574e+03	4.470e+04	2.778e+00	7.889e+01
0.3	4.150e+13	6.057e+03	1.308e+05	1.149e+01	2.481e+02
0.4	2.115e+14	8.278e+04	1.369e+06	1.613e+02	2.667e+03
0.5	3.218e+14	2.624e+05	3.463e+06	5.150e+02	6.797e+03
0.6	4.833e+14	7.054e+05	7.695e+06	1.377e+03	1.502e+04
0.8	3.874e+14	1.381e+06	1.120e+07	2.628e+03	2.129e+04
1.0	1.341e+14	9.354e+05	6.057e+06	1.724e+03	1.117e+04
1.5	7.818e+13	1.735e+06	7.724e+06	2.919e+03	1.299e+04
2.0	1.498e+13	7.046e+05	2.509e+06	1.090e+03	3.881e+03
3.0	2.521e+10	3.066e+03	8.326e+03	4.160e+00	1.130e+01
4.0	1.447e+05	3.198e-02	7.342e-02	3.956e-05	9.083e-05
5.0	6.857e+08	2.308e+02	4.725e+02	2.646e-01	5.417e-01
TOTALS:	1.823e+15	5.818e+06	4.020e+07	1.043e+04	7.416e+04

	Sensitivity	Variable		(1 of 3)	(30.48 cm)
0.015	2.845e+08	0.000e+00	2.329e-26	0.000e+00	1.998e-27
0.02	6.183e+11	8.320e-192	7.967e-23	2.882e-193	2.760e-24
0.03	6.381e+13	7.541e-59	1.818e-20	7.474e-61	1.802e-22
0.04	1.405e+12	1.389e-27	1.061e-21	6.142e-30	4.694e-24
0.05	6.594e+12	6.452e-15	6.208e-14	1.719e-17	1.654e-16
0.06	1.914e+12	5.044e-10	9.223e-09	1.002e-12	1.832e-11
0.08	7.437e+12	7.049e-05	2.436e-03	1.116e-07	3.854e-06
0.1	7.069e+12	4.535e-03	2.373e-01	6.938e-06	3.630e-04
0.15	1.128e+13	4.597e-01	3.197e+01	7.571e-04	5.264e-02
0.2	5.004e+13	1.344e+01	9.088e+02	2.372e-02	1.604e+00
0.3	4.150e+13	9.823e+01	4.927e+03	1.863e-01	9.347e+00
0.4	2.115e+14	2.042e+03	7.435e+04	3.978e+00	1.449e+02
0.5	3.218e+14	8.819e+03	2.430e+05	1.731e+01	4.769e+02
0.6	4.833e+14	3.021e+04	6.581e+05	5.896e+01	1.284e+03
0.8	3.874e+14	8.514e+04	1.279e+06	1.619e+02	2.432e+03
1.0	1.341e+14	7.525e+04	8.504e+05	1.387e+02	1.568e+03
1.5	7.818e+13	2.172e+05	1.533e+06	3.654e+02	2.580e+03
2.0	1.498e+13	1.156e+05	6.141e+05	1.788e+02	9.496e+02
3.0	2.521e+10	6.905e+02	2.588e+03	9.368e-01	3.511e+00
4.0	1.447e+05	8.620e-03	2.612e-02	1.066e-05	3.231e-05
5.0	6.857e+08	6.981e+01	1.819e+02	8.003e-02	2.085e-01
TOTALS:	1.823e+15	5.351e+05	5.261e+06	9.263e+02	9.450e+03

	Sensitivity	Variable		(2 of 3)	(60.96 cm)
0.015	2.845e+08	0.000e+00	2.329e-26	0.000e+00	1.998e-27
0.02	6.183e+11	4.173e-301	7.967e-23	1.445e-302	2.760e-24

	Sensitivity	Variable		(2 of 3)	(60.96 cm)
0.015	2.845e+08	0.000e+00	2.329e-26	0.000e+00	1.998e-27

Page : 4
 DOS File: 2SP24RDP.MS5
 Run Date: August 18, 2005
 Run Time: 10:35:23 AM
 Duration: 00:01:29

EC-RADN-1135
 Page 278

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.03	6.381e+13	1.762e-94	1.818e-20	1.747e-96	1.802e-22
0.04	1.405e+12	2.250e-45	1.061e-21	9.953e-48	4.694e-24
0.05	6.594e+12	2.196e-26	1.629e-20	5.850e-29	4.338e-23
0.06	1.914e+12	1.093e-18	4.284e-17	2.172e-21	8.509e-20
0.08	7.437e+12	3.118e-11	2.062e-09	4.934e-14	3.264e-12
0.1	7.069e+12	1.690e-08	2.080e-06	2.586e-11	3.182e-09
0.15	1.128e+13	1.511e-05	3.128e-03	2.488e-08	5.151e-06
0.2	5.004e+13	1.275e-03	2.785e-01	2.251e-06	4.915e-04
0.3	4.150e+13	3.329e-02	5.195e+00	6.316e-05	9.854e-03
0.4	2.115e+14	1.584e+00	1.655e+02	3.085e-03	3.224e-01
0.5	3.218e+14	1.258e+01	9.254e+02	2.470e-02	1.816e+00
0.6	4.833e+14	6.936e+01	3.779e+03	1.354e-01	7.376e+00
0.8	3.874e+14	3.989e+02	1.353e+04	7.588e-01	2.574e+01
1.0	1.341e+14	5.931e+02	1.408e+04	1.093e+00	2.596e+01
1.5	7.818e+13	4.042e+03	5.273e+04	6.801e+00	8.872e+01
2.0	1.498e+13	3.629e+03	3.302e+04	5.612e+00	5.105e+01
3.0	2.521e+10	3.978e+01	2.329e+02	5.397e-02	3.160e-01
4.0	1.447e+05	7.004e-04	3.134e-03	8.665e-07	3.877e-06
5.0	6.857e+08	7.062e+00	2.610e+01	8.096e-03	2.992e-02
TOTALS:	1.823e+15	8.794e+03	1.185e+05	1.449e+01	2.013e+02

Energy MeV	Activity photons/sec	Sensitivity		Variable	
		Variable	Variable	(3 of 3)	(91.44 cm)
0.015	2.845e+08	0.000e+00	2.329e-26	0.000e+00	1.998e-27
0.02	6.183e+11	0.000e+00	7.967e-23	0.000e+00	2.760e-24
0.03	6.381e+13	4.511e-130	1.818e-20	4.471e-132	1.802e-22
0.04	1.405e+12	4.006e-63	1.061e-21	1.772e-65	4.694e-24
0.05	6.594e+12	8.259e-38	1.629e-20	2.200e-40	4.338e-23
0.06	1.914e+12	2.635e-27	3.393e-20	5.233e-30	6.739e-23
0.08	7.437e+12	1.549e-17	1.483e-15	2.451e-20	2.347e-18
0.1	7.069e+12	7.117e-14	1.592e-11	1.089e-16	2.436e-14
0.15	1.128e+13	5.633e-10	2.491e-07	9.276e-13	4.101e-10
0.2	5.004e+13	1.373e-07	6.808e-05	2.423e-10	1.202e-07
0.3	4.150e+13	1.276e-05	4.397e-03	2.420e-08	8.340e-06
0.4	2.115e+14	1.384e-03	2.997e-01	2.696e-06	5.840e-04
0.5	3.218e+14	2.017e-02	2.917e+00	3.958e-05	5.725e-03
0.6	4.833e+14	1.784e-01	1.827e+01	3.482e-04	3.567e-02
0.8	3.874e+14	2.084e+00	1.239e+02	3.964e-03	2.357e-01
1.0	1.341e+14	5.192e+00	2.045e+02	9.570e-03	3.770e-01
1.5	7.818e+13	8.288e+01	1.647e+03	1.394e-01	2.772e+00
2.0	1.498e+13	1.247e+02	1.650e+03	1.928e-01	2.552e+00
3.0	2.521e+10	2.484e+00	1.998e+01	3.370e-03	2.711e-02
4.0	1.447e+05	6.125e-05	3.632e-04	7.577e-08	4.493e-07
5.0	6.857e+08	7.649e-01	3.658e+00	8.768e-04	4.194e-03
TOTALS:	1.823e+15	2.183e+02	3.671e+03	3.504e-01	6.010e+00

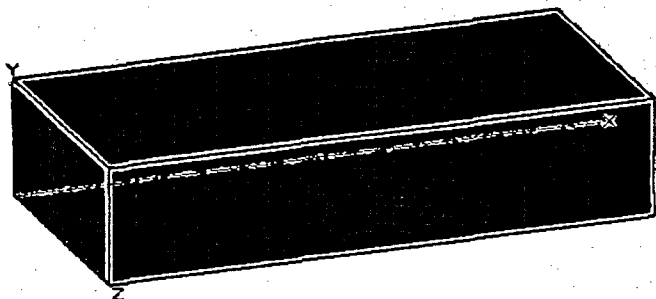
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1RB1RADP.MS5
 Run Date: August 18, 2005
 Run Time: 10:31:11 AM
 Duration: 00:00:27

EC-RADN-1135
 Page 279

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 1 Hour, RADTRAD + Cs-138, Xe-135m, Xe-138
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 14 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded

Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	5.6916e-001	2.1059e+010	8.6210e-005	3.1898e+000
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	7.5461e+005	2.7920e+016	1.1430e+002	4.2291e+006
Ba-140	1.0973e+006	4.0598e+016	1.6620e+002	6.1494e+006
Ce-141	1.0075e+004	3.7276e+014	1.5260e+000	5.6462e+004
Ce-143	9.2164e+003	3.4101e+014	1.3960e+000	5.1652e+004
Ce-144	8.4836e+003	3.1389e+014	1.2850e+000	4.7545e+004
Cm-242	1.4967e+002	5.5377e+012	2.2670e-002	8.3879e+002
Cm-244	8.7410e+000	3.2342e+011	1.3240e-003	4.8988e+001
Co-58	1.6584e+002	6.1362e+012	2.5120e-002	9.2944e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Cs-134	6.4501e+005	2.3866e+016	9.7700e+001	3.6149e+006
Cs-136	2.0552e+005	7.6042e+015	3.1130e+001	1.1518e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
Cs-138	2.5074e+006	9.2775e+016	3.7980e+002	1.4053e+007
I-131	3.6001e+006	1.3320e+017	5.4530e+002	2.0176e+007
I-132	5.2459e+006	1.9410e+017	7.9460e+002	2.9400e+007
I-133	7.3282e+006	2.7114e+017	1.1100e+003	4.1070e+007
I-134	5.8890e+006	2.1789e+017	8.9200e+002	3.3004e+007
I-135	6.4033e+006	2.3692e+017	9.6990e+002	3.5886e+007
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	2.6058e+006	9.6415e+016	3.9470e+002	1.4604e+007
Kr-87	3.5314e+006	1.3066e+017	5.3490e+002	1.9791e+007
Kr-88	6.5578e+006	2.4264e+017	9.9330e+002	3.6752e+007
La-140	4.6973e+003	1.7380e+014	7.1150e-001	2.6325e+004
La-141	3.6001e+003	1.3320e+014	5.4530e-001	2.0176e+004
Kr-85m	2.6058e+006	9.6415e+016	3.9470e+002	1.4604e+007
Kr-87	3.5314e+006	1.3066e+017	5.3490e+002	1.9791e+007

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
La-142	2.7775e+003	1.0277e+014	4.2070e-001	1.5566e+004
Mo-99	5.6150e+004	2.0775e+015	8.5050e+000	3.1469e+005
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nd-147	1.6201e+003	5.9945e+013	2.4540e-001	9.0798e+003
Np-239	1.1831e+005	4.3774e+015	1.7920e+001	6.6304e+005
Pr-143	3.6172e+003	1.3384e+014	5.4790e-001	2.0272e+004
Pr-144	3.3947e+003	1.2561e+014	5.1420e-001	1.9025e+004
Pu-238	2.5589e+001	9.4681e+011	3.8760e-003	1.4341e+002
Pu-239	2.7088e+000	1.0023e+011	4.1030e-004	1.5181e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Rb-86	6.0646e+003	2.2439e+014	9.1860e-001	3.3988e+004
Rh-103m	4.8003e+004	1.7761e+015	7.2710e+000	2.6903e+005
Rh-105	3.1287e+004	1.1576e+015	4.7390e+000	1.7534e+005
Rh-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Ru-103	4.8003e+004	1.7761e+015	7.2710e+000	2.6903e+005
Ru-105	2.9359e+004	1.0863e+015	4.4470e+000	1.6454e+005
Ru-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Sb-127	5.2288e+004	1.9346e+015	7.9200e+000	2.9304e+005
Sb-129	1.6842e+005	6.2314e+015	2.5510e+001	9.4387e+005
Sr-89	5.7860e+005	2.1408e+016	8.7640e+001	3.2427e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	6.8133e+005	2.5209e+016	1.0320e+002	3.8184e+006
Sr-92	6.0435e+005	2.2361e+016	9.1540e+001	3.3870e+006
Tc-99m	5.0149e+004	1.8555e+015	7.5960e+000	2.8105e+005
Te-127	5.2288e+004	1.9346e+015	7.9200e+000	2.9304e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	1.7918e+005	6.6296e+015	2.7140e+001	1.0042e+006
Te-129m	3.7374e+004	1.3828e+015	5.6610e+000	2.0946e+005
Te-131m	1.1831e+005	4.3774e+015	1.7920e+001	6.6304e+005
Te-132	8.5694e+005	3.1707e+016	1.2980e+002	4.8026e+006
Xe-133	2.3833e+007	8.8183e+017	3.6100e+003	1.3357e+008
Xe-135	8.9985e+006	3.3295e+017	1.3630e+003	5.0431e+007
Xe-135m	3.5657e+006	1.3193e+017	5.4010e+002	1.9984e+007
Xe-138	1.1058e+006	4.0916e+016	1.6750e+002	6.1975e+006
Y-90	3.0580e+002	1.1315e+013	4.6320e-002	1.7138e+003
Y-91	3.0178e+003	1.1166e+014	4.5710e-001	1.6913e+004
Y-92	3.0686e+003	1.1354e+014	4.6480e-001	1.7198e+004
Y-93	2.2632e+003	8.3737e+013	3.4280e-001	1.2684e+004
Zr-95	4.2999e+003	1.5910e+014	6.5130e-001	2.4098e+004
Zr-97	4.0886e+003	1.5128e+014	6.1930e-001	2.2914e+004

Buildup

The material reference is : Source

Integration Parameters

X Direction	25
Y Direction	25
Z Direction	25

Results

<u>Energy</u> <u>MeV</u>	<u>Activity</u> <u>photons/sec</u>	<u>Fluence Rate</u>		<u>Exposure Rate</u>	
		<u>MeV/cm²/sec</u> No Buildup	<u>MeV/cm²/sec</u> With Buildup	<u>mR/hr</u> No Buildup	<u>mR/hr</u> With Buildup
0.015	2.084e+11	2.054e+01	2.461e+01	1.761e+00	2.111e+00

Page : 3
 DOS File: 1RB1RADP.MS5
 Run Date: August 18, 2005
 Run Time: 10:31:11 AM
 Duration: 00:00:27

EC-RADN-1135
 Page 281

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.02	3.638e+14	1.049e+05	1.401e+05	3.633e+03	4.855e+03
0.03	5.093e+17	3.490e+08	5.444e+08	3.459e+06	5.396e+06
0.04	1.189e+15	1.226e+06	2.014e+06	5.421e+03	8.906e+03
0.05	4.168e+15	5.627e+06	9.371e+06	1.499e+04	2.496e+04
0.06	1.066e+15	1.767e+06	2.901e+06	3.510e+03	5.762e+03
0.08	3.278e+17	7.425e+08	1.154e+09	1.175e+06	1.826e+06
0.1	5.416e+15	1.556e+07	2.279e+07	2.380e+04	3.486e+04
0.15	1.070e+17	4.720e+08	6.405e+08	7.772e+05	1.055e+06
0.2	4.105e+17	2.453e+09	3.093e+09	4.330e+06	5.459e+06
0.3	6.198e+16	5.685e+08	6.772e+08	1.078e+06	1.285e+06
0.4	2.486e+17	3.088e+09	3.560e+09	6.017e+06	6.936e+06
0.5	4.971e+17	7.813e+09	8.812e+09	1.534e+07	1.730e+07
0.6	3.888e+17	7.401e+09	8.224e+09	1.445e+07	1.605e+07
0.8	7.066e+17	1.819e+10	1.980e+10	3.460e+07	3.765e+07
1.0	3.223e+17	1.048e+10	1.127e+10	1.932e+07	2.077e+07
1.5	3.408e+17	1.691e+10	1.785e+10	2.846e+07	3.003e+07
2.0	2.337e+17	1.563e+10	1.631e+10	2.417e+07	2.522e+07
3.0	2.794e+16	2.839e+09	2.929e+09	3.851e+06	3.973e+06
4.0	2.698e+12	3.682e+05	3.774e+05	4.555e+02	4.669e+02
TOTALS:	4.195e+18	8.696e+10	9.489e+10	1.571e+08	1.730e+08

MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1RB8RADP.MS5
 Run Date: August 18, 2005
 Run Time: 10:32:13 AM
 Duration: 00:00:32

EC-RADN-1135
 Page 282

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 8 Hour, RADTRAD + Cs-138, Xe-135m, Xe-138
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 14 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded

Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	5.7087e-001	2.1122e+010	8.6470e-005	3.1994e+000
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	2.4216e+004	8.9600e+014	3.6680e+000	1.3572e+005
Ba-140	1.0801e+006	3.9963e+016	1.6360e+002	6.0532e+006
Ce-141	1.0028e+004	3.7105e+014	1.5190e+000	5.6203e+004
Ce-143	7.9686e+003	2.9484e+014	1.2070e+000	4.4659e+004
Ce-144	8.4836e+003	3.1389e+014	1.2850e+000	4.7545e+004
Cm-242	1.4967e+002	5.5377e+012	2.2670e-002	8.3879e+002
Cm-244	8.7410e+000	3.2342e+011	1.3240e-003	4.8988e+001
Co-58	1.6545e+002	6.1215e+012	2.5060e-002	9.2722e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Cs-134	6.4501e+005	2.3866e+016	9.7700e+001	3.6149e+006
Cs-136	2.0229e+005	7.4845e+015	3.0640e+001	1.1337e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
Cs-138	3.2145e+002	1.1894e+013	4.8690e-002	1.8015e+003
I-131	3.5228e+006	1.3034e+017	5.3360e+002	1.9743e+007
I-132	4.9891e+006	1.8460e+017	7.5570e+002	2.7961e+007
I-133	5.8632e+006	2.1694e+017	8.8810e+002	3.2860e+007
I-134	5.1430e+004	1.9029e+015	7.7900e+000	2.8823e+005
I-135	3.0600e+006	1.1322e+017	4.6350e+002	1.7150e+007
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	8.8269e+005	3.2659e+016	1.3370e+002	4.9469e+006
Kr-87	7.7838e+004	2.8800e+015	1.1790e+001	4.3623e+005
Kr-88	1.1831e+006	4.3774e+016	1.7920e+002	6.6304e+006
La-140	4.6630e+003	1.7253e+014	7.0630e-001	2.6133e+004
La-141	1.0543e+003	3.9011e+013	1.5970e-001	5.9089e+003
Kr-85m	8.8269e+005	3.2659e+016	1.3370e+002	4.9469e+006
Kr-87	7.7838e+004	2.8800e+015	1.1790e+001	4.3623e+005

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
La-142	1.1435e+002	4.2308e+012	1.7320e-002	6.4084e+002
Mo-99	5.2077e+004	1.9268e+015	7.8880e+000	2.9186e+005
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nd-147	1.5911e+003	5.8870e+013	2.4100e-001	8.9170e+003
Np-239	1.0840e+005	4.0110e+015	1.6420e+001	6.0754e+005
Pr-143	3.6172e+003	1.3384e+014	5.4790e-001	2.0272e+004
Pr-144	3.3947e+003	1.2561e+014	5.1420e-001	1.9025e+004
Pu-238	2.5589e+001	9.4681e+011	3.8760e-003	1.4341e+002
Pu-239	2.7088e+000	1.0023e+011	4.1030e-004	1.5181e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Rb-86	6.0006e+003	2.2202e+014	9.0890e-001	3.3629e+004
Rh-103m	4.7785e+004	1.7681e+015	7.2380e+000	2.6781e+005
Rh-105	2.9359e+004	1.0863e+015	4.4470e+000	1.6454e+005
Rh-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Ru-103	4.7785e+004	1.7681e+015	7.2380e+000	2.6781e+005
Ru-105	9.8568e+003	3.6470e+014	1.4930e+000	5.5241e+004
Ru-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Sb-127	5.0149e+004	1.8555e+015	7.5960e+000	2.8105e+005
Sb-129	5.5714e+004	2.0614e+015	8.4390e+000	3.1224e+005
Sr-89	5.7860e+005	2.1408e+016	8.7640e+001	3.2427e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	4.0972e+005	1.5160e+016	6.2060e+001	2.2962e+006
Sr-92	1.0075e+005	3.7276e+015	1.5260e+001	5.6462e+005
Tc-99m	4.8643e+004	1.7998e+015	7.3680e+000	2.7262e+005
Te-127	5.1859e+004	1.9188e+015	7.8550e+000	2.9064e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	8.5694e+004	3.1707e+015	1.2980e+001	4.8026e+005
Te-129m	3.7242e+004	1.3779e+015	5.6410e+000	2.0872e+005
Te-131m	1.0075e+005	3.7276e+015	1.5260e+001	5.6462e+005
Te-132	8.0544e+005	2.9801e+016	1.2200e+002	4.5140e+006
Xe-133	2.3747e+007	8.7865e+017	3.5970e+003	1.3309e+008
Xe-135	1.1316e+007	4.1869e+017	1.7140e+003	6.3418e+007
Xe-135m	1.6630e+006	6.1533e+016	2.5190e+002	9.3203e+006
Xe-138	1.1223e-003	4.1527e+007	1.7000e-007	6.2900e-003
Y-90	3.0376e+002	1.1239e+013	4.6010e-002	1.7024e+003
Y-91	3.0006e+003	1.1102e+014	4.5450e-001	1.6817e+004
Y-92	1.4656e+003	5.4229e+013	2.2200e-001	8.2140e+003
Y-93	1.3990e+003	5.1762e+013	2.1190e-001	7.8403e+003
Zr-95	4.2827e+003	1.5846e+014	6.4870e-001	2.4002e+004
Zr-97	3.0620e+003	1.1329e+014	4.6380e-001	1.7161e+004

Buildup

The material reference is : Source

Integration Parameters

X Direction	25
Y Direction	25
Z Direction	25

Results

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u>		<u>Exposure Rate</u>	
		<u>MeV/cm²/sec</u> No Buildup	<u>MeV/cm²/sec</u> With Buildup	<u>mR/hr</u> No Buildup	<u>mR/hr</u> With Buildup
0.015	1.787e+11	1.761e+01	2.110e+01	1.510e+00	1.810e+00

Page : 3
 DOS File: 1RB8RADP.MS5
 Run Date: August 18, 2005
 Run Time: 10:32:13 AM
 Duration: 00:00:32

EC-RADN-1135
 Page 284

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec <u>No Buildup</u>	MeV/cm ² /sec <u>With Buildup</u>	mR/hr <u>No Buildup</u>	mR/hr <u>With Buildup</u>
0.02	3.499e+14	1.009e+05	1.348e+05	3.494e+03	4.668e+03
0.03	4.895e+17	3.354e+08	5.232e+08	3.324e+06	5.185e+06
0.04	8.007e+14	8.256e+05	1.357e+06	3.651e+03	5.999e+03
0.05	3.918e+15	5.289e+06	8.809e+06	1.409e+04	2.347e+04
0.06	1.040e+15	1.725e+06	2.831e+06	3.425e+03	5.623e+03
0.08	3.265e+17	7.396e+08	1.150e+09	1.170e+06	1.819e+06
0.1	4.498e+15	1.292e+07	1.892e+07	1.977e+04	2.895e+04
0.15	3.380e+16	1.491e+08	2.023e+08	2.455e+05	3.332e+05
0.2	4.203e+17	2.512e+09	3.166e+09	4.433e+06	5.588e+06
0.3	3.185e+16	2.922e+08	3.481e+08	5.542e+05	6.602e+05
0.4	1.253e+17	1.556e+09	1.794e+09	3.032e+06	3.495e+06
0.5	3.097e+17	4.867e+09	5.489e+09	9.553e+06	1.077e+07
0.6	2.987e+17	5.687e+09	6.319e+09	1.110e+07	1.233e+07
0.8	2.525e+17	6.501e+09	7.075e+09	1.237e+07	1.346e+07
1.0	1.266e+17	4.116e+09	4.425e+09	7.587e+06	8.156e+06
1.5	1.082e+17	5.371e+09	5.667e+09	9.036e+06	9.535e+06
2.0	4.558e+16	3.048e+09	3.180e+09	4.713e+06	4.918e+06
3.0	7.488e+14	7.608e+07	7.849e+07	1.032e+05	1.065e+05
4.0	1.111e+11	1.516e+04	1.554e+04	1.875e+01	1.922e+01
TOTALS:	2.580e+18	3.527e+10	3.945e+10	6.726e+07	7.643e+07

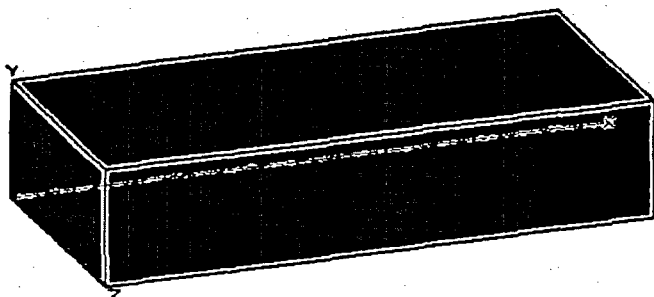
MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 1RB24RDP.MS5
 Run Date: August 18, 2005
 Run Time: 10:31:40 AM
 Duration: 00:00:30

EC-RADN-1135
 Page 285

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 24 Hour, RADTRAD + Cs-138, Xe-135m, Xe-138
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 14 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded

Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	5.7259e-001	2.1186e+010	8.6730e-005	3.2090e+000
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	9.3022e+000	3.4418e+011	1.4090e-003	5.2133e+001
Ba-140	1.0418e+006	3.8546e+016	1.5780e+002	5.8386e+006
Ce-141	9.9030e+003	3.6641e+014	1.5000e+000	5.5500e+004
Ce-143	5.7002e+003	2.1091e+014	8.6340e-001	3.1946e+004
Ce-144	8.4440e+003	3.1243e+014	1.2790e+000	4.7323e+004
Cm-242	1.4947e+002	5.5304e+012	2.2640e-002	8.3768e+002
Cm-244	8.7608e+000	3.2415e+011	1.3270e-003	4.9099e+001
Co-58	1.6439e+002	6.0824e+012	2.4900e-002	9.2130e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Cs-134	6.4501e+005	2.3866e+016	9.7700e+001	3.6149e+006
Cs-136	1.9522e+005	7.2232e+015	2.9570e+001	1.0941e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
Cs-138	3.4066e-007	1.2605e+004	5.1600e-011	1.9092e-006
I-131	3.3690e+006	1.2465e+017	5.1030e+002	1.8881e+007
I-132	4.3203e+006	1.5985e+017	6.5440e+002	2.4213e+007
I-133	3.4462e+006	1.2751e+017	5.2200e+002	1.9314e+007
I-134	1.9238e-001	7.1181e+009	2.9140e-005	1.0782e+000
I-135	5.6572e+005	2.0932e+016	8.5690e+001	3.1705e+006
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	7.4206e+004	2.7456e+015	1.1240e+001	4.1588e+005
Kr-87	1.2689e+001	4.6949e+011	1.9220e-003	7.1114e+001
Kr-88	2.3833e+004	8.8183e+014	3.6100e+000	1.3357e+005
La-140	4.5600e+003	1.6872e+014	6.9070e-001	2.5556e+004
La-141	5.2230e+001	2.3025e+012	9.4260e-003	3.4876e+002
Kr-85m	7.4206e+004	2.7456e+015	1.1240e+001	4.1588e+005
Xe-135	3.2698e+001	4.5049e+012	1.9230e-003	3.4316e+002

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
La-142	7.6781e-002	2.8409e+009	1.1630e-005	4.3031e-001
Mo-99	4.3936e+004	1.6256e+015	6.6550e+000	2.4624e+005
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nd-147	1.5257e+003	5.6452e+013	2.3110e-001	8.5507e+003
Np-239	8.9127e+004	3.2977e+015	1.3500e+001	4.9950e+005
Pr-143	3.5829e+003	1.3257e+014	5.4270e-001	2.0080e+004
Pr-144	3.3776e+003	1.2497e+014	5.1160e-001	1.8929e+004
Pu-238	2.5629e+001	9.4827e+011	3.8820e-003	1.4363e+002
Pu-239	2.7128e+000	1.0037e+011	4.1090e-004	1.5203e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Rb-86	5.8500e+003	2.1645e+014	8.8610e-001	3.2786e+004
Rh-103m	4.7145e+004	1.7444e+015	7.1410e+000	2.6422e+005
Rh-105	2.2500e+004	8.3249e+014	3.4080e+000	1.2610e+005
Rh-106	1.9179e+004	7.0962e+014	2.9050e+000	1.0748e+005
Ru-103	4.7363e+004	1.7524e+015	7.1740e+000	2.6544e+005
Ru-105	8.1006e+002	2.9972e+013	1.2270e-001	4.5399e+003
Ru-106	1.9179e+004	7.0962e+014	2.9050e+000	1.0748e+005
Sb-127	4.4577e+004	1.6493e+015	6.7520e+000	2.4982e+005
Sb-129	4.5006e+003	1.6652e+014	6.8170e-001	2.5223e+004
Sr-89	5.7008e+005	2.1093e+016	8.6350e+001	3.1950e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	1.2775e+005	4.7267e+015	1.9350e+001	7.1595e+005
Sr-92	1.6802e+003	6.2168e+013	2.5450e-001	9.4165e+003
Tc-99m	4.2431e+004	1.5699e+015	6.4270e+000	2.3780e+005
Te-127	4.8432e+004	1.7920e+015	7.3360e+000	2.7143e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	2.8587e+004	1.0577e+015	4.3300e+000	1.6021e+005
Te-129m	3.6819e+004	1.3623e+015	5.5770e+000	2.0635e+005
Te-131m	6.9453e+004	2.5698e+015	1.0520e+001	3.8924e+005
Te-132	6.9849e+005	2.5844e+016	1.0580e+002	3.9146e+006
Xe-133	2.3061e+007	8.5325e+017	3.4930e+003	1.2924e+008
Xe-135	6.3003e+006	2.3311e+017	9.5430e+002	3.5309e+007
Xe-135m	3.0772e+005	1.1386e+016	4.6610e+001	1.7246e+006
Xe-138				
Y-90	3.0145e+002	1.1154e+013	4.5660e-002	1.6894e+003
Y-91	3.0006e+003	1.1102e+014	4.5450e-001	1.6817e+004
Y-92	9.9096e+001	3.6665e+012	1.5010e-002	5.5537e+002
Y-93	4.6630e+002	1.7253e+013	7.0630e-002	2.6133e+003
Zr-95	4.2464e+003	1.5712e+014	6.4320e-001	2.3798e+004
Zr-97	1.5904e+003	5.8846e+013	2.4090e-001	8.9133e+003

Buildup

The material reference is : Source

Integration Parameters

X Direction	25
Y Direction	25
Z Direction	25

Results

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	1.466e+11	1.445e+01	1.732e+01	1.240e+00	1.486e+00

Page : 3
 DOS File: 1RB24RDP.MS5
 Run Date: August 18, 2005
 Run Time: 10:31:40 AM
 Duration: 00:00:30

EC-RADN-1135
 Page 287

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec		Exposure Rate mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.02	3.188e+14	9.190e+04	1.228e+05	3.183e+03	4.253e+03
0.03	4.556e+17	3.122e+08	4.870e+08	3.094e+06	4.826e+06
0.04	7.243e+14	7.468e+05	1.227e+06	3.303e+03	5.427e+03
0.05	3.399e+15	4.588e+06	7.641e+06	1.222e+04	2.035e+04
0.06	9.867e+14	1.636e+06	2.686e+06	3.250e+03	5.335e+03
0.08	3.170e+17	7.180e+08	1.116e+09	1.136e+06	1.766e+06
0.1	3.645e+15	1.047e+07	1.533e+07	1.602e+04	2.346e+04
0.15	8.591e+15	3.789e+07	5.142e+07	6.240e+04	8.468e+04
0.2	2.362e+17	1.412e+09	1.780e+09	2.492e+06	3.141e+06
0.3	2.178e+16	1.998e+08	2.380e+08	3.790e+05	4.515e+05
0.4	1.104e+17	1.372e+09	1.581e+09	2.673e+06	3.081e+06
0.5	1.752e+17	2.753e+09	3.105e+09	5.404e+06	6.095e+06
0.6	2.564e+17	4.882e+09	5.424e+09	9.529e+06	1.059e+07
0.8	1.998e+17	5.144e+09	5.598e+09	9.784e+06	1.065e+07
1.0	6.921e+16	2.250e+09	2.419e+09	4.148e+06	4.459e+06
1.5	4.046e+16	2.008e+09	2.119e+09	3.378e+06	3.565e+06
2.0	8.205e+15	5.487e+08	5.725e+08	8.485e+05	8.854e+05
3.0	1.288e+13	1.308e+06	1.350e+06	1.775e+03	1.831e+03
4.0	7.457e+07	1.018e+01	1.043e+01	1.259e-02	1.291e-02
TOTALS:	1.908e+18	2.166e+10	2.452e+10	4.297e+07	4.965e+07

MicroShield v5.01 (5.01-00076)
 Pennsylvania Power & Light Co.

Page : 1
 DOS File: 2RB1RADP.MS5
 Run Date: August 19, 2005
 Run Time: 3:37:13 PM
 Duration: 00:02:01

EC-RADN-1135
 Page 288

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

Case Title: Reactor Building Air
 Description: 1 Hour, RADTRAD + Cs-138, Xe-135m, Xe-138
 Geometry: 13 - Rectangular Volume



Source Dimensions
 Length 4.0e+3 cm 131 ft 0.0 in
 Width 1.9e+3 cm 63 ft
 Height 861.06 cm 28 ft 3.0 in

Dose Points
 # 1 X Y Z
 4297.68 cm 430.53 cm 960.12 cm
 141 ft 0.0 in 14 ft 1.5 in 31 ft 6.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm ³	Air	0.00122
Shield 1	15.24 cm	Concrete	2.35
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

Nuclide	curies	becquerels	μCi/cm ³	Bq/cm ³
Am-241	5.6916e-001	2.1059e+010	8.6210e-005	3.1898e+000
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	7.5461e+005	2.7920e+016	1.1430e+002	4.2291e+006
Ba-140	1.0973e+006	4.0598e+016	1.6620e+002	6.1494e+006
Ce-141	1.0075e+004	3.7276e+014	1.5260e+000	5.6462e+004
Ce-143	9.2164e+003	3.4101e+014	1.3960e+000	5.1652e+004
Ce-144	8.4836e+003	3.1389e+014	1.2850e+000	4.7545e+004
Cm-242	1.4967e+002	5.5377e+012	2.2670e-002	8.3879e+002
Cm-244	8.7410e+000	3.2342e+011	1.3240e-003	4.8988e+001
Co-58	1.6584e+002	6.1362e+012	2.5120e-002	9.2944e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Cs-134	6.4501e+005	2.3866e+016	9.7700e+001	3.6149e+006
Cs-136	2.0552e+005	7.6042e+015	3.1130e+001	1.1518e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
Cs-138	2.5074e+006	9.2775e+016	3.7980e+002	1.4053e+007
I-131	3.6001e+006	1.3320e+017	5.4530e+002	2.0176e+007
I-132	5.2459e+006	1.9410e+017	7.9460e+002	2.9400e+007
I-133	7.3282e+006	2.7114e+017	1.1100e+003	4.1070e+007
I-134	5.8890e+006	2.1789e+017	8.9200e+002	3.3004e+007
I-135	6.4033e+006	2.3692e+017	9.6990e+002	3.5886e+007
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	2.6058e+006	9.6415e+016	3.9470e+002	1.4604e+007
Kr-87	3.5314e+006	1.3066e+017	5.3490e+002	1.9791e+007
Kr-88	6.5578e+006	2.4264e+017	9.9330e+002	3.6752e+007
Xe-135m	4.6973e+003	1.7380e+014	7.1150e-001	2.6325e+004
Xe-138	1.6630e+003	6.1533e+015	2.5190e+001	9.3203e+005
Xe-139	2.6058e+006	9.6415e+016	3.9470e+002	1.4604e+007

Page : 2
 DOS File: 2RB1RADP.MS5
 Run Date: August 19, 2005
 Run Time: 3:37:13 PM
 Duration: 00:02:01

EC-RADN-1135
 Page 289

Nuclide	curies	becquerels	$\mu\text{Ci}/\text{cm}^3$	Bq/cm^3
La-141	3.6001e+003	1.3320e+014	5.4530e-001	2.0176e+004
La-142	2.7775e+003	1.0277e+014	4.2070e-001	1.5566e+004
Mo-99	5.6150e+004	2.0775e+015	8.5050e+000	3.1469e+005
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nd-147	1.6201e+003	5.9945e+013	2.4540e-001	9.0798e+003
Np-239	1.1831e+005	4.3774e+015	1.7920e+001	6.6304e+005
Pr-143	3.6172e+003	1.3384e+014	5.4790e-001	2.0272e+004
Pr-144	3.3947e+003	1.2561e+014	5.1420e-001	1.9025e+004
Pu-238	2.5589e+001	9.4681e+011	3.8760e-003	1.4341e+002
Pu-239	2.7088e+000	1.0023e+011	4.1030e-004	1.5181e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Rb-86	6.0646e+003	2.2439e+014	9.1860e-001	3.3988e+004
Rh-103m	4.8003e+004	1.7761e+015	7.2710e+000	2.6903e+005
Rh-105	3.1287e+004	1.1576e+015	4.7390e+000	1.7534e+005
Rh-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Ru-103	4.8003e+004	1.7761e+015	7.2710e+000	2.6903e+005
Ru-105	2.9359e+004	1.0863e+015	4.4470e+000	1.6454e+005
Ru-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Sb-127	5.2288e+004	1.9346e+015	7.9200e+000	2.9304e+005
Sb-129	1.6842e+005	6.2314e+015	2.5510e+001	9.4387e+005
Sr-89	5.7860e+005	2.1408e+016	8.7640e+001	3.2427e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	6.8133e+005	2.5209e+016	1.0320e+002	3.8184e+006
Sr-92	6.0435e+005	2.2361e+016	9.1540e+001	3.3870e+006
Tc-99m	5.0149e+004	1.8555e+015	7.5960e+000	2.8105e+005
Te-127	5.2288e+004	1.9346e+015	7.9200e+000	2.9304e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	1.7918e+005	6.6296e+015	2.7140e+001	1.0042e+006
Te-129m	3.7374e+004	1.3828e+015	5.6610e+000	2.0946e+005
Te-131m	1.1831e+005	4.3774e+015	1.7920e+001	6.6304e+005
Te-132	8.5694e+005	3.1707e+016	1.2980e+002	4.8026e+006
Xe-133	2.3833e+007	8.8183e+017	3.6100e+003	1.3357e+008
Xe-135	8.9985e+006	3.3295e+017	1.3630e+003	5.0431e+007
Xe-135m	3.5657e+006	1.3193e+017	5.4010e+002	1.9984e+007
Xe-138	1.1058e+006	4.0916e+016	1.6750e+002	6.1975e+006
Y-90	3.0580e+002	1.1315e+013	4.6320e-002	1.7138e+003
Y-91	3.0178e+003	1.1166e+014	4.5710e-001	1.6913e+004
Y-92	3.0686e+003	1.1354e+014	4.6480e-001	1.7198e+004
Y-93	2.2632e+003	8.3737e+013	3.4280e-001	1.2684e+004
Zr-95	4.2999e+003	1.5910e+014	6.5130e-001	2.4098e+004
Zr-97	4.0886e+003	1.5128e+014	6.1930e-001	2.2914e+004

Buildup

The material reference is : Shield 1

Integration Parameters

X Direction 25
 Y Direction 25
 Z Direction 25

Results

Z Direction 25

Page : 3
 DOS File: 2RB1RADP.MS5
 Run Date: August 19, 2005
 Run Time: 3:37:13 PM
 Duration: 00:02:01

EC-RADN-1135
 Page 290

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	2.084e+11	6.396e-127	1.085e-24	5.486e-128	9.310e-26
0.02	3.638e+14	9.221e-52	2.982e-21	3.194e-53	1.033e-22
0.03	5.093e+17	7.073e-11	1.433e-10	7.009e-13	1.420e-12
0.04	1.189e+15	3.700e-04	1.237e-03	1.636e-06	5.471e-06
0.05	4.168e+15	3.357e+00	1.804e+01	8.942e-03	4.806e-02
0.06	1.066e+15	3.185e+01	2.519e+02	6.326e-02	5.002e-01
0.08	3.278e+17	2.301e+05	2.862e+06	3.641e+02	4.530e+03
0.1	5.416e+15	1.530e+04	2.426e+05	2.340e+01	3.712e+02
0.15	1.070e+17	1.523e+06	2.729e+07	2.509e+03	4.494e+04
0.2	4.105e+17	1.417e+07	2.334e+08	2.501e+04	4.119e+05
0.3	6.198e+16	6.618e+06	8.281e+07	1.255e+04	1.571e+05
0.4	2.486e+17	5.681e+07	5.558e+08	1.107e+05	1.083e+06
0.5	4.971e+17	2.015e+08	1.603e+09	3.956e+05	3.146e+06
0.6	3.888e+17	2.488e+08	1.667e+09	4.856e+05	3.255e+06
0.8	7.066e+17	9.106e+08	4.697e+09	1.732e+06	8.934e+06
1.0	3.223e+17	7.023e+08	2.986e+09	1.294e+06	5.504e+06
1.5	3.408e+17	1.839e+09	5.699e+09	3.094e+06	9.588e+06
2.0	2.337e+17	2.284e+09	5.901e+09	3.533e+06	9.125e+06
3.0	2.794e+16	5.857e+08	1.221e+09	7.947e+05	1.656e+06
4.0	2.698e+12	9.234e+04	1.697e+05	1.142e+02	2.099e+02
TOTALS:	4.195e+18	6.852e+09	2.468e+10	1.148e+07	4.291e+07

	Sensitivity	Variable	Shield #1	(1 of 3)	(30.48 cm)
0.015	2.084e+11	8.384e-253	1.085e-24	7.191e-254	9.310e-26
0.02	3.638e+14	1.214e-106	2.982e-21	4.207e-108	1.033e-22
0.03	5.093e+17	6.871e-29	9.232e-18	6.810e-31	9.150e-20
0.04	1.189e+15	3.242e-13	1.316e-12	1.434e-15	5.820e-15
0.05	4.168e+15	4.502e-06	3.487e-05	1.199e-08	9.290e-08
0.06	1.066e+15	1.119e-03	1.458e-02	2.222e-06	2.896e-05
0.08	3.278e+17	1.207e+01	2.989e+03	1.910e-01	4.729e+00
0.1	5.416e+15	2.386e+01	8.802e+02	3.650e-02	1.347e+00
0.15	1.070e+17	7.253e+03	3.542e+05	1.194e+01	5.833e+02
0.2	4.105e+17	1.162e+05	5.476e+06	2.051e+02	9.665e+03
0.3	6.198e+16	1.043e+05	3.656e+06	1.978e+02	6.935e+03
0.4	2.486e+17	1.369e+06	3.523e+07	2.667e+03	6.865e+04
0.5	4.971e+17	6.644e+06	1.309e+08	1.304e+04	2.570e+05
0.6	3.888e+17	1.048e+07	1.646e+08	2.045e+04	3.213e+05
0.8	7.066e+17	5.543e+07	6.141e+08	1.054e+05	1.168e+06
1.0	3.223e+17	5.596e+07	4.770e+08	1.032e+05	8.792e+05
1.5	3.408e+17	2.291e+08	1.260e+09	3.854e+05	2.120e+06
2.0	2.337e+17	3.737e+08	1.584e+09	5.779e+05	2.450e+06
3.0	2.794e+16	1.317e+08	4.068e+08	1.787e+05	5.519e+05
4.0	2.698e+12	2.486e+04	6.337e+04	3.076e+01	7.840e+01
TOTALS:	4.195e+18	8.645e+08	4.683e+09	1.387e+06	7.833e+06

	Sensitivity	Variable	Shield #1	(2 of 3)	(60.96 cm)
0.015	2.084e+11	0.000e+00	1.085e-24	0.000e+00	9.310e-26
0.02	3.638e+14	4.077e-216	2.982e-21	1.412e-217	1.033e-22

	Sensitivity	Variable	Shield #1	(2 of 3)	(60.96 cm)
0.015	2.084e+11	0.000e+00	1.085e-24	0.000e+00	9.310e-26

Page : 4
 DOS File: 2RB1RADP.MS5
 Run Date: August 19, 2005
 Run Time: 3:37:13 PM
 Duration: 00:02:01

EC-RADN-1135
 Page 291

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec		Exposure Rate mR/hr	
		No Buildup	With Buildup	No Buildup	With Buildup
0.03	5.093e+17	1.104e-64	9.232e-18	1.095e-66	9.150e-20
0.04	1.189e+15	3.880e-31	5.714e-20	1.716e-33	2.527e-22
0.05	4.168e+15	1.196e-17	1.219e-16	3.186e-20	3.248e-19
0.06	1.066e+15	1.972e-12	5.324e-11	3.916e-15	1.058e-13
0.08	3.278e+17	4.570e-05	2.502e-03	7.232e-08	3.959e-06
0.1	5.416e+15	7.827e-05	7.846e-03	1.198e-07	1.200e-05
0.15	1.070e+17	2.163e-01	3.628e+01	3.562e-04	5.974e-02
0.2	4.105e+17	1.014e+01	1.777e+03	1.789e-02	3.137e+00
0.3	6.198e+16	3.290e+01	4.129e+03	6.240e-02	7.831e+00
0.4	2.486e+17	9.960e+02	8.454e+04	1.941e+00	1.647e+02
0.5	4.971e+17	8.944e+03	5.386e+05	1.756e+01	1.057e+03
0.6	3.888e+17	2.281e+04	1.025e+06	4.452e+01	2.001e+03
0.8	7.066e+17	2.480e+05	7.025e+06	4.716e+02	1.336e+04
1.0	3.223e+17	4.235e+05	8.486e+06	7.806e+02	1.564e+04
1.5	3.408e+17	4.134e+06	4.641e+07	6.955e+03	7.809e+04
2.0	2.337e+17	1.144e+07	9.058e+07	1.770e+04	1.401e+05
3.0	2.794e+16	7.455e+06	3.859e+07	1.011e+04	5.236e+04
4.0	2.698e+12	1.993e+03	7.958e+03	2.465e+00	9.844e+00
TOTALS:	4.195e+18	2.374e+07	1.928e+08	3.608e+04	3.028e+05

Energy MeV	Sensitivity	Variable	Shield #1 (3 of 3)		
			(91.44 cm)		
0.015	2.084e+11	0.000e+00	1.085e-24	0.000e+00	9.310e-26
0.02	3.638e+14	0.000e+00	2.982e-21	0.000e+00	1.033e-22
0.03	5.093e+17	2.266e-100	9.232e-18	2.246e-102	9.150e-20
0.04	1.189e+15	5.733e-49	5.714e-20	2.536e-51	2.527e-22
0.05	4.168e+15	3.836e-29	6.550e-19	1.022e-31	1.745e-21
0.06	1.066e+15	4.138e-21	1.236e-18	8.219e-24	2.454e-21
0.08	3.278e+17	2.030e-11	1.761e-09	3.212e-14	2.786e-12
0.1	5.416e+15	2.989e-10	5.751e-08	4.572e-13	8.798e-11
0.15	1.070e+17	7.432e-06	2.820e-03	1.224e-08	4.644e-06
0.2	4.105e+17	1.013e-03	4.287e-01	1.788e-06	7.567e-04
0.3	6.198e+16	1.180e-02	3.484e+00	2.238e-05	6.608e-03
0.4	2.486e+17	8.189e-01	1.530e+02	1.596e-03	2.982e-01
0.5	4.971e+17	1.354e+01	1.701e+03	2.658e-02	3.339e+00
0.6	3.888e+17	5.561e+01	4.974e+03	1.085e-01	9.709e+00
0.8	7.066e+17	1.235e+03	6.475e+04	2.348e+00	1.232e+02
1.0	3.223e+17	3.548e+03	1.242e+05	6.539e+00	2.290e+02
1.5	3.408e+17	8.175e+04	1.462e+06	1.375e+02	2.459e+03
2.0	2.337e+17	3.813e+05	4.571e+06	5.896e+02	7.068e+03
3.0	2.794e+16	4.547e+05	3.346e+06	6.168e+02	4.539e+03
4.0	2.698e+12	1.709e+02	9.329e+02	2.114e-01	1.154e+00
TOTALS:	4.195e+18	9.227e+05	9.575e+06	1.353e+03	1.443e+04

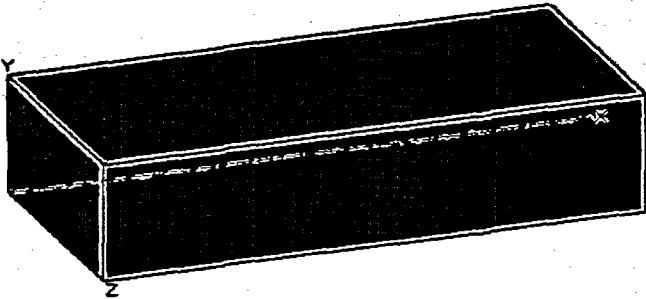
**MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.**

Page : 1
 DOS File: 2RB8RADP.MS5
 Run Date: August 19, 2005
 Run Time: 3:41:20 PM
 Duration: 00:02:01

EC-RADN-1135
 Page 292

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

**Case Title: Reactor Building Air
 Description: 8 Hour, RADTRAD + Cs-138, Xe-135m, Xe-138
 Geometry: 13 - Rectangular Volume**



Source Dimensions

Length	4.0e+3 cm	131 ft	0.0 in
Width	1.9e+3 cm		63 ft
Height	861.06 cm	28 ft	3.0 in

Dose Points

	<u>X</u>	<u>Y</u>	<u>Z</u>
# 1	4297.68 cm	430.53 cm	960.12 cm
	141 ft	1.5 in	31 ft 6.0 in

Shields

<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	6.60e+09 cm ³	Air	0.00122
Shield 1	15.24 cm	Concrete	2.35
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
Am-241	5.7087e-001	2.1122e+010	8.6470e-005	3.1994e+000
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	2.4216e+004	8.9600e+014	3.6680e+000	1.3572e+005
Ba-140	1.0801e+006	3.9963e+016	1.6360e+002	6.0532e+006
Ce-141	1.0028e+004	3.7105e+014	1.5190e+000	5.6203e+004
Ce-143	7.9686e+003	2.9484e+014	1.2070e+000	4.4659e+004
Ce-144	8.4836e+003	3.1389e+014	1.2850e+000	4.7545e+004
Cm-242	1.4967e+002	5.5377e+012	2.2670e-002	8.3879e+002
Cm-244	8.7410e+000	3.2342e+011	1.3240e-003	4.8988e+001
Co-58	1.6545e+002	6.1215e+012	2.5060e-002	9.2722e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Cs-134	6.4501e+005	2.3866e+016	9.7700e+001	3.6149e+006
Cs-136	2.0229e+005	7.4845e+015	3.0640e+001	1.1337e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
Cs-138	3.2145e+002	1.1894e+013	4.8690e-002	1.8015e+003
I-131	3.5228e+006	1.3034e+017	5.3360e+002	1.9743e+007
I-132	4.9891e+006	1.8460e+017	7.5570e+002	2.7961e+007
I-133	5.8632e+006	2.1694e+017	8.8810e+002	3.2860e+007
I-134	5.1430e+004	1.9029e+015	7.7900e+000	2.8823e+005
I-135	3.0600e+006	1.1322e+017	4.6350e+002	1.7150e+007
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	8.8269e+005	3.2659e+016	1.3370e+002	4.9469e+006
Kr-87	7.7838e+004	2.8800e+015	1.1790e+001	4.3623e+005
Kr-88	1.1831e+006	4.3774e+016	1.7920e+002	6.6304e+006
La-140	4.6630e+003	1.7253e+014	7.0630e-001	2.6133e+004
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	8.8269e+005	3.2659e+016	1.3370e+002	4.9469e+006

Page : 2
 DOS File: 2RB8RADP.MS5
 Run Date: August 19, 2005
 Run Time: 3:41:20 PM
 Duration: 00:02:01

EC-RADN-1135
 Page 293

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
La-141	1.0543e+003	3.9011e+013	1.5970e-001	5.9089e+003
La-142	1.1435e+002	4.2308e+012	1.7320e-002	6.4084e+002
Mo-99	5.2077e+004	1.9268e+015	7.8880e+000	2.9186e+005
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nd-147	1.5911e+003	5.8870e+013	2.4100e-001	8.9170e+003
Np-239	1.0840e+005	4.0110e+015	1.6420e+001	6.0754e+005
Pr-143	3.6172e+003	1.3384e+014	5.4790e-001	2.0272e+004
Pr-144	3.3947e+003	1.2561e+014	5.1420e-001	1.9025e+004
Pu-238	2.5589e+001	9.4681e+011	3.8760e-003	1.4341e+002
Pu-239	2.7088e+000	1.0023e+011	4.1030e-004	1.5181e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Rb-86	6.0006e+003	2.2202e+014	9.0890e-001	3.3629e+004
Rh-103m	4.7785e+004	1.7681e+015	7.2380e+000	2.6781e+005
Rh-105	2.9359e+004	1.0863e+015	4.4470e+000	1.6454e+005
Rh-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Ru-103	4.7785e+004	1.7681e+015	7.2380e+000	2.6781e+005
Ru-105	9.8568e+003	3.6470e+014	1.4930e+000	5.5241e+004
Ru-106	1.9199e+004	7.1035e+014	2.9080e+000	1.0760e+005
Sb-127	5.0149e+004	1.8555e+015	7.5960e+000	2.8105e+005
Sb-129	5.5714e+004	2.0614e+015	8.4390e+000	3.1224e+005
Sr-89	5.7860e+005	2.1408e+016	8.7640e+001	3.2427e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	4.0972e+005	1.5160e+016	6.2060e+001	2.2962e+006
Sr-92	1.0075e+005	3.7276e+015	1.5260e+001	5.6462e+005
Tc-99m	4.8643e+004	1.7998e+015	7.3680e+000	2.7262e+005
Te-127	5.1859e+004	1.9188e+015	7.8550e+000	2.9064e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	8.5694e+004	3.1707e+015	1.2980e+001	4.8026e+005
Te-129m	3.7242e+004	1.3779e+015	5.6410e+000	2.0872e+005
Te-131m	1.0075e+005	3.7276e+015	1.5260e+001	5.6462e+005
Te-132	8.0544e+005	2.9801e+016	1.2200e+002	4.5140e+006
Xe-133	2.3747e+007	8.7865e+017	3.5970e+003	1.3309e+008
Xe-135	1.1316e+007	4.1869e+017	1.7140e+003	6.3418e+007
Xe-135m	1.6630e+006	6.1533e+016	2.5190e+002	9.3203e+006
Xe-138	1.1223e-003	4.1527e+007	1.7000e-007	6.2900e-003
Y-90	3.0376e+002	1.1239e+013	4.6010e-002	1.7024e+003
Y-91	3.0006e+003	1.1102e+014	4.5450e-001	1.6817e+004
Y-92	1.4656e+003	5.4229e+013	2.2200e-001	8.2140e+003
Y-93	1.3990e+003	5.1762e+013	2.1190e-001	7.8403e+003
Zr-95	4.2827e+003	1.5846e+014	6.4870e-001	2.4002e+004
Zr-97	3.0620e+003	1.1329e+014	4.6380e-001	1.7161e+004

Buildup

The material reference is : Shield 1

Integration Parameters

X Direction 25
 Y Direction 25
 Z Direction 25

Results

Z Direction 25

Page : 3
 DOS File: 2RB8RADP.MS5
 Run Date: August 19, 2005
 Run Time: 3:41:20 PM
 Duration: 00:02:01

EC-RADN-1135
 Page 294

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm ² /sec		Exposure Rate mR/hr	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	1.787e+11	5.485e-127	9.308e-25	4.705e-128	7.984e-26
0.02	3.499e+14	8.867e-52	2.868e-21	3.072e-53	9.935e-23
0.03	4.895e+17	6.797e-11	1.377e-10	6.736e-13	1.365e-12
0.04	8.007e+14	2.492e-04	8.333e-04	1.102e-06	3.686e-06
0.05	3.918e+15	3.155e+00	1.696e+01	8.405e-03	4.518e-02
0.06	1.040e+15	3.108e+01	2.458e+02	6.174e-02	4.883e-01
0.08	3.265e+17	2.292e+05	2.851e+06	3.627e+02	4.512e+03
0.1	4.498e+15	1.270e+04	2.015e+05	1.943e+01	3.083e+02
0.15	3.380e+16	4.812e+05	8.621e+06	7.925e+02	1.420e+04
0.2	4.203e+17	1.451e+07	2.389e+08	2.561e+04	4.217e+05
0.3	3.185e+16	3.401e+06	4.256e+07	6.452e+03	8.073e+04
0.4	1.253e+17	2.863e+07	2.801e+08	5.578e+04	5.458e+05
0.5	3.097e+17	1.255e+08	9.985e+08	2.464e+05	1.960e+06
0.6	2.987e+17	1.912e+08	1.281e+09	3.731e+05	2.501e+06
0.8	2.525e+17	3.254e+08	1.679e+09	6.190e+05	3.193e+06
1.0	1.266e+17	2.758e+08	1.173e+09	5.084e+05	2.162e+06
1.5	1.082e+17	5.840e+08	1.810e+09	9.826e+05	3.045e+06
2.0	4.558e+16	4.455e+08	1.151e+09	6.890e+05	1.780e+06
3.0	7.488e+14	1.570e+07	3.272e+07	2.130e+04	4.439e+04
4.0	1.111e+11	3.802e+03	6.985e+03	4.703e+00	8.641e+00
TOTALS:	2.580e+18	2.011e+09	8.698e+09	3.529e+06	1.575e+07

	Sensitivity	Variable	Shield #1	(1 of 3)	(30.48 cm)
0.015	1.787e+11	7.189e-253	9.308e-25	6.166e-254	7.984e-26
0.02	3.499e+14	1.168e-106	2.868e-21	4.046e-108	9.935e-23
0.03	4.895e+17	6.603e-29	8.872e-18	6.544e-31	8.793e-20
0.04	8.007e+14	2.184e-13	8.864e-13	9.660e-16	3.920e-15
0.05	3.918e+15	4.232e-06	3.278e-05	1.127e-08	8.732e-08
0.06	1.040e+15	1.092e-03	1.423e-02	2.169e-06	2.826e-05
0.08	3.265e+17	1.202e+02	2.977e+03	1.903e-01	4.711e+00
0.1	4.498e+15	1.981e+01	7.309e+02	3.031e-02	1.118e+00
0.15	3.380e+16	2.291e+03	1.119e+05	3.773e+00	1.843e+02
0.2	4.203e+17	1.190e+05	5.606e+06	2.100e+02	9.895e+03
0.3	3.185e+16	5.358e+04	1.879e+06	1.016e+02	3.564e+03
0.4	1.253e+17	6.899e+05	1.776e+07	1.344e+03	3.460e+04
0.5	3.097e+17	4.139e+06	8.156e+07	8.124e+03	1.601e+05
0.6	2.987e+17	8.052e+06	1.265e+08	1.572e+04	2.468e+05
0.8	2.525e+17	1.981e+07	2.195e+08	3.768e+04	4.175e+05
1.0	1.266e+17	2.198e+07	1.873e+08	4.051e+04	3.453e+05
1.5	1.082e+17	7.273e+07	4.002e+08	1.224e+05	6.733e+05
2.0	4.558e+16	7.288e+07	3.090e+08	1.127e+05	4.778e+05
3.0	7.488e+14	3.529e+06	1.090e+07	4.788e+03	1.479e+04
4.0	1.111e+11	1.024e+03	2.609e+03	1.266e+00	3.228e+00
TOTALS:	2.580e+18	2.040e+08	1.360e+09	3.436e+05	2.384e+06

	Sensitivity	Variable	Shield #1	(2 of 3)	(60.96 cm)
0.015	1.787e+11	0.000e+00	9.308e-25	0.000e+00	7.984e-26
0.02	3.499e+14	3.920e-216	2.868e-21	1.358e-217	9.935e-23

	Sensitivity	Variable	Shield #1	(2 of 3)	(60.96 cm)
0.015	1.787e+11	0.000e+00	9.308e-25	0.000e+00	7.984e-26

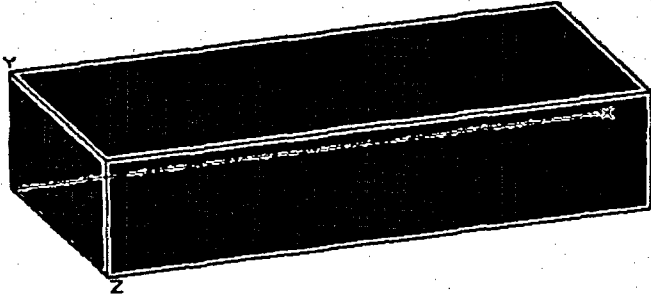
**MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.**

Page : 1
 DOS File: 2RB24RDP.MS5
 Run Date: August 19, 2005
 Run Time: 3:39:15 PM
 Duration: 00:02:04

EC-RADN-1135
 Page 296

File Ref: _____
 Date: _____
 By: _____
 Checked: _____

**Case Title: Reactor Building Air
 Description: 24 Hour, RADTRAD + Cs-138, Xe-135m, Xe-138
 Geometry: 13 - Rectangular Volume**



Source Dimensions

Length	4.0e+3 cm	131 ft 0.0 in
Width	1.9e+3 cm	63 ft
Height	861.06 cm	28 ft 3.0 in

Dose Points

	<u>X</u>	<u>Y</u>	<u>Z</u>
# 1	4297.68 cm	430.53 cm	960.12 cm
	141 ft 0.0 in	14 ft 1.5 in	31 ft 6.0 in

Shields

<u>Shield Name</u>	<u>Dimension</u>	<u>Material</u>	<u>Density</u>
Source	6.60e+09 cm ³	Air	0.00122
Shield 1	15.24 cm	Concrete	2.35
Air Gap		Air	0.00122

Source Input
 Grouping Method : Standard Indices
 Number of Groups : 25
 Lower Energy Cutoff : 0.015
 Photons < 0.015 : Excluded
 Library : Grove

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>μCi/cm³</u>	<u>Bq/cm³</u>
Am-241	5.7259e-001	2.1186e+010	8.6730e-005	3.2090e+000
Ba-137m	9.2164e+004	3.4101e+015	1.3960e+001	5.1652e+005
Ba-139	9.3022e+000	3.4418e+011	1.4090e-003	5.2133e+001
Ba-140	1.0418e+006	3.8546e+016	1.5780e+002	5.8386e+006
Ce-141	9.9030e+003	3.6641e+014	1.5000e+000	5.5500e+004
Ce-143	5.7002e+003	2.1091e+014	8.6340e-001	3.1946e+004
Ce-144	8.4440e+003	3.1243e+014	1.2790e+000	4.7323e+004
Cm-242	1.4947e+002	5.5304e+012	2.2640e-002	8.3768e+002
Cm-244	8.7608e+000	3.2415e+011	1.3270e-003	4.9099e+001
Co-58	1.6439e+002	6.0824e+012	2.4900e-002	9.2130e+002
Co-60	8.9391e+001	3.3075e+012	1.3540e-002	5.0098e+002
Cs-134	6.4501e+005	2.3866e+016	9.7700e+001	3.6149e+006
Cs-136	1.9522e+005	7.2232e+015	2.9570e+001	1.0941e+006
Cs-137	4.8643e+005	1.7998e+016	7.3680e+001	2.7262e+006
Cs-138	3.4066e-007	1.2605e+004	5.1600e-011	1.9092e-006
I-131	3.3690e+006	1.2465e+017	5.1030e+002	1.8881e+007
I-132	4.3203e+006	1.5985e+017	6.5440e+002	2.4213e+007
I-133	3.4462e+006	1.2751e+017	5.2200e+002	1.9314e+007
I-134	1.9238e-001	7.1181e+009	2.9140e-005	1.0782e+000
I-135	5.6572e+005	2.0932e+016	8.5690e+001	3.1705e+006
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Kr-85m	7.4206e+004	2.7456e+015	1.1240e+001	4.1588e+005
Kr-87	1.2689e+001	4.6949e+011	1.9220e-003	7.1114e+001
Kr-88	2.3833e+004	8.8183e+014	3.6100e+000	1.3357e+005
Xe-135m	4.5600e+003	1.6872e+014	6.9070e-001	2.5556e+004
Kr-85	1.6630e+005	6.1533e+015	2.5190e+001	9.3203e+005
Xe-135	7.4206e+004	2.7456e+015	1.1240e+001	4.1588e+005

Page : 4
 DOS File: 2RB8RADP.MS5
 Run Date: August 19, 2005
 Run Time: 3:41:20 PM
 Duration: 00:02:01

EC-RADN-1135
 Page 295

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.03	4.895e+17	1.061e-64	8.872e-18	1.052e-66	8.793e-20
0.04	8.007e+14	2.614e-31	3.849e-20	1.156e-33	1.702e-22
0.05	3.918e+15	1.124e-17	1.146e-16	2.995e-20	3.053e-19
0.06	1.040e+15	1.924e-12	5.196e-11	3.822e-15	1.032e-13
0.08	3.265e+17	4.553e-05	2.492e-03	7.204e-08	3.943e-06
0.1	4.498e+15	6.500e-05	6.516e-03	9.944e-08	9.968e-06
0.15	3.380e+16	6.833e-02	1.146e+01	1.125e-04	1.887e-02
0.2	4.203e+17	1.038e+01	1.820e+03	1.832e-02	3.211e+00
0.3	3.185e+16	1.691e+01	2.122e+03	3.207e-02	4.025e+00
0.4	1.253e+17	5.020e+02	4.260e+04	9.780e-01	8.301e+01
0.5	3.097e+17	5.572e+03	3.355e+05	1.094e+01	6.585e+02
0.6	2.987e+17	1.752e+04	7.876e+05	3.421e+01	1.537e+03
0.8	2.525e+17	8.862e+04	2.511e+06	1.686e+02	4.775e+03
1.0	1.266e+17	1.663e+05	3.333e+06	3.066e+02	6.143e+03
1.5	1.082e+17	1.313e+06	1.474e+07	2.208e+03	2.480e+04
2.0	4.558e+16	2.232e+06	1.767e+07	3.451e+03	2.732e+04
3.0	7.488e+14	1.998e+05	1.034e+06	2.711e+02	1.403e+03
4.0	1.111e+11	8.204e+01	3.276e+02	1.015e-01	4.053e-01
TOTALS:	2.580e+18	4.023e+06	4.045e+07	6.452e+03	6.672e+04
	Sensitivity	Variable	Shield #1	(3 of 3)	(91.44 cm)
0.015	1.787e+11	0.000e+00	9.308e-25	0.000e+00	7.984e-26
0.02	3.499e+14	0.000e+00	2.868e-21	0.000e+00	9.935e-23
0.03	4.895e+17	2.178e-100	8.872e-18	2.158e-102	8.793e-20
0.04	8.007e+14	3.862e-49	3.849e-20	1.708e-51	1.702e-22
0.05	3.918e+15	3.606e-29	6.157e-19	9.605e-32	1.640e-21
0.06	1.040e+15	4.039e-21	1.206e-18	8.022e-24	2.396e-21
0.08	3.265e+17	2.022e-11	1.754e-09	3.199e-14	2.775e-12
0.1	4.498e+15	2.482e-10	4.776e-08	3.797e-13	7.306e-11
0.15	3.380e+16	2.348e-06	8.909e-04	3.866e-09	1.467e-06
0.2	4.203e+17	1.037e-03	4.389e-01	1.830e-06	7.747e-04
0.3	3.185e+16	6.063e-03	1.790e+00	1.150e-05	3.396e-03
0.4	1.253e+17	4.127e-01	7.712e+01	8.042e-04	1.503e-01
0.5	3.097e+17	8.436e+00	1.060e+03	1.656e-02	2.080e+00
0.6	2.987e+17	4.273e+01	3.822e+03	8.340e-02	7.460e+00
0.8	2.525e+17	4.412e+02	2.314e+04	8.392e-01	4.402e+01
1.0	1.266e+17	1.393e+03	4.879e+04	2.568e+00	8.993e+01
1.5	1.082e+17	2.596e+04	4.642e+05	4.368e+01	7.810e+02
2.0	4.558e+16	7.436e+04	8.915e+05	1.150e+02	1.379e+03
3.0	7.488e+14	1.218e+04	8.966e+04	1.653e+01	1.216e+02
4.0	1.111e+11	7.036e+00	3.841e+01	8.704e-03	4.752e-02
TOTALS:	2.580e+18	1.144e+05	1.522e+06	1.787e+02	2.425e+03

Page : 2
 DOS File: 2RB24RDP.MS5
 Run Date: August 19, 2005
 Run Time: 3:39:15 PM
 Duration: 00:02:04

EC-RADN-1135
 Page 297

<u>Nuclide</u>	<u>curies</u>	<u>becquerels</u>	<u>µCi/cm³</u>	<u>Bq/cm³</u>
La-141	6.2230e+001	2.3025e+012	9.4260e-003	3.4876e+002
La-142	7.6781e-002	2.8409e+009	1.1630e-005	4.3031e-001
Mo-99	4.3936e+004	1.6256e+015	6.6550e+000	2.4624e+005
Nb-95	4.3151e+003	1.5966e+014	6.5360e-001	2.4183e+004
Nd-147	1.5257e+003	5.6452e+013	2.3110e-001	8.5507e+003
Np-239	8.9127e+004	3.2977e+015	1.3500e+001	4.9950e+005
Pr-143	3.5829e+003	1.3257e+014	5.4270e-001	2.0080e+004
Pr-144	3.3776e+003	1.2497e+014	5.1160e-001	1.8929e+004
Pu-238	2.5629e+001	9.4827e+011	3.8820e-003	1.4363e+002
Pu-239	2.7128e+000	1.0037e+011	4.1090e-004	1.5203e+001
Pu-240	4.3718e+000	1.6176e+011	6.6220e-004	2.4501e+001
Pu-241	1.0755e+003	3.9792e+013	1.6290e-001	6.0273e+003
Rb-86	5.8500e+003	2.1645e+014	8.8610e-001	3.2786e+004
Rh-103m	4.7145e+004	1.7444e+015	7.1410e+000	2.6422e+005
Rh-105	2.2500e+004	8.3249e+014	3.4080e+000	1.2610e+005
Rh-106	1.9179e+004	7.0962e+014	2.9050e+000	1.0748e+005
Ru-103	4.7363e+004	1.7524e+015	7.1740e+000	2.6544e+005
Ru-105	8.1006e+002	2.9972e+013	1.2270e-001	4.5399e+003
Ru-106	1.9179e+004	7.0962e+014	2.9050e+000	1.0748e+005
Sb-127	4.4577e+004	1.6493e+015	6.7520e+000	2.4982e+005
Sb-129	4.5006e+003	1.6652e+014	6.8170e-001	2.5223e+004
Sr-89	5.7008e+005	2.1093e+016	8.6350e+001	3.1950e+006
Sr-90	7.3282e+004	2.7114e+015	1.1100e+001	4.1070e+005
Sr-91	1.2775e+005	4.7267e+015	1.9350e+001	7.1595e+005
Sr-92	1.6802e+003	6.2168e+013	2.5450e-001	9.4165e+003
Tc-99m	4.2431e+004	1.5699e+015	6.4270e+000	2.3780e+005
Te-127	4.8432e+004	1.7920e+015	7.3360e+000	2.7143e+005
Te-127m	8.9127e+003	3.2977e+014	1.3500e+000	4.9950e+004
Te-129	2.8587e+004	1.0577e+015	4.3300e+000	1.6021e+005
Te-129m	3.6819e+004	1.3623e+015	5.5770e+000	2.0635e+005
Te-131m	6.9453e+004	2.5698e+015	1.0520e+001	3.8924e+005
Te-132	6.9849e+005	2.5844e+016	1.0580e+002	3.9146e+006
Xe-133	2.3061e+007	8.5325e+017	3.4930e+003	1.2924e+008
Xe-135	6.3003e+006	2.3311e+017	9.5430e+002	3.5309e+007
Xe-135m	3.0772e+005	1.1386e+016	4.6610e+001	1.7246e+006
Xe-138				
Y-90	3.0145e+002	1.1154e+013	4.5660e-002	1.6894e+003
Y-91	3.0006e+003	1.1102e+014	4.5450e-001	1.6817e+004
Y-92	9.9096e+001	3.6665e+012	1.5010e-002	5.5537e+002
Y-93	4.6630e+002	1.7253e+013	7.0630e-002	2.6133e+003
Zr-95	4.2464e+003	1.5712e+014	6.4320e-001	2.3798e+004
Zr-97	1.5904e+003	5.8846e+013	2.4090e-001	8.9133e+003

Buildup

The material reference is : Shield 1

Integration Parameters

X Direction 25
 Y Direction 25
 Z Direction 25

Results

Z Direction 25

Page : 3
 DOS File: 2RB24RDP.MS5
 Run Date: August 19, 2005
 Run Time: 3:39:15 PM
 Duration: 00:02:04

EC-RADN-1135
 Page 298

Energy MeV	Activity photons/sec	Fluence Rate		Exposure Rate	
		MeV/cm ² /sec No Buildup	MeV/cm ² /sec With Buildup	mR/hr No Buildup	mR/hr With Buildup
0.015	1.466e+11	4.502e-127	7.639e-25	3.861e-128	6.552e-26
0.02	3.188e+14	8.079e-52	2.613e-21	2.798e-53	9.051e-23
0.03	4.556e+17	6.326e-11	1.282e-10	6.270e-13	1.271e-12
0.04	7.243e+14	2.254e-04	7.538e-04	9.970e-07	3.334e-06
0.05	3.399e+15	2.737e+00	1.471e+01	7.291e-03	3.919e-02
0.06	9.867e+14	2.949e+01	2.332e+02	5.858e-02	4.632e-01
0.08	3.170e+17	2.225e+05	2.768e+06	3.521e+02	4.380e+03
0.1	3.645e+15	1.029e+04	1.633e+05	1.575e+01	2.498e+02
0.15	8.591e+15	1.223e+05	2.191e+06	2.014e+02	3.608e+03
0.2	2.362e+17	8.155e+06	1.343e+08	1.439e+04	2.370e+05
0.3	2.178e+16	2.326e+06	2.911e+07	4.412e+03	5.521e+04
0.4	1.104e+17	2.524e+07	2.469e+08	4.917e+04	4.811e+05
0.5	1.752e+17	7.103e+07	5.649e+08	1.394e+05	1.109e+06
0.6	2.564e+17	1.641e+08	1.100e+09	3.203e+05	2.147e+06
0.8	1.998e+17	2.575e+08	1.328e+09	4.898e+05	2.526e+06
1.0	6.921e+16	1.508e+08	6.412e+08	2.780e+05	1.182e+06
1.5	4.046e+16	2.183e+08	6.765e+08	3.673e+05	1.138e+06
2.0	8.205e+15	8.020e+07	2.072e+08	1.240e+05	3.204e+05
3.0	1.288e+13	2.700e+05	5.627e+05	3.663e+02	7.634e+02
4.0	7.457e+07	2.553e+00	4.690e+00	3.158e-03	5.803e-03
TOTALS:	1.908e+18	9.783e+08	4.934e+09	1.788e+06	9.205e+06

	Sensitivity	Variable	Shield #1	(1 of 3)	(30.48 cm)
0.015	1.466e+11	5.900e-253	7.639e-25	5.061e-254	6.552e-26
0.02	3.188e+14	1.064e-106	2.613e-21	3.686e-108	9.051e-23
0.03	4.556e+17	6.146e-29	8.258e-18	6.091e-31	8.184e-20
0.04	7.243e+14	1.976e-13	8.018e-13	8.738e-16	3.546e-15
0.05	3.399e+15	3.671e-06	2.843e-05	9.778e-09	7.574e-08
0.06	9.867e+14	1.036e-03	1.350e-02	2.058e-06	2.682e-05
0.08	3.170e+17	1.167e+02	2.890e+03	1.847e-01	4.573e+00
0.1	3.645e+15	1.605e+01	5.923e+02	2.456e-02	9.061e-01
0.15	8.591e+15	5.823e+02	2.844e+04	9.589e-01	4.683e+01
0.2	2.362e+17	6.688e+04	3.151e+06	1.180e+02	5.561e+03
0.3	2.178e+16	3.664e+04	1.285e+06	6.951e+01	2.437e+03
0.4	1.104e+17	6.081e+05	1.565e+07	1.185e+03	3.050e+04
0.5	1.752e+17	2.342e+06	4.614e+07	4.596e+03	9.058e+04
0.6	2.564e+17	6.912e+06	1.086e+08	1.349e+04	2.119e+05
0.8	1.998e+17	1.568e+07	1.737e+08	2.982e+04	3.303e+05
1.0	6.921e+16	1.202e+07	1.024e+08	2.215e+04	1.888e+05
1.5	4.046e+16	2.719e+07	1.496e+08	4.575e+04	2.517e+05
2.0	8.205e+15	1.312e+07	5.562e+07	2.029e+04	8.601e+04
3.0	1.288e+13	6.069e+04	1.875e+05	8.234e+01	2.544e+02
4.0	7.457e+07	6.874e-01	1.752e+00	8.504e-04	2.167e-03
TOTALS:	1.908e+18	7.803e+07	6.563e+08	1.375e+05	1.198e+06

	Sensitivity	Variable	Shield #1	(2 of 3)	(60.96 cm)
0.015	1.466e+11	0.000e+00	7.639e-25	0.000e+00	6.552e-26
0.02	3.188e+14	3.572e-216	2.613e-21	1.237e-217	9.051e-23

	Sensitivity	Variable	Shield #1	(2 of 3)	(60.96 cm)
0.015	1.466e+11	0.000e+00	7.639e-25	0.000e+00	6.552e-26

Page : 4
 DOS File: 2RB24RDP.MS5
 Run Date: August 19, 2005
 Run Time: 3:39:15 PM
 Duration: 00:02:04

EC-RADN-1135
 Page 299

<u>Energy</u> MeV	<u>Activity</u> photons/sec	<u>Fluence Rate</u> MeV/cm ² /sec		<u>Exposure Rate</u> mR/hr	
		<u>No Buildup</u>	<u>With Buildup</u>	<u>No Buildup</u>	<u>With Buildup</u>
0.03	4.556e+17	9.880e-65	8.258e-18	9.791e-67	8.184e-20
0.04	7.243e+14	2.364e-31	3.482e-20	1.046e-33	1.540e-22
0.05	3.399e+15	9.750e-18	9.940e-17	2.597e-20	2.648e-19
0.06	9.867e+14	1.826e-12	4.930e-11	3.627e-15	9.793e-14
0.08	3.170e+17	4.420e-05	2.419e-03	6.994e-08	3.828e-06
0.1	3.645e+15	5.267e-05	5.280e-03	8.059e-08	8.078e-06
0.15	8.591e+15	1.736e-02	2.913e+00	2.859e-05	4.796e-03
0.2	2.362e+17	5.833e+00	1.023e+03	1.029e-02	1.805e+00
0.3	2.178e+16	1.156e+01	1.451e+03	2.193e-02	2.753e+00
0.4	1.104e+17	4.425e+02	3.756e+04	8.621e-01	7.318e+01
0.5	1.752e+17	3.152e+03	1.898e+05	6.187e+00	3.725e+02
0.6	2.564e+17	1.504e+04	6.760e+05	2.936e+01	1.320e+03
0.8	1.998e+17	7.012e+04	1.986e+06	1.334e+02	3.778e+03
1.0	6.921e+16	9.093e+04	1.822e+06	1.676e+02	3.359e+03
1.5	4.046e+16	4.907e+05	5.510e+06	8.256e+02	9.270e+03
2.0	8.205e+15	4.018e+05	3.180e+06	6.213e+02	4.918e+03
3.0	1.288e+13	3.436e+03	1.779e+04	4.662e+00	2.413e+01
4.0	7.457e+07	5.509e-02	2.200e-01	6.815e-05	2.721e-04
TOTALS:	1.908e+18	1.076e+06	1.342e+07	1.789e+03	2.312e+04

<u>Energy</u> MeV	<u>Sensitivity</u>	<u>Variable</u>	<u>Shield #1</u>	<u>(3 of 3)</u>	
				<u>(3 of 3)</u>	<u>(91.44 cm)</u>
0.015	1.466e+11	0.000e+00	7.639e-25	0.000e+00	6.552e-26
0.02	3.188e+14	0.000e+00	2.613e-21	0.000e+00	9.051e-23
0.03	4.556e+17	2.027e-100	8.258e-18	2.009e-102	8.184e-20
0.04	7.243e+14	3.493e-49	3.482e-20	1.545e-51	1.540e-22
0.05	3.399e+15	3.128e-29	5.341e-19	8.332e-32	1.423e-21
0.06	9.867e+14	3.832e-21	1.144e-18	7.611e-24	2.273e-21
0.08	3.170e+17	1.963e-11	1.703e-09	3.106e-14	2.694e-12
0.1	3.645e+15	2.011e-10	3.870e-08	3.077e-13	5.921e-11
0.15	8.591e+15	5.967e-07	2.264e-04	9.826e-10	3.728e-07
0.2	2.362e+17	5.828e-04	2.467e-01	1.029e-06	4.354e-04
0.3	2.178e+16	4.146e-03	1.224e+00	7.865e-06	2.323e-03
0.4	1.104e+17	3.638e-01	6.798e+01	7.089e-04	1.325e-01
0.5	1.752e+17	4.773e+00	5.995e+02	9.368e-03	1.177e+00
0.6	2.564e+17	3.668e+01	3.281e+03	7.159e-02	6.404e+00
0.8	1.998e+17	3.491e+02	1.831e+04	6.640e-01	3.483e+01
1.0	6.921e+16	7.618e+02	2.668e+04	1.404e+00	4.917e+01
1.5	4.046e+16	9.705e+03	1.735e+05	1.633e+01	2.920e+02
2.0	8.205e+15	1.339e+04	1.605e+05	2.070e+01	2.482e+02
3.0	1.288e+13	2.096e+02	1.542e+03	2.843e-01	2.092e+00
4.0	7.457e+07	4.724e-03	2.579e-02	5.845e-06	3.191e-05
TOTALS:	1.908e+18	2.445e+04	3.845e+05	3.946e+01	6.339e+02